

B.—APPLIED CHEMISTRY

JULY 4 and 11, 1930.*

I.—GENERAL; PLANT; MACHINERY.

High-temperature furnace based on the surface-combustion principle. E. RYSCHKEWITSCH (Chem. Fabr., 1930, 61—63).—To operate a surface-combustion furnace necessitates the use of special mixing chambers for the gas and air and a higher gas velocity through the porous walls than the rate of flame propagation. It is not possible to preheat the air much, and it may be necessary to work with a reducing atmosphere. The furnace described avoids these disadvantages by the separate introduction of gas and air and the reduction of resistance to gas flow to a minimum. The combustion space lies between two concentric cylinders and contains vertical rods of refractory material parallel to the (upward) gas flow. The hot gases pass down outside the outer cylinder and then preheat the inlet air. Combustion is complete in about 0.01 sec., and it is possible to attain a temperature of 2100° with town's gas. At these temperatures the "contact effect" is independent of the chemical composition of the surfaces, and may be attributed to the liberation of free electrons rather than to adsorption. C. IRWIN.

Heat insulation. A. B. WINTERBOTTOM (Proc. Inst. Mech. Eng., 1929, 1075—1086).—The laws of the conduction, convection, and radiation of heat are summarised. In considering the transfer of heat through lagging it is convenient not to consider radiation and convection separately, but to treat each surface as having a "coefficient of emission or absorption" which under the conditions of many problems is substantially constant. A formula is given for the calculation of heat transference in terms of these quantities, surface, conductivity, and temperature difference. Apart from the use of a vacuum, the best insulating medium is stagnant air. This is usually obtained by using a substance having a cellular structure. For low temperatures compressed granulated cork is more reliable than slag wool. For temperatures from 8° to 20° hair felt is generally used, and for steam-plant insulation best results are obtained with kieselguhr plastic covered with slag wool or plastic magnesia and a setting composition. Removable insulating coverings are usually constructed of asbestos and magnesia. For superheated steam plastic magnesia cannot be applied direct owing to the possibility of dissociation, and kieselguhr must be used. A new cellular insulating substance of promise consists of crinkled aluminium foil. For high temperatures kieselguhr brick is usual. C. IRWIN.

Insulation of heated and cooled surfaces. J. F. S. GARD and R. S. ROBINSON (J.S.C.I., 1930, 49, 125—137 r).—Types of heat insulation for various conditions are discussed, and their outstanding advantages and disadvantages compared.

Information is given relating to the selection of suitable materials and their protection in service. Methods of testing are touched on, and the mathematical aspect of the subject is dealt with at length. Test results for different materials are compared and discussed. Examples of cost of application and fuel saving effected in specific cases of boilers, pipe lines, etc. are included. References are made to the further advantages to be derived from suitable insulation other than the primary object of fuel economy. A number of graphs and tables are included.

Multiple-bulb consistometer. W. H. HERSCHEL (J. Rheology, 1929, 1, 68—75).—The instrument consists of a U-tube, one arm of which is formed of six bulbs of 5-c.c. capacity, enabling the rate of flow at six different pressures to be measured. Narrow necks between the bulbs increase the accuracy of the instrument, and opacity of the liquid causes no difficulty, as the bulbs are being filled, not emptied. C. W. GIBBY.

Modified plastometer for industrial use. D. V. GREGORY, G. M. RASSWEILER, and K. C. LAMPERT (J. Rheology, 1929, 1, 30—45).—A plastometer is described for use with clear or coloured liquids of viscosities varying between those of raw linseed oil and pastes containing 90% of pigment; it is quick in action, and requires only 5 c.c. of liquid. The rate of flow of the liquid through one of a set of calibrated capillary tubes is measured, suction being applied by a filter pump connected to a pressure regulator, manometer, and ballast tank which also serves as a trap. The tubes are easily cleaned *in situ* by drawing through suitable solvents. C. W. GIBBY.

Orsat gas-analysis apparatus. BAHR.—See II.
Heating mixers with blast-furnace gas. D'HUART.
Steel for machines. DUESING. **Alloy steels for locomotives.** JOHNSON. **Heat-treatment of locomotive parts.** STANIER.—See X.

PATENTS.

Oil-heating furnace. L. DE FLOREZ (B.P. 328,064, 8.2.29).—It is desired that the heat from the flame be transmitted to the oil-carrying tubes by radiation alone. To this end the tubes are arranged as a cylindrical cage close to the walls of the furnace and the flame passes upwards (or downwards), without obstruction, along the axis of the cage; to keep the gases away from the tubes as far as possible without using shields, both the burner chamber and outlet flue are of smaller cross-section than that of the combustion chamber. The oil may flow through the tubes in series, in parallel, or series-parallel, and the gases after leaving the combustion chamber may pass through an air preheater of known convective type. B. M. VENABLES.

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

[Boiler] furnaces. J. F. O. STRATTON (B.P. 328,055, 28.1.29).—Means for supplying forced air through a jet formed between two grate-like carriages at the bottom of the combustion chamber are described.

B. M. VENABLES.

Centrifugal steam dryer or separator. W. H. TAYLOR and C. SHAW (B.P. 328,122, 30.4.29).—A stationary device suitable for placing inside a boiler or accumulator is described.

B. M. VENABLES.

Packing of tubular heat-exchangers. P. S. D. SMITH. From CRANE PACKING CO. (B.P. 328,066, 9.2.29).—The holes in the tube plates are rebated, the annular space between the tube and the larger part of the hole is filled with compressible packing, and the end of the tube is belled out.

B. M. VENABLES.

Heating and cooling of liquids and automatically controlling the temperature thereof. H. S. BENSON (B.P. 327,729, 9.1. and 28.3.29).—A heat-sensitive device (thermometer or thermostat) closes one of two electrical circuits which include solenoids at opposite ends of a tilting trough of mercury, the tilting of which closes other switches which operate the actual heat control.

B. M. VENABLES.

Refrigerant with low f.p. STRATMANN & WERNER (F.P. 637,898, 19.7.27).—A solution of crystallised calcium chloride (d 1.4) at 65° is mixed under pressure with a solution of magnesium chloride (d 1.3) at 18° which is circulating at high speed through a branched tube.

A. R. POWELL.

Desiccating apparatus. A. H. HARVEY, Assr. to BOWEN RES. CORP. (U.S.P. 1,745,168, 28.1.30. Appl., 8.5.28).—A desiccator, of the type in which the liquid is sprayed into a drying medium such as warm air, has the lower part of the apparatus, in which the dried material collects, arranged to telescope into the upper part so that the volume of the drying zone can be varied. The lower part is formed of pervious fabric, forms the outlet filter for the gases, and is preferably conical to collect the dried material; it is cooled by jets of cold air or other gas impinging on the outside, and the cooling and drying media flow away together.

B. M. VENABLES.

Homogenising or like mills for liquid-borne solids. W. EPPENBACH (B.P. 327,808, 13.2.29).—In a mill of the type in which discs rotate with relative velocity and small clearance, the working faces are provided with grooves which are saw-toothed in section, with the steep faces radial, and decrease in depth from the periphery. They may start from either the inner or outer periphery, according to whether the feed is supplied to the inside or outside, or they may be formed from both edges, but in every case an annular smooth zone is left to hinder the flow of the pulp; the shearing action of the teeth is believed to effect most of the reduction.

B. M. VENABLES.

Production of mixtures of finely-divided solids and gases. H. HARPER, R. SCOTT, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 327,840, 20.3.29).—The powder is tumbled in a barrel provided with longitudinal lifters. The gas is blown in and the mixture out through pipes which are on the axis and preferably have their openings adjacent to each other. The apparatus is

suitable for feeding a gas producer, *e.g.*, water-gas may be the conveying medium and the steam may be mixed subsequently.

B. M. VENABLES.

Vapour fractionation. J. C. MORRELL, Assr. to UNIVERSAL OIL PRODUCTS CO. (U.S.P. 1,738,386, 3.12.29. Appl., 25.4.27).—Below the trays of a fractionating column are placed diaphragms having depressions formed in them immediately under the downflow pipes and forming liquid seals for the latter. The remaining area of the diaphragms is perforated.

B. M. VENABLES.

Purifiers for evaporating apparatus. APPAREILS ET EVAPORATEURS KESTNER (B.P. 328,092, 20.3.29. Fr., 23.11.28).—A scrubber which is inserted in the vapour outlet of any stage of an evaporator is of the trickling type, which does not throw any back-pressure in spite of the flow of liquid being countercurrent to the vapour.

B. M. VENABLES.

Fluids for use in fluid-pressure apparatus. HYDRAULIC BRAKE CO., Assees. of A. T. K. TSENG (B.P. 299,370, 19.10.28. U.S., 24.10.27).—A fluid which has a higher b.p., lower vapour pressure, and more uniform viscosity than alcoholic mixtures, and which remains liquid even at -35° , does not affect metals or rubber, and is unlikely to form acids, is made by mixing an oil (preferably castor oil) with diacetone alcohol, preferably in equal parts, with addition of a metallic hydroxide if desired.

B. M. VENABLES.

Apparatus for bringing liquids and gases, or different liquids, into intimate contact. LEVER BROS., LTD., P. PRITCHARD, and R. CRAIG (B.P. 327,748, 11.1.29).—D-Shaped transverse baffles are inserted in a trough or pipe and by means of ports alternately on either side of the axis the liquid is caused to flow in a zigzag manner; meanwhile the other fluid is forced into it through passages with outlet jets formed in the baffles, which are of cast material, and when a number are assembled in abutting relation a common inlet passage is formed.

B. M. VENABLES.

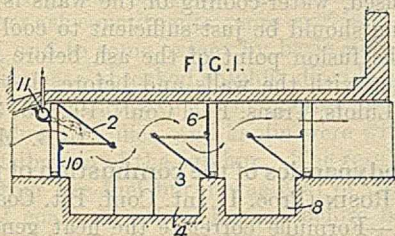
Centrifugal apparatus for separating and collecting dust or other solid particles from air and gases. C. H. W. CHELTNAM (B.P. 327,703, 5.12.28).—In a cyclone separator the lower, inverted, conical wall reverses to an upright cone and then reverts to an inverted cone so that a zone of increased diameter is formed, within which may be placed a baffle to prevent disturbance of the settled dust by the outgoing air. In the gas outlet is placed a diffuser in order to recover the dynamic head of the whirling gases; it comprises a double-conical thimble with sleeve, the outlet being through the annular space.

B. M. VENABLES.

Gas-washing towers. H. A. BRASSER & Co. (B.P. 304,753, 3.12.28. U.S., 27.1.28).—The tower is constructed of a number of superposed cylindrical sections decreasing in diameter upwards and alternating with tapered or stepped sections which are not provided with filling. The lower edge of every cylindrical shell extends below the joint, so that any liquid running down the wall will fall clear and be dispersed on the hurdles or other filling next below. The area of the sections may be proportional to the volume of the gases as reduced by absorption and/or reduction of temperature.

B. M. VENABLES.

Device for separating unburnt particles from hot gases. G. KAMP (B.P. 309,045, 3.4.29. Holl., 3.4.28).—The gases are passed through a flue having



inclined baffles and doors for withdrawal of dust, as shown in the figure. The flue may encircle the base of a chimney.

B. M. VENABLES.

Re-activation of catalysts. L'AIR LIQUIDE SOC. ANON. POUR L'ETUDE DE L'EXPLOIT. DES PROC. G. CLAUDE (B.P. 301,736, 1.12.28. Fr., 3.12.27).—Reduced metals, e.g., iron or copper, which have been used for removing oxides of nitrogen from gas mixtures, are re-activated by washing the catalyst with a solution of uncombined alkali or alkaline salts, including ammonia.

C. A. KING.

Effecting catalytic reactions between gases under pressure and at high temperature. S. G. S. DICKER. From M. CASALE-SACCHI (B.P. 328,139, 22.5.29).—All the operations of preheating, catalysing, recovery of heat, final cooling, condensation, and separation of products are carried out in one pressure-tight casing which is divided into annular compartments for the various functions, the innermost or catalytic zone being provided with an electric heater and the outermost with a cooling coil or other means of condensing the products; if necessary, the pressure-tight outer wall and covers may also be cooled. The recirculation of the residual gas is effected by an injector worked by the incoming fresh gas.

B. M. VENABLES.

Measurement of heat-quantities. SIEMENS & HALSKE A.-G. (B.P. 305,532, 16.1.29. Ger., 6.2.28).—A testing chamber is attached to the surface from which the flow of heat is to be measured, and in it are placed two temperature-sensitive devices, such as bimetallic coils, both approximately in the same place, but in line with the flow of heat, so that the second one will need a supplementary supply of heat to equalise the temperature of both. The supplementary supply is electrical and the bimetallic strips operate contacts, so that the current is on when there is any difference in temperature, and off (or reduced) when the temperature becomes equal. The supply of electrical heat is measured by a watt-hour meter, and is proportional to the integrated heat flow from the surface.

B. M. VENABLES.

[Recording] pyrometers adapted to the control of temperature. J. BRIDGES, and ELECTROFLO METERS Co., LTD. (B.P. 327,861, 12.4.29).—The pointer of such an instrument, while clamped by the printing bar, detains or allows to fall fully a tongue which drops in such a direction that no torque is exerted on the pointer. The tongue is adjustable longitudinally of the scale according to the temperature desired, and makes appropriate electrical contacts, which, though they operate at every recording period, only carry current

in the event of an adjustment to the heat supply being necessary.

B. M. VENABLES.

Thermostats. J. H. GRAYSON (B.P. 327,775, 21.1.29).—A tube and rod of different metals are connected together at one end, and the other end of the rod operates a plunger having a circular ridge on its face which engages with a thin convex disc of slightly larger diameter, and has its edge supported, but not clamped. The other side of the disc engages centrally with the stem of a poppet valve which controls the heating fluid. The valve may be arranged to open gradually or with a snap, the latter if the disc is allowed to buckle over the dead-centre; in either case the disc acts as a magnifying lever and the desired temperature may be adjusted by altering the length of the rod, it having a screwed joint for this purpose.

B. M. VENABLES.

Continuous absorption refrigerating apparatus. R. F. BOSSINI and G. MAIURI (U.S.P. 1,758,215, 13.5.30. Appl., 28.3.29. U.K., 11.4.28).—See B.P. 307,236; B., 1929, 501.

Centrifugal machines. SHARPLES SPECIALTY Co., Assees. of A. U. AYRES (B.P. 306,079, 29.1.26. U.S., 15.2.28).—See U.S.P. 1,737,137; B., 1930, 223.

Filter for liquids. A. GRÖNNING (U.S.P. 1,758,284, 13.5.30. Appl., 13.9.27. Denm., 25.7.27).—See B.P. 300,600; B., 1929, 80.

Apparatus for removing dust from gases or vapours. E. M. SALERNI, ASST. to E.M.S. INDUSTRIAL PROCESSES, LTD. (U.S.P. 1,758,624, 13.5.30. Appl., 31.10.25. U.K., 10.11.24).—See B.P. 247,274; B., 1926, 304.

Furnace walls. M. H. DETRICK Co. (B.P. 328,651, 8.2.29. U.S., 30.11.28).

Continuous production of cold by the compression method. DEUTS. GASGLÜHLICHT-AUER.-GES.M.B.H. (B.P. 310,474, 25.4.29. Ger., 26.4.28).

Jacketed metal drums. F. KRUPP A.-G. (B.P. 328,902, 30.9.29. Ger., 27.10.28. Addn. to B.P. 310,531).

Separation of particles from gases (B.P. 327,622).—See II. **Gas containers** (B.P. 304,775).—See VI. **Inert atmospheres** (U.S.P. 1,743,167).—See XI.

II.—FUEL; GAS; TAR; MINERAL OILS.

Lignins of some peat-forming plants and of a sphagnum peat. II. G. STADNIKOV and A. BARYSCHEVA (Brennstoff-Chem., 1930, 11, 169—171; cf. B., 1930, 308).—Lignins isolated from samples of peat taken from a sphagnum peat bog at depths of 1.5 and 2 m. were similar in composition to the lignin of cotton grass (*Eriophorum vaginatum*) which has been shown to be represented by the formula $C_{50}H_{49}O_{11}(OMe)_2(CO_2H)(OH)_4$. It is concluded that the peat bog was originally formed from both sphagnum moss and cotton grass, but that the lignin of the former was transformed into humic acids more rapidly than that of the latter. The slow rate of transformation of wood and cotton-grass lignin is attributed to its colloidal nature, rather than to the antiseptic action of the accompanying resins.

One of the first stages in the transformation of lignin into humic acid, as shown by a comparison of lignins isolated from peat samples taken from different depths in the bog, is the loss of methoxyl groups.

A. B. MANNING.

Brown coal as a raw material for gas production.

W. HAUSWALD (Brennstoff-Chem., 1930, 11, 151—152, 172—174).—The possibility of producing town's gas from brown coal is discussed. High-temperature carbonisation has disadvantages, particularly the action of the ash on the retort walls, the somewhat low calorific value of the gas, and the difficulty of disposing of the coke. Low-temperature carbonisation yields a gas which when diluted with water-gas to the desired calorific value has still too high a sp. gr. and carbon monoxide content. Other suggested processes depend on subjecting the gases and tar vapours issuing from the retort to further heat-treatment. A gas of the desired properties could probably be produced by gasifying the brown coal in a suitably designed generator.

A. B. MANNING.

Combustion of powdered fuel.

A. L. GODBERT (Fuel, 1930, 9, 57—75).—For the most efficient utilisation of powdered fuel in a furnace, the thermal intensity of the combustion should be maintained at its maximum value. According to Rosin (cf. following abstract) the thermal intensity is inversely proportional to the combustion period of the particles. Combustion, however, does not begin immediately the dust enters the chamber, and the ignition period is as important a factor as the combustion period in determining the effective use made of the combustion chamber. Since heat is absorbed in the ignition space from the combustion space, the former is detrimental to the furnace load; it can be reduced by preheating the air for combustion, injecting the dust into the furnace at as low a speed as possible, and supplying the minimum amount of air to the dust at the burner to suspend it. The ease of ignition of coal dusts is related to their rational analyses, low-rank coals being more easily ignited than high-rank coals, and durainous coals than bright coals. The relationship between combustibility and rank is less definite. The combustion periods of individual particles of coal have been investigated by a photographic method (cf. Griffin, Adams, and Smith, B., 1929, 877), but the results are of limited applicability to the combustion of powdered fuel in the plant. The combustion period decreases with increase of the specific surface of the dust, but this is limited in practice by the cost of pulverisation. The combustion period at first decreases with increasing proportion of excess air, then, after passing through a minimum, increases again (cf. Audibert, Rev. de l'Ind. Min., 1924, 73, 1). The system in which the whole of the air is mixed with the dust when it begins to burn is more favourable to rapid combustion than that in which part only is supplied at first, and the remainder when the "volatile matter" has burnt. By inducing turbulence in the dust cloud, the thermal intensity of combustion is improved; the effect is probably due more to the better dispersion of the dust than to the higher relative motion between the dust and the air. A high temperature of the combustion

space favours a high rate of combustion. To prevent destruction of the chamber lining when high temperatures are used, water-cooling of the walls is essential; such cooling should be just sufficient to cool the burnt gases to the fusion point of the ash before they come into contact with the walls and before they enter the boiler (cf. Lülöfs, Trans. Fuel Conf., 1928, 3, 362).

A. B. MANNING.

Thermodynamics of the combustion of powdered coal.

P. ROSIN (Proc. II Int. Conf. Bit. Coal, 1928, 1, 838—864).—Formulae correlate the heat generated per unit volume of combustion space; shape, size, and temperature of particles; combustion time, calorific value, and composition of the fuel. In most power plants the combustion time of the largest particle is 1.5—3.6 sec., and in locomotives 0.17—0.4 sec.

CHEMICAL ABSTRACTS.

Control of vertical retorts [for continuous carbonisation].

H. B. KENDRICK (Gas J., 1930, 190, 306—309).—Results obtained in working Glover-West retorts since their construction in 1922 are discussed, and attention is drawn to the ease of control of calorific value in the gas made. Factors such as the voltage of current supplied to extractor-gear motors, or the quantity of steam admitted to the charge, must be carefully regulated, and it is suggested that by operating producers under pressure much better temperature control would be possible. Leakage of gas to or from the retorts would be diminished by similar practice. R. H. GRIFFITH.

Low-temperature carbonisation [of coal] in thin layers.

H. MANTEL (Brennstoff-Chem., 1930, 11, 150—151).—A process has recently been developed for carbonising coal in layers 1 mm. or less in thickness (cf. B.P. 301,907; B., 1929, 968). Owing to the consequent rapidity with which the heat is transmitted through the material the required throughput is attained without raising the temperature of the retort itself anywhere much above the desired temperature of carbonisation. The tars produced therefore undergo a minimum of cracking. The apparatus, which consists of a ring-shaped retort through which the material is conveyed on a rotating plate, is briefly described.

A. B. MANNING.

Distribution of sulphur in the combustion of coal and coke.

I. TRIFONOV and E. RASCHEVA-TRIFONOVA (Brennstoff-Chem., 1930, 11, 165—169).—A gas coal was finely powdered and the bulk of the ash separated therefrom by flotation in a mixture of carbon tetrachloride and xylene of d 1.30. The remainder of the inorganic sulphur was then removed from the coal by treatment with cold nitric acid (d 1.20) and subsequent washing. The purified coal contained about 1% of ash and 1.1% of organic sulphur. Coke free from inorganic sulphur was prepared by carbonising some of this coal and treating the coke with nitric acid. The coal and coke were burnt in an electrically heated muffle at 900°, alone and with 10—15% of various forms of inorganic sulphur and other ash constituents; the distribution of the sulphur between the ash and the gaseous products of combustion was determined. Pyrites lost its total sulphur as sulphur dioxide. Calcium sulphide lost more sulphur than the sulphate, whereas

the reverse was true for the corresponding magnesium compounds. The sulphur dioxide evolved from the organic and pyritic sulphur was partly retained by certain other ash constituents, more especially by calcium carbonate, and to some extent by basic silicates. Magnesium carbonate absorbed sulphur dioxide at temperatures below 800° , but gave up the greater part of it again at 900° . Alumina, silica, and kaolin were without effect on the distribution of the sulphur. The results were the same whether the fuel burnt was coal or coke. If the mixture of coal and ash is burned before being coked the sulphur distribution is affected only when calcium sulphate or carbonate is present; this is attributed partly to the reduction of calcium sulphate to sulphide and partly to the volatilisation of some of the sulphur during carbonisation.

A. B. MANNING.

Preparation of active carbon. E. BERL and H. BURKHARDT (Z. angew. Chem., 1930, 43, 330—333).—Numerous samples of active carbon have been prepared by dropping various pure organic compounds into a steel cylinder heated at 1000° and quenching the carbonised product in water. When the compound contained potassium a vigorous evolution of hydrogen occurred during heating, but the corresponding sodium compound did not exhibit this phenomenon. After washing the carbons with hot dilute hydrochloric acid, then with water, their adsorptive capacity for methylene-blue and heat of moistening with benzene were determined. The tabulated results show that the presence of potassium in the molecule of the organic compound used causes a highly active form of carbon to be obtained, whilst the simultaneous presence of potassium and sulphur in the compound leads to the production of a much more highly active form of carbon than any hitherto prepared. Thus from potassium naphthalenedisulphonate the carbon has an effective surface area of $1080 \text{ m}^2/\text{g.}$, and will absorb 46% of its weight of ether from air containing 4.125 g./m^3 .

A. R. POWELL.

Volumetric determination of carbon in graphite.

E. SCHWARZ VON BERGKAMPF and L. HANANT (Z. angew. Chem., 1930, 43, 333—335).—The finely-powdered sample (0.1 g.) is heated at 1200° in a current of oxygen and the gases are collected and measured in the usual gas-analysis apparatus with a burette and automatic pipette of 600 c.c. capacity. The carbon dioxide is then absorbed in potassium hydroxide and the decrease in volume measured. A correction must be applied if the original substance contained carbonates; these are determined in a separate trial in the usual way. A nomograph for calculating the weight of carbon dioxide from the volume at various temperatures and pressures is included.

A. R. POWELL.

Determination of volatile matter [in fuels etc.].

A. P. SHAKHNO and M. D. ZHOOKOVSKAIA (Izv. Tepl. Inst., 1929, 7, 38—50).—The use of a new platinum crucible gives high values, probably owing to catalytic action.

CHEMICAL ABSTRACTS.

Determination of thiocyanates in coke-oven liquors. TRAVERS and AVENET (Compt. rend., 1930, 190, 1128—1129).—Sulphides are removed by precipitation as zinc or cadmium sulphide, the remaining solution is saturated with sulphur dioxide, and the

CNS ion precipitated as cuprous thiocyanate by means of copper sulphate. If more than 0.1% of thiosulphate is present from oxidation of polysulphides, the solution should be cooled. After 3 hrs. the precipitate is washed, dissolved in an excess of ammonia, oxidised by addition of a few drops of hydrogen peroxide, the excess of which is boiled off, and the cupric compound titrated with potassium permanganate solution in the cold in the presence of a 15% excess of free sulphuric acid. The CNS ion is decomposed into the CN ion, which does not react, and sulphur, which is oxidised to sulphuric acid. The accuracy is 1% .

J. GRANT.

Fuel gas technique. Some modern developments.

L. H. SENSICLE (J.S.C.I., 1930, 49, 57—66 T).—More than half the gas used in industry is still made at the consumer's works. The constant quality demanded in modern applications is rendered possible by the new accurate recording calorimeters. In the Thomas calorimeter variations in temperature and humidity of the calorimetric air affect the accuracy of the instrument. Calculations are given. Modern methods of gas storage such as waterless piston holders and high-pressure spherical holders are discussed. In the combustion of gas the three types of air admixture, viz., (1) when no primary air is mixed with the gas before combustion, (2) part of the air is added before combustion, (3) all the air required is supplied before combustion, are discussed in relation to recent developments. In particular, submerged combustion, belonging to category (3), has important uses in chemical industry for concentrating corrosive liquids such as ammonium chloride solutions. Recent work in relation to gas fires indicates that radiation in the main shorter than $2.0 \times 10^{-3} \text{ mm.}$ wave-length is desirable owing to the scorching effect produced by absorption of infra-red rays longer than this. In large-scale gas burners automatic adjustment of the air supply is necessary for high efficiency. Types of apparatus are described. The corrosion of mains is discussed, and the author's method for rapidly testing pipe coverings is outlined and results are given. A few weeks' controlled electrolysis in wet ground is adequate to determine the liability to corrosion of protected pipes. Problems awaiting solution are discussed.

Purification of illuminating gas by the dry method.

C. MAZZETTI (Annali Chim. Appl., 1930, 20, 139—147).—The volume of gas that can be freed from hydrogen sulphide by a given quantity of ferric oxide is rigorously constant within the limits of experimental error, so that the principal reaction must be a true chemical reaction. The presence of hydrogen or carbon monoxide in the gas has no influence on the purification, provided that oxygen is absent. Addition of oxygen to mixtures of hydrogen sulphide with nitrogen greatly increases the volume purified by a definite amount of the purifying agent, this effect being diminished considerably if hydrogen is also present, but remaining unaffected by carbon monoxide. The added oxygen does not revivify the mass *in situ*, but determines the reaction, $2\text{H}_2\text{S} + \text{O}_2 = 2\text{H}_2\text{O} + 2\text{S} + 110,000 \text{ g.-cal.}$, which is activated catalytically by the ferric oxide. Increased concentration of the hydrogen in the

gas exerts an inhibiting function on this reaction owing to adsorption phenomena. T. H. POPE.

[Coal] gas drying. R. MEZGER and F. PISTOR (*Gas- u. Wasserfach*, 1930, 73, 193—200).—The principles involved in the drying of coal gas are reviewed, and the chief advantages and drawbacks of the process are discussed. It is shown that although the volume of the dried gas is smaller, its calorific value is higher than that of the moist gas, so that a slightly larger proportion of water-gas can be added to it. Methods for adapting water-sealed gas holders for storage of dry gas, by use of a suitable oil film, are mentioned and the various types of dehydration plant are described. These may depend on compression, cooling, adsorption, or washing with hygroscopic liquids, and it appears that drying by means of glycerin or calcium chloride can be most cheaply operated. A bibliography is included in the paper. R. H. GRIFFITH.

Determination of the explosion limits of gases and gas mixtures. H. LÖFFLER (*Brennstoff-Chem.*, 1930, 11, 145—146).—A micro-gas calorimeter is described which permits the determination of the calorific value of a gas, of which only 10 c.c. are available, with an error not greater than 0.33%. It can be used to determine also the limiting explosive mixtures with air or oxygen, the limiting mixtures giving complete combustion, the carbon dioxide content of the gases before and after combustion, and the diminution in pressure due to combustion. It consists essentially of a vacuum-jacketed, glass, explosion vessel at the centre of which is the bulb of a sensitive mercury thermometer. The vessel is connected by capillary tubes to a water-jacketed gas burette and a mercury reservoir; a carbon dioxide absorption tube, through which the gas can be passed when desired, is also provided. A spark gap in the explosion vessel, in series with which is a small argon vacuum tube to act as an indicator, is connected to an induction coil actuated by a pocket-lamp battery. A. B. MANNING.

Determination of the water-gas equilibrium under the influence of the electric discharge under reduced pressure. K. PETERS and H. KÜSTER (*Brennstoff-Chem.*, 1930, 11, 171—172; cf. B., 1930, 44).—Mixtures of carbon dioxide and hydrogen were passed through a tube wherein they were subjected to an electric discharge under pressures of 20—80 mm. of mercury, and the issuing gases were analysed. It was impossible to correlate the observed equilibrium constants with either the electrical measurements or determinations of the gas temperature. With a high electrical energy input, particularly in the range of high initial carbon dioxide concentrations, the equilibria were comparable with those obtained in the purely thermal reaction. Equilibrium is attained in less than 0.15 sec., and is unaffected by variations of pressure from 20 to 60 mm. of mercury. A. B. MANNING.

Orsat apparatus for quick and accurate gas analysis. H. A. BAHR (*Gas- u. Wasserfach*, 1930, 73, 440—444).—A modified Orsat apparatus for the analysis of coke-oven and similar gases is described. The apparatus is in two portions, one portion being used for absorption and the other for combustion analysis.

Errors due to the capacity of the connecting capillaries are eliminated by keeping these filled with the confining liquid (saturated sodium chloride solution acidified and coloured red). Karlsruhe three-way taps placed in the bridge itself above the absorption pipettes facilitate this procedure. Accidental loss of gas is prevented by placing safety pipettes of more than 100-c.c. capacity, and containing the sodium chloride solution, at the ends of the capillary and absorption train. The pipettes used are of a modified valve type, and have been found satisfactory in use. They are sealed to the atmosphere by connecting to pipettes containing either water (in the case of cuprous chloride pipettes) or sulphuric acid (for the fuming sulphuric acid pipette). The glowing-wire combustion pipette is provided with electrodes consisting of glass tubes expanded at the ends and filled with mercury covered with saturated sodium chloride solution. The platinum wire is energised from the electric mains through either a transformer or resistance. Provision is made for the control of the temperature of the wire. When methane or one of its homologues is present in the gas sample the hydrogen is determined by passing the gas over copper oxide at 300° and the methane etc. is determined afterwards by combustion in a quartz tube maintained at 800—1000°. The apparatus is flushed out with carbon dioxide when hydrogen is being determined, and with oxygen in the case of methane determinations, the cleansing gases being absorbed after combustion. The carbon dioxide is generated by a small Kipp's apparatus and the oxygen by electrolysis. Recently it has been found that the carbon dioxide reduced the activity of the copper oxide and the use of oxygen as cleansing gas leads to simplification of the apparatus. A coke-oven gas can be analysed with an accuracy of 0.1—0.2% in the apparatus in 20 min. H. E. BLAYDEN.

Determination of sulphur in gas. J. H. STEINKAMP (*Chem. Weekblad*, 1930, 27, 271—272).—The absorption apparatus in which the products of combustion are brought into contact with hydrogen peroxide solution is provided with a cooling coil, to avoid decomposition of the hydrogen peroxide. S. I. LEVY.

Determination of naphthalene in oils and coal gas. S. TWEEDY (*Gas World*, 1930, 92, 497).—Oil containing naphthalene is heated slowly, in a U-tube immersed in an oil-bath, to 150°, and a stream of air is passed over it to a 10-bulb Meyer absorption tube containing picric acid solution. The naphthalene picrate formed is separated by means of a sintered glass filter, and the picric acid liberated by its decomposition is titrated. R. H. GRIFFITH.

Cracking of tar acids from coal. J. C. MORRELL and G. EGLOFF (*J.S.C.I.*, 1930, 49, 263—271 T).—The economic success of low-temperature carbonisation depends on the profitable disposal or utilisation of low-temperature coal tar, and this in turn depends in a large measure on the profitable utilisation of the tar acids. In the present work the problem is approached from the viewpoint of converting, by the cracking process, the high-boiling tar acids into tar acids or phenols of lower mol. wt. and lower boiling range which possess greater toxicity as antiseptics and have greater utility for other

uses, such as wood preservatives, animal dip, phenol-aldehyde condensation products, mineral flotation, etc. High yields of low-boiling tar acids were obtained. The percentage of phenols and cresols made by the cracking process was determined. The germicidal efficiency of the low-boiling phenols was also determined. A study of the effect of water vapour on the cracking of tar acids was made.

Ultra-violet ray analysis as applied to coal-tar pitch and bitumen. W. TEUSCHER (Chem. Fabr., 1930, 53).—Solutions of pitch, bitumen, and mixtures of the two can be distinguished by observation from above of the fluorescence colour as shown in three reagent vessels mounted in a block of wood transversely to the rays of a Heraeus lamp. C. IRWIN.

Substitute for amalgamation in testing bituminous materials for m.p., ductility, and float test. H. EISNER (Ind. Eng. Chem. [Anal.], 1930, 2, 176).—The use of an amalgamated plate on which excess mercury may be left is open to objection on account of the danger of mercury poisoning. It cannot be replaced by a highly polished plate, to which bitumen sticks, but a rough plate of brass or stainless steel cleaned and covered with a layer of glycerin is satisfactory. C. IRWIN.

Disintegration of kukkersite in organic liquids. K. LUTS (Brennstoff-Chem., 1930, 11, 148—150. Cf. Craig, also Kogerman, B., 1922, 799 A).—Pieces of kukkersite placed in ether or acetone undergo considerable swelling, principally in a direction perpendicular to the bedding plane, and numerous cracks appear in the material which rapidly breaks down into small plates. At the same time a marked evolution of gas occurs. The material behaves similarly in chloroform, pyridine, or carbon disulphide; it softens, but does not break down, in alcohol or aniline, and petroleum or benzene is without effect on it. The rapidity with which the material breaks down in different liquids is roughly proportional to the heat of wetting of the material by the liquid, and is also related to the surface tension of the liquid. The breakdown appears to be due to the gas pressure set up by the penetration of the liquid into the capillaries. Some other oil shales exhibit a similar phenomenon, but to a lesser degree. A. B. MANNING.

Generation of oil in rocks by shearing processes. J. E. HAWLEY (Bull. Amer. Assoc. Petr. Geol., 1929, 13, 303—366).—The determination of soluble organic material in oil shales is considered. Oxidation renders soluble some of the insoluble organic material. Shales which have been subjected to high shearing pressures give an extract containing more volatile hydrocarbons than those not sheared. Experiments on the effect of shearing indicate that high shearing pressures at low temperatures and during short periods of time are unimportant in the generation of oil. CHEMICAL ABSTRACTS.

Oil and water content of Grozni oil sands. N. T. LINDTROP and V. M. NIKOLAEV (Bull. Amer. Soc. Petr. Geol., 1929, 13, 811—822).—A study of the displacement of oil by water in sands of different grain sizes leads to consideration of the large amount of water retained

in reservoir sand and of questions of production and recovery. CHEMICAL ABSTRACTS.

Paraffin content of Baku crude oils. L. GUKHMAN and D. GOLDBERG (Azerbaij. Neft. Choz., 1929, No. 10, 74—76).—Removal of resins with fuller's earth, silica gel, or activated carbon yielded from the same sample paraffin in quantity and m.p., respectively, 2.1%, 43°; 3.45%, 53°; 3.05%, 53°. The wax was extracted from the absorbent with a loss of 30%. The wax is preferably separated from acid sludge heated at 65—75° with a low-cold test gas oil as diluent. CHEMICAL ABSTRACTS.

Fergana crude oils. V. FOMENKO (Neft. Choz., 1929, 17, 560—569).—Characteristics of crude and fractionated oils from the Chimion, Santo, and Shor-Su districts are recorded. CHEMICAL ABSTRACTS.

Perm petroleum. D. M. MARKO (Bull. inst. rech. biol. univ. Perm, 1929, 6, 524).—The petroleum from Tschussovski Gorodki had $d_{40}^{15.0}$ 0.948, viscosity at 50° 1.52, ignition temperature below 5°, congealing temperature below -20°, S 3.1%, wax 32%, decomp. 270°. CHEMICAL ABSTRACTS.

Ural crude oil. M. M. FAINGARD and E. M. BRANDO (Neft. Choz., 1929, 17, 83—85).—The oil (I. V. Kosior) had d 0.955, E_{30} 2.67, Abel-Pensky flash point 10°, SO_3 4.5%, S 1.2%, initial b.p. 66°, aromatic compounds 7%. Other data are also recorded. CHEMICAL ABSTRACTS.

Cracking of Ural crude oil. M. D. TILITSCHÉEV (Neft. Choz., 1929, 17, 82—83).—The crude oil, d 0.938, E_{50} 1.49, was stripped of gasoline and cracked at 425° at 10—20 atm., yielding 10% of gasoline, 86% of residue (d 1.04, E_{50} 7), and 4% of gases etc. In a second experiment, with recycling, the gas-oil fraction yielded 22% of gasoline and 71% of residue (d 1.104, E_{100} 9.2). CHEMICAL ABSTRACTS.

Refining of crude oil. J. C. COLDHAM (Chem. Eng. Min. Rev., 1930, 22, 261—268).—The plant and lay-out at the works of the Commonwealth Oil Refineries, Laverton, Victoria, is described and illustrated by diagrams. Anglo-Persian crude oil is handled exclusively, the monthly output of the plant being approx. 10,000 tons, and consisting of motor spirit 25, kerosene 10, fuel oil 62 vol.-%. Exhausted bauxite from the treatment of the crude kerosene is steamed and revived by roasting at 600°. A plant for the manufacture of sodium hypochlorite (from purchased caustic soda and chlorine) for washing the various distillates is described. H. S. GARLICK.

Decolorising efficiency of Russian and foreign clays. V. TOKMANOV (Azerbaij. Neft. Choz., 1930, No. 1, 58—65).—Experiments with a solution of ozokerite in kerosene showed that Glukhov clays, activated with sulphuric acid, are effective. The adsorptive power is greatly increased by drying at 100—105°; further heating up to 350° has no effect on raw clays. CHEMICAL ABSTRACTS.

Recracking [of kerosene]. B. K. TARASSOV and V. V. RUDENKO (Neft. Choz., 1929, 17, 530—532).—A kerosene (aromatics 13.2, naphthenes 35.2, paraffins 51.6%) was passed 24 times through an iron tube at 600—610°, the bottoms being mixed with fresh stock

to give the same charge. The total yield of gasoline (final b.p. 200°) was 45%, the content of aromatic hydrocarbons being increased by each cracking operation. Characteristics of the kerosene fraction are recorded.

CHEMICAL ABSTRACTS.

Action of potassium permanganate on unsaturated hydrocarbons. D. A. HOWES and A. W. NASH (J.S.C.I., 1930, 49, 113—119 t).—The action of solutions of potassium permanganate on a commercial liquid-phase cracked petrol and on pure unsaturated and saturated hydrocarbons was studied. As experimental controls, the determination of bromine values and aniline points was investigated. The effects of concentration, time, and temperature on these permanganate oxidations were studied. It was found that the use of 2% alkaline permanganate solution at 0° constituted the best conditions to obtain oxidation of unsaturated compounds, without affecting the other series of hydrocarbons possibly present, although this concentration of the oxidising agent only lowered the bromine value of the cracked spirit from 24.1 to 22.0 in 6 hrs. The oxidation of synthetic mixtures of olefinic hydrocarbons in *n*-heptane or light petroleum showed the olefines to vary in ease of oxidisability. It was attempted to correlate the ease of oxidation with anti-knock value, and generally speaking the olefines more easily oxidised were the poorer anti-knocks. Diamylene samples, however, did not fall into line with the other olefines in this respect.

Knock ratings of aromatic hydrocarbons. D. A. HOWES and A. W. NASH (J.S.C.I., 1930, 49, 16 t).—Following the investigation of a number of pure hydrocarbons (B., 1929, 272), a series of pure aromatic hydrocarbons (20% by volume in a standard benzine) were rated as regards anti-knock property in the Delco testing unit. Toluene has a better knock rating than benzene, and the three xylenes are more effective than toluene. Of the xylenes, *p*-xylene is the most effective and *o*-xylene the least. In general, the *p*-disubstituted benzenes are the best anti-knocks, *e.g.*, *p*-cymene, *p*-xylene, and *p*-*tert*-butyltoluene. Tertiary groupings appear to have a better effect than secondary groups; *e.g.*, *tert*-butylbenzene is more effective in reducing knocking than *sec*-butylbenzene. Only one of the aromatic hydrocarbons tested was found to have a lower anti-knock value than benzene, namely, *sec*-butylbenzene.

Polymerising action of sulphuric acid on unsaturated hydrocarbons contained in light cracked oils. I. E. BESPOLOV (Neft. Choz., 1929, 16, 730—736).—Addition of acid in small portions increases the amount of sludge. The action of 90—100% acid differs from that of 70—80% acid. Oil partly polymerised by storage, when treated with acid, gives unusually dark polymerides which are similar to those obtained by direct action of acid. Heating during treatment with acids produces a smaller quantity of polymerides of different appearance and properties.

CHEMICAL ABSTRACTS.

Composition of cracked gas oil. I. E. BESPOLOV (Azerbaid. Neft. Choz., 1929, No. 10, 57—71).—Gas-oil fractions from the Vickers coil were similar in composition to straight-run gas-oil fractions.

CHEMICAL ABSTRACTS.

Radioactivity of ash from certain crude oils. L. BOGOYAVLENSKI (Neft. Choz., 1929, 17, 91—92).—Ukhta borehole water contains 7.5×10^{-9} g. of radium per litre, as well as some mesothorium and its decomposition products. The radioactivity of the mineral matter is approximately inversely proportional to the amount.

CHEMICAL ABSTRACTS.

Natural crude-oil emulsions from the Boryslav-Tustanovic territory. III. T. KRZYŃSKI (Przemysł Chem., 1927, 11, 605—614).—The conductivities of the crude oil and of emulsions with water have been determined.

CHEMICAL ABSTRACTS.

Fractional analysis [of oils and gases]. F. L. KALLAM, G. W. DECKERT, and L. J. COULTHURST (Oil Gas J., 1929, 28, 209, 212, 370, 373).—A discussion of requirements for accuracy.

CHEMICAL ABSTRACTS.

Determination of sulphur [in oils] by the bomb method. A. MALYATSKI and B. NAKASHIDZE (Azerbaid. Neft. Choz., 1930, No. 1, 110—114).—The U.S. standard bomb method is satisfactory for cracked gasoline. The pressure of oxygen should be (for 0.60—0.65 g.) 16—18 atm. for gasoline, 25 atm. for gas oil, and 30—35 atm. for heavy oils.

CHEMICAL ABSTRACTS.

Conradson carbon determination. N. VASILIEV (Azerbaid. Neft. Choz., 1929, No. 4, 90—93).—Oils which are not properly washed after treatment with sulphuric acid show a high coke content. The amount of resins can be calculated from the values for coke and asphaltenes.

CHEMICAL ABSTRACTS.

Comparison of American and Russian paraffin waxes. S. S. NAMETKIN, A. S. VELIKOVSKI, and S. S. NIFONTOVA (Neft. Choz., 1929, 17, 533—549).—Grozni oil affords paraffins of higher quality than American, but contains much resin and is insufficiently sweated. The determination of the qualities of wax is discussed.

CHEMICAL ABSTRACTS.

Acids of montan wax. D. HOLDE, W. BLEYBERG, and H. VOHRER (Brennstoff-Chem., 1930, 11, 128—132, 146—148. Cf. Tropisch, B., 1929, 1005).—The acid, $C_{28}H_{56}O_2$, of m.p. 84.4°, previously separated from montan wax and then believed to be the *iso*acid, has been further purified by micro-distillation under very low pressure, and a product obtained the m.p. of which agrees closely with that of *n*-octacosic acid (89°). That this is the normal acid has been confirmed by X-ray examination. In a similar manner, from a fraction of lower m.p., *n*-hexacosic acid has been isolated in a sufficiently pure state to be identified by a mixed m.p. determination. Evidence was found of the presence of *n*-behenic acid ($C_{22}H_{44}O_2$) in the fraction of lowest m.p. It is concluded that the fatty acids derived from montan wax, like those from arachis oil, beeswax, etc., consist exclusively of the normal acids containing an even number of carbon atoms.

A. B. MANNING.

Fergana ceresin. V. E. TOKMANOV (Neft. Choz., 1929, 17, 556—559).—Ceresins are harder than paraffins, do not sweat, and usually have a fine crystalline structure. On distillation ceresins afford paraffins, but the latter have not yet been converted into the former.

CHEMICAL ABSTRACTS.

Petrolatums from Surakhani crude oil. A. VELIKOVSKI and S. S. NIFONTOZA (*Neft. Choz.*, 1929, 17, 71—78).

Carbon ratios and oil gravities in the Rocky Mountain region of the United States. C. E. DOBBIN (*Bull. Amer. Assoc. Petr. Geol.*, 1929, 13, 1247—1256).

PATENTS.

Treatment of coal [slurry]. B. NORTON (B.P. 327,845, 21.3.29).—The slurry from a coal-washing plant is delivered on to a vibrating draining screen and the water containing fine pyrites, clay, etc., which first drains away, is separated from the cleaner water, which drains away subsequently, by arranging two or more transverse gutters or troughs below the screen. The cleaner water is returned to the circulating system of the washer. A clean-water sprayer may be arranged above the screen to aid in washing the dense impurities from the coal. By arranging a valve in the gutter for the dense water a certain amount of sedimentation may be brought about therein, and the cleaner water may be allowed to flow over into the second gutter for recirculation with the other clean water.

A. B. MANNING.

Treatment of fine coal dust to render it suitable for transport in open vessels. S. and W. L. TULIP (B.P. 327,813, 16.2.29).—The fine dust is conveyed in a current of air to a vertical cylinder wherein it is brought into contact with low-pressure steam. The coal, with a uniform moisture content of about 10%, is delivered from the cylinder directly to the wagon used for transport.

A. B. MANNING.

Removal of liquid from peat, coal-mud, or like watery substances. A. TEN BOSCH (B.P. 304,329, 19.1.29. *Holl.*, 19.1.28).—The peat is provided with an increased draining or de-watering surface by perforating the outer surface of the mass, e.g., by passing the material below a spiked roller. The increased surface is rendered more permeable by the application of heat, which may be generated by passing an electric current through the mass, the means used for producing the perforations serving as electrodes. In another modification the peat is perforated in a mould between spiked plungers heated preferably to 150—200°.

A. B. MANNING.

Vertical retort oven. J. VAN ACKEREN, Assr. to KOPPERS Co. (U.S.P. 1,738,743, 10.12.29. *Appl.*, 20.3.26).—A series of vertical coking chambers alternating with vertical heating flues extend along one side of a battery and the regenerators along the other. The structure is made up of sections, each comprising a set of vertical flues with the heating walls on either side and the corresponding regenerators. Between adjacent sections are expansion joints extending from the coking chamber to each of the outer ends of the sections, the joints being so arranged that any leak therein may be readily stopped. The joints in the outer wall adjacent to the coking chambers are staggered, and the adjacent surfaces in the wall between the chambers and regenerators are connected by vertically-extending tongue-and-groove joints. A. B. MANNING.

Apparatus for treating carbonaceous material. W. RHOADES (U.S.P. 1,743,394, 14.1.30. *Appl.*, 24.3.26).—Oil shale is treated in a retort the lower part of which forms a combustion chamber. The formation of clinker in the lower part of the combustion chamber is prevented by the rotation of two cylinders provided with curved teeth. These cylinders serve also to support the column of shale. Below them are two other rotatable cylinders provided with undercut pockets and adapted to discharge the spent shale as it is produced. The shale is fed continuously into the upper end of the retort, and a continuous updraft is maintained through the combustion chamber, the hot gases from which bring about the distillation of the material in the upper part of the retort.

A. B. MANNING.

[Steaming in] horizontal chamber ovens, especially coke ovens. O. Y. IMRAY. From N.V. SILICA EN OVENBOUW MIJ. (B.P. 327,442, 7.12. and 15.12.28).—Provision is made for introducing steam into the ovens through openings in the lower part of the heating walls. The steam ducts are so arranged that the steam enters the chamber in a downward direction, or recesses are provided in the chamber walls into which the steam ducts open. The ratio height: width of these recesses is less than corresponds with the angle of repose of the coal. The recesses preferably extend the whole length of the wall. The steam ducts are placed either in the partition walls between the regenerators or in the walls between the heating flues.

A. B. MANNING.

Dry-cooling of coke and the like. O. PIETTE (B.P. 327,819, 22.2.29).—The hot coke is delivered into a number of adjacent, inclined chambers having floors formed of shutter-like plates upon which the coke is spread in sufficiently thin layers. Between the floor plates are spaces through which a continuous current of non-oxidising gases is circulated in such a manner that they pass up through the layer of coke in the lower part and down through that in the upper part of each chamber. After passing through a dust-collecting receptacle, the now hot gases are brought into contact with the heating surface of a steam generator, and are then returned to the first cooling chamber.

A. B. MANNING.

Activated charcoal. F. MIK, Assr. to HOLZVERKOHLUNGSIND. A.-G. (U.S.P. 1,743,975, 14.1.30. *Appl.*, 6.2.29. *Ger.*, 27.12.27).—A highly-activated charcoal is produced by carbonising hard wood when in the condition of "white rot," and subsequently activating the product by known means.

A. B. MANNING.

Preparation of highly active carbon. A.-G. F. STICKSTOFFDÜNGER (B.P. 315,810, 18.7.29. *Ger.*, 18.7.28. *Addn.* to B.P. 301,330; B., 1930, 449).—In the process of the prior patent, the sorting is effected by an elutriation process, either alone or in combination with a sifting process.

A. B. MANNING.

Manufacture of carbon-black from carbon monoxide. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,548, 11.3.29).—In the production of carbon-black by the thermal decomposition of carbon monoxide

in the presence of a solid catalyst, about 3% by wt. of water vapour is added to the gas.

A. B. MANNING.

Manufacture of a material applicable as an adsorbent, comprising carbon, iron, and iron oxide. C. J. G. AARTS (B.P. 308,351, 14.3.29. Holl., 22.3.28).—The product, which can also be used as a pigment, a carburising agent, and for the manufacture of electrodes, is prepared by passing a gas containing carbon monoxide, but practically free from water vapour, over iron oxide distributed over dried carbonaceous material (charcoal, wood-wool, hay, etc.) at 350–450° and under conditions such that carbon dioxide forms 46–65% of the combined carbon monoxide and dioxide content of the issuing gas and the product contains, *e.g.*, 80–90% of carbon.

L. A. COLES.

Destructive hydrogenation. W. R. TATE, H. P. STEPHENSON, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 327,443, 31.12.28).—In the destructive hydrogenation of carbonaceous materials in the liquid phase the temperature of the hydrogenation vessel is regulated by circulation of part of the liquid material being treated through an external heater, without substantial release of the pressure and without the addition of hydrogen.

A. B. MANNING.

Production of acetic acid, wood naphtha, and other products of the distillation of wood and similar carbonaceous substances. P. POORE (B.P. 327,415, 2.1.29).—The yield of liquid products is increased by distributing superheated steam into the charge in the upper part of the retort. The steam is superheated by passing through a coil of piping within the retort, and adjacent to the wall thereof.

A. B. MANNING.

Combustible gas generator. W. J. MURDOCK, E. E. LUNGREN, and O. B. EVANS, ASSTS. to PIER PROCESS CORP. (U.S.P. 1,743,724, 14.1.30. Appl., 2.5.25).—The generator is rectangular or elliptical in horizontal cross-section, the width being not greater than 3–4 ft. The formation of a central inactive core of fuel is thereby avoided.

A. B. MANNING.

Gas producers. BAMAG-MEGUIN A.-G., and O. HELLER (B.P. 306,143, 14.2.29. Ger., 17.2.28).—Pulverised fuel is gasified in a current of preheated steam and gas, the apparatus comprising a heater for the current of steam and gas, and a reaction chamber. The mixture of fuel, steam, and gas is injected vertically up the centre of the reaction chamber from a nozzle in a hollow beam traversing the lower part of the chamber; the gases produced and the ash pass out through an exit at the bottom of the chamber. A relatively small volume of compressed gas is used to convey the fuel to the nozzle where it mixes with the steam and gas from the heater. The latter is of the regenerator type, and is heated intermittently by the combustion of producer gas therein. The fuel is supplied intermittently, but the current of conveying gas continuously, to the reaction chamber. The gases produced pass through a dry dust separator, and, except for the part which is by-passed for re-circulation, through a scrubber to a holder.

A. B. MANNING.

Manufacture of producer gas. W. J. MURDOCK, E. E. LUNGREN, and O. B. EVANS, ASSTS. to PIER PROCESS CORP. (U.S.P. 1,743,726, 14.1.30. Appl., 28.8.26. Renewed 7.9.29. Cf. U.S.P. 1,602,242; B., 1927, 35).—The producer is so designed that the fuel is disposed in an annular column between inner and outer refractory walls, all portions of the fuel being within an effective radiating distance, *e.g.*, 18–24 in., of the walls. Formation of a central impermeable mass of fuel is thereby avoided, and the entire fuel bed is blasted and processed uniformly with a minimum of channelling. The producer may be used with coals of relatively high volatile matter content.

A. B. MANNING.

Separation of solid particles from combustion gases. A. R. V. KEARSLEY (B.P. 327,622, 21.5.29).—The combustion gases pass through a casing in which the solid particles are thrown radially outward by a fan rotating about a horizontal axis. A receiver for the particles consists of a series of peripheral ducts formed by the spaces between wedge-shaped deflectors. A baffle plate behind each duct causes the particles to fall into a groove behind each wedge-shaped deflector, whence they pass to a convenient receptacle below. A fluid-spraying means may be provided at each duct to keep it clear.

A. B. MANNING.

Miner's safety lamp indicating the amount of firedamp in the air. G. SCHAULY (U.S.P. 1,744,416, 21.1.30. Appl., 10.8.27. Fr., 10.8.26).—A nickel-chromium thermocouple is supported above the flame of a miner's lamp. The elongation of the flame due to the presence of methane raises the temperature of the thermocouple, the potential of which is used to indicate the concentration of methane in the air.

A. B. MANNING.

Production of asphalt and road oil. J. F. FABER and M. L. CHAPPELL, ASSIS. to STANDARD OIL CO. OF CALIFORNIA (U.S.P. 1,745,155, 28.1.30. Appl., 20.12.26).—Asphalts of high ductility at low temperatures are produced by distilling asphaltic-base oils in the presence of acid sludge obtained by treating lamp oil with fuming sulphuric acid or lubricating oil with acid of d 1.83. The oil should not contain more than 3–4% of wax and light distillates should be removed before adding the acid sludge. The sludge-oil mixture (5–30% of sludge) is heated at 285–340° under a pressure of 1–3 in. of mercury, with admission of steam. The product is free from sulphuric acid. An asphalt having a penetration of 50 at 25° is produced. By the admission of air during distillation higher-melting asphalts are produced.

T. A. SMITH.

Improvement of asphalt and bituminous masses. K. WINKLER (B.P. 307,466, 8.3.29. Ger., 8.3.28. Addn. to B.P. 307,465; B., 1930, 559).—The process described in the prior patent is modified by substituting fresh or used rubber, in solution if necessary, for a part of the drying oils.

A. B. MANNING.

Obtaining products from low-temperature and other tars and pitches. G. T. MORGAN and D. D. PRATT (B.P. 327,797, 4.2.29).—“Resinoic acids,” “resinamines,” and “resinenes” are isolated from tars and pitches by extracting the crude carboxylic acid, basic

and neutral fractions, respectively, with petrol, dissolving the residues in an organic solvent, *e.g.*, ether, benzene, or low-temperature tar spirit, and reprecipitating the desired products from the solution by the addition of petroleum. In treating the residues with the organic solvent part may remain insoluble; this is separately collected and forms a resinous material of high m.p. The products may be used to form the basis of stains, lacquers, etc.

A. B. MANNING.

Production of refined hydrocarbon oils and the like. I. G. FARBERIND. A.-G. (B.P. 327,463, 6.11.28. Addn. to B.P. 300,900; B., 1930, 499).—The impure oils are purified by treatment with hydrogen or gases containing hydrogen at temperatures above 300° and pressures above 10 atm. The reaction is carried out in the presence of catalysts of group VI which are immune from sulphur poisoning and do not contain iron, nickel, or cobalt. By the use of high pressures a greater throughput can be attained in a reaction vessel of given size. The temperature and pressure are also governed by the nature of the oil and its sulphur content. The tendency to produce low-boiling products is increased with the duration of the treatment. A crude lubricating oil, obtained from low-temperature tar and giving a high refining loss by the ordinary methods, is treated with hydrogen for 50 min. at 400° and 200 atm. in the presence of a zinc oxide, magnesia, and molybdic acid catalyst. Very little decomposition to low-boiling products takes place and little further refining is required. Motor fuels and burning oils may be similarly refined.

T. A. SMITH.

Removal of petrolatum from hydrocarbon oils. R. S. LANE and S. A. MONTGOMERY, ASSTS. to STANDARD OIL Co. (U.S.P. 1,744,648, 21.1.30. Appl., 6.3.25).—Wax-containing oils, such as cylinder stocks and lubricating oil distillates, are mixed with 1–2 times their vol. of a mixture of naphtha (35–60%), butyl alcohol (15–30%), and benzol (18–35%) and cooled to –6°. The layer containing wax settles out and may be separated either centrifugally or by gravity. The wax-free oil is freed from naphtha by distillation.

T. A. SMITH.

Treatment of [lubricating] oil. W. D. HARRIS and R. V. AYCOCK, ASSTS. to REFINOIL MANUFACTURING CORP. (U.S.P. 1,745,167, 28.1.30. Appl., 8.3.29).—Hot lubricating oil drawn from a still is passed upwards through a bed of fuller's earth. It is then allowed to settle and filtered downwards through the same bed. The sludge produced by the action of the fuller's earth on the oil forms a very efficient filter and further treatment is unnecessary. If the oil is passed only once through the earth the advantage of the improved filtering capacity of the earth is lost.

T. A. SMITH.

Distillation of refined, cracked oils without avoidable decomposition or discoloration. F. C. AXTELL, ASST. to AXTELL RES. LABS., INC. (U.S.P. 1,738,518, 10.12.29. Appl., 8.2.27).—Acid-treated cracked spirits are distilled in the presence of soda ash (5–6 lb. per barrel). With this addition it is possible to distil out more gasoline without producing discoloration of the products or of the residue in the still.

T. A. SMITH.

Treatment of hydrocarbons. TAR & PETROLEUM PROCESS Co. (B.P. 311,689, 21.9.28. U.S., 14.5.28).—Hydrocarbons in liquid form, *e.g.*, tars, pitches, oil residues, are deposited at a controlled rate on to an externally heated horizontal surface and are coked thereon, the deposition being continued until a solid layer of metallurgical coke of substantial thickness has been formed. The surface may be made of heat-resistant glass or of a refractory material containing at least 60% Al_2O_3 . The hydrocarbons may first be distilled in the upper part of the chamber by causing them to flow in thin films over heated surfaces, *e.g.*, by delivering them into a rotating basket containing loose material, preferably coke. The volatile products are withdrawn from the chamber to a condensing system, and the liquid residue is coked as described above. The layer of coke is periodically discharged.

A. B. MANNING.

Treatment of vapours produced by cracking hydrocarbons. ANGLO-PERSIAN OIL Co., LTD., and A. E. DUNSTAN (B.P. 327,421, 4.10.28).—The vapours obtained in cracking processes, especially vapour-phase cracking, are passed through a filter charged with pumice which has been steeped in an alcoholic solution of zinc chloride. The filtering material is maintained at 200° and the gum-forming constituents of the spirit are polymerised. The polymerides are removed at the bottom of the filter and at the base of an adjacent dephlegmating tower through which the vapours leaving the filter are led. A distillate of good colour and odour and free from unstable compounds is obtained. For the treatment of 40 gals. of spirit 1 lb. of reagent is required, and the highest useful compression ratio is not materially altered. The filter is maintained at the required temperature by surrounding it with a jacket through which the vapours to be treated are passed, and the contents of the filter are occasionally flushed with refined spirit to maintain the activity of the filtering material.

T. A. SMITH.

Oxidation of organic compounds of high mol. wt. [paraffin wax]. J. Y. JOHNSON. From I. G. FARBERIND A.-G. (B.P. 327,707, 5.1.29).—In the oxidation of paraffin wax, montan wax, etc. to acids by air or oxygen and/or nitrogen oxides, the formation of hydroxyacids is avoided by gradually making the conditions milder as oxidation proceeds, *e.g.*, by lowering the temperature, diluting the oxidant, or decreasing the pressure or velocity of the gases.

C. HOLLINS.

[Paraffin] wax sweating and crystallising apparatus. H. L. ALLAN and J. MOORE, ASSTS. to BURMAH OIL Co., LTD. (U.S.P. 1,743,746. 14.1.30. Appl., 9.2.28. U.K., 26.3.27).—The apparatus consists of an upright vessel divided by transverse plates into a number of wax compartments. Each compartment is heated or cooled by a series of transverse coils of close pitch (not more than 2 in.) which act as a support for the wax during sweating. During cooling wax mixture is admitted to the upper portion of each compartment to compensate for the contraction of the mass and air is excluded. The wax mixture admitted at the top of each cell keeps fluid the wax at the base of the next cell above until sweating commences. Steam-pipes for steaming out the wax after sweating are fitted to the base of each cell.

T. A. SMITH.

Washing of coal and other minerals. A. FRANCE (U.S.P. 1,758,035, 13.5.30. Appl., 3.11.25. Belg., 23.4.25).—See B.P. 251,246; B., 1926, 971.

Generation of gases for power development. Improving the flowing characteristics of coal. W. E. TRENT, Assr. to TRENT PROCESS CORP. (U.S.P. 1,758,630—1, 13.5.30. Appl., 25.10.26).—See B.P. 299,718; B., 1929, 311.

Production of liquid fuels. A. JOSEPH, Assr. to SOC. INTERNAT. DES PROC. PRUDHOMME HOUDRY (U.S.P. 1,758,796, 13.5.30. Appl., 11.7.27. Fr., 21.7.26).—See F.P. 632,360; B., 1930, 230.

Obtaining peat [briquettes]. M. N. KORELIN (B.P. 328,658, 30.10.28).

Installations for dry-cooling of hot coke. SULZER FRÈRES SOC. ANON. (B.P. 317,392, 16.3.29. Switz., 15.8.28. Addn. to B.P. 312,033).

Apparatus for cooling coke. HUMPHREYS & GLASGOW, LTD., Assees. of W. T. BOSLER (B.P. 328,887, 23.8.29. U.S., 4.10.28).

Burners for fuel in pulverulent condition. P. W. GRIFFIN (B.P. 328,682, 4.2.29).

Mixtures of solids and gases (B.P. 327,840). Fractionation (U.S.P. 1,738,386).—See I. Condensation of aromatic compounds (B.P. 327,382).—See III. Decolorising clays (U.S.P. 1,739,734). Hydrogen from methane (B.P. 328,048).—See VII. Roads, paths, etc. (B.P. 328,166).—See IX. Carbon black (B.P. 307,743).—See XIV.

III.—ORGANIC INTERMEDIATES.

Eutectic mixtures of alcohols and acetic esters. E. ALINARI (Annali Chim. Appl., 1930, 20, 159—167).—Owing to the formation of eutectic mixtures, fractional distillation at the ordinary pressure does not separate an ester (acetate) from the corresponding alcohol, except when the ester is in excess of the proportion present in the eutectic mixture, and thus forms a tail-product of the distillation. For the first three members of the homologous series of alcohols, separation from the acetates may be effected by washing the mixture with very concentrated calcium chloride solution, in which the alcohol is soluble but the acetate insoluble. In the first treatment with the chloride solution small quantities of the ester may be dissolved if a large proportion of the alcohol has passed into the calcium chloride, as this alcohol acts as a solvent for the acetate. In the successive treatments, however, the losses of ester are very small, so that a good yield of high-grade ester is obtainable. The treatment is continued until the volume of the residual ester remains practically unchanged. For mixtures of the higher alcohols, such as propyl, and their acetates treatment with calcium chloride solution is useless, but four successive washings of the eutectic mixture, containing about 55% of propyl acetate, with water yields about 50% by vol. of a product containing about 88% of the ester. B.p. curves are given for mixtures of methyl, ethyl, propyl, *n*-butyl, and isoamyl alcohols with their respective acetates. The b.p. of methyl iodide (lit. 44—45°,

42.3—42.8°) is lowered by the presence of small proportions of methyl alcohol, owing to the formation of the compound 3MeI.MeOH (b.p. 40°). T. H. POPE.

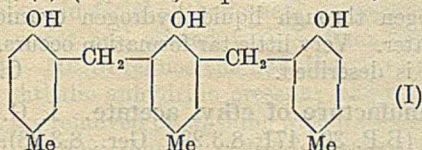
Amination of 2:5-dichloronitrobenzene. L. McMASTER and A. STEINER (Ind. Eng. Chem., 1930, 22, 547—548).—In the formation of *p*-chloro-*o*-nitroaniline (m.p. 115—116°) from 2:5-dichloronitrobenzene (25 pts.) and aqueous ammonia (140 pts. of 28% concentration) a maximum yield of 93% was obtained by heating with constant stirring for 2 hrs. at 170° and 1627 cm. pressure without catalysts such as vanadium pentoxide or copper salts. D. F. TWISS.

Preparation of *o*- and *p*-xenylamines (amino-diphenyls). G. T. MORGAN and L. P. WALLS (J.S.C.I., 1930, 49, 15 t).—When required for various synthetic purposes *o*-aminodiphenyl has generally been prepared by means of the Heusler-Hirsch reaction, which involves a pyrolysis of diazoaminobenzene in presence of aniline. This method, which gives a small yield, is unduly laborious when large quantities of the base are required, and accordingly the following processes have been employed, by means of which both *o*- and *p*-aminodiphenyls (*o*- and *p*-xenylamines) can be readily prepared from technically available diphenyl. Nitration to a mixture of *o*- and *p*-nitrodiphenyls was effected in glacial acetic acid followed by a separation of these isomerides based on difference in solubility in the nitrating medium and distillation of the *o*-compound under reduced pressure. The two xenylamines (*o*- and *p*-aminodiphenyls) were prepared by reducing the corresponding nitrodiphenyls with iron and acidified water and purified by distillation under reduced pressure.

Formaldehyde condensations with aromatic compounds. G. T. MORGAN (J.S.C.I., 1930, 49, 245—251 t).—The formaldehyde condensations with aromatic amines, phenols, and aromatic hydrocarbons are reviewed. The reactions whereby the methylene radical becomes attached to the aromatic nuclei of the amines are utilised in the manufacture of such dyes as the magentas, acridine-orange, and auramine, and in the production of certain synthetic drugs including proflavine and acriflavine. The processes of preparing ionamine dyes and indigo from phenylglycine also involve the intervention of a formaldehyde condensation. In the basic series the introduction of the methylene group is more useful industrially than the addition of the radical CH·OH, but in the phenolic group both these types of condensations are employed; the former is more characteristic of acidic condensations, the latter of alkaline condensations. Resins of the Novolak type are obtained in the former case, those of Bakelite type in the latter. The case of *m*-cresol was studied in detail. The phenolic constituents of low-temperature tar are readily amenable to formaldehyde condensations, furnishing both soluble and insoluble resinoids. The aromatic hydrocarbons, and especially acenaphthene, are generally capable of condensing with formaldehyde in acidic media.

Formaldehyde condensations with phenol and its homologues. N. J. L. MEGSON and A. A. DRUMMOND (J.S.C.I., 1930, 49, 251—257 t).—Resinous condensations of phenols with formaldehyde are performed

in volatile organic solvents as controlling media, using both acidic and alkaline condensing agents. With hydrochloric acid in alcoholic solution, and subsequent steam extraction, phenol and paraformaldehyde yield 4:4'- and 2:4'-dihydroxydiphenylmethane (identified by the diacetate and diethyl ether). The yield of the 2:4'-isomeride is shown to decrease with increase of resin, that of the 4:4'-isomeride remaining constant. Bromination of the 2:4'-isomeride gives 3:5:3':5'-tetrabromo-2:4'-dihydroxydiphenylmethane, m.p. 199°. Under similar conditions, *o*-cresol yields 4:4'-dihydroxy-3:3'-dimethyldiphenylmethane (identified by dibromo-derivative), *m*-cresol yields needles, m.p. 161°, probably 4:4'-dihydroxy-2:2'-dimethyldiphenylmethane, in minute amount. *p*-Cresol yields needles, m.p. 124°, 2:2'-dihydroxy-5:5'-dimethyldiphenylmethane (diacetate, m.p. 124°; bromo-derivative, m.p. 202°), and prisms, m.p. 214°, insoluble in benzene, 3:5-bis-2-hydroxy-5-methylbenzyl-*p*-cresol (I) (triacetate, m.p. 117–119°; dibromo-



derivative, m.p. 175°), in addition to a resin soluble in benzene, and an amorphous powder of unknown constitution. The yields of needles and prisms are compared with resin formation, both increasing to a maximum, and then falling off. Diethylal is isolated from distillation of the alcoholic solvent in all the above cases. Using various controlling solvents, phenol and formaldehyde in presence of alkali under varying conditions of concentration yield saligenin and *p*-hydroxybenzyl alcohol. *m*-Cresol yields a homosaligenin, m.p. 108°, probably 2-hydroxy-4-methylbenzyl alcohol. 1:3:5-Xylenol yields xylenol dialcohol. All these phenols give heat-sensitive resins, caustic alkalis causing their formation more readily than mild alkalis. A method of removing condensing agent from a solution of resin consists in repeated washings with saturated aqueous solutions of certain inorganic salts (e.g., potassium carbonate, sodium carbonate, sodium thiosulphate). Purified resinous products are thus prepared for application to electrical insulation. Fractionation of the heat-sensitive resins is brought about through precipitation of the resin from solution, by a non-solvent for the resins (e.g., benzene, chloroform), which retains crystalline material in solution. Such precipitation may take place on to an inert pulverulent substrate (e.g., sand, powdered glass, anhydrous sodium sulphate), and the latter may be extracted with successive quantities of ethyl acetate and acetone. From a *m*-cresol resin ethyl acetate removes a syrup hardening at 100°, and acetone removes an amorphous powder hardening after some hours at 50–60°.

Friedel-Crafts reactions, naphthalene series. I. Preparation of naphthanthraquinone. P. H. GROGINS and H. P. NEWTON (Ind. Eng. Chem., 1930, 22, 157–159).—A detailed study of the effects of the following factors: (1) reaction solvent and temperature, (2) ratio of naphthalene to phthalic anhydride, (3) ratio of anhydrous aluminium chloride to phthalic anhydride,

(4) conditions of hydrolysis of the reaction product, and (5) the conditions of formation of the ammonium salt and precipitation of α -naphthoylbenzoic acid, on the purity and yield of the product in the preparation of 1:2-benzanthraquinone from phthalic anhydride and naphthoic acid and subsequent dehydration of the α -naphthoylbenzoic acid so formed, is described. On the basis of the results the following technique is developed. A 97.5% yield of α -naphthoylbenzoic acid, m.p. 168–170° (purity 99.2%) [pure acid has m.p. 174.4° (corr.)] is obtained by condensing equimolecular proportions of naphthalene and phthalic anhydride in 3 pts. of *o*-dichlorobenzene with a 10% excess of aluminium chloride at 0°. Hydrolysis of the reaction mixture is effected by adding it gradually to dilute sulphuric acid with non-swirling agitation at 0°. After steam-distillation of the solvent (99% recovery) the crude acid is filtered, dissolved in dilute ammonia, the solution heated with vegetable carbon and filtered, and the cool filtrate fed slowly into cold dilute sulphuric acid with continuous agitation. Coagulation of the precipitated acid occurs if the ammonium salt solution is added too rapidly, or is too warm, or if the sulphuric acid is too concentrated. The only effective reagent to bring about ring-closure of the α -naphthoylbenzoic acid to benzantraquinone is 6 pts. of 95% sulphuric acid for 7 hrs. at 80°, at which temperature considerable sulphonation occurs normally, but is prevented by addition of boric acid (equal weight to that of the α -naphthoylbenzoic acid) as an inhibitor. Sulphonation is increased by use of a higher acid ratio or by a decrease in the proportion of boric acid used, whilst a lower acid ratio tends to result in incomplete ring-closure. The reaction mixture is diluted with 20% sulphuric acid to a residual acidity of 50%, cooled to 25°, and the crude product filtered, washed successively with 50% sulphuric acid and hot water, digested with 2% sodium hydroxide solution, washed, and dried. Under these conditions a 94% yield of benzantraquinone, m.p. 168°, is obtained, the degree of purity being unaffected by the use of either pure or the crude α -naphthoylbenzoic acid.
J. W. BAKER.

Cracking of tar acids from coal. MORRELL and EGLOFF.—See II. **Analysis of formic esters.** TOCCO and NYSENS.—See V. **Tests for peroxides in ethyl ether.** PINES. **Testing etc. of paraldehyde.** SCHULEK.—See XX.

PATENTS.

Manufacture of condensation products [flotation agents containing nitrogen and sulphur] from acetylene. I. G. FARBENIND. A.-G. (B.P. 316,282, 30.1.29. Ger., 27.7.28).—Acetylene and ammonia are passed at 300–400° with hydrogen sulphide or sulphur over a metal or metal sulphide (copper sulphide on coke, copper and cobalt sulphides on zinc oxide) to give products containing nitrogen and sulphur. A product of b.p. 120–300° is suitable for ore flotation.

C. HOLLINS.

Manufacture of formaldehyde. A. J. WEITH, V. E. MEHARG, and H. W. AHLBECK, Assrs. to BAKELITE CORP. (U.S.P. 1,738,745, 10.12.29. Appl., 29.10.27).—Ammonia is added to the mixture of methyl alcohol

vapour and air to prevent an acid reaction; or the product may be neutralised before distillation.

C. HOLLINS.

Manufacture of alcohols [from aldehydes or ketones]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,573, 6.4.29).—Aldehydes or ketones are reduced with gas mixtures not rich in hydrogen (less than 80%), freed from carbon monoxide, sulphur, etc., at 20–30 atm. in presence of an appropriate catalyst. *E.g.*, acetaldehyde at 30–35° and 20 atm. is reduced to ethyl alcohol by 80% hydrogen in presence of nickel or copper on kieselguhr; aldol gives *n*-butyl alcohol and a little γ -butylene glycol.

C. HOLLINS.

Catalysts for production of ketones. HOLZVER-KOHLUNGS-IND. A.-G. (B.P. 315,818, 10.1.29. Ger., 19.7.28).—Sponge iron or iron turnings are allowed to rust in the presence of acetic acid or calcium acetate and the product is mixed with a paste of manganese carbonate or of chromic or aluminium hydroxide and the mixture is heated at 500–550°. The mass is an efficient catalyst for the conversion of unsaturated aliphatic hydrocarbons and of aldehydes and alcohols into ketones in the presence of steam at 450–550°. [Stat. ref.]

A. R. POWELL.

Carrying out condensation reactions with non-aromatic compounds. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,411, 27.11.28).—A non-aromatic hydrocarbon is condensed with an organic compound containing halogen, alkoxyl, or carbalkoxyl substituents in presence of aluminium chloride etc., the reaction being performed at raised pressures. Polymethylene ketones are obtained from petroleum of b.p. 60–70°, carbonyl chloride, and aluminium chloride at 100°; *n*-butane similarly gives an oil, b.p. 120–150°/15 mm. Hexane is condensed with acetyl chloride or ethyl chloride, ethylene with methyl chloride or with the double compound of ether and boron fluoride, cyclohexane with benzoyl chloride.

C. HOLLINS.

Separation of anhydrous acetic acid from its aqueous solutions. SOC. ANON. DES DISTILLERIES DES DEUX-SÈVRES (B.P. 317,462, 21.12.28. Fr., 17.8.28).—An accessory liquid (petroleum fraction of b.p. 114–116°) which forms an azeotropic mixture with acetic acid is added to the anhydrous mixture of solvent (amyl acetate) and acetic acid obtained by the method of B.P. 296,974 (B., 1929, 349), and on distillation a mixture of anhydrous acid and accessory liquid, separable by decantation (especially after addition of about 1% of water), is collected, whilst the extracting solvent remains behind. The solution of acid in amyl acetate may, *e.g.*, be introduced at the middle of a heated tower down which flows the petroleum. Vapours of acetic acid and petroleum pass from the top of the tower to a condenser and receiver, where the desired amount of water is added and the acid decanted. The amyl acetate, unvaporised, is collected at the foot of the tower.

C. HOLLINS.

Removal of water from aqueous acetic acid. KODAK, LTD. From EASTMAN KODAK Co. (B.P. 327,444, 3.1.29).—Ethylene dichloride is used as entraining liquid in the distillation of water from aqueous acetic acid. The hotaqueous acid may be supplied to a

fractionating column, ethylene dichloride being introduced at the top in large excess (9 pts. for each pt. of water to be removed); water and ethylene dichloride are separated in the receiver after condensation, whilst the mixture of acetic acid and excess ethylene dichloride drawn from the base of the column is rectified separately. Suitable apparatus is figured.

C. HOLLINS.

Manufacture of methylamine [from hydrogen cyanide]. G. BARSKY, ASSR. to AMER. CYANAMID Co. (U.S.P. 1,736,872, 26.11.29. Appl., 30.3.26).—Hydrogen cyanide and large excess of hydrogen are passed over platinum-black on asbestos at 150–180° and at 50–100 lb./in.², the warm exit gases being scrubbed with cold acid and returned to the circuit. After about 10 days' working, during which the temperature should be raised 1½° per day from 165° to 180°, the catalyst is re-activated by washing it with 30% nitric acid. The gas mixture is conveniently produced by passing hydrogen through liquid hydrogen cyanide cooled in ice-water. Very little tar formation occurs. A suitable plant is described.

C. HOLLINS.

Manufacture of ethyl acetate. I. G. FARBENIND. A.-G. (B.P. 307,471, 8.3.29. Ger., 8.3.28).—A mixture of ethyl alcohol, excess of acetic acid, and a little sulphuric acid is distilled through a column. The lower (aqueous) layer in the receiver is run off, and the upper (alcohol and ester) layer is returned to the top of the column until its content of ester attains a maximum. Thereafter alcohol is run into the still gradually and a corresponding quantity of ester is drawn off from the receiver, the remainder being returned to the column as before. Finally the small residue of acetic acid is esterified by adding excess of alcohol and the distillate from this is added to the next batch.

C. HOLLINS.

Production of isopropyl alcohol. G. F. HORSLEY, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 327,224, 25.1.20).—Acetone vapour is hydrogenated at 180° in presence of a copper-nickel catalyst prepared as in B.P. 316,399 (B., 1929, 806).

C. HOLLINS.

Esterification of polyvalent alcohols or their derivatives. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 327,165, 22.11.28).—The products (red compounds of unknown constitution) obtained by treating organic acid chlorides with pyridine to remove hydrogen chloride are used as esterifying agents for cellulose, glycerol, etc. Acid chlorides mentioned are lauryl, acetyl, naphthenic, and phenylacetyl.

C. HOLLINS.

Manufacture of urea [carbamide]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,026, 15.4.29).—Ammonia gas (7 pts.) and carbon oxysulphide (4 pts.) are liquefied in a pressure vessel and heated at 120° (pressure 18–36 atm.). Carbamide is obtained in 70–78% yield without isolation of the thiocarbamate.

C. HOLLINS.

Condensation of aromatic compounds with olefinic compounds. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,382, 28.11.28).—Olefines condense with aromatic, hydroaromatic, or aliphatic compounds at 300–400° and 15–50 atm. pressure in presence of cerium metaphosphate or other phosphate,

borate, or arsenate not reduced by hydrogen under these conditions. Products from ethylene and naphthalene, toluene, soft paraffin wax, stearin, aniline (giving higher arylamines and heterocyclic bases), phenol, chlorobenzene, tetra- and deca-hydronaphthalenes, gas oil, anthracene, of propylene with toluene, and of styrene with naphthalene, are described. C. HOLLINS.

Manufacture of *m*-2-xylidine. IMPERIAL CHEM. INDUSTRIES, LTD., and J. KENNER (B.P. 327,830, 5.3.29).—*m*-2-Xylidine nitrate separates out substantially free from isomerides when the mixed xylidines remaining after removal of most of the *m*-4-xylidine as sulphate are dissolved in hot dilute nitric acid and the solution is allowed to cool. C. HOLLINS.

Manufacture of pure benzoic acid. I. G. FARBENIND. A.-G. (B.P. 307,343, 18.2.29. Ger., 5.3.28).—Crude benzoic acid from phthalic acid or anhydride is pasted with water and stirred with sodium hydrogen sulphite at 40–50° to reduce the naphthaquinones and hydrate the phthalic anhydride present; the reduction products etc. are removed by washing with water, leaving benzoic acid of 99% purity. Other reducing agents may be used. C. HOLLINS.

Preparation of *o*-(*p*-sulphobenzoyl)benzoic acid derivatives and anthraquinone compounds derivable therefrom. I. GUBELMANN, H. J. WEILAND, and O. STALLMANN (B.P. 327,130, 24.9.28).—*o*-(*p*-Sulphobenzoyl)benzoic acid is nitrated in sulphuric acid at 35–38° to give 4-nitro-4'-sulphobenzophenone-2-carboxylic acid, which is reduced with iron and acetic acid to the 4-amino-compound. The latter on cyclisation in sulphuric acid yields 2-aminoanthraquinone-7-sulphonic acid, from which by the action of ammonia in presence of ammonium arsenate at 180° 2:7-diaminoanthraquinone, m.p. 330–332°, is obtained. 2-Nitroanthraquinone-7-sulphonic acid, from the nitro-ketone, is converted into 7-chloro-2-nitroanthraquinone, m.p. 251–252°, reducible to 7-chloro-2-aminoanthraquinone, m.p. 302–303°. C. HOLLINS.

Manufacture of *o*-(aminoaroyl)benzoic acids and inner anhydrides thereof. I. G. FARBENIND. A.-G. (B.P. 305,593, 7.2.29. Ger., 7.2.28).—*N*-Arylphthalimides are transformed by heating with sodium aluminium chloride etc. into lactams of 2-*o*-aminobenzoylbenzoic acids, from which the free acids are readily obtained by hydrolysis. The preparation of 2-(*o*-aminobenzoyl)benzoic acid, m.p. 195° (decomp.) (lactam, m.p. 245–246°); 2-(4'-chloro-2'-aminobenzoyl)benzoic acid, m.p. 204–205° (decomp.) (lactam, m.p. about 300°); and the corresponding 3'-chloro- (acid, m.p. 176°; lactam, m.p. 293°), 6'-chloro- (acid, m.p. 188°; lactam), 3(?)-chloro- [acid, m.p. 168° (decomp.)], 4'-bromo- [acid, m.p. 170° (decomp.)]; lactam, m.p. 285°], and 4'-methyl [m.p. 194° (decomp.)]; lactam, m.p. 238–240°] derivatives is described. C. HOLLINS.

Manufacture of esters of *O*-arylated or *O*-aralkylated bivalent [dihydric] alcohols [perfumes]. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 327,705, 29.12.28).—Ethylene or γ -propylene glycol monoaryl or monoaralkyl ethers are treated with acylating agents derived from acids other than formic

and acetic. The following compounds are described: β -phenoxyethyl propionate, b.p. 121°/4 mm. (odour resembling hyacinth), butyrate, m.p. 129–131°/4 mm., isobutyrate, b.p. 125–127°/4 mm., isovalerate, b.p. 135–136°/4 mm., benzoate, m.p. 64°, and cinnamate, m.p. 64°; β -*p*-tolylloxyethyl isobutyrate, b.p. 124–125°/3 mm.; β -*o*-tolylloxyethyl isobutyrate, b.p. 128–130°/4 mm.; β -benzylloxyethyl isobutyrate, b.p. 134–137°/5 mm.; γ -phenoxypropyl isobutyrate, b.p. 138–141°. The products find application in perfumes. C. HOLLINS.

Manufacture of derivatives of aldehyde-amine reaction products [vulcanisation accelerators]. W. SCOTT, ASSR. to RUBBER SERVICE LABS. CO. (U.S.P. 1,737,391, 26.11.29. Appl., 18.5.26).—Dibenzylamine is condensed with formaldehyde, and the product is treated with carbon disulphide to give a vulcanisation accelerator. C. HOLLINS.

Manufacture of aldehyde-amine reaction products [vulcanisation accelerators]. C. O. NORTH and W. SCOTT, ASSRS. to RUBBER SERVICE LABS. CO. (U.S.P. 1,737,384, 26.11.29. Appl., 8.4.26).—Butyldenedianiline, CHPr(NHPh)₂, is condensed with heptaldehyde (1 mol.) below 50° to give a vulcanisation accelerator. Other alkylidenedianilines may be used. C. HOLLINS.

Manufacture of heterocyclic bases of the amino-iminazoline [aminodihydroglyoxaline] series. I. G. FARBENIND. A.-G. (B.P. 310,534, 24.4.29. Ger., 27.4.28).—2-Thiol-4:5-dihydroglyoxaline ("ethylenethiourea") is treated with methyl iodide or sulphate and the product is heated with a primary or secondary amine (e.g., *p*-toluidine) at 130°, with or without a solvent (amyl alcohol). The *p*-toluidino- (m.p. 133–134°), methylanilino- (m.p. 131°), and anilino- (m.p. 122°) derivatives are described. They are vulcanisation accelerators. C. HOLLINS.

Manufacture of [hydroxy-]carbazole derivatives. I. G. FARBENIND. A.-G. (B.P. 303,520, 4.1.29. Ger., 5.1.28).—Unlike 3-aminocarbazole, the 1- and 2-isomerides may be converted by the usual method (boiling the diazo compounds with water) into the corresponding hydroxycarbazoles. [Stat. ref.] C. HOLLINS.

Manufacture of hydroxycarboxylic acids of carbazole. I. G. FARBENIND. A.-G. (B.P. 303,901, 11.1.29. Ger., 12.1.28).—Hydroxycarbazoles are treated with alkali and carbon dioxide under pressure. 2-Hydroxycarbazole, potassium hydrogen carbonate, and carbon dioxide under 25 atm. pressure at 275° yield a separable mixture of 2-hydroxycarbazole-3-carboxylic acid, m.p. 273–274° (decomp.) (acetyl derivative, m.p. 227°; *o*-anisidide, m.p. 204–206°), and the isomeric 1-carboxylic acid, m.p. 271–272° (*o*-anisidide, m.p. 192–193°). The latter gives an indophenol with *p*-nitrosophenol. C. HOLLINS.

Manufacture of nitrohalogenoquinazolines [2- or 4-halogeno-*Bz*-nitroquinazolines]. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 327,450, 4.1.29).—A *Bz*-nitro-2- or -4-hydroxyquinazoline is treated with phosphorus penta-chloride or -bromide, or with phosphoryl chloride. The preparation of 4-chloro-6-nitro- (m.p. 128°), 4-chloro-7-nitro- (m.p.

148°, sublimes 200—230°, 4-chloro-6-nitro-7-methyl- (m.p. 100°, b.p. about 190°), and 4-chloro-7-nitro-2-phenyl-quinazolines, and of 6-nitro-4-hydroxy-7-methyl-quinazoline, m.p. 278°, and 7-nitro-4-hydroxy-2-phenyl-quinazoline, m.p. 240—250°, is described. The products have therapeutical application and serve as agents for combating insect pests.

C. HOLLINS.

Manufacture of perylenetetracarboxylic anhydride. F. BENSA (B.P. 309,163, 11.2.29. Austr., 6.4.28).—The dyes of B.P. 278,325 (B., 1928, 399), obtained by the action of cuprous cyanide on diacetyl or dipropionyl derivatives of 3:9-dichloroperylene, are oxidised almost quantitatively to perylenetetracarboxylic anhydride by dichromate or permanganate.

C. HOLLINS.

Preparation of thymol and its isomerides. RHEINISCHE KAMPFER-FABR. G.M.B.H. (B.P. 308,681, 14.2.29. Ger., 26.3.28. Addn. to B.P. 326,215; B., 1930, 532).—*iso*Propylated or propylated *m*-cresols are isomerised without catalysts at 330—400°, the chief products being thymol, m.p. 51°, b.p. 232°, and an isomeride, m.p. 114°, b.p. 245—246°, which itself undergoes partial conversion into thymol at 380°.

C. HOLLINS.

Manufacture of menthane. SCHERING-KAHLBAUM A.-G. (B.P. 327,924, 16.7.29. Ger., 8.6.29).—Dipentene is hydrogenated in presence of a nickel catalyst at elevated temperatures and pressure.

C. HOLLINS.

Manufacture of derivatives of 2:3-hydroxy-naphthoic acid. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 326,971, 26.2.29).—2:6-Dihydroxy-3-naphthoic acid is treated with ammonia or a primary or secondary amine to give 6-amino-2-hydroxy-3-naphthoic acids. The 6-amino- (m.p. 295°), 6-methylamino-, 6-anilino- (m.p. 222—223°), 6-methylanilino-, and 6-benzylamino-compounds are described.

C. HOLLINS.

Purification of crude aromatic hydrocarbons [anthracene, phenanthrene]. SELDEN Co., Assees. of A. O. JAEGER (B.P. 299,419, 8.10.28. U.S., 26.10.27).—Crude anthracene is mixed with air and passed over heated catalysts for preferential oxidation of carbazole and aliphatics; the phenanthrene may subsequently be removed by solvents. Suitable catalyst mixtures are: ilmenite and potassium hydroxide on pumice; ceria and potassium nitrate on pumice or aluminium; precipitated ferric oxide and titania with potassium hydroxide on pumice; etc. [Stat. ref.]

C. HOLLINS.

Manufacture of anthraquinone derivatives. CHEM. WORKS, FORMERLY SANDOZ (CHEM. FABR. VORM. SANDOZ) (B.P. 308,713, 13.2.29. Ger., 27.3.28).—Diamino-anthra-rufin- and -chrysazin-2-sulphonic acids are tetramethylated by treatment with formaldehyde (3.5 mols.) in presence of a little sulphuric acid; formic acid is unnecessary. Excess of formaldehyde tends to split off the sulphonic acid group and should be avoided.

C. HOLLINS.

Manufacture of aralkylbenzanthrones. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 327,526, 27.2.29).—Benzanthrones containing a free 3-position are treated with benzyl chlorides in presence of copper and a diluent or with a *p*-substituted benzyl alcohol in

presence of sulphuric acid. 3-Benzyl (m.p. 187°), 3-*p*-nitrobenzyl, 6:11-dichloro-3-benzyl (m.p. 207°), and 3-*m*-nitro-*p*-methoxybenzyl (m.p. 227°) derivatives of benzanthrone are described.

C. HOLLINS.

Manufacture of stable leuco-indigo preparations. IMPERIAL CHEM. INDUSTRIES, LTD., A. DAVIDSON, A. J. HAILWOOD, F. HENESEY, and A. SHEPHERDSON (B.P. 327,864, 15.4.29).—Dispersed indigo of particle size 3 μ or less is reduced with 0.6—1.0 mol. of dextrose and 4—7 mols. of caustic alkali. The leuco-indigo paste so prepared is stable and is suitable for feeding fermentation vats.

C. HOLLINS.

Manufacture of substituted arylsulphonic acids. K. DAIMLER and G. BALLE, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,758,277, 13.5.30. Appl., 18.3.26. Ger., 1.4.25).—See B.P. 250,241; B., 1927, 470.

Preparation of nuclear-substituted arylsulphonic acids. K. DAIMLER and G. BALLE, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,758,356, 13.5.30. Appl., 16.3.27. Ger., 27.3.26).—See B.P. 268,375; B., 1927, 743.

Diazo salt preparation. F. KELLER and K. SCHNITZSPAHN, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,758,912, 13.5.30. Appl., 8.12.25. Ger., 27.12.24).—See B.P. 273,352; B., 1927, 647.

Condensation products of the benzodiazine series. W. HENTRICH and M. HARDTMANN, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,758,792, 13.5.30. Appl., 14.12.27. Ger., 13.12.26).—See B.P. 309,102; B., 1929, 935.

Catalytically reducing anthraquinone compounds and hydrogenated products derived therefrom. J. VON BRAUN and O. BAYER, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,758,381—2, 13.5.30. Appl., 10.6.27. Ger., 3.3.25).—See B.P. 248,759; B., 1927, 597.

Manufacture of 2:7-dinitroanthraquinone. R. E. SCHMIDT and B. STEIN, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,758,855, 13.5.30. Appl., 28.6.26. Ger., 25.6.25).—See B.P. 291,886; B., 1928, 598.

Acetic acid from wood etc. (B.P. 327,415). **Oxidation of organic compounds** (B.P. 327,707).—See II. **Condensation products from carbazoles and olefines** (B.P. 327,746).—See XIII. **Fermentation of starch etc.** (B.P. 328,723).—See XVIII. **Ketones** (B.P. 325,669).—See XX.

IV.—DYESTUFFS.

Formaldehyde condensations with aromatic compounds. MORGAN.—See III. **Arsenic in food-colouring materials.** ANON.—See XIX.

PATENTS.

Manufacture of basic dyes [of the acridine series]. DURAND & HUGUENIN A.-G. (B.P. 316,315, 26.7.29. Ger., 28.7.28).—In the nitration of tetramethyl- or tetraethyl-diaminodiphenylmethane for Acridine-orange, additional nitric acid (*e.g.*, 4 mols. in place of 2) is used, whereby an acridine is eventually obtained which gives red-brown or copper-red shades on tannin-mordanted cotton. The methyl groups appear to be attacked.

C. HOLLINS.

Dyes and dyeing [soluble esters of leuco-vat dyes]. R. S. BARNES, B. WYLAM, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. 327,672, 4.10.28).—The sodium salts of acid sulphuric esters of leuco-vat dyes or of other leuco-quinones are converted into quaternary ammonium salts by double decomposition, by acidification, followed by neutralisation with a quaternary ammonium hydroxide with or without isolation of the free acid ester, or by conversion into pyridine salt followed by treatment with alkyl halide.

C. HOLLINS.

Preparation of dyes of the anthraquinone series [for wool and acetate silk]. IMPERIAL CHEM. INDUSTRIES, LTD., F. LODGE, and W. W. TATUM (B.P. 326,949, 8.2.29).—1:4-Diaminoanthraquinone-2-sulphonic acids are heated with alkali and a polyhydric alcohol to give (probably) hydroxy-ethers. 1:4-Diaminoanthraquinone-2:3-disulphonic acid with glycerol gives a bluish-red dye for acetate silk; glycerol or glycol and 1-amino-4-anilinoanthraquinone-2-sulphonic acid (violet on wool), "triethanolamine" and 1-amino-4-anilinoanthraquinone-2-sulphonic acid (reddish-blue on acetate silk) are similarly condensed.

C. HOLLINS.

Manufacture of vat dyes [of the anthraquinone-acridone series]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,758, 17.12.28).—Anthraquinoneacridones containing both chlorine and bromine are bluish-red vat dyes fast to light. Products from brominated anthraquinone-2:1-acridone and sulphuryl chloride or chlorine, and from chloroanthraquinone-2:1-acridone and bromine are described. [Stat. ref.]

C. HOLLINS.

Manufacture of anthanthrone derivatives [vat dyes]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,712, 9.10.28. Cf. B.P. 325,797; B., 1930, 501).—Diaminoanthanthrones are acylated or otherwise converted into *N*-substituted derivatives. Diaminoanthanthrone, synthesised from 5-nitro-8-amino-1-naphthoic acid, is dibenzoylated for a bluish-red vat dye; the diamine obtained by reducing dinitrated anthanthrone is condensed with benzoyl chloride (rose-red), *m*-methoxybenzoyl chloride, 1-chloroanthraquinone (grey), and 1-aminoanthraquinone-2-carboxyl chloride (blue-red) for vat dyes.

C. HOLLINS.

Manufacture of vat dyes [of the dibenzpyrene-quinone series]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,756, 18.10.28, 18.4. and 19.7.29).—1:2:6:7-Dibenzpyrene-3:8-quinone or a derivative is halogenated in chlorosulphonic acid etc. in presence of a carrier under mild conditions, *e.g.*, with chlorine at 50°, bromine at 60°, or iodine at 110°. At the higher temperatures the time of reaction must be shortened by using excess of halogen or of carrier (*e.g.*, 1.5% of sulphur or iodine). Thirty-three examples of special conditions for the production of clear, golden-yellow to orange vat dyes are described. C. HOLLINS.

Manufacture of vat dyes [of the isodibenzanthrone series] containing nitrogen. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,141, 27.12.28).—Vat dyes, differing from the aminoisodibenzanthrones of B.P. 23,052 of 1910 (B., 1911, 739) in that they are stable to hypochlorite, are obtained by the action of

hydroxylamine or isodibenzanthrones, with or without simultaneous or subsequent alkylation, acylation, or halogenation. *iso*Dibenzanthrone and hydroxylamine sulphate in presence of sulphuric acid and ferrous sulphate at 165–170° give a dark blue vat dye completely fast to chlorine; the presence of methyl sulphate leads to a redder dye, whilst benzoylation gives a navy-blue. Dibromo- and dichloro-*isobenzanthrones* give blue vat dyes.

C. HOLLINS.

Manufacture of nitrogenous derivatives of pyranthrone [vat dyes]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,734, 9.10.28. Cf. B.P. 325,250; B., 1930, 453).—*N*-Substituents are introduced into amino- or diamino-pyranthrone by condensation, especially with vatable compounds. Aminopyranthrone gives with 1-chloroanthraquinone an olive-brown vat dye, with monobrominated dibenzanthrone a blue-grey to blue-black; a blue-red vat dye is obtained from diaminopyranthrone and 1-amino-2-aldehydoanthraquinone.

C. HOLLINS.

Manufacture of a vat dye [sulphonated indanthrone]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,007, 25.3.29).—Pure indanthrone, obtained, *e.g.*, by the process of B.P. 184,193 (B., 1924, 49), is monosulphonated with 100% sulphuric acid at 120° in presence of boric acid. [Stat. ref.]

C. HOLLINS.

Manufacture of vat dye preparations. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,087, 25.3.29. Cf. B.P. 320,397; B., 1930, 277).—Mixtures of a pure sulphonic acid of indanthrone and preferably pure indanthrone containing 3–60% of the former have good fastness properties and strength. C. HOLLINS.

Iodination of organic compounds capable of being vatted. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,702, 29.10.28 and 6.4.29).—Vatable compounds are iodinated with iodine, iodine monochloride, etc. in sulphuric acid (monohydrate or weak oleum), perchloric acid, periodic acid, or phosphoric acid, in presence of carriers if desired. Vat dyes are prepared by iodination of anthanthrone (orange), bromoanthanthrone (red), chlorobromoanthanthrone (orange-red), pyranthrone (reddish-orange), dibenzanthrone (blue-violet), *isobenzanthrone* (violet), bromo-2:3:6:7-dibenzpyrene-1:8-quinone (blue-red), indanthrone (greenish-blue), 1:2:6:7-diphthaloylacridone (red-orange), benzanthronepyrazolanthrone (navy-blue), *ms*-anthradianthrone (yellow-orange), *allo-ms*-naphthadianthrone (orange), 6:6'-dichloro-4:4'-dimethylthioindigo (red-violet), and perylene (grey). Anthraquinone is similarly iodinated.

C. HOLLINS.

Manufacture of organic iodo-halogen compounds. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,711, 29.10.28 and 20.6.29. Cf. B.P. 327,702, preceding).—Vatable iodinated compounds are brominated or chlorinated especially in sulphuric or chlorosulphonic acid. Vat dyes are obtained by chlorination of iodoanthanthrone (scarlet-red), iodo-1:2:6:7-dibenzpyrene-3:8-quinone (orange-yellow), iodypyranthrone (orange), iododibenzanthrone (navy-blue), iodobenzanthronepyrazolanthrone (reddish-blue), and 7:7'-di-iodothioindigo (bluish-red); by bromination of iodoanthanthrone

(scarlet-red), iodo-1 : 2 : 6 : 7-dibenzpyrene-3 : 8-quinone (orange), iodopyranthrone (orange-red), iodobenzanthronepyrazolanthrone (blue), and 7 : 7'-di-iodothioindigo (violet); and by chlorination and bromination of iodopyranthrone (orange-red), iodoanthanthrone (reddish-orange), iododibenzanthrone (reddish-blue), and iodoisodibenzanthrone (bluish-violet). C. HOLLINS.

Manufacture of halogenated *allo*-ms-naphthodianthrones and condensation products thereof. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,175, 27.12.28. Addn. to B.P. 303,184; B., 1929, 238).—The halogenation is performed in inorganic acids (especially chlorosulphonic acid or oleum) below 60°. Vat dyes are obtained by the bromination or chlorination of *allo*-ms-naphthodianthrone (orange to scarlet), its cyano- (orange), amino- (grey-green), methoxy- (red-brown), and diphenoxy- (blue-red) derivatives.

C. HOLLINS.

Manufacture of diazonium fluorosulphonates. I. G. FARBENIND. A.-G. (B.P. 303,527, 5.1.29. Ger., 6.1.28).—Diazo compounds are treated with fluorosulphonic acid to give moderately soluble diazonium fluorosulphonates, which are not sensitive to shock and decompose without explosion when heated. The products are used in dyeing and against insect pests. C. HOLLINS.

Manufacture of azo dyes and complex metal compounds thereof. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,380, 1.10.28).—*o*-Aminophenols are diazotised and coupled with *N*-alkylated, -aralkylated, or -arylated 4-hydroxy-2-quinolones, at least one sulphonic group being present in one or both components. The dyes may be chromed in substance or on the fibre, or may be dyed on chromed material. Examples are: 4-chloro-*o*-aminophenol-6-sulphonic acid \rightarrow 4-hydroxy-1-phenyl-2-quinolone (chrome, bordeaux-red); 4-nitro-*o*-aminophenol-6-sulphonic acid \rightarrow 4-hydroxy-1-ethyl-2-quinolone (chrome, yellowish-red); picramic acid \rightarrow 4-hydroxy-1-methyl-2-quinolonesulphonic acid (chrome, red-brown); 1 : 2 : 4-aminonaphtholsulphonic acid \rightarrow 4-hydroxy-1-methyl-2-quinolone (chrome, violet); 4-chloro-*o*-aminophenol-6-sulphonic acid \rightarrow 4-hydroxy-1-*o*-anisyl-2-quinolone (chrome, bordeaux-red).

C. HOLLINS.

Manufacture of [direct] dis- and poly-azo dyes. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 326,791, 17.11.28).—The coupling of *N*-acylated 1 : 8-aminonaphthol derivatives, or of 1 : 8-aminonaphthols carrying in the amino-group a heterocyclic (e.g., cyanuric) residue, with diazotised 1 : 8-aminonaphthol derivatives through one or more middle components proceeds smoothly in presence of pyridine. Where the end component carries an *N*-aminobenzoyl group etc., the external amino-group may be modified by treatment of the product with phosgene, cyanuric chloride, organic acid chlorides, etc., or by diazotisation and development on the fibre or in substance. The dye H-acid \rightarrow cresidine is coupled with: 1-anisamido-8-naphthol-6-sulphonic acid (blue); the product from H-acid, aniline, and 2 : 4-dichloroquinazalone or cyanuric chloride (greenish-blue); 1-*p*-aminobenzamido-8-naphthol-6-sulphonic acid (blue; developed on the fibre with phenylmethylpyrazolone, green); 1-*m*-acetamidobenzamido-8-naphthol-6-sulphonic

acid (blue); or the product from 1 : 8 : 6-aminonaphthol-sulphonic acid (2 mols.) and terephthaloyl chloride (bluish-green), etc. C. HOLLINS.

Sulphur dyes. E. KRAMER, L. ZEH, and B. BOLLWEG, ASSTS. to GEN. ANILINE WORKS, INC. (U.S.P. 1,758,324, 13.5.30. Appl., 13.6.28. Ger., 30.6.27).—See B.P. 315,910; B., 1929, 809.

Manufacture of dyes containing sulphur and chromium. F. STRAUB, H. MEYER, and H. SCHNEIDER, ASSTS. to SOC. CHEM. IND. IN BASLE (U.S.P. 1,758,865, 13.5.30. Appl., 2.5.28. Switz., 7.5.27).—See B.P. 290,179; B., 1929, 238.

Preparation of azo dyes. H. WAGNER, H. EICHWEDE, and E. FISCHER, ASSTS. to GEN. ANILINE WORKS, INC. (U.S.P. 1,758,383, 13.5.30. Appl., 16.3.27. Ger., 31.3.26).—See B.P. 268,807; B., 1928, 741.

Manufacture of azo dyes [ice colours and pigments]. H. HEYNA, W. KIRST, H. KRACKER, and K. MOLDAENKE, ASSTS. to GEN. ANILINE WORKS, INC. (U.S.P. 1,746,652, 11.2.30. Appl., 13.3.28. Ger., 21.3.27).—See B.P. 287,479; B., 1929, 711.

Azo dyes and material dyed therewith. W. ECKERT and W. KIRST, ASSTS. to GEN. ANILINE WORKS, INC. (U.S.P. 1,758,313, 13.5.30. Appl., 3.12.28. Ger., 10.12.27).—See B.P. 302,173; B., 1930, 550.

Preventing the settling out of paste dyestuffs. W. H. CLUTTERBUCK (U.S.P. 1,758,145, 13.5.30. Appl., 2.1.29. U.K., 1.2.28).—See B.P. 310,830; B., 1929, 674.

Sodium tetraiodophenolphthalein (B.P. 304,589).—See XX.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Reactivity of plain and mercerised, or other swollen, cottons. C. BIRTWELL, D. A. CLIBBENS, A. GEAKE, and B. P. RIDGE (J. Text. Inst., 1930, 21, T 85—104).—A measure of the chemical reactivity of cotton is afforded by determining its copper number (Braid) after oxidation with an alkaline hypobromite solution under conditions which are examined and standardised in this paper. The figure obtained is expressed as a ratio to that given by "plain" bleached cotton (i.e., bleached cotton which has never been immersed in a liquid which causes swelling) and is called the "reactivity ratio" by analogy with the absorption (mercerisation) ratio (cf. B., 1925, 584; 1927, 293). The reactivity ratio of plain bleached cotton is therefore 1, whilst that of mercerised or other swollen cottons exceeds 1 by an amount which depends on the conditions of the swelling treatment. The method described has the following advantages over Schwalbe's "hydrolysis number" method (B., 1909, 216). The copper number obtained is almost independent of the time and temperature of treatment, all plain bleached cottons give approximately the same copper number irrespective of their geographical origin, mechanical form, and the nature of the bleaching process, and the measurement is unaffected by slight over-bleaching or acid attack. On the other hand, more care is required in the preparation of the hypobromite solution than in that of Schwalbe's 5% sulphuric acid. The reactivity ratios of

plain bleached cottons lie strictly within the range 0.95–1.12, whilst trade-mercerised materials have values of 1.3–1.6. When the reactivity ratios of cotton mercerised to different extents by treatment with sodium or potassium hydroxide solutions of different concentrations are plotted against concentration of alkali, curves are obtained which are exactly analogous to the corresponding absorption-ratio curves both at -10° and 18° , and the only divergence between the behaviours of the reactivity and absorption ratios is afforded by the fact that the reactivity ratio of mercerised cotton is not affected by drying the material at 110° . Values for cotton material treated with concentrated sulphuric acid may lie within or above the range for mercerised cotton, according to the nature of the material and the conditions of treatment, whilst the reactivity ratio is very sensitive to small changes of acid concentration within the range 64–69%. Two procedures for determination of the reactivity ratio are described, one for accurate analysis, and the other for use as a works' test to distinguish between chemically and mechanically finished materials, and the effects of various factors such as origin of the cotton, conditions of scouring and bleaching, attack by oxidising agents and acids, etc., are examined.

B. P. RIDGE.

Copper number of cotton. A. CREMONINI (*Annali Chim. Appl.*, 1930, 20, 168–170).—A more rapid procedure is given for determining the copper number of cotton, auto-reduction of the Fehling solution and the use of the stirrer employed in Schwalbe's method being avoided. The air-dried cotton (drying at 100 – 105° sometimes increases the copper number) is heated in a boiling water-bath with diluted Fehling solution, and the cuprous oxide formed determined either by means of ferric ammonium alum and standard permanganate, or by means of standard thiosulphate and potassium iodide.

T. H. POPE.

Adsorption of water by wool. J. B. SPEAKMAN (*J.S.C.I.*, 1930, 49, 209–213 r).—The amount of water adsorbed by seven different types of wool at 25° over a wide range of humidity has been determined, the existence of marked hysteresis between adsorption and desorption being revealed for the first time in the case of wool. The study of water adsorption by "diazotised" and formaldehyde-treated wools showed that free amino-groups play a relatively insignificant part in water adsorption by untreated wool. A comparison of the changes produced in the elastic properties and size-characteristics of wool by water adsorption suggests that the fibre is built up of long-chain protein molecules arranged preferentially about the long axis of the fibre. The polypeptide groups in these molecules are responsible for the adsorption of water which is so effective in reducing the rigidity of wool.

Determination of sulphur in wool and similar materials. C. RIMINGTON (*J.S.C.I.*, 1930, 49, 139–140 r).—A rapid and convenient method for the determination of sulphur in materials such as wool and hair is described. The method is based on a process of wet oxidation, using copper nitrate as the oxidant. All the sulphur is converted into sulphuric acid, which is determined as barium sulphate in the usual way. The

necessity of using sealed tubes, as required in the Carius method, is dispensed with, thereby affording a considerable economy of time and labour.

Thermal conductivity of textile materials and fabrics. J. B. SPEAKMAN and N. H. CHAMBERLAIN (*J. Text. Inst.*, 1930, 21, r 29–56).—Relations between thermal conductivity and thickness for compressed pads of loose wool and between thermal conductivity and density at constant thickness for compressed wool, cotton, and viscose rayon; the effects of various finishing processes (soap treatments etc.) on the thermal conductivity of wool fabrics; and the specific conductivities of a wide range of wool, cotton, linen, silk, rayon, and mixture fabrics have been determined. The warmth of all-wool fabrics is expressed by means of a general equation involving measurements of their thickness and density only.

B. P. RIDGE.

Swelling of sulphite-cellulose. V. I. SHARKOV (*J. Appl. Chem., Russia*, 1929, 2, 753–773).—No direct relationship exists between the increase in thickness and decrease in length of the cellulose fibres.

CHEMICAL ABSTRACTS.

Influence of the presence of γ -cellulose on swelling of a cellulose cardboard in alkalis. V. I. SHARKOV (*J. Appl. Chem., Russia*, 1929, 2, 749–752).— β - and γ -Celluloses differ in swelling properties in sodium hydroxide solutions.

CHEMICAL ABSTRACTS.

Desulphurisation of viscose [rayon] silk with ammonia solution. Y. KAMI and M. INUBUSHI (*J. Cellulose Inst., Tokyo*, 1930, 6, 99–106; cf. B., 1930, 96).—Raw viscose rayon was treated in a closed vessel with a solution of ammonia under controlled conditions, washed free from ammonia, and dried below 40° . Tearing strength, extensibility, and sulphur content were determined on the treated material. It is found that in this way the sulphur content may be reduced to a lower value (below 0.01%) than when sodium sulphide is used, but it is impossible to remove the whole of the sulphur. Conditions of treatment recommended are: for 1 hr. with a solution of 150 g. of ammonia per litre at 70° , or, for a quicker process, 30 min. with a solution of 250 g. per litre at 50° . Tearing strength and extensibility are increased, and the increase is roughly proportional to the time of treatment and inversely proportional to the temperature. The material is generally whiter, softer, and more lustrous, but a disadvantage is that the process must be carried out in airtight apparatus.

B. P. RIDGE.

Method of analysis of cellulose formate [or other formic esters] by oxidation. G. TOCCO and A. NYSSENS (*Giorn. Chim. Ind. Appl.*, 1930, 12, 124–126).—This method is applicable only to cellulose formates, since with the acetate the proportions of oxygen required for the complete oxidation of the cellulose and acetic acid are too nearly equal to allow of accurate results. The ester (1 g.), rendered absolutely dry by heating at 100 – 105° for 2 hrs. or at a lower temperature in a vacuum, is treated with 135–150 c.c. of *N*-potassium dichromate and, slowly and with cooling, with 40 c.c. of sulphuric acid. If necessary, the evolution of carbon dioxide is restrained by cooling. After the lapse of

30 min. the beaker is left for 8 hrs. in a boiling water-bath, the excess of dichromate (which should be at least 10 c.c.) being determined by titration either with ferrous sulphate or iodometrically. The number of c.c. of *N*-dichromate required for 1 g. is 148.14, 136.78, 128.43, or 121.95 for cellulose and the mono-, di-, and tri-formates, respectively. This procedure, which may be used also for other formic esters, such as those of starch, has been employed to control methods of hydrolysis by means of alkali. Of the finely-powdered product, 1 g. is dissolved in 40% potassium thiocyanate solution and treated for 3 hrs. with excess (40 c.c.) of cold *N*-sodium hydroxide, the excess of which is then titrated (1 g. of the mono-, di-, or tri-formate requires 5.26, 9.18, or 12.19 c.c. of the alkali, respectively). If the ester is not finely powdered, the hydrolysis requires heat. For formic esters which are not readily attacked by normal sodium hydroxide, or are only slightly soluble in thiocyanates, or are of very abnormal composition, the oxidation method is recommended.

T. H. POPE.

Beating of [paper] pulp. VIII. Effect of various reagents on the stuff in beating. IX. Effect of beating on the viscosity of stuffs. M. NAKANO (J. Cellulose Inst., Tokyo, 1930, 6, 89—99, 106—107; cf. B., 1930, 552).—VIII. The effects of various reagents and of various pretreatments on the beating of stuff in the ball-mill have been investigated. Pretreatment with dilute solutions of strong acids causes wet-beating to be attained rapidly, owing to the reduction in the degree of aggregation of the cellulose, but increasing loss of minute fibres, or slime from the wire-cloth results and the strength of the paper sheets is greatly diminished. When such dilute solutions are used as beating media, the effect is the same as when water alone is used. Weakly xanthated pulps give very wet pulps which become very free when decomposed with acid. Xanthated and subsequently decomposed pulps can only be wet-beaten with difficulty. Addition of alcohol or glycerin to the water retards beating. Pulps pretreated with concentrated zinc chloride solutions give very free stuffs and very absorbent paper sheets. Those beaten in alkaline solutions also give free stuffs, but pulps pretreated with concentrated alkaline solutions can only be wet-beaten with difficulty. Kraft pulps become soft on bleaching, and are easily wet-beaten, but the effects of bleaching sulphite-pulps depend on the degree of bleaching. Addition of lactic acid to the water, or preliminary steeping of pulps in dilute lactic acid solutions does not accelerate beating, which is contrary to Schwalbe's claim (G.P. 379,996; B., 1923, 1172 A). Pulps for artificial silks are similar in behaviour to ordinary paper pulps, whilst those for nitrocellulose are difficult to beat to wetness.

IX. Surgical cotton was beaten for 7 hrs. until a very wet stuff was obtained and the viscosity of the solution obtained by dissolving the dried product in 0.5% cuprammonium solution containing 182 g. NH_3 and 11 g. Cu per litre was compared with that of the original cotton under the same conditions at 25°. The average relative viscosities were found to be: cotton 10.8, beaten stuff 6.7; this considerable fall is attributed to

a reduction in the size of the micelles in the cellulose fibres.

B. P. RIDGE.

Digestion of pine wood [*Pinus sylvestris*] by the sulphite process. K. BERNDT (Papier-Fabr., 1930, 28, 313—319).—A summary of suggested methods for the pretreatment of pine wood to enable use to be made of the sulphite process. The heart-wood in its natural state does not respond to this process; the sap-wood may be pulped by this process and the residual heart-wood dealt with separately.

T. T. POTTS.

Irregular distribution of acid in a sulphite [pulp] digester. A. ECKE (Papier-Fabr., 1930, 28, 297—303).—The concentration of acid in a sulphite digester is greater in the lower part than in the upper. It is suggested that under the conditions of digestion the acid behaves as a solution of sulphur dioxide in water, and as the hydrostatic pressure is greater in the lower part of the digester the solubility of the gas is higher. Alternatively, the phenomenon may be explained as due to preferential adsorption by the wood in the upper part of the digester during the addition of the liquor.

T. T. POTTS.

Soda recovery in the sulphate-pulp process. W. GÜNTHER and T. KLEINICKE (Papier-Fabr., 1930, 28, 281—288).—An analysis of the cost of counter-current washing of sulphate-pulp, followed by recovery of soda by means of multiple-effect evaporation of the washings, incineration in a rotary oven, and causticising, is given.

T. T. POTTS.

Modern pulp-sizing problems. B. WIEGER (Papier-Fabr., 1930, 8, 113—116).—The alkaline and acid processes of sizing are compared. The author's "Bewoid" process utilises a 100% free rosin size produced by mechanical means. 100 kg. of rosin are dispersed in 10—15 min. to a particle size of 0.5—1.0 μ , with a power consumption of 4 h.p. It is found that particle size is the controlling factor in free rosin sizing. With particles below 1 μ sizing is always good, above 1 μ it diminishes, and above 10 μ it is negligible. The particles of a 40% free rosin size were found to lie between 0.2 and 1 μ . An optical method is used to determine the particle size. The size of particle does not increase with the free rosin content. The coagulation of rosin size is a time reaction dependent on the free rosin content: the higher the rosin content the slower is the reaction. With the mechanical dispersions several days are required for flocculation. The size of particle is not increased, there being merely a coalescence. The large flocs caused by rapid coagulation can act as sizing agents only by virtue of filtration, i.e., they act as loadings. The size should be thoroughly distributed throughout the stuff before coagulation in order that the formation of large flocs be avoided, the largest surface of fibres be covered, and the optimum particle size be not exceeded.

T. T. POTTS.

Determination of cellulose in wood and pulp. K. KÜRSCHNER and A. HOFFER (Tech. u. Chem. Papier Zellstoff-Fabr., 1929, 26, 125—139; Chem. Zentr., 1930, i, 146).—The dry wood (1 kg.), in small shavings, is heated for 1 hr. on the water-bath under reflux with 25 c.c. of 20 vol.-% alcoholic nitric acid; after

filtration through a glass filter-crucible the residue is again similarly treated once or twice. Finally the pure white cellulose is washed with water and dried at a temperature gradually rising to 108°. Only 75% of the hemicellulose of wood is removed, but the quantity remaining in the crude cellulose of similar kinds of wood is constant. The method was also applied to bleached and unbleached pulps. A. A. ELDRIDGE.

Testing of paper half-stuffs for strength. W. HUMM (Papier-Fabr., 1930, 8, 116—119).—The method given is claimed to render tests on half-stuffs independent of the paper-making factors, such as beating, "shake," and pressing, attending the preparation of test sheets, and to give figures which represent the strength of the individual fibres. The tests are made with an attachment fitted between the jaws of the Schopper tensile tester, and consisting essentially of two steel plates with a central aperture and a steel punch (4.75 mm. diam.) giving a circumference of 15 mm. (the width of the standard strip for the tensile test). Test sheets of the substance (200 g./m.²) are prepared and clamped between the steel plates. The punch is brought slowly to bear on the exposed surface until the test-piece is punched through. The pressure required is read off in the usual way. The force is considered as acting only at the circumference, as distinct from the bursting test. The specific resistance of the fibres to punching is obtained by multiplying the "punching length" by the sp. gr. of the fibres. Beating in the Lampén mill increases the punching strength, independently of the length of the fibres, as does also the removal of incrustants by bleaching. The strength of the original untreated fibres may be obtained by extrapolation. It is suggested that the method may be applied to pulp-boards. T. T. POTTS.

Determination of moisture in paper. E. H. RISENFELD and T. HAMBURGER (Papier-Fabr., 1930, 28, 288—289).—Drying paper in an oven at 105° does not remove water of adsorption or "hydration" (mechanical). Extraction for 1 hr. with carbon tetrachloride removes a maximum of water, which is determined volumetrically in the extract. An attempt to differentiate between mechanically-bound and chemically-bound water in parchment papers failed, as papers of different degrees of parchmentsation gave almost identical results. It is assumed that parchments do not contain chemical water of hydration, or, alternatively, that it is not removable by this method. On a wide range of papers, moisture contents differing by 0.5—1.5% are obtained when determined by oven-drying and extraction methods. T. T. POTTS.

Absorption, transmission, and reflection of radiant heat by fabrics. Transfer of moisture through fabrics. J. GREGORY (J. Text. Inst., 1930, 21, T 57—65, T 66—84).

Cellulose-decomposing organisms. SKINNER.—See XVI.

PATENTS.

Viscose spinning-bath solutions. C. F. M. VERSTYEN (B.P. 328,492, 18.6.29).—The concentration of the spinning bath is maintained by addition of the

salts (magnesium or zinc sulphate) in the substantially anhydrous state. F. R. ENNOS.

Manufacture of stable viscose solutions. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 328,044, 24.12.28).—Phenols or naphthols are added during the production of the viscose. F. R. ENNOS.

Manufacture of artificial threads. ACETA GES. M.B.H. (B.P. 311,763, 24.4.29. Ger., 16.5.28).—Artificial threads of uniform individual titers are produced by the dry-spinning process by causing the spinning solution to flow in symmetrically-placed streams, and in as thin a layer as possible, through the narrow space between two metallic bodies of high heat capacity which are placed directly above the spinning nozzle. F. R. ENNOS.

Manufacture of artificial threads. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,671 and 327,737, 4.10.28).—(A) Viscose is spun through a nozzle either of metal or vitreous material having a straight, cylindrical bore (diam. less than 0.2 mm., length at least five times internal diam.) into the usual precipitating bath; the spun threads are directly stretched to at least five times (metal nozzle) or ten times (vitreous nozzle) their original length. (B) A solution of an organic derivative of cellulose is spun through a glass nozzle (dimensions as in A) into air heated to 50—55°, and the spun threads are stretched to at least five times their original length. F. R. ENNOS.

Treatment of freshly spun threads of artificial silk. SONDERMANN & Co. (B.P. 307,357, 5.3.29. Ger., 5.3.28).—Threads coming from the spinning bath are reeled without doubling in close set, quick-traverse turns free from gaps, and preferably in a thick layer; the resulting compact cheeses are removed without skeining and treated in perforated containers, centrifuges, etc. with the appropriate liquids. F. R. ENNOS.

Production of artificial filaments or threads by the dry-spinning method. BRIT. CELANESE, LTD., and W. I. TAYLOR (B.P. 327,740, 6.10.28).—A lustre-modifying liquid (xylene, water, etc.) is applied by means of a wick at an early stage in the drying of the filaments of organic cellulose derivatives while they contain a relatively high proportion of solvent; the effect produced may be in the direction of reduced or of enhanced lustre, depending on the liquid used and on the stage of drying reached by the filaments. F. R. ENNOS.

Manufacture of [artificial] threads, foils, etc. [from polymerised diolefines]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,164, 17.11. and 31.12.28).—A filtered solution of synthetic rubber (from butadiene) in cyclohexane, methylene dichloride, or other suitable solvent is spread on glass plates (for foil) or pressed through a nozzle (for threads), and after evaporation of the solvent the product is treated with sulphur chloride vapour until it has lost its extensibility. Thin transparent foils or threads suitable for photographic purposes or for packing of comestibles are obtained. [Stat. ref.] C. HOLLINS.

Manufacture of cellulose acetate. U.S. INDUSTRIAL ALCOHOL Co. (B.P. 306,531, 22.1.29. U.S., 24.2.28).—

Cellulose acetate, produced by acetylation of cellulosic material under pressure, with or without a catalyst, in a medium of liquid sulphur dioxide, is discharged from the reaction vessel so that the sulphur dioxide is abruptly liberated as gas, thus disrupting the ester with production of a light and fluffy product. F. R. ENNOS.

Manufacture of benzyl cellulose. IMPERIAL CHEM. INDUSTRIES, LTD., and D. TRAILL (B.P. 327,714, 3.10.28).—After mercerising cellulose with 18–20% caustic soda and pressing to $2\frac{1}{2}$ –4 times the weight of cellulose used, the product is matured at 22–35°, mixed with 50–100 pts. of solid caustic soda for each 100 pts. by wt. of raw cellulose, and benzylated; by maturing for different times and at different temperatures within the prescribed limits, products differing in viscosity and solubility are obtained. F. R. ENNOS.

Manufacture of cellulose ethers. H. DREYFUS (B.P. 327,157, 23.12.28).—Cellulose hydroxyalkyl ethers (cf. B.P. 277,721; B., 1927, 872) are etherified, e.g., with alkali and ethyl sulphate, to reduce the capacity for dissolving or swelling in water. C. HOLLINS.

Preparation of cellulose esters and ethers. BRIT. CELANESE, LTD. (B.P. 308,348, 12.3.29. U.S., 22.3.28).—Cotton, wood pulp, etc. is treated with hydrofluoric acid to remove silicious matter, with an aliphatic acid (formic or acetic) to remove oils, wax, etc., and is afterwards washed and converted into the required cellulose derivative. F. R. ENNOS.

Production of distended fibrous material. F. L. BRYANT, Assr. to S. L. SCHWARZ (U.S.P. 1,740,280, 17.12.29. Appl., 19.12.28).—A mixture of fibrous material, e.g., cellulose pulp, asbestos, wool, with a foam-forming substance, e.g., saponin, is thoroughly agitated and afterwards dried with the bubbles incorporated therein. F. R. ENNOS.

Production of cellulosic material. B. DORNER, Assr. to CORNSTALK PRODUCTS CO. (U.S.P. 1,758,655, 13.5.30. Appl., 17.1.27).—See B.P. 283,851; B., 1929, 593.

Apparatus for the gassing of textile yarns or threads. J. STUBBS, LTD., and J. H. STUBBS (B.P. 327,913, 20.6.29).

Process and apparatus for treating artificial threads. I. G. FARBENIND. A.-G. (B.P. 311,399, 17.4.29. Ger., 11.5.28).

Making bands of artificial fibres. I. G. FARBENIND. A.-G. (B.P. 304,667, 23.1.29. Ger., 23.1.28. Addn. to B.P. 286,603).

[Machine for] drying of cellulosic films. A. J. MAURER (B.P. 328,566, 28.1.29).

Wood substitute (G.P. 461,775).—See IX.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Substantivity [of dyes]. E. JUSTIN-MUELLER (Bull. Soc. Ind. Mulhouse, 1930, 96, 215–216).—It is more difficult to obtain clear white discharges (using sodium hyposulphite) on sulphur than on indigo dyes; this is attributed to the greater substantivity of sulphur dyes on cotton. A. J. HALL.

Adsorption of sodium hydroxide by cellulose and mercerisation. M. M. CHILIKIN (J. Appl. Chem., Russia, 1929, 2, 739–747).—The phenomena of mercerisation (swelling accompanied by a change in colloidal state) and adsorption of sodium hydroxide by cellulose are explained by considering the cellulose to be a two-phase system, consisting of a crystalline network in an amorphous mass. Adsorption from dilute sodium hydroxide solutions follows the laws of adsorption, which hold also for adsorption by the mercerised cellulose until (at high concentrations) a ratio of approximately $C_6H_{10}O_5 : NaOH$ is reached. Mercerised cellulose adsorbs more sodium hydroxide from aqueous-alcoholic solutions than does ordinary cellulose. Experiments with mercerised cellulose show that a certain concentration of sodium hydroxide within the cellulose can be in equilibrium with various concentrations of sodium hydroxide in water or aqueous ethyl alcohol.

CHEMICAL ABSTRACTS.

Reactivity of mercerised cottons. BIRTWELL and others.—See V. **Dyeing of leather.** WOODROFFE and HILL.—See XV.

PATENTS.

Dyeing and printing of cellulose acetate. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,394, 1.10.28).—Acetate silk is dyed by means of azo dyes formed by coupling a diazo compound of the benzene series free from sulphonie or carboxylic groups with an *N*-alkylated 4-hydroxy-2-quinolone. Examples are: *m*-nitroaniline \rightarrow 4-hydroxy-*N*-methyl-2-quinolone (greenish-yellow); *p*-aminodimethylaniline \rightarrow 4-hydroxy-*N*-methyl-2-quinolone (red-violet); *p*-chloroaniline \rightarrow 6-chloro-4-hydroxy-*N*-ethyl-2-quinolone (yellow). C. HOLLINS.

Wet treatment of yarn or the like. SONDERMANN & Co. (B.P. 314,402, 26.6.29. Ger., 26.6.28).—The threads on spools are disposed at an angle to the directions of flow of the treatment fluid.

Rendering textiles impermeable and rot-proof. M. and R. WALRAVE (F.P. 638,377, 3.12.26).—The fabric is soaked in a mixture of a mineral or vegetable oil and a metal soap, e.g., a mixture of 25% of rape oil, 35% of ozokerite, and 40% of zinc oleate. A. R. POWELL.

Manufacture of [coated fabric for use as] gas containers. GOODYEAR-ZEPPELIN CORP., Assees. of K. HUERTLE (B.P. 304,775, 22.1.29. U.S., 27.1.28).—The fabric is coated with a Bakelite varnish mixed with a softener (tritolyl phosphate, castor oil) and thinner (acetone), and is dried at 90–100°. F. R. ENNOS.

Dyeing apparatus. J. P. DE G. ANGLADA (B.P. 310,006, 17.4.29. Spain, 19.4.28).

[Machine for] ornamentation of fabrics, paper, etc. W. LOWE, and FLEURET FABRICS, LTD. (B.P. 328,730, 7.3.29).

Calendering of textile fabrics. C. H. WEISBACH KOMM.-GES. (B.P. 329,259, 19.10.29. Ger., 20.10.28).

Dyeing with leuco-vat dyes (B.P. 327,672).—See IV. **Coating compositions** (B.P. 297,681).—See XIII.

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

Determination of nitrous acid in spent nitrating acids. F. HOLDEN (J.S.C.I., 1930, 49, 220—221 r).—Spent nitrating acids containing substances which interfere with the usual titration methods are treated with urea solution in a nitrometer. The volume of nitrogen and nitric oxide obtained is measured over sodium hydroxide solution in a second nitrometer. The nitric oxide is measured by absorption with potassium permanganate or sodium sulphite. A less accurate method requiring only one nitrometer is also described.

Apparatus for the continuous generation of very dilute mixtures of nitrogen peroxide and air of controlled humidity and temperature. H. J. POOLE and W. J. POWELL (J.S.C.I., 1930, 49, 29—34 r).—An apparatus designed primarily for testing the sensitivity and uniformity of indicator papers used for the detection of nitrogen peroxide, but also suitable for use with other gas mixtures and the general study of gas reactions at high dilutions, is described. The principle involved is that of mixing two uniformly moving streams, one a slow stream of known velocity containing nitrogen peroxide and the other a fast one of air, also of known velocity. Successive dilutions are obtained by addition of further measured air streams to the original stream. A number of accessories devised for the accurate control and measurement of the velocity of gas streams are described.

Production of sodium carbonate from sodium sulphate, with ammonia as by-product. H. MIURA and R. HARA (Tech. Rep. Tôhoku, 1930, 9, 57—68).—The interaction of nitrogen in presence of an iron catalyst on the reactants of the Leblanc soda process, as represented by the equation: $\text{Na}_2\text{SO}_4 + \text{CaCO}_3 + 6\text{C} + \text{N}_2 = 2\text{NaCN} + \text{CaS} + 2\text{CO}_2 + 3\text{CO}$, was investigated (cf. B., 1925, 497). The sodium cyanide produced (yield about 70%) is somewhat difficult to separate in a pure state from the sulphur compounds present. It may, however, be practically quantitatively converted into ammonia by means of superheated steam; a solid residue is then left having the same composition as "black ash," except that it also contains iron as metal or oxide. On lixiviation of this residue and evaporation of the extract in presence of carbon dioxide, sodium carbonate of 99.96% purity, corresponding to 90—98% of the sodium sulphate originally used, is obtained.

S. K. TWEEDY.

Ammonium phosphates. E. V. BRITZKE, A. P. DUNAIEV, and E. P. POKHVALINSKAJA (Trans. Sci. Inst. Fertilisers, Moscow, 1928, No. 51, 5—79).—The dissociation pressure in the reaction $(\text{NH}_4)_2\text{HPO}_4 = \text{NH}_3 + \text{NH}_4\text{H}_2\text{PO}_4$ at 98—147° satisfied the Clausius-Clapryron equation $d \log p / dT = U / RT^2$, for $t = 117.5^\circ$, $U = -19.26$ g.-cal. per mol. Diammonium hydrogen phosphate can be obtained below 130° by using excess of ammonia. Since the concentration of phosphoric acid has no influence on the process, the low concentrations of this substance from the volatilisation process can be fully utilised. Solubility curves are reproduced.

CHEMICAL ABSTRACTS.

Production of ammonium phosphate. S. VOLF-KOVICH (Fertilisers and Yields, Russia, 1929, 30—37).—Britzke's method requires a 50% concentration of P_2O_5 . Phosphoric acid concentrations of 6—18% P_2O_5 can be used when the reactions are allowed to take place in two stages with intermediate formation of ammonium dihydrogen phosphate. The sesquioxides can be completely precipitated in the first stage. The triammonium phosphate is unstable, and may be treated with phosphoric or sulphuric acid or mixed with the product of the first stage. CHEMICAL ABSTRACTS.

Thermal method of obtaining potassium phosphates. E. V. BRITZKE, N. E. PESTOV, and E. P. POKHVALINSKAJA (Fertilisers and Yields, Russia, 1929, 69—71).—Potassium metaphosphate was obtained by interaction of potassium chloride and phosphoric acid at 250—500°.

CHEMICAL ABSTRACTS.

Formation and volumetric determination of potassium thiosulphate in the mother-liquors of potassium metabisulphite. F. DE BACCO (Giorn. Chim. Ind. Appl., 1930, 12, 121—122).—The formation of thiosulphate together with metabisulphite when potassium hydroxide or carbonate solution is treated with the mixed gases from sulphur burners is doubtless due to the action of entrained sulphur vapour or powder, but its appearance in small proportion when pure sulphur dioxide is used is not readily explainable. To determine the thiosulphate, 10 c.c. of the mother-liquor are made up to 500 c.c. with cold, recently boiled water, and 100 c.c. of this solution are shaken with 10 c.c. of formalin previously neutralised to phenolphthalein by means of *N*-sodium hydroxide, and left for about 10 min. The solution is then made slightly acid to methyl-orange with *N*-sulphuric acid and, after the lapse of 20 min. to allow of the formation of the bisulphite-formaldehyde compound, the thiosulphate is titrated with iodine solution in presence of starch paste. In another aliquot part of the solution the bisulphite, sulphite, and free sulphur dioxide (rarely present) are determined.

T. H. POPE.

Radioactive ash from crude oils. BOGOYAVLENSKI.—See II. **Russian phosphate deposits.** FIVEC and ROZANOV.—See XVI. **Detection of gold chloride.** SETTIMJ.—See XXI. **Absorption of mercury chloride by charcoal.** RAKUSIN.—See XXIII.

PATENTS.

Manufacture of potassium nitrate. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 328,272, 12.12.28 and 8.4.29).—In the treatment of calcium nitrate with potassium chloride, a quantitative yield of potassium nitrate may be obtained if the separation of the salt is carried out in presence of ammonia. This may be introduced by using ammoniacal solutions of the original salts, or by adding it after mixing, or after separation of the potassium nitrate. A further improvement consists in cooling the mother-liquor to as low as —30°, and then treating it with gaseous ammonia, or with the gas mixtures obtained in the synthesis of ammonia, to separate calcium chloride.

W. J. WRIGHT.

Production of alkali nitrates. F. JOST (B.P. 306,046, 14.2.29. Ger., 14.2.28).—Alkali chlorides are

converted by means of phosphoric acid into alkali phosphates, which latter are then converted by reaction with calcium nitrate into alkali nitrate and calcium phosphate. The process may be carried out in a cyclic manner. Thus the calcium phosphate may be treated with sulphuric acid and converted into calcium sulphate and phosphoric acid, the latter being then used in the process and the former being converted with ammonia and carbon dioxide into calcium carbonate and ammonium sulphate. The calcium carbonate is then converted into calcium nitrate, which is used in the process, the carbon dioxide being recovered for further treating calcium sulphate. Alternatively, the calcium phosphate may be treated with nitric acid directly, the phosphoric acid being treated in the solution containing calcium nitrate with alkali chlorides. S. K. TWEEDY.

Removal of alkali chlorides from crude potassium carbonate solutions. I. G. FARBENIND. A.-G. (B.P. 327,938, 4.9.29. Ger., 16.10.28).—Ammonia gas is passed through the crude potassium carbonate solution, preferably to saturation point. The liquid is allowed to settle and the upper ammoniacal layer which forms, containing the bulk of the alkali chloride impurities, is removed. S. K. TWEEDY.

Manufacture of alkaline-earth chlorides from the corresponding sulphates. I. G. FARBENIND. A.-G., Assecs. of F. LINDNER (G.P. 460,572, 16.12.24).—Mineral sulphates, *e.g.*, barytes, are heated at 800° in a current of water-gas or producer gas to which chlorine has been added. An extraction of 95% of the barium as chloride is claimed. A. R. POWELL.

Manufacture of alkali fluorides. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 328,211, 18.1. and 24.9.29).—By causing excess of gaseous hydrofluoric acid to act on solid alkali chloride at temperatures below 50°, liquid alkali fluoride is formed with some loosely combined hydrofluoric acid. By heating this compound, alkali difluoride and fluoride are obtained. If the alkali chloride is heated with the hydrofluoric acid at 80–120° the neutral fluoride is produced, or the latter may be obtained by heating sodium difluoride at temperatures above 100°. W. J. WRIGHT.

Manufacture of carbamates and conversion products of the same. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 328,005, 14.1.29).—Salts of metals other than potassium, *e.g.*, sodium chloride, calcium chloride, lead nitrate, are treated in solution in liquid ammonia with carbon dioxide, generally at the usual temperature; water or ammonium nitrate or acetate may be added to increase the solubility of the salts in the ammonia. The carbamates formed, after separation from the ammonia by filtration, may be converted by heat into other compounds, *e.g.*, calcium carbamate into the cyanamide. L. A. COLES.

Dehydration of (A) solid substances, (B) salts. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,481–2, 17.1.29).—Liquid ammonia is used for dehydrating, *e.g.*, (A) silica hydrogels, (B) crystalline magnesium chloride; the process is effected, *e.g.*, on the Soxhlet principle, and residual ammonia, whether retained mechanically or in chemical combination, as

in the case of magnesium chloride, is removed by heat. L. A. COLES.

Manufacture of rinsing, grease-removing, and cleaning compositions. HENKEL & Co., G.M.B.H. (B.P. 328,097, 23.3.29. Ger., 27.2.29).—Aqueous solutions containing alkali phosphates with an alkaline reaction and soluble silicates, together, if desired, with alkali hydroxides, are dried in atomising apparatus with the simultaneous addition of regulated quantities of powdered, calcined sodium carbonate in the atomising zone. L. A. COLES.

Manufacture of sodium glutamate. Y. S. FONG (B.P. 327,810, 14.2.29).—Glutamic acid hydrochloride, from hydrolysis of gluten with concentrated hydrochloric acid and a little nitric acid, is dissolved in hot water, sodium carbonate equivalent to the hydrochloric acid is added, and the glutamic acid which separates on cooling is washed with ice-water to remove salt and finally neutralised with sodium carbonate to give monosodium glutamate of purity suitable for flavouring matters. C. HOLLINS.

Recovering zinc sulphide from zinc-containing liquids. F. KAUBA (B.P. 327,596, 24.4.29).—Solutions containing zinc compounds obtained, *e.g.*, in metallurgical leaching processes are treated with a mixture of non-reacting gases containing hydrogen sulphide to remove copper, lead, cadmium, etc., and a little zinc as their sulphides and to saturate the solution with the non-reacting gases; the residual solution is treated with a gas rich in hydrogen sulphide so that the remaining zinc is precipitated completely as its sulphide. The first gas mixture is prepared by passing mixed gases containing hydrogen (*e.g.*, coke-oven gas, water-gas) over red-hot iron pyrites, and the second by treating with acids the ferrous sulphide obtained in preparing the first mixture. L. A. COLES.

Preparation of pure zirconium sulphate from zirconium ores decomposed by sulphuric acid. DEUTS. GASGLÜHLICHT-AUER-GES.M.B.H. (G.P. 434,987, 26.9.23).—The concentrated, slightly acid solution of zirconium sulphate obtained by digesting the ore with sulphuric acid is treated with sulphuric or hydrochloric acid to precipitate zirconium sulphate. This is redissolved in dilute acid, the solution neutralised and boiled to precipitate a basic sulphate, and this salt redissolved and re-precipitated by either of the above methods to eliminate the last traces of iron and titanium. A. R. POWELL.

Treatment of decolorising clays. W. A. RAINE and R. C. POLLOCK, Assrs. to UNION OIL CO. OF CALIFORNIA (U.S.P. 1,739,734, 17.12.29. Appl., 21.12.22).—The clay, *e.g.*, halloysite, is made into a slurry with water and heated until a thin colloidal paste is obtained. Strong sulphuric acid is added in a thin stream to the hot paste, and heating and stirring are continued for 2 hrs., soluble material is then removed by washing and decantation, and the activated residue is dried first at 120° then at 80–85°. A. R. POWELL.

Production of metal carbonyls. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,956, 14.12.28).—Metal compounds capable of reduction are converted

into the metal carbonyls by treatment with carbon monoxide at elevated temperatures and pressures, *e.g.*, nickel oxide, nickel sulphide, and iron oxide are treated with the gas at 250° under 350 atm., at 200° under 200 atm., or at 225° under 200 atm., respectively.

L. A. COLES.

Preparation of [colloidal] silica gel. A. P. OKATOFF (B.P. 328,241, 23.10.28).—Sodium silicate is mixed with hydrochloric acid, and when syneresis begins the gel is treated with solutions of alkali salts or ammonium salts of polybasic acids in presence of ammonia, after which the gel is washed, and activated by drying at a high temperature.

W. J. WRIGHT.

Production of hydrogen [from methane]. D. TYRER, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 328,048, 25.1.29).—Methane or a gas mixture containing it is blown together, if desired, with steam into molten iron; the carbon liberated by the decomposition of the methane dissolves in the iron and is subsequently removed by blowing with air. Alternatively, the methane and air are blown continuously into the opposite ends of a reaction chamber provided with a partition dipping below the surface of the iron to prevent admixture of the gaseous products in the two sections; secondary air may be admitted above the iron in the oxidation section to oxidise the carbon monoxide formed therein.

L. A. COLES.

Manufacture of hydrogen peroxide. I. G. FARBENIND. A.-G., Assees. of W. FRANKENBURGER and C. STEIGERWALD (G.P. 461,635, 7.1.27).—A mixture of gases containing hydrogen and preferably less than 5% of oxygen together with the vapour of a metal is subjected to the radiation from a metal-vapour lamp.

A. R. POWELL.

Producing ammonium phosphate or mixed fertilisers containing it by leaching of raw phosphate. F. G. LILJENROTH (U.S.P. 1,758,448, 13.5.30. Appl., 21.6.28. Swed., 12.7.27).—See B.P. 290,518; B., 1928, 539.

Production of phosphorus and alumina cement. R. SUCHY, Assr. to I. G. FARBENIND. A.-G. (U.S.P. 1,758,241, 13.5.30. Appl., 24.3.28. Ger., 19.3.27).—See B.P. 287,036; B., 1928, 366.

Refrigerant (F.P. 637,898). Catalysts (B.P. 301,736).—See I. **Acetic acid from wood etc.** (B.P. 327,415).—See II. **Anhydrous acetic acid** (B.P. 317,462 and 327,444).—See III. **Tin from tin salt solutions** (B.P. 313,166).—See X. **Carbon monoxide** (U.S.P. 1,740,139).—See XVIII.

VIII.—GLASS; CERAMICS.

Glasses transparent to ultra-violet radiation. A. R. WOOD and M. N. LEATHWOOD (Nature, 1930, 125, 351).—Polemical against English (B., 1930, 239).

L. S. THEOBALD.

Raw and white ground-coat [for enamels]. A. MALINOVSKY (J. Amer. Ceram. Soc., 1930, 13, 277—284).—The use of lepidolite (*cf.* B.P. 307,259; B., 1929, 356) as a ground-coat for enamel is shown to be impracticable for cast iron, though it might be suitable for steel. Details are given of the composition of a

number of ground-coat mixtures. Cobalt oxide is not essential to give good adhesion of the ground-coat. Silica, boric oxide, and sodium oxide, in the proportions of 9—14SiO₂, 2B₂O₃, and Na₂O, are indispensable components. The comparative adhesion of fritted and raw ground-coats was studied and the results are illustrated.

F. SALT.

Opacifying effect of some fluorides in enamel mill additions. R. M. PEARCE and R. M. KING (J. Amer. Ceram. Soc., 1930, 13, 272—276).—A study was made of the effect of barium fluoride and zinc fluoride, when added in the mill after fritting, on four types of enamels—high-silica, high-borax, high-lead, and an antimony oxide enamel. The results, which are presented in triaxial diagrams, were entirely negative. In the high-silica enamel the fluoride decreased the opacity.

F. SALT.

Simplified practice of mixing coloured glazes. V. J. BOEHM (J. Amer. Ceram. Soc., 1930, 13, 285—286).—To facilitate the mixing of a number of coloured glazes, using one base glaze to which the different wet stains are added, curves are plotted relating the percentage of solids and ounces per pint in both the base glaze and the stains.

F. SALT.

Refractories and refractory cements for the non-ferrous foundry. H. E. WHITE (J. Amer. Ceram. Soc., 1930, 13, 219—236).—A review is presented of the recent developments in linings for open-flame, crucible, and electric furnaces, and in refractory cements. The use of fireclay refractories in this industry is being rapidly superseded by a series of new products and super-refractory cements. For crucible furnaces, preference is being shown for silicon carbide refractories and cements, which materials are finding increased favour for open-flame furnaces also, although in this latter class alumina and alumina-silica combinations are competing strongly. High-alumina and mullite-containing refractories are favoured for electric furnaces. The life of fireclay refractories is being considerably prolonged by the use of suitable refractory cements.

F. SALT.

Forming pressure of dry-pressed refractories. I. Effect of pressure variations on the properties of green and dry bodies. R. E. BIRCH (J. Amer. Ceram. Soc., 1930, 13, 242—255).—Tests have been made on 8 commercial dry-press mixtures, test bricks being formed in a hydraulic press giving a maximum pressure of 6000 lb./in.² on the flat. The bulk density of the dry and green samples increased with increasing forming pressure, the effect being most marked at the lower pressures. The same applied also to the transverse strength. Pressures applied in industrial practice are low, and could be increased by the use of materials of lower moisture content; a slight increase would greatly improve the green strength of the ware. Dry-press bodies approach a condition of maximum compactness, beyond which additional pressure produces no further increase in density.

F. SALT.

PATENTS.

Tunnel kiln. A. McD. DUCKHAM, Assr. to WOODALL-DUCKHAM (1920), LTD. (U.S.P. 1,758,785, 13.5.30. Appl., 8.4.27. U.K., 3.12.26).—See B.P. 280,044; B., 1928, 92.

Refractory [coatings for silicon carbide] articles and their protection. R. H. MARTIN, Asst. to NORTON Co. (Re-issue 17,661, 13.5.30, of U.S.P. 1,653,918, 27.12.27).—See B., 1928, 158.

Preparation [drying etc.] of ceramic articles. W. and M. LENGERSDORFF (B.P. 328,777, 22.4.29).

Artificial masses (B.P. 327,722).—See XIII.

IX.—BUILDING MATERIALS.

Magnesium cement. N. S. KURNAKOV, S. F. SHEMTSCHUSHNI and V. A. AGEIEVA (J. Appl. Chem., Russia, 1929, 2, 651—661).—Cement containing magnesium chloride has three setting periods; the three breaks in the heating curve are due, respectively, to the boiling of the magnesium chloride solution, the dissociation of magnesium hydroxide, and the formation of a solid, possibly basic magnesium chloride. The region of maximum hardness is within the limits of the third break.

CHEMICAL ABSTRACTS.

Heat insulation. WINTERBOTTOM.—See I. **Refractory cements.** WHITE.—See VIII.

PATENTS.

Manufacture of concrete. J. S. MORGAN (B.P. 328,030, 17.11.28).—Adherent air is prevented or removed from concrete mixtures by agitating the cement with water in a high-speed disintegrator and then mixing the slurry with a wetted aggregate. The process may be conducted under reduced pressure.

C. A. KING.

Manufacture of roads, paths, etc. S. J. L. ROBINSON and W. T. COLLIS (B.P. 328,166, 5.7.29).—A suitable grade of aggregate (75—95%) is mixed with 5—20% of powdered pitch and sprayed with 0.5—5% of creosote. The process of mixing is continued until the creosote has softened the pitch and caused it to adhere to the aggregate.

C. A. KING.

Treatment of roads, paved surfaces, etc. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 327,968, 12.1. and 16.5.29).—The roads etc. are cleansed by treatment with solutions containing sulphonated organic compounds (e.g., aromatic or hydroaromatic hydrocarbons or their derivatives) or with other substances which induce the solubility of oils and rubber in water.

C. A. KING.

Manufacture of a wood substitute. H. BRANDT (G.P. 461,775, 26.3.25).—The product obtained by digesting paper with potassium hydroxide solution is treated with sodium hydroxide and materials containing tannin, the mixture is dried and pulverised, and the powder mixed with sodium bicarbonate, talc, antimony trichloride, and a binder, e.g., glue. Cement or other fillers can also be added.

A. R. POWELL.

Kiln for manufacture of fused cement. A. BAUCHERE and G. ARNOU (U.S.P. 1,758,778, 13.5.30. Appl., 26.3.25. Fr., 9.4.24).—See B.P. 232,155; B., 1925, 549.

Production of artificial stone. J. JAKOB, Asst. to A. T. OTTO & SONS, INC. (U.S.P. 1,758,518, 13.5.30. Appl., 2.11.25. Ger., 22.12.24).—See G.P. 417,360; B., 1926, 130.

Flooring [composition]. C. PIA and G. POLINI (B.P. 327,950, 12.12.28).

[Photogravure process for] reproduction of the natural appearance of articles [e.g., wood, marble] on other surfaces. OXFORD VARNISH CORP., Assees. of L. V. CASTO (B.P. 301,042, 23.11.28. U.S., 23.11.27).

Road oil (U.S.P. 1,745,155). **Asphalt etc. masses** (B.P. 307,466).—See II. **Artificial masses** (B.P. 327,722).—See XIII.

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

Heating [pig-iron] mixers with blast-furnace gas. K. D'HUART (Stahl u. Eisen, 1930, 50, 585—588).—The construction of several types of mixer fired with blast-furnace flue gas is illustrated and a new direct-fired regenerative mixer and ancillary plant is briefly described with reference to diagrammatic plans.

A. R. POWELL.

Recent developments in corrosion- and heat-resisting steels. (Sir) R. HADFIELD, T. G. ELLIOT, and R. J. SARJANT (J.S.C.I., 1930, 49, 41—51 r).—Heat-resisting steels are similar in constitution to corrosion-resisting steels, though silicon and tungsten are further added to give resistance to heat. These various materials may also conveniently be classified according to whether or not they are hardened by quenching in water from high temperatures. The austenitic steels offer generally greater resistance to corrosion. Particulars are given of the resistance to various corroding agents, such as the atmosphere, sea-water, mineral and organic acids, and steam contaminated with salt spray. The significance of mechanical tests at high temperatures is discussed, and an alloy Era H.R.1 is described having a limiting creep stress of $2\frac{1}{2}$ tons per in.² at 800°. In regard to resistance to scaling, the heat-resisting steels give as good a performance at 950° in 4000 hrs. as the best cast irons at 800° in only 100 hrs. Tables are given showing the mechanical and physical qualities of the various materials, and their working properties are also described. Typical applications of the special steels made by the authors' firm are mentioned.

Ageing of steel castings. A. POMP (Stahl u. Eisen, 1930, 50, 440—441).—The impact strength of mild-steel castings (notched bars) containing 0.1—0.27% C, 0.16—0.46% Si, 0.45—1.37% Mn, 0.05—0.06% P, and 0.04% S decreases on ageing at 250° for 1 hr. after forging to a reduction in area of 7—10%, but not nearly to the same extent as it does after completely annealing. The values obtained for the annealed metal at 20° to —20° were consistently below 2 mkg./cm.², whereas those for the aged metal varied from about 6 mkg./cm.² at 20° to about 2—3 mkg./cm.² at —20°.

A. R. POWELL.

Alloy steels in theory and practice. A. RYS (Stahl u. Eisen, 1930, 50, 423—438).—A lecture delivered at the annual meeting of Society of German Steel Founders describing the mechanical, physical, and chemical properties of alloy steels and the effect of heat and mechanical treatment on the properties of forged steels.

A. R. POWELL.

Tensile strength at high temperatures of steel containing small quantities of nickel and molybdenum. W. LIESTMANN and C. SALZMANN (Stahl u. Eisen, 1930, 50, 442—446).—The tensile properties of steel with 0.2% C, 0.8% Mn, 0.25% Si, 0.4—2.2% Ni, and 0.2—0.6% Mo have been determined at 500° after annealing at 900—950°. Nickel and molybdenum both increase the tensile strength and yield point, but reduce the ductility, 0.1% Mo increasing the ultimate strength by 1 kg./mm.² and the yield point by 2 kg./mm.², and 0.5% Ni increasing the former by 2 kg./mm.² and the latter by 1.8 kg./mm.². With higher proportions of molybdenum the ratio ultimate strength/yield point is unfavourably affected, but further addition of nickel improves this ratio. The steel with 2.1% Ni and 0.5% Mo has a yield point of 25.5 kg./mm.², a tensile strength of 42 kg./mm.², an elongation of 11%, and a reduction in area of 20% at 500°. A. R. POWELL.

Cast steel as a constructional material for machines. F. W. DUESING (Stahl u. Eisen, 1930, 50, 438—440).—Mild-steel castings for machinery parts must be thoroughly annealed before being incorporated in the work; they should have an average yield point of 28 kg./mm.², a tensile strength of 46 kg./mm.², an elongation of 30%, and a reduction in area of 40—50%. These values are well above the German standard specifications, so that with reasonable care these should readily be fulfilled. A. R. POWELL.

Alloy steels for locomotive construction. W. A. JOHNSON (Proc. Inst. Mech. Eng., 1929, 1087—1097).—Carbon steels cannot be relied upon to give a tensile strength above about 55 tons/in.², and such steels have low impact resistance if the tensile strength is high. Alloy steels on the contrary may have good impact strength, a tensile strength of 40—110 tons/in.², and are more easily heat-treated. Hence the use of nickel steel, vanadium steel, and nickel-chromium-molybdenum steel facilitates a reduction in deadweight. A recently developed German steel of similar properties contains 0.1—0.15% C and 0.67—1.5% Si. No difficulty in machining usually occurs. The subject is discussed chiefly from the engineering point of view. It is concluded that the possible saving of weight on a locomotive is 7%. C. IRWIN.

Heat-treatment of locomotive parts. W. A. STANIER (Proc. Inst. Mech. Eng., 1929, 1069—1073).—A graph is given showing the appropriate temperature for the heat-treatment of steel forgings with increasing carbon content, together with photomicrographs of samples treated in various ways. C. IRWIN.

Destructive action of zinc, at and above galvanising temperatures, on metals and alloys. V. Cast iron, malleable iron, case-hardened and alloy steels. W. G. IMHOFF (Amer. Metal Market, 1930, 37, No. 29, 6).—Alloy steels containing higher contents of chromium and nickel are more readily dissolved by molten zinc; impurities in the steel favour dissolution. CHEMICAL ABSTRACTS.

Gases in refined copper. A. E. WELLS and R. C. DALZIEL (Amer. Inst. Min. Met. Eng. Tech. Pub., 1930, No. 270, 3—15).—It is considered that colloidal dis-

persed cuprous oxide adsorbs gases, part of which is liberated on agglomeration. Evolution of nitrogen, water, and carbon dioxide is the chief cause of porosity. CHEMICAL ABSTRACTS.

Oxides in brass. O. W. ELLIS (Amer. Inst. Min. Met. Eng. Tech. Pub., 1930, No. 283, 3—19).—Retention of the charge in the furnace between the first and second pours increases the "oxide count" only in the absence of flux. Poling has a beneficial effect on charges to which flux has been added. CHEMICAL ABSTRACTS.

α - β -Transformation in brass. A. J. PHILLIPS (Amer. Inst. Min. Met. Eng. Tech. Pub., 1930, No. 288, 3—9).—Conversion of β - into α -brass takes place rapidly if there is no change in composition; the α -structure was produced by quenching brass containing 62% Cu. CHEMICAL ABSTRACTS.

Effects of oxidation and certain impurities in bronze. J. W. BOLTON and S. A. WEIGAND (Amer. Inst. Min. Met. Eng. Tech. Pub., 1930, No. 281, 3—17).—Oxidation by the furnace atmosphere causes shrinkage, loss of strength, sluggishness of metal, and loss of zinc. The undesirable effects of silicon, sulphur, and aluminium on the properties of bronze melted in a neutral furnace atmosphere are discussed. CHEMICAL ABSTRACTS.

α -Phase boundary of the ternary system copper-silicon-manganese. C. S. SMITH (Amer. Inst. Min. Met. Eng. Tech. Pub., 1930, No. 292, 3—32).—Alloys containing more than 90% Cu were studied. The addition of manganese causes a fall in the temperatures of the reactions in the copper-silicon system; for 2.5% Mn the peritectic reaction is at 760°, at which temperature there is a quaternary reaction with Mn₂Si. The solubility of this compound diminishes rapidly with fall of temperature. CHEMICAL ABSTRACTS.

Thermal conductivity of copper alloys. C. S. SMITH (Amer. Inst. Min. Met. Eng. Tech. Pub., 1930, No. 291, 3—24).—On passing from pure copper to the saturated α -solid solution (39% Zn) the thermal conductivity falls from 0.941 to 0.285 g.-cal. per cm.² per cm. per sec. per 1°. The appearance of the β -phase causes an increase in the conductivity and a rapid decrease in the temperature coefficient. CHEMICAL ABSTRACTS.

Mechanism of the corrosion of duralumin by sea-water. E. HERZOG and G. CHAUDRON (Compt. rend., 1930, 190, 1189—1191).—The rate of corrosion of duralumin immersed in sea-water or 3% sodium chloride solution in an atmosphere of oxygen increases linearly with the gas pressure up to 90 atm., but only slowly thereafter (up to 130 atm.). The position of the test-piece plays an important part, and corrosion is greater for horizontal than for vertical immersions. Corrosion by this method, or by addition of hydrogen peroxide, is inhibited or arrested by addition of small quantities of phosphates, alkali borates, salts of magnesium, and especially of manganese, zinc, and titanium, which, presumably, fix or destroy the hydrogen peroxide added or formed during corrosion under pressure. J. GRANT.

Corrosion by superheated steam. J. K. RUMMEL (Iron Age, 1929, 124, 1525—1527).—By determining the

hydrogen evolved, the rates of corrosion of various steels in superheated steam at pressures of 220–3450 lb. per in.² were determined. In steam free from oxygen the corrosion is negligible up to 430°, but corrosion and evolution of hydrogen are, in general, accelerated by the presence of oxygen. Within limits, alkalinity does not stop corrosion due either to the action of oxygen or to the evolution of hydrogen. CHEMICAL ABSTRACTS.

Hydrogen-ion concentration [in water works' corrosion problems]. S. GOTTLIEB (J. Amer. Water Works' Assoc., 1930, 22, 543–544).—An error in Van Giesen's paper (cf. B., 1930, 286), relating to that author's explanation of the p_H range of soils causing corrosion, is pointed out and corrected. C. JEPSON.

Determination of aluminium and magnesium in zinc-base die-casting alloys. C. M. CRAIGHEAD (Ind. Eng. Chem. [Anal.], 1930, 2, 188–190).—These alloys contain about 90% Zn, which creates difficulties in most methods for the determination of aluminium and magnesium. Electrolysis with a weakly acid solution and a mercury cathode, however, completely separates these constituents. The alloy (2 g.) is dissolved in 20 c.c. of 50% sulphuric acid and 100 c.c. of water are added. The solution is electrolysed for 5 hrs. with a current density of 1 amp./6.25 cm.², the aluminium is precipitated by Blum's method, and the magnesium as phosphate. C. IRWIN.

X-Ray determination of particle size. R. BRILL (Metall.-Wirt., 1929, 8, 699–701; Chem. Zentr., 1930, i, 125).—The particle size of iron liberated by thermal decomposition of iron carbonyl is 10^{-6} cm.

A. A. ELDRIDGE.

Application of microscopical analysis to mixtures of metals and alloys. W. F. WHITMORE and F. SCHNEIDER (Ind. Eng. Chem. [Anal.], 1930, 2, 173–176).—Microscopical tests up to the present have been used mainly for confirmatory purposes with previous separation of the different elements present. A new system of separation is given which omits the use of hydrogen sulphide and separates the more common metals into four groups. The different elements in each group can be identified by described methods of micro-analysis without further separation. Photomicrographs of the salts used for identification purposes are given. C. IRWIN.

Utility of the platinum metals in chemical industry. E. R. THEWS (Chem. Fabr., 1930, 49–53).—The chemical and physical properties of the six metals of the platinum group, together with various applications of the metals and of their alloys, such as for the resistors in electric furnaces, for crucibles, etc., are described. C. IRWIN.

Superconducting alloy with resistance-temperature hysteresis. J. C. McLENNAN (Nature, 1930, 125, 447).—The resistance of an alloy of bismuth, lead, and tin decreased slowly with temperature down to 9° Abs., at which point it suddenly fell to zero. On raising the temperature the alloy remained superconducting to 13.2° Abs. and then the resistance reappeared and rose to a steady value at 13.8° Abs. L. S. THEOBALD.

Properties of Permalloy-C. ANON. (Engineering, 1930, 129, 567).—An alloy consisting of about 80% Ni

and 20% Fe, known as Permalloy-A, has been displaced by a modified alloy known as Permalloy-C. Magnetically, this alloy is the softest material available, and it has a resistivity equal to that of silicon-steel. The alloy, produced in a high-frequency tilting furnace, can be rolled into sheet or rod, and it requires only a single annealing process, care being taken in the regulation of the heating and cooling conditions. The use of this alloy should result in marked improvement in the design of electrical relays and measuring instruments.

C. A. KING.

Electrolytic preparation of zinc. G. EGER (Chem.-Ztg., 1929, 53, 857–858, 878–879).—Technical practice in the preparation of electrolytic zinc in Europe and America is briefly reviewed. G. E. WENTWORTH.

Hardness and polishing of electrodeposits. D. J. MACNAUGHTAN and A. W. HOTHERSALL (J. Electroplaters' Dep. Tech. Soc., 1930, 5, 63–82).—Scratch tests are untrustworthy; the Brinell test is accurate. As ordinarily deposited, metals have the following ranges of hardness: lead 3–5, cadmium 12–53, zinc 40–50, silver 61–130, copper 58–150, iron 167–350, nickel 155–420, cobalt 270–311, chromium 500–900. Abrasion hardness and the influence of the electrolyte are discussed. CHEMICAL ABSTRACTS.

Ground-coat for enamels. MALINOVSKY. **Refractories and cements.** WHITE.—See VIII. **Absorption of mercury by charcoal.** RAKUSIN.—See XXIII.

PATENTS.

Reduction of [iron] ores. J. HERRMANN, B. G. FRANZEN, L. MACB. HUBBARD, and E. R. ZACHARIAS (B.P. 327,687, 4.1.29).—Iron pyrites or other iron ore is melted and supplied to an electric furnace in which it is subjected to the action of carbon dioxide under pressure and to a magnetic field at 800–900°. It is claimed that steel is thus obtained which is drawn out of the slag by the action of the magnetic field.

A. R. POWELL.

Smelting of oolitic granules and similar finely-divided ores or slimes obtained from minette. P. GREDT (B.P. 328,240, 15.10.28. Addn. to B.P. 240,165; B., 1925, 996).—The ore is fed into the top of a mechanically-rabbed, multiple-hearth furnace on the upper hearths of which it is preheated by the combustion of waste gases from the lower hearths in which the ore is reduced by hot gases supplied from a common producer to every hearth from a common pipe-line.

A. R. POWELL.

Manufacture of shaped metal articles [pure sheet iron]. J. Y. JOHNSON. From I. G. FARBERIND. A.-G. (B.P. 327,955, 14.12.28).—Scrap iron, preferably slightly oxidised, is cut into small pieces which are mixed with iron powder obtained by the decomposition of iron carbonyl, the mixture is pressed into an ingot and sintered in hydrogen at 950°, and the mass is forged and rolled into sheet. A. R. POWELL.

Production of shaped bodies for tools of material difficult to work, such as carbides, their alloys, etc. F. KRUPP A.-G., Assees. of PATENT-TREUHAND-GES. F. ELEKTR. GLÜHLAMPEN M.B.H. (B.P. 313,619, 14.6.29, Ger., 15.6.28).—The material, e.g., a mixture of carbides

and nickel or cobalt powder, is mixed with a binding material which sets at the ordinary temperature, *e.g.*, shellac, gums, dextrin, or cellulose acetate, and the mixture is pressed into shapes which are allowed to harden. After grinding and polishing to obtain the more complicated shapes, if desired, they are heated to remove the binding material and sintered. A. R. POWELL.

Heat-treatment of steel. H. HANEMANN (B.P. 304,196, 10.1.29. Ger., 16.1.28).—The metal is heated in the ordinary way to a temperature just below the Ar3 point, then heated suddenly by electrical resistance or induction to a temperature about 50° above the Ar3 point, and allowed to cool. This procedure produces a uniform fine-grained structure throughout the metal. A. R. POWELL.

Improving the fatigue strength of metal work pieces. A. L. MOND. From I. G. FARBENIND. A.-G. (B.P. 327,660, 15.8.29).—Metal articles, *e.g.*, engine casings, which may be subjected to fatigue stresses in use, are subjected to continuous dynamic stresses, which at first are considerably lower than the initial fatigue limit and which later increase more nearly to, but are always less than, that value. C. A. KING.

Treatment of iron prior to coating with tin or lead. G. RADTKE (MATUSCHEK METALLIND. G. RADTKE) (B.P. 308,804, 26.3.29. Ger., 29.3.28).—After the usual pickling in acid baths, the metal is rinsed and immersed in a boiling dilute solution of a nickel or cobalt salt for 10–30 min., rinsed, and dipped immediately into the coating bath. A. R. POWELL.

Coating and heat-treating [metals, *e.g.*, iron to be galvanised or tinned]. A. O. AUSTIN, Assr. to OHIO BRASS CO. (U.S.P. 1,740,639, 24.12.29. Appl., 25.5.25).—The metal is dipped into the cooler end of a long galvanising, tinning, or heat-treating bath, covered with a layer of flux, and slowly drawn towards the hotter end through a series of baffles on the surface of the bath, which serve to retain the impurities at the cooler end. A. R. POWELL.

[Inhibitor for pickling] treatment of metals with acid liquids. SOC. CHEM. IND. IN BASLE (B.P. 313,135, 7.6.29. Switz., 7.6.28).—A small quantity of a base of the di- or tri-arylmethane series, with or without a mineral salt, sulphite-cellulose liquor, a sulphonated oil, mono- or (*as*) di-acylated diamines, or a sulphonated tar product, is added to a hydrochloric acid pickling bath for cleaning iron or steel; *e.g.*, 0.02% of 4:4'-tetramethyldiaminodiphenylmethane hydrochloride or 0.01% of 3:3'-diamino-4:4'-dimethyldiphenylmethane hydrochloride is added to 15% hydrochloric acid. A. R. POWELL.

Manufacture of nickel-iron alloys. GEN. ELECTRIC CO., LTD., S. V. WILLIAMS, and G. R. POLGREEN (B.P. 327,865, 18.4.29).—A solution containing nickel, iron, and, if desired, cobalt salts is treated with an excess of sodium hydroxide and the precipitate is collected, washed, dried, and heated at 900° in hydrogen. The resulting alloy powder is ground in a ball-mill and used for the manufacture of dust cores for loading coils. A. R. POWELL.

Manufacture of [nickel-iron alloy] metal dust. STANDARD TELEPHONES & CABLES, LTD., J. C. CHASTON,

and A. F. B. NORWOOD (B.P. 327,419, 4.10.28).—Nickel-iron alloys containing cobalt or other metals are partially oxidised to render them brittle then pulverised in a ball-mill. The fine dust is removed by screening and the oversize annealed at a temperature at which it recrystallises to a fine-grained structure; the resulting material may be readily pulverised to obtain powder for the manufacture of dust cores. A. R. POWELL.

Soldering or like methods of joining metal parts. G. W. CHRISTOPH (B.P. 327,742, 11.10.28).—The parts, *e.g.*, of a radiator, are fitted into position and the whole structure is dipped into a molten metal, which fills in the interstices between the various sections. Excess of the solder is then removed by making the article the anode in a suitable electrolytic bath. A. R. POWELL.

Coating for welding rods. H. R. PENNINGTON, Assr. to HOLLUP CORP. (U.S.P. 1,745,267, 28.1.30. Appl., 22.5.26).—The coating comprises a mixture of 70% of powdered carbon and 30% of iron powder, bonded with sodium silicate. A. R. POWELL.

Articles of high resistance to wear, well polishable, and neutral to chemical agents. F. HAUPTMEYER (B.P. 307,011, 5.1.29. Ger., 1.3.28).—Teeth fillings and objects used in the brewing industry are made from a mixture of nickel-chromium, nickel-chromium-iron, or nickel-chromium-steel alloy powder mixed with a suitable cement. A. R. POWELL.

Granulation of blende. SOC. ANON. LA NOUVELLE MONTAGNE (B.P. 328,162, 27.6.29. Belg., 7.6.29).—A mixture of raw blende and more or less completely roasted blende is fed on to a conveyor belt from a series of hoppers between each pair of which the mixture is sprayed with dilute sulphuric acid, zinc sulphate solution, or, if the mixture contains zinc sulphate, water. The moist powder sets rapidly to a granular mass owing to the formation of a basic zinc sulphate. A. R. POWELL.

Zinc-base alloys and articles made therefrom. NEW JERSEY ZINC CO., Assees. of W. MCG. PEIRCE and E. A. ANDERSON (B.P. 305,651, 31.12.28. U.S., 9.2.28).—The alloys contain a minimum of 92% Zn and preferably more than 95% Zn, 0.005–0.5% Mg, and 0.05–5% Cu; they are suitable for rolling into sheets of high strength and high resistance to corrosion. [Stat. ref.] A. R. POWELL.

Preparation of aluminium and aluminium alloys. A. PACZ (B.P. 303,755, 7.1.29. Ger., 7.1.28).—The alumina used in the cryolite bath is prepared by the use of two alkali hydroxides, *e.g.*, sodium and potassium or sodium and lithium hydroxides, or small quantities of the second alkali in the form of aluminate, carbonate, hydroxide, or borate are added to the cryolite bath. By the addition of titanium, zirconium, or silicon compounds to the bath alloys of aluminium with these metals are obtained. The products obtained by the process disclosed are claimed to be superior in mechanical properties to aluminium and its alloys obtained by the usual method. A. R. POWELL.

Coating aluminium, magnesium, and their alloys with oxides of manganese. O. SPRENGER PATENTVERWERTUNG JIROTKA M.B.H., and B. JIROTKA (B.P. 328,485,

4.6.29. Addn. to B.P. 314,769; B., 1929, 725).—Manganous, ferrous, or stannous salts are added to the baths claimed in the chief patent, *e.g.*, the bath comprises a solution of 10.8 g. of potassium permanganate, 32 g. of potassium dichromate, 5 g. of manganous chloride, and 10.4 c.c. of hydrofluoric acid per litre. A. R. POWELL.

Recovery of tin from scrap tin-plate and like tin-bearing materials. H. WADE. From W. B. BALANTINE and M. G. GILBERT (B.P. 327,997, 15.1.29).—The scrap is immersed in a boiling solution of lead acetate in sodium hydroxide, whereby the tin replaces the lead. When all the lead is precipitated the tin is recovered by precipitation with zinc or by treating the solution with carbon dioxide. In the latter case the alkali is regenerated by addition of milk of lime and the acetic acid recovered as calcium acetate by crystallisation. The lead-coated iron is pickled with dilute acetic acid to regenerate lead acetate for use again.

A. R. POWELL.

Electrolyser for separation of tin from tin salt solutions. L. U. CORSA (B.P. 313,166, 30.5.29. Italy, 9.6.28).—The apparatus comprises a semi-cylindrical trough with two side troughs of rectangular cross-section at its upper ends. The large trough acts as cathode and the smaller troughs serve for the collection of the sponge tin which is removed from the inside surface of large trough by means of a scraper attached to a rotating anode, which revolves around the horizontal axis of the trough.

A. R. POWELL.

Electrical annealing [of metals]. M. FARMER (U.S.P. 1,739,958, 17.12.29. Appl., 2.8.26).—The apparatus comprises a refractory base on which the metal articles are stacked, a gastight hood which can be lowered over the articles, and a second hood of refractory material lined internally with electrical resistors and adapted to fit over the first hood. Means are provided for filling the heating chamber with an inert or reducing gas.

A. R. POWELL.

Electroplating metals with chromium. J. BAUER (B.P. 327,911, 17.6.29).—To prevent spraying, to each litre of the bath 0.5 c.c. of light petroleum or gasoline is added, or the surface of the bath is heated by radiation from electrical resistors heated at 800°.

A. R. POWELL.

Cadmium plating. C. H. HUMPHRIES (B.P. 304,668, 23.1.29. U.S., 23.1.28).—An electrolytic bath for cadmium plating contains, per gal. of water, 1–6 oz. of cadmium (as sulphate), 1–10 oz. of free sulphuric acid, 2–12 oz. of ammonium sulphate, and 1–10 g. of glue.

C. A. KING.

Production of gold and silver [from scrap iron]. V. VOLPATO (B.P. 306,048, 14.2.29. Italy, 14.2.28).—Scrap iron or steel that has been subjected to high stress is exposed to the prolonged action of a magnetic force that imparts a centipetal velocity to the electrons, and the treated metal is dissolved in cold hydrochloric acid. The colloidal precious metals which are said to result from this treatment may be coagulated by the addition of Fontainebleau sand.

A. R. POWELL.

Metal polish. R. J. THOMPSON (B.P. 327,479, 17.1.29).—A paste, claimed to give a lasting silver effect

to brass or copper and to render steel stainless, consists of tin, antimony, silver, and mercury, made into an amalgam and powdered; to this is added silver oxalate, together with whiting, putty powder, aluminium chloride, and the usual colouring agents and vehicles.

L. A. COLES.

Mechanical ore-roasting furnace. J. HARRIS (U.S.P. 1,758,154, 13.5.30. Appl., 21.5.28. U.K., 2.6.27).—See B.P. 287,356; B., 1928, 372.

Process and furnace for extracting metals from ores. S. C. G. EKELEND (U.S.P. 1,758,786, 13.5.30. Appl., 15.10.26. Swed., 19.10.25).—See B.P. 309,651; B., 1929, 522.

Apparatus for subjecting a mass of powdered or granular material to the action of gases, particularly applicable to the calcining and roasting of ores and similar materials. H. McK. RIDGE (U.S.P. 1,758,805, 13.5.30. Appl., 9.5.28).—See B.P. 305,883; B., 1929, 522.

Proofing of iron and steel against rust. W. H. COLE (B.P. 328,580, 29.1.29. Addn. to B.P. 289,906; B., 1929, 488).—See U.S.P. 1,719,464; B., 1929, 781.

Foam-producing process and material for acid metal-cleaning baths. J. H. GRAVELL, Assr. to AMER. CHEM. PAINT CO. (U.S.P. 1,757,959, 13.5.30. Appl., 29.3.27. Renewed 20.3.30).—See B.P. 287,911; B., 1929, 725.

Producing a [rubber] coating stable towards acids and alkalis on metallic articles. F. AHRENS, Assr. to HARZER ACHSENWERKE GES.M.B.H. (U.S.P. 1,758,420, 13.5.30. Appl., 7.7.27. Ger., 18.5.25).—See B.P. 283,049; B., 1928, 204.

Material containing carbon, iron, and iron oxide (B.P. 308,351).—See II. Flotation agents (B.P. 316,282). Catalysts for ketones (B.P. 315,818).—See III. Paint for iron surfaces (B.P. 305,218). “Alkyd” resins (B.P. 299,424).—See XIII. Coating metal with rubber (B.P. 327,452). Rubber-metal adhesive (U.S.P. 1,744,840).—See XIV.

XI.—ELECTROTECHNICS.

Water-gas equilibrium. PETERS and KÜSTER.—See II. Refractories and cements. WHITE.—See VIII. Zinc-base alloys. CRAIGHEAD. Superconducting alloy. McLENNAN. Permalloy-C. ANON. Zinc. EGER. Hardness etc. of electrodeposits. MACNAUGHTAN and HOTHERSALL.—See X. Testing equipment for paints etc. GARDNER and SWARD.—See XIII. p_H of tan liquors. GOLDMAN.—See XV.

PATENTS.

Provision of inert atmospheres [in electrical apparatus etc.]. C. A. STYER, Assr. to WESTINGHOUSE ELECTRIC & MANUF. CO. (U.S.P. 1,743,167, 14.1.30. Appl., 29.12.23).—An inert atmosphere is formed above the oil in transformers, circuit breakers, etc. by providing an apparatus through which the air passing into the vessel, or already therein, can circulate, and is thereby brought into contact with hot carbonaceous material, *e.g.*, sugar-carbon. The latter is supported on or between gauze partitions and is heated electrically.

A. B. MANNING.

[Leading-in] electric insulators [for gas-purification apparatus]. STEATIT-MAGNESIA A.-G. (B.P. 319,317, 15.7.29. Ger., 20.9.28).

[Hydrometric device for testing] electric storage batteries. S. FRAIS (B.P. 328,774, 19.4. and 31.7.29).

Heating and cooling of liquids (B.P. 327,729). Measurement of heat quantities (B.P. 305,532). Recording pyrometers (B.P. 327,861).—See I. Drying of peat etc. (B.P. 304,329). Material containing carbon, iron, and iron oxide (B.P. 308,351). Miner's lamp (U.S.P. 1,744,416).—See II. Reduction of iron ores (B.P. 327,687). Nickel-iron alloys (B.P. 327,865 and 327,419). Soldering etc. (B.P. 327,742). Tin from tin salt solutions (B.P. 313,166). Annealing of metals (U.S.P. 1,739,958). Chromium (B.P. 327,911). Cadmium plating (B.P. 304,668).—See X. Coating metal with rubber (B.P. 327,452).—See XIV.

XII.—FATS; OILS; WAXES.

Component glycerides of Borneo (Illipé) tallow. T. P. HILDITCH and J. PRIESTMAN (J.S.C.I., 1930, 49, 197—200 r).—The mixed fatty acids of a sample of neutral Borneo (Illipé) tallow (m.p. 36—36.5°, setting point 28.8°, saponification equivalent 290.7, iodine value 32.3, and unsaponifiable matter 0.74%) consisted of myristic (1.5%), palmitic (21.5%), stearic (39.0%), and oleic (38.0%) acids. The fat contained only 4.5% of fully saturated glycerides, the acids present in which were palmitic (57%) and stearic (43%); the remainder of the fat (95.5%) therefore consisted of mixed saturated-unsaturated glycerides, with saturated and unsaturated acids in the molecular ratio of 1.55:1. This corresponds with a general glyceride structure of (1) fully-saturated glycerides (4.5%); (2) mono-oleodisaturated glycerides (78 to 87%); (3) dioleomonosaturated glycerides (17.5—0%); and (4) triolein (0—8.5%). If the triolein content (which cannot at present be directly determined) were 4%, the amount of these four classes in the fat would be (1) 4.5%, (2) 85%, (3) 6.5%, and (4) 4%. Experimental verification was obtained of the presence of oxidation products of mono-oleodisaturated glycerides equivalent to a content of over 63% of the latter in the original fat, whilst it was also indicated that oleopalmitostearins predominated over other glyceride forms. Borneo (Illipé) tallow is therefore very similar in general structure to cacao butter (Lea, B., 1929, 331), but contains somewhat less oleic acid and a higher ratio of stearic to palmitic acid than the latter; the total amount of mono-oleodisaturated glycerides is even higher in Borneo tallow than in cacao butter, but there is probably more oleodistearin present in the former fat by reason of its relatively greater stearic acid content.

Fatty acids of nutmeg (mace) butter and of expressed oil of laurel. G. COLLIN and T. P. HILDITCH (J.S.C.I., 1930, 49, 141—143 r).—The quantitative composition of the mixed fatty acids of nutmeg butter (from *Myristica officinalis*), of the fat from *M. malabarica* kernels, and of expressed oil of laurel have been determined with the following results: (1) Nutmeg butter: lauric (1.5%), myristic (76.6%), palmitic (10.1%), oleic (10.5%), and linoleic (1.3%) acids. (2) *Myristica*

malabarica fat: myristic (39%), palmitic (13%), other saturated acids (3%), oleic (44%), and linoleic (1%) acids. (3) Expressed oil of laurel: lauric (35.0%), palmitic (9.7%), oleic (36.6%), and linoleic (18.7%) acids. All the oils contained appreciable amounts of resinous compounds in addition to fats; the laurel oil was a genuine trade sample, and evidently contained fats from both the kernel and the pericarp. Examination of the individual fats from the kernels and pericarps of laurel berries is in progress.

Dika fat (*Irvingia* butter). G. COLLIN and T. P. HILDITCH (J.S.C.I., 1930, 49, 138—139 r).—The white solid fat from the kernels of *Irvingia Barteri* (Nigeria) had saponification equivalent 233.9, iodine value 9.1%, unsaponifiable 1%, and melts at 41—42°; its constituent fatty acids were lauric (38.8%), myristic (50.6%), and oleic (10.6%). The composition of the mixed fatty acids was thus similar to that given by previous workers for the kernel fats of other *Irvingia* species from West Africa and of *I. Oliveri* (Cay-Cay fat from Indo-China). Although quite suitable for edible purposes, the low fat content of the nuts (about 12%) and the difficulty of removing the massive shells from the kernels will probably restrict the commercial outlets for this fat.

Cholesterol of buffalo butter. E. DE'CONNO and L. FINELLI (Annali Chim. Appl., 1930, 20, 148—154).—The buffalo butter examined yielded 87% of fat having d_{4}^{100} 0.865, m.p. 32°, solidif. p. 20°, m.p. of insol. fatty acids 41°, solidif. point of insol. fatty acids 38°, acid value 1.11, saponif. value 228, iodine value 37, acid value of soluble volatile acids (Reichert) 27, acid value of insol. volatile acids (Polenske) 1.30, butyrefractometer number at 35° 45. The cholesterol, $C_{27}H_{45} \cdot OH, \frac{1}{2}H_2O$, separated by Bömer's method (A., 1899, ii, 191) gave all the colour reactions of ordinary cholesterol, had m.p. 136°, $[\alpha]_D^{20}$ —33° 3', and yielded a formate, m.p. 86°, $[\alpha]_D^{19}$ —56° 52', an acetate, m.p. 104°, $[\alpha]_D^{20}$ —51° 56', a benzoate, m.p. 134°, $[\alpha]_D^{20}$ —9° 51', and a dibromide, $C_{27}H_{46}OBr_2$, m.p. 101°. The cholesterol is probably a higher homologue of the cholesterol of cows' milk or bile. T. H. POPE.

Occurrence of arachidonic acid in lard. J. B. BROWN and E. M. DECK (J. Amer. Chem. Soc., 1930, 52, 1135—1138).—Four specimens of commercial lard have been shown to contain 0.31—0.40% of arachidonic acid (cf. Ellis and Isbell, A., 1926, 972), as shown by the isolation of methyl octobromoarachidonate from the methyl esters. Direct bromination of lard yielded ether-insoluble bromine additive products which were probably a mixture of α -palmitodistearin and a glyceride of octabromoarachidic acid. R. K. CALLOW.

Babassu fat. A. HEIDUSCHKA and R. AGSTEN (J. pr. Chem., 1930, [ii], 126, 53—64).—Babassu fat was found, on hydrolysis, to yield the following fatty acids: hexoic (0.1%), octoic (6.5%), decoic (2.7%), lauric (45.8%), myristic (19.9%), palmitic (6.9%), and oleic acid (18.1%). H. A. PIGGOTT.

Continuous working in the soap industry. W. PROSCH (Chem. Fabr., 1930, 3, 158—160, 166—168).—A general description is given of modern plant layout and machinery for continuous and automatic working

in the production of finished soap. The manufacture of milled toilet soaps (cooling on chilled rolls followed by oven-drying of the soap shreds; drying on hot rolls followed by shredding, milling, etc.), household soaps (cooling in blocks, cutting, continuous drying ovens, etc.), and soap powders (spray-drying) is considered.

E. LEWKOWITSCH.

Determining volatile hydrocarbons in soap. C. T. N. MARSH (Ind. Eng. Chem. [Anal.], 1930, 2, 166—167).—The standard U.S. method for the determination of hydrocarbons in naphtha soaps is modified as follows. Calcium chloride solution is added to the distillation flask to reduce foaming and allow quicker distillation. The naphtha is collected in a Mohr's burette connected to a levelling tube and coloured with a particle of oil-soluble dye. It is allowed to run quietly down the burette side, thereby avoiding emulsification.

C. IRWIN.

Lubricating greases made from soaps of phenylstearic acid. W. S. GILFOIL (Ind. Eng. Chem., 1930, 22, 487).—Calcium, sodium, and lead phenylstearates used as bases for lubricant greases show no advantage over the usual oleate soaps.

J. O. CUTLER.

Determination of fully-saturated glycerides as an aid in the analysis of fats. B. C. CHRISTIAN and T. P. HILDITCH (Analyst, 1930, 55, 75—90).—An application to ordinary analytical practice has been made of the general method of oxidation of neutral fats in acetone solution with potassium permanganate, whereby the unsaturated fatty acid groups combined with glycerol are quantitatively converted into acidic products and fully saturated glycerides are left untouched (cf. B., 1928, 791; 1929, 253). Not more than 50 g. of fat are used, and the results are arrived at in 2 days or less. The order of accuracy of the percentage of fully-saturated glycerides, and still more of their apparent saponification equivalents, is less than in the more elaborate process, but empirical correction factors are introduced. For details of procedure, the original paper must be consulted. The ether is evaporated from the main ethereal extract of neutral products of oxidation, and from the ethereal extract from the primary washings with ammonia and water, and, after drying and weighing, determinations are made of the iodine values, saponification equivalents, acid values, and m.p. It was found that the fully saturated glyceride contents of the nut oils and some other fats are probably almost constant for a given fat, but units of variation for such fats as butter, tallow, oleo and palm oils require further study. The method was found most useful for the detection of nut oils in butter fats, since the proportion of fully-saturated glycerides in nut oils is much higher than in butter fats, and an approximate estimation of the percentage of nut fat present can be made if its nature is known. Diminution in the saponification value of the fully-saturated glycerides of carcase fats and increases in the m.p., as compared with the figures for butter, make the detection of such fats in butter and ghee possible, though not so exactly as in the case of nut oils. The utility of the process for elucidating margarine fat mixtures is not so marked, but it is considered that by accumulation of sufficient data for

a large range of typical mixtures, and a consideration of other factors, the determination of the fully-saturated glyceride content will prove useful. D. G. HEWER.

Detection of fats in ultra-violet light. J. LENFELD (Z. Fleisch- Milch-hyg., 1929, 39, 451—454, 477—481; Chem. Zentr., 1929, ii, 2841).—Changes in appearance observed when various edible fats are exposed to the light of the analytical quartz lamp are recorded. Marked differences in fats from the same species were often observed.

A. A. ELDRIDGE.

Constitution and drying of tung oil. G. G. SWARD and H. A. GARDNER (Amer. Paint and Varnish Manufs.' Assoc., Circ. 358, Jan., 1930, 58—62).—A brief résumé of the present knowledge of the structure of tung oil.

S. S. WOOLF.

Removal of mucilage from linseed oil. F. FRITZ (Farben-Ztg., 1930, 35, 1408—1409).—A brief account is given of the available methods of freeing linseed oil from mucilage. Although various processes are patented, it would appear that a simple heating process is still widely used. The greening of linseed oil in these processes is not caused by the use of copper kettles, as has been suggested, but is due to a colour change of the natural yellow colouring matter of the oil.

S. S. WOOLF.

Hexabromide determination on linseed oil. F. FRITZ (Chem.-Ztg., 1930, 54, 383).—The ether solution of the fatty acids and the wash-ether may be conveniently cooled by the direct addition of carbon dioxide snow. A modified procedure for the determination is outlined, using 1 g. of fatty acids, and removing the ether and (small) excess bromine by a stream of dry air; ether saturated with hexabromide is used for the separation of the bromides. Hexabromide numbers found for a Baltic and a La Plata linseed oil were 57.8 and 50.5, respectively.

E. LEWKOWITSCH.

Treatment of the fruits of the oil palm. A. STELTJES (Bull. Mat. Grasses, 1929, 357—364).—From experiments conducted by the Institut Coloniale de Marseille it was found that palm fruit was satisfactorily depulped by the Sigg machine; from the pulp so produced an 85—90% yield of oil was obtained with only a single pressing at 40 kg. pressure (cf. Sumatran practice giving about the same yield from double pressing of whole fruit). As the small amounts of broken nut-shells which pass into the pulp would cause rapid wear of the "scourtins," the Estrayer-Gueidon press, which uses none, was employed. The oil produced contained not more than 5% of slimes, of which the bulk was deposited on leaving the press; the remaining 1—1.5% of impurities was easily removed on being passed through a supercentrifuge. The nuts from the depulper were free from fibre. It appeared that this procedure could be adopted with advantage on the large scale. Solvents are preferably to be used only after the bulk of the oil and water has been removed from the fruit by pressure. A rapid procedure for routine determinations of acid value is described, in which 7.8 g. of oil are dissolved in 30—40 c.c. of alcohol and titrated with 0.5N-caustic soda (to phenolphthalein); the burette reading indicates directly the free acidity (as % oleic acid).

E. LEWKOWITSCH.

Grape-fruit seed oil. G. S. JAMIESON, W. F. BAUGHMAN, and S. I. GERTLER (Oil & Fat Ind., 1930, 7, 181—183).—Air-dried grape-fruit seeds contain about 30% of a semi-drying oil with a bitter taste, which gives a medium hard, free-lathering sodium soap. An expressed oil (clear yellow) and an extracted oil (greenish-yellow, purple fluorescence by reflected light) had, respectively: d_{25}^{25} 0.9170, d_{15}^{15} 0.9207; n_D^{25} 1.4700, 1.4696; acid value 2.5, 3.3; iodine value (Hanus) 106.3, 100.4; saponif. value 194.1, 194.3; acetyl value 7.7, —; unsaponifiable matter 0.7%, 0.7%; saturated acids (corr.) 26.6, 27.63; unsaturated acids (corr.) 68.5%, 67.77%; iodine value of unsaturated acids 146.2 (155.2 calc.), —. The expressed oil contained the glycerides of oleic (20.5), linoleic (51), palmitic (20.1), stearic (7.6), and lignoceric acid (0.1%), together with 0.7% of unsaponifiable matter. The extracted seed-cake had a bitter taste and contained 21.4% of protein, 38.8% of nitrogen-free extract, and 22% of crude fibre; it would be a good cattle-feed if rendered palatable by admixture with other feeding-stuffs.

E. LEWKOWITSCH.

Canadian pilchard oil. H. A. GARDNER (Amer. Paint and Varnish Manufs.' Assoc., Circ. 358, Jan., 1930, 43—44).—A sample of Canadian pilchard oil showed iodine value (Wijs) 191.1, saponif. value 192.1, n_D^{25} 1.482, octabromide value 32.7%. On addition of driers, the oil dries slightly faster than does linseed oil similarly treated, but the films produced are slightly harder in the latter case. Pilchard oil contains a considerable percentage of solid fats which separate out at ordinary temperatures, giving the oil a granular appearance and causing dullness in films. It is suggested that the oil could be used in oil paints where high gloss is not essential, and could possibly be worked up for varnish with other oils and resins.

S. S. WOOLF.

Sardine oil colour standards. P. W. TOMPKINS (Oil & Fat Ind., 1930, 7, 55—58).—The difficulty is discussed of finding simple colorimetric standards or reference liquids by which to control not only amber oils, with 5—25 red (Lovibond) and 20—100 yellow, but also oils with a greenish cast (due to the feeding habits of the fish), which have only 2—4 red and 60—150 yellow. Dichromate, iodine, and caramel standards do not accommodate the wide colour-range, and even over short ranges cannot be used to compare both amber and greenish oils. Provisional grading of oils not exceeding 14 red (yellow to match) as "light," and oils over 14 red as "dark" has been adopted in Monterey and San Pedro for the last three seasons.

E. LEWKOWITSCH.

Carnauba wax. ANON. (Riv. comm. ital.-brasil, 1929, No. 12, 33).—Values for carnauba (Brazilian), Japan, and candelilla waxes were, respectively: d_{15}^{15} 0.999, 0.997, 0.947; d_{98}^{98} 0.8422, —, —; m.p. 85°, 51°, 75.8—77.4°; saponif. value 79.8—88.3, 221.3, 105—106; iodine value 13.5, 4.5, 5.2—5.5; fatty acids 47.95, —, —.

CHEMICAL ABSTRACTS.

Acids of montan wax. HOLDE and others.—See II.
Natural fats of goatskins. INNES.—See XV.
Fat in milk and cream. ELSDON and STUBBS.—See XIX.

PATENTS.

Manufacture of products resembling wax. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,162, 24.9.28. Cf. B.P. 324,631; B., 1930, 519).—A bleached montan wax (B.P. 305,552, 308,996, and 320,854; B., 1929, 273, 425; 1930, 156) is esterified with ricinoleic acid, e.g., by heating at 160° with castor oil (or with castor oil acids) in a current of hydrogen chloride.

C. HOLLINS.

Manufacture of esters of fatty acids and of mixtures containing fatty acids. E. WECKER (U.S.P. 1,758,634, 13.5.30. Appl., 20.6.27. Ger., 23.6.26).—See B.P. 273,276; B., 1928, 902.

Grease-removing compositions (B.P. 328,097).
Decolorising clays (U.S.P. 1,739,734).—See VII.
Oil paints (G.P. 461,383). **Waxes** (B.P. 327,417).—See XIII.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Ultramicroscopical study of linseed oil containing metallic driers. J. M. PURDY, W. G. FRANCE, and W. L. EVANS (Ind. Eng. Chem., 1930, 22, 508—510).—Cobalt and lead acetates were separately and in admixture dispersed in refined linseed oil under arbitrarily defined standard conditions. Ultramicroscopical photographs were taken during the period of ageing subsequent to preparation. The photographs show that the cobalt soap particles rapidly dispersed in the media and that peptisation of the lead soap was delayed. The incorporation of cobalt acetate with lead acetate accelerates the dispersion of the lead soap. Acid values of the clear media after settlement of the undispersed soaps show that increasing the percentage of lead decreases the value, although the increase of acid value is greatest with the maximum lead content. Direct ultramicroscopical observation in an electric field shows the soap particles to be negatively charged.

J. O. CUTTER.

Turpentine and wood-turpentine: wood-turpentine of the root-resin of *Pinus sylvestris*. V. KRESTINSKI and F. SOLODKI (J. pr. Chem., 1930, [ii], 126, 1—23).—The wood-turpentine extracted from *Pinus sylvestris* (grown in northern and mid-Russia) by distillation either in steam (extract A) or in steam from an alkaline solution (extract B) has been analysed by determinations of physical constants, and the main constituents have been isolated by fractional distillation under reduced pressure. Extract B contained about 43% of α -pinene, 38.5% of Δ^3 -carene, 6.5% of terpinolene, 7% of two alcohols of empirical formula $C_{10}H_{18}O$ (b.p. 102°/12 mm. or 213—213.5°/760 mm., d_4^{20} 0.9371, n_D^{20} 1.48299; and b.p. 106°/12 mm., d_4^{20} 0.9371, n_D^{20} 1.48521), the constitution of which is unknown, 3.5% of the sesquiterpene cadinene, and 1.5% of uninvestigated residue. Extract A contains 42.5% of α -pinene, 32.5% of Δ^3 -carene, 4% of terpinolene, 14% of alcohols, 3% of cadinene, and 4% of residue. β -Pinene is absent from both products.

H. A. PIGGOTT.

Wood rosin in antifouling paints. H. A. GARDNER (Amer. Paint and Varnish Manufs.' Assoc., Circ. 358, Jan., 1930, 25—27).—Parallel exposure tests on anti-corrosive and antifouling paints containing gum resin

and wood rosin show the latter to be equal or possibly slightly superior to the former from the point of view of toxicity to marine animals. The addition of 5% of zinc chromate improves resistance against corrosion. It is pointed out that a well-balanced antifouling paint should contain mercury oxide, cuprous oxide, zinc oxide, and pine oil. S. S. WOOLF.

Silicon esters and their application to the paint industry. G. KING (J. Oil & Colour Chem. Assoc., 1930, 13, 28—50).—The historical development of silicon esters is traced and their properties are described at length. By controlled hydrolysis of ethyl silicates, stone preservative and silicon-ester paint medium are obtained. The use of the latter is discussed, consideration being given to application, suitable pigmentation, disadvantages, etc. S. S. WOOLF.

Settling of paints containing acid, alkaline, or neutral pigment. G. G. SWARD (Amer. Paint and Varnish Manufs.' Assoc., Circ. 358, Jan., 1930, 22—24).—Paints were prepared from samples of Titanox previously treated with aqueous sulphuric acid, sodium hydroxide, and ammonia, respectively, and dried. The oil absorptions of these treated pigments were 35.0, 35.5, and 37, respectively, whilst that of the untreated pigment was 36.5. Normal and accelerated settling tests on these paints indicate that the "acid" pigment had the greatest, and the "alkaline" pigment the least, tendency towards settling. No relation apparently existed between oil absorption and rate of settling in these tests. S. S. WOOLF.

Accelerated testing equipment [for paints etc.]. H. A. GARDNER and G. G. SWARD (Amer. Paint and Varnish Manufs.' Assoc., Circ. 358, Jan., 1930, 64—69).—Types of accelerated testing equipments employing carbon-arc and mercury-quartz lamps are illustrated. For adhesion and brittleness tests, films are removed from the accelerated weathering cabinet and cooled very rapidly by use of liquid carbon dioxide and an expansion chamber. S. S. WOOLF.

[Exposures of] quick-drying house paints. H. A. GARDNER (Amer. Paint and Varnish Manufs.' Assoc., Circ. 358, Jan., 1930, 2—11).—The results of two years' exposure tests give indications that the introduction of bodied oil or long-oil varnish into the vehicle of linseed oil paints greatly delays their weathering, but information as to the best type of heat-bodied oil or the optimum concentration is not yet available. S. S. WOOLF.

Rezyl exposures. A. W. VAN HEUCKEROTH and H. A. GARDNER (Amer. Paint and Varnish Manufs.' Assoc., Circ. 358, Jan., 1930, 47—57).—The results of 5 months' exposures of various nitrocellulose lacquers containing Rezyls, Rezyl balsam plasticiser, and various other resins, both synthetic and natural, and plasticisers, are detailed and illustrated. S. S. WOOLF.

New-type driers ["Soligenates"]. S. LEVY (Amer. Paint and Varnish Manufs.' Assoc., Circ. 358, Jan., 1930, 41—42).—"Soligenate" driers are understood to be lead, manganese, and cobalt salts of naphthenic acids derived from the oxidation of petroleum. High metal content conducive to rapid drying, freedom from resin, absence of tendency to spontaneous com-

bustion, and very little tendency to discoloration of clear varnishes are advantages claimed for these driers. They are soluble in vegetable oils, turpentine, mineral spirits, benzol, and toluol, giving solutions initially clear. Preliminary tests on drying power do not indicate that "Soligenates" are superior to linoleates and resinsates in equivalent metal content. S. S. WOOLF.

Red lead. H. GROHN (Farben-Ztg., 1930, 35, 1354—1356, 1406—1408, 1457—1459).—The influence on the red lead-linseed oil system of the following factors was studied: particle size and structure of the red lead; addition of linseed oil fatty acids, glycerin, litharge, and oxides of alkaline-earth metals; variation of type of oil; storing at normal and elevated temperatures; viscosity changes on storing. It was shown that particle size, true red-lead content, and sedimentation volume cannot be directly connected with the thickening process, and that the controlling factors are content of lead monoxide, and its form in the red-lead particles. Linseed oil fatty acids neither retard thickening nor disperse an already thickened system. Glycerin retards the thickening at ordinary temperatures, but is an accelerator at raised temperatures. Litharge accelerates the thickening as does magnesium oxide, but in the presence of litharge in active form lime is a retarder. With the exception of fish oil, the type of oil used appeared to exert no influence on the thickening. The slight fall in viscosity in the early stages of storing is explained by the progressive wetting of the pigment by the oil. These results are fully discussed in the light of previous work, and it is considered that phase-reversal will account for the observed phenomena, the lead glyceride-linseed oil system changing under suitable conditions to a more or less rigid linseed oil-lead glyceride system. S. S. WOOLF.

Determination of titania in titanium white. G. AGAMENNONE (Giorn. Chim. Ind. Appl., 1930, 12, 123—124).—The titanium is dissolved as sulphate, reduced to the titanous state, and titrated with ferric alum: 0.5 g. of the pigment is heated, at first gently and then more strongly, with 8—9 g. of anhydrous sodium sulphate and 25 c.c. of concentrated sulphuric acid until dissolved. The cold liquid is mixed with 150 c.c. of water and heated for a few moments to boiling, the precipitated barium sulphate and silica being subsequently filtered off, and the filtrate and the washing liquor (5% sulphuric acid solution, followed by water) made up to 250 c.c. 100 C.c., diluted with an equal volume of water, are heated to about 50°. Meanwhile 150 c.c. of 5% sulphuric acid are poured through a stop-cock burette (60 cm. long, 3 cm. wide) charged with amalgamated zinc and having a long outlet tube passing into a 750-c.c. vacuum flask. Suction is applied and the acid drawn into the flask at the rate of 30 c.c. per min. The titanium solution is similarly introduced and is followed by 150 c.c. of 5% sulphuric acid and 150 c.c. of water, both used to rinse out the beaker, which is finally washed out into the burette. The air in the flask is displaced by a current of carbon dioxide passed through a second tube traversing the stopper, the flask being then detached and the contents titrated with 0.1N-ferric alum after addition of 10 c.c. of 25% ammonium thiocyanate solution. (1 C.c. of ferric alum

solution corresponds with 0.00801 g. TiO_2 .) If the pigment does not dissolve completely in the hot mixture of sodium sulphate and sulphuric acid, it may be fused with potassium hydrogen sulphate. T. H. POPE.

Crystallising lacquers. H. A. GARDNER (Amer. Paint and Varnish Manufs.' Assoc., Circ. 358, Jan., 1930, 70—71).—If phthalic anhydride be dissolved in acetone and added to nitrocellulose compositions (a suggested ratio being 1 pt. of phthalic anhydride to 2 pts. of nitrocellulose) crystallising lacquers are obtained. These appear to crystallise more rapidly on bare than on primed metal surfaces. They are not suitable for exterior exposure. S. S. WOOLF.

Nitrocellulose. R. G. DANIELS (J. Oil and Colour Chem. Assoc., 1930, 13, 99—107).—Routine determination of alcohol content, nitrogen content, and stability of nitrocellulose yields information irrelevant from the point of view of lacquer manufacture, and the elimination of these tests is recommended. Undue significance is given to the individual boiling ranges of the volatile constituents of lacquers, when vapour tension at low temperatures of complex mixtures is the real issue. Legal regulations controlling the manufacture and use of nitrocellulose lacquers have not kept pace with the growth of the industry and thus present difficulties. It is considered that separate recommendations are necessary for manufacturer and consumer. The datum figure of 73° F. laid down by the Petroleum Act gives rise to anomalies when applied to lacquers, and specific legislation is considered desirable. S. S. WOOLF.

Flow relationships in nitrocellulose dispersions. D. R. WIGGAM (J. Rheology, 1929, 1, 48—69).—Viscosity measurements have been made at 25° on solutions of nitrocellulose in a number of solvents. The laws of viscous flow are not followed, but the results can be represented by Williamson's equation modified to take account of the radius of the capillary tube. C. W. GIBBY.

Purification of wood rosin. H. E. KAISER and R. S. HANCOCK (Ind. Eng. Chem., 1930, 22, 446—448).—Solvent-extracted wood rosin contains two colouring materials: (A) which produces the ruby-red coloration, and (B) which readily reacts with alkali to form coloured substances. Vacuum distillation improves the colour by the removal of A. By dissolution of the rosin in petrol and the addition of a second immiscible substance after adequate agitation, B can be removed. The secondary substance added may be a substituted ether, a phenol, aniline, furfuryl alcohol, ethylene chlorohydrin, or furfuraldehyde. A successful simple process of purification has been based upon the use of furfuraldehyde, since this liquid is practically immiscible with petrol. The rosin is dissolved in petrol, warmed, and agitated with furfuraldehyde. The two layers of liquid are separated after cooling, and the solvents recovered by evaporation. The undesirable colouring matter is concentrated in 20% of the rosin recovered. The process can also be modified to produce abietic esters of good colour. J. O. CUTTER.

Resins. V. Adulteration of sandarac. E. STOCK (Farben-Ztg., 1930, 35, 1459—1460; cf. B., 1930, 249).—

The presence of pistachio and pine resins as adulterants of sandarac may be detected by decrease in acid value, increase in saponif. value, and variation of the characteristic "capillary analysis" phenomena observed.

S. S. WOOLF.

Resins and resin substances. VII. Tolu balsam. A. ROLLETT [with O. SCHNEIDER] (Monatsh., 1930, 55, 151—157).—The residue from the ether-soluble extract of the resin is extracted with 20% acetone, whereby cinnamic acid is obtained. Further extraction of the residue from this with 20% alcohol affords a further amount of cinnamic acid, and the remainder of the product consists of impure tolueresinophenol (cf. Oberlaender, A., 1895, i, 188). Distillation of this gives an oil resembling clove oil. Reduction with zinc dust and acetic acid furnishes a product with an odour of eugenol, whilst oxidation with chromic acid affords vanillin. Hydrolysis with 5% potassium hydroxide solution yields cinnamic acid and a substance corresponding with a polymeric coniferyl alcohol. Successive extraction of the ether-insoluble portion of the resin with 20 and 50% acetone affords benzoic acid and vanillin, respectively. H. BURTON.

Acid values of dark-coloured resins. H. H. COBURN (Ind. Eng. Chem. [Anal.], 1930, 2, 181).—Determination of the acid value of a resin by titration with phenolphthalein is difficult if the resin is highly coloured. Good results are, however, given by the use of two layers, viz., a benzene-alcohol mixture and an aqueous layer saturated with sodium chloride. Excess of alkali is added with vigorous shaking and the excess titrated back. C. IRWIN.

Plastometer. GREGORY and others.—See I. **Formaldehyde condensations with aromatic compounds.** MORGAN; also MEGSON and DRUMMOND.—See III. **Pilchard oil.** GARDNER.—See XII. **White fillers for rubber.** DAWSON.—See XIV.

PATENTS.

Preparation of oil paints. A. HERMSDORF (G.P. 461,383, 11.4.26).—The oil used is prepared by heating linseed, poppy-seed, hempseed, tung, soya-bean, or whale oil with sulphur. When linseed oil is so treated 5—7% of a water-soluble sulpho-fatty acid is obtained which can be used for the preparation of fat-splitting compounds. A. R. POWELL.

Preparation of durable paints. CHEM. FABR. DR. J. WIERNIK & Co. A.-G., and BAKELITE GES.M.B.H., Assees. of J. SCHEIBER (B.P. 304,761, 27.12.28. Ger., 26.1.28. Addn. to B.P. 299,024; B., 1930, 469).—A deoxidant is added to the paint itself, in a primarily inert form, but which is adapted to be readily decomposed by the substances (acid degradation products, water, etc.) formed during the completion of the film, so that whereas the initial stages of drying are unaffected, the subsequent degradation is retarded. Suitable deoxidants are normal salts of lead, zinc, barium, magnesium, etc. with phenols or phenolic ethers, or amines combined with suitable metallic salts, e.g., zinc chloride, to form readily hydrolysable double salts. [Stat. ref.] S. S. WOOLF.

[Paint for] protection of iron surfaces against corrosion. I. G. FARBENIND. A.-G. (B.P. 305,218,

30.1.29. Ger., 2.2.28).—An anti-rust paint comprises a cellulose ester of a fatty, naphthenic, or resin acid of high mol. wt., a heavy metal salt of the same or similar acid, a cellulose ether insoluble in water, a drying oil, a colouring matter, and a softening or filling agent, *e.g.*, 20 pts. of cellulose trilaurate, 50 pts. of benzene, 50 pts. of xylene, 5 pts. of copper naphthenate, oleate, or similar compound, with or without 15 pts. of benzylcellulose.

A. R. POWELL.

Manufacture of coating compositions. ATLAS POWDER CO., ASSEES. OF D. CARNEGIE, JUN. (B.P. 297,681, 24.9.28. U.S., 23.9.27).—A drying or semi-drying oil, *e.g.*, raw linseed oil, is oxidised without substantial polymerisation, *e.g.*, by blowing air therethrough below 250°, until it attains a viscosity at which a solid steel ball (diam., $\frac{1}{4}$ in.) requires 20–80 sec. (preferably 60–75 sec.) to fall under gravity a distance of 12 in. through the oil at 25–30°. Then 3–4 pts. of the oxidised oil are mixed with 1 pt. of a cellulose ester, *e.g.*, cellulose nitrate, to give a composition suitable for use in imitation leather manufacture.

S. S. WOOLF.

Manufacture of coating preparations and solutions of their constituents. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 326,824, 15.11.28).—Cellulose derivatives soluble in organic solvents are dissolved in a solvent consisting of or containing an aliphatic homologue of 1:4-dioxan, and, if desired, other organic solvents, diluents, resins, pigments, dyes, etc.

S. S. WOOLF.

Graining composition. E. I. DU PONT DE NEMOURS & Co. (B.P. 315,214, 6.5.29. U.S., 9.7.28).—Dispersions of pigment in ethylene glycol and water with a small amount of a gum soluble in both solvents, *e.g.*, gum arabic, are claimed.

S. S. WOOLF.

Production of pictures in one or more colours on metallic bases. G. MANETTI, P. BENAGLIA, and M. LUCHSINGER (B.P. 303,419, 2.1.29. It., 2.1.28).—Metallic, gilded, or silvered surfaces etc. are covered with a layer of varnish (comprising a cellulose derivative) on which colours are subsequently printed. The metallic surface may be given a design in relief either before or after the colour-printing.

S. S. WOOLF.

Manufacture of a stable red lead paste. CHEMISCHES LABORATORIUM F. ANSTRICHSTOFFE GES.M.B.H. (G.P. 451,496, 10.1.25).—Red lead is ground in a mixture of linseed oil or linseed oil varnish with kieselguhr or a neutral or basic aluminium salt of a resin acid or a fatty acid.

A. R. POWELL.

Manufacture of condensation products of urea [carbamide] or derivatives thereof and formaldehyde. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,673, 6.10.28).—Water-insoluble formaldehyde-urea resins, obtained by condensation in anhydrous mono- or poly-hydric alcohols (C_4 and higher) as solvents, are precipitated by the addition of low-boiling aliphatic, aromatic, or hydroaromatic hydrocarbons or ethers (excluding acetals) in a finely-pulverulent state which facilitates removal of solvent and excess formaldehyde by washing. *E.g.*, urea (2 pts.) in commercial alcohol (1.6 pts.) is treated with concentrated hydrochloric acid (0.024 pt.) and added to anhydrous formaldehyde (2.3 pts.) dissolved in amyl alcohol (9 pts.) at 110°;

the product is neutralised with trisodium phosphate, and the resin is precipitated by light petroleum (5–10 times the weight of mixture), washed with ether, and dried at 50°. This product, dissolved in *n*-propyl and ethyl alcohols, gives a water-resistant lacquer.

C. HOLLINS.

Manufacture of phenol-formaldehyde condensation products. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 327,158, 28.12.28).—Less brittle and more easily workable resins are obtained by incorporating, during the condensation of phenol and formaldehyde, a polyalkylene glycol aryl ether, made, *e.g.*, by the action of ethylene oxide (3 mols.) on technical cresol.

C. HOLLINS.

Phenolic resin moulding mixtures. H. WADE. From BAKELITE CORP. (B.P. 326,840, 21.12.28).—Mixtures of a potentially-reactive phenolic resin and a cellulose ester, *e.g.*, cellulose acetate, the ester having a fibrous structure and being present in sufficient proportion to impart moulding capabilities to the mass, with the addition, if desired, of plasticisers, are claimed. A preferred mixture comprises approximately equal proportions of the two constituents.

S. S. WOOLF.

Manufacture of synthetic resins. H. WADE. From BAKELITE CORP. (B.P. 326,884, 24.12.28).—Cresol is condensed with furfuraldehyde in the presence of a base, *e.g.*, lime, until a fusible resin is formed substantially in the absence of free phenol; more lime and, if desired, a fusible resin, *e.g.*, a non-reactive phenol-methylene resin, are added and the reaction is continued.

S. S. WOOLF.

["Alkyd"] resinous compositions. BRIT. THOMSON-HOUSTON CO., LTD., ASSEES. OF R. H. KIENLE (B.P. 299,424, 19.10.28. U.S., 26.10.27).—Polybasic acids (phthalic acid) are heated with monohydric alcohols (amyl or butyl alcohol) to a reaction temperature until combination occurs, whereupon polyhydric alcohols (glycerin) are added and the mixture is heated to resinification. Monobasic acids, *e.g.*, oleic acid, may replace polybasic acids in part. The "alkyd" resins produced have high flexibility and water-resistance, and are suitable for coating wires and sheet metal.

S. S. WOOLF.

Manufacture of artificial masses [resins from polyhydric alcohols and dicarboxy-ethers or -thioethers, and their application]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,722, 10.12.28, 18.7., 19.7., 9.8., and 12.8.29).—A polyhydric alcohol or alcohol mixture, *e.g.*, glycol, glycerol, erythritol, pentaerythritol, mannitol, hydroxyalkyl esters and ethers, etc., are heated with dicarboxy-ethers or -thioethers or their anhydrides, *e.g.*, diglycollic acid, carboxymethyl ether of salicylic acid, methyl diglycollic acid, "thiodiglycollic acid" (sulphidodiacetic acid), etc.; the products may be hardened by further heating. The condensation may be modified by the addition of other polybasic acids, fatty acids or esters (including drying oils and their acids), fillers, colouring matters, resins, softening agents, diluents, or solvents. A glycerol partly esterified with fatty acids (*e.g.*, linoleic) may be used as the polyhydric alcohol. The products serve all the purposes of "Glyptal" resins, and also form substitutes for glass, horn, or shellac (for binding together

mica plates); mixed with hydraulic cement, lime, etc. they harden rapidly at 40–100°. C. HOLLINS.

Preparation of resinous condensation products.

A. H. V. DURR, ASSR. TO COMP. NAT. MAT. COL. ET MANUF. DE PROD. CHIM. DU NORD RÉUNIES, ETABL. KUHLMANN (U.S.P. 1,739,446—8, 10.12.29. Appl., 2.1.29. Fr., 31.12.27).—Mixed phthalic and resinic esters of glycerol are made (A) by heating together glycerin, phthalic anhydride, and colophony, (B) with subsequent incorporation of drying oils, or (C) by heating together a glyceryl phthalate and a glyceryl resinate.

C. HOLLINS.

* **Manufacture of [resinous] condensation products of carbazole compounds and olefines.** A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 327,746, 11.12.28).—Mono- or poly-alkylated carbazoles or higher condensation products are obtained by heating carbazoles with olefines at 100–200°, in presence of aluminium chloride etc., fuller's earth, tonsil, or frankonite, preferably in presence of an inert solvent (light petroleum, paraffin oil, cyclohexane, decahydronaphthalene, etc.). Carbazole with propylene gives a soft resin, b.p. 210–240°/1 mm., probably diisopropylcarbazole, with cyclohexene a hard resin, b.p. 270–340°/1 mm.; *N*-ethylcarbazole and propylene yield a soft resin, b.p. 200–230°/mm.

C. HOLLINS.

Manufacture of products having the properties of resins and waxes. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 327,417, 29.9.28).—Bleached montan wax, beeswax, carnauba wax, or their conversion products, containing carboxylic acid groups, are esterified with hydroxylated high-molecular resoles or resins (free from aromatic or hydroaromatic sulphur compounds), e.g., the product from formaldehyde and *o*-cresol, or aldol resin. Part of the acidity may be neutralised by addition, e.g., of lime before reaction. The resins may be hardened, and are then thermoplastic, although they do not melt. If formaldehyde or trioxymethylene be added during esterification, hard, non-thermoplastic masses result.

C. HOLLINS.

Material containing carbon, iron, and iron oxide (B.P. 308,351). **Products from tars and pitches** (B.P. 327,797).—See II.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Spiral [molecular] model for rubber. F. KIRCHHOF (Kautschuk, 1930, 6, 31–33).—By means of quotations from earlier publications (cf. B., 1922, 335 A) the author demonstrates that he had anticipated the essential features of the spiral formula recently formulated for rubber by Fikentscher and Mark (B., 1930, 249).

D. F. TWISS.

Solvation of substances of high mol. wt., particularly rubber. P. STAMBERGER and C. M. BLOW (Kautschuk, 1930, 6, 22–27; cf. B., 1929, 692).—From measurements of the swelling pressure of rubber in toluene and of the lowering of the vapour pressure of this solvent by rubber it is probable that rubber does not consist of a mixture of molecules in various stages of polymerisation and that the mastication of rubber does not induce depolymerisation as is commonly assumed. The vapour-pressure lowering is not influenced by the

viscosity of the solution, so that the latter is not an index to the molecular magnitude of the dissolved rubber; this conclusion also follows from measurements of the viscosity of solutions of rubber from mixtures with carbon black. The condition of substances of high mol. wt. in solution is discussed briefly.

D. F. TWISS.

Adsorption-chemical studies on rubber fillers and rubber mixings. I. G. FROMANDI (Kautschuk, 1930, 6, 27–30).—Various types of amorphous carbon used as ingredients for rubber mixings exhibit different degrees of adsorptive power for acetic acid from aqueous solution. The adsorptive power is conveniently estimated by measuring the final acidity of the filtered solution. The relation of this adsorptive power to the reinforcing qualities of the powder is under investigation.

D. F. TWISS.

Comparison of white fillers for rubber, with special reference to pigmentation. T. R. DAWSON (India-rubber J., 1930, 79, 315–317).—Vulcanised mixtures of rubber with various white pigments and fillers, e.g., lithopone, titanium white, zinc oxide, zinc sulphide, whiting, barium sulphate, magnesium carbonate, were examined as to their mechanical properties and colour. In reinforcing effect zinc oxide and magnesium carbonate were exceptionally good. Zinc sulphide had the most intense pigmenting effect, but imparted a distinctly yellowish tint; titanium white was second, but amorphous titanium dioxide was deficient in pigmentation power. The lithopone samples discoloured considerably on exposure to light; the zinc oxide samples appeared to be the most resistant to "yellowing" in storage. A bibliography of papers dealing with "whiteness" in pigments, paints, and rubber is appended.

D. F. TWISS.

Vulcanisation with sulphur chloride. E. WURM (Kautschuk, 1930, 6, 33–36).—Some advantages of the cold-vulcanisation process for manufacturing purposes are indicated, and consideration is given to various factors, e.g., choice of compounding ingredients and pigments, dusting powders, calendering, conditions of vulcanisation, etc., which are favourable to satisfactory results.

D. F. TWISS.

Ageing of rubber and its retardation by the surface application of antioxidants. Diffusion process. C. MOUREU, C. DUFRAISSE, and P. LOTTE (Ind. Eng. Chem., 1930, 22, 549–551).—The changes caused in organic substances by oxygen are of two distinct types: one of ordinary chemical nature and the other catalytic. In order to accelerate the natural ageing of rubber, it is not sufficient to expedite the absorption of oxygen. An excess of oxygen may even alter the course of the reaction, as it does with acrolein, and the oxygen-ageing test for rubber may lead to false conclusions. The Geer heat-ageing test does not give a faithful representation of natural ageing, but is useful for comparative purposes, especially for articles to be used at elevated temperatures. For this purpose comparison of the behaviour at 90° until the control samples show considerable deterioration is useful; care is necessary, however, to prevent contamination of the control samples by vapours or dust from antioxidants in other

samples, but circulation of fresh air is unessential. Exposure to ultra-violet light is only of use where objects are to be used under similar conditions; ultra-violet light leads to formation of ozone, and deterioration by ozone is a different phenomenon from depreciation by oxygen, being influenced by different factors. The presence of ozone should be avoided in comparative experiments designed to determine the efficiency of an antioxygen. It is often sufficient to apply an antioxygen to the surface of the rubber, in solid, liquid, or vapour form. If a solution be used, the nature of the solvent is of importance, probably by influencing the degree of penetration of the antioxygen; ether is a suitable solvent for antioxygens of the quinol type. The "diffusion process," as this method of surface treatment is termed, has several advantages, including that of renewability. On scientific grounds the term "antioxygen" is preferred to "antioxidant," the latter designation being likely to lead to misconception as to the mode of action and limitations of such preservatives against ageing. D. F. TWISS.

Determination of total sulphur in rubber. J. G. MACKAY (J.S.C.I., 1930, 49, 233—241 t).—An account is given of an attempt to devise a method of determining total sulphur, of greater rapidity than but still comparable in accuracy with the Carius method. A series of vulcanised rubber samples were prepared containing varying proportions of sulphur and involving the commoner compounding ingredients; these were standardised by the Carius method. The analytical figures obtained in this way were lower than the "theoretical" values by more than the allowable amount in mixings containing carbon black, china clay, silica, French chalk, antimony sulphide, and compounds of iron and calcium. Suggested explanations of these discrepancies are given. The method of oxidation recently described by Kahane (B., 1927, 532), involving the use of fuming nitric and perchloric acids, was found to be inaccurate, but when several modifications were introduced satisfactory results were obtained. It is shown that the sulphuric acid produced by this method of oxidation can be accurately determined volumetrically as benzidine sulphate. A procedure for the determination of total sulphur was thus developed, and when applied to the standardised mixings yielded results in good agreement with those obtained by the Carius method. The new procedure gave better figures for the mixings containing calcium, antimony, and iron compounds than did the older method, and a determination in duplicate requires less than 4 hrs.

PATENTS.

Purification of aqueous dispersions [e.g., rubber latex]. ANODE RUBBER CO., LTD., Assees. of E. B. NEWTON (B.P. 319,344, 15.3.29. U.S., 22.9.28).—The greater part of the dissolved gases or volatile substances can be removed from latex or similar dispersions by injecting a vigorous current of inert gas into the heated liquid. In order to prevent coagulation on account of the loss of ammonia or other volatile base a non-volatile alkali or alkaline substance, e.g., potassium hydroxide or sodium phosphate, is added. A preservative, e.g.,

an alkali phenoxide, may also be introduced before, during, or after the heating or blowing operation.

D. F. TWISS.

Manufacture of rubber composition [and carbon black therefor]. THERMATOMIC CARBON CO., Assees. of E. B. SPEAR and R. L. MOORE (B.P. 307,743, 20.2.29. U.S., 12.3.28).—An improved thermatomic black of low stiffening qualities for rubber, but possessing the black colour and rubber-strengthening qualities associated with carbon black made by the channel process, and imparting a greater ultimate elongation than that given either by commercial carbon black or ordinary thermatomic black, is produced by decomposing hydrocarbon gases, diluted with inert gases, in a heated retort. Normally natural petroleum gas is used, and the inert gases consist of the gaseous products of decomposition, mainly hydrogen, resulting from the process after removal of the entrained carbon. D. F. TWISS.

Manufacture of goods of rubber or similar material. DUNLOP RUBBER CO., LTD., E. A. MURPHY, and D. F. TWISS (B.P. 327,451, 5.1.29).—Compounding ingredients such as gas black, clay, silica, or whiting, which in sufficient amounts normally cause coagulation of latex, are added to aqueous dispersions of rubber or similar material in the presence of a stabilising agent, e.g., an ammonium soap, which arrests their coagulative effect. Further addition of similar ingredients or others, e.g., zinc oxide, with stirring then leads to the formation of an incoherent mass, which dries to a crumb-like condition. The products can be consolidated by pressure or by milling for a short time. It is possible in this way to obtain uniform workable mixtures of rubber with high proportions of carbon black.

D. F. TWISS.

Manufacture of articles of rubber or similar material. DUNLOP RUBBER CO., LTD., R. F. MCKAY, and W. G. THORPE (B.P. 328,015, 16.1.29).—A former is dipped into latex, which preferably has been concentrated and/or compounded, and the uncoagulated deposit thereon is submitted to a spray or gaseous or vaporuous current containing a coagulant, such as acetic acid, and/or to a spray containing a setting agent. Deposits of considerable thickness can thus be set; thicker articles can be obtained by superposing several such deposits.

D. F. TWISS.

Manufacture of artificial rubber. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 304,207, 15.1.29).—Artificial rubber produced by the polymerisation of aqueous dispersions of α -butadiene or its analogues is separated from the resulting latex-like emulsion by cooling below 0° and removing the coagulum. The emulsifying agent is thereby recovered in the aqueous layer. Emulsifying agent retained in the coagulum may also be recovered, e.g., by washing, but, being strongly adsorbed by unchanged diolefine, it is advisable to remove this previously, e.g., by evaporation.

D. F. TWISS.

Manufacture of age-resisting rubber compounds. IMPERIAL CHEM. INDUSTRIES, LTD., S. COFFEY, and W. J. S. NAUNTON (B.P. 328,115, 18.4.29).—Nitrogenous organic compounds capable of dissociating into free radicals containing bivalent nitrogen (excluding aryl-

naphthylnitrosoamines) are incorporated in rubber mixes before vulcanisation. Examples are tetraphenylhydrazine and diphenyltriphenylmethylamine.

C. HOLLINS.

Coating of metal articles with rubber or similar materials. C. MACINTOSH & Co., LTD., H. C. YOUNG, and C. HEMM (B.P. 327,452, 5.1.29).—Objects with closely-grooved, corrugated, or ribbed surfaces, or with deep re-entrant angles are given coatings of substantially uniform thickness by first subjecting them to electrophoretic deposition, simultaneously or subsequently conditioning the deposits to impart a high specific resistance throughout, and then effecting further electrophoretic deposition in any known manner. The initial coating of high resistance may be produced, for example, by electrophoretic treatment for a few seconds with an aqueous dispersion of high ammonia content or by partial drying of an electrophoretic deposit produced in the ordinary manner.

D. F. TWISS.

Adhesive material [from rubber]. W. C. GEER, Assr. to B. F. GOODRICH Co. (U.S.P. 1,744,880, 28.1.30. Appl., 9.2.25).—The balata-like isomeride obtained from rubber by the action of sulphuric or sulphonic acids is mixed with an anti-ager (acetaldehyde- α -naphthylamine, benzidine, 1:8-naphthylenediamine, 4:4'-tetramethyldiaminothiocarbanilide) and tung oil, and used as an adhesive, especially for rubber-metal joins.

C. HOLLINS.

Heterocyclic bases (B.P. 310,534). **Vulcanisation accelerators** (U.S.P. 1,737,384 and 1,737,391).—See III. **Artificial threads etc.** (B.P. 327,164).—See V.

XV.—LEATHER; GLUE.

Biochemistry of soaking and liming [of animal skins]. V. Effect of various acids on the diffusion of coagulable proteins from animal skin. E. R. THEIS (J. Amer. Leather Chem. Assoc., 1930, 25, 48–56; cf. B., 1930, 252).—Pieces of skin were treated with solutions of sodium chloride of different concentrations respectively, solutions of hydrochloric acid, and solutions of different organic acids of different concentrations. After 48 hrs. treatment the solutions were analysed for coagulable and non-coagulable proteins. As the concentration of the sodium chloride was increased, the total dissolved protein decreased. Maximum coagulable protein was dissolved by the 10–15% solutions of sodium chloride. At high concentrations of hydrochloric acid (0.1–1.0N), practically no coagulable protein was dissolved, but as the p_H value increased both the amount of total dissolved and of coagulable nitrogen increased, thus showing that the coagulable protein in skin was coagulated by acid. Pieces of skin were treated for 48 hrs. with 0.1N-solutions of hydrochloric, nitric, sulphuric, phosphoric, formic, acetic, lactic, citric, oxalic, and mono-, di-, and tri-chloroacetic acids, respectively, then for 48 hrs. with a solution of sodium hydroxide equivalent to the acid present in the pieces, and finally for 48 hrs. with a 15% solution of sodium chloride. The amounts of total dissolved and coagulable nitrogen were determined in the acid soak-liquors, the

neutralisation liquors, and in the sodium chloride solutions after use. The coagulable protein in the skin was rendered insoluble by all these acids, but this coagulation effect was reversed by the sodium hydroxide except in the case of hydrochloric, phosphoric, formic, mono- and di-chloroacetic acids. The time of bating will be increased for skins which have been soaked in solutions of these coagulating acids.

D. WOODROFFE.

Natural fats of goatskins and their relation to the formation of fatty spue in chrome[-tanned] leather. R. F. INNES (J. Soc. Leather Trades' Chem., 1929, 13, 375–382).—A purple compound of chromium and fatty acid associated with fatty spues on finished chrome-tanned leathers was observed on chrome-tanned skins which had not been fat-liquored. The fatty spue associated with this on finished leathers was shown to be chiefly free fatty acids (m.p. 50–51°). The purplish compound could be produced artificially only on skins containing free oleic acid or calcium oleate. No purple stain could be produced even on greasy skins containing no free fatty acid. In imported goat-skins 20% of the total fat was shown to be free fatty acids, from which lime soaps are formed during manufacture, and these are decomposed only in the two-bath chrome-tanning process. Degreased, bated skins were impregnated with oleic acid, olein, and stearic acid, respectively, and then chrome-tanned, fat-liquored, and finished; pink stains were observed on the "blue" skins prepared from the pelt which had been treated with oleic acid and spue was observed on the finished leather, which contained the stearic acid. Lipase, produced by micro-organisms in the presence of moisture and protein, has been found in cured goatskins. It is suggested that if putrefactive organisms develop before or during the curing of the skins, or if the cured skins become damp, lipase is formed, the natural fats are hydrolysed, and white spues result from the stearic acid thus liberated. The remedy is more efficient curing and preservation of the cured skins in a dry store.

D. WOODROFFE.

Conservation of hides and skins. M. C. LAMB (J. Soc. Leather Trades' Chem., 1930, 14, 207–210).—Sheepskins are often damaged by burrs, i.e., the fruits of certain grasses, e.g., *Tragus racemosus*, All., *Medicago*, App., *Triumfetta annua*, L., and *Xanthium spinosum*, L., which collect in the wool. Short hairs of vegetable origin have been found on unhaird skins. The grain of South African sheepskins is often perforated by "spear grass" (*Hepteropogon contortus*, L.) and "steek grass" (*Aristida barbicollis* and *A. congesta*). Uruguayan sheepskins are often damaged by the awns of *Stipa charruana*, Arech.

D. WOODROFFE.

Analysis of artificial pancreatic bates. A. ULČEK (J. Soc. Leather Trades' Chem., 1930, 14, 189–202; cf. B., 1927, 662, 758).—Kubelka and Wagner's criticisms (B., 1929, 755, 1025) are answered. The author's method evaluates the increase in acidity in the presence of formaldehyde, which has been shown to be proportional to the dissolved nitrogenous matter. The presence of erepsin does not affect the result. A certain minimum concentration of casein solution is necessary

to differentiate bates of different strengths. A lower temperature than 40° can be used. An apparent increased activity is obtained in presence of certain alkaline reagents due to the incomplete precipitation of the casein. The Kubelka-Wagner method of determining the enzymic strength of commercial bates is unsatisfactory and is not in accord with modern conceptions of the chemistry of proteins and enzymes. Certain neutral salts, *e.g.*, ammonium, oppose the absorption of the enzyme by the wood-meal or sawdust. Distinction must be made between "enzymic capacity" (the activity of the total amount of enzyme in the sample) and "enzymic intensity" (the activity due to the dissolved enzyme when the sample is mixed with water). The former can be determined by digesting the casein solution with water and the enzyme without previously making an extract, filtering the product, and using an aliquot portion for a nitrogen determination; another portion is mixed with formaldehyde and the acidity titrated.

D. WOODROFFE.

Determination of p_H in tan liquors. L. GOLDMAN (J. Soc. Leather Trades' Chem., 1930, 14, 211–213).—Inconsistent results with the hydrogen electrode in the determination of p_H in tan liquors are probably due to the reduction of certain constituents of the tan liquor by hydrogen in the presence of the platinum-black catalyst. To minimise this, the electrode is placed above the liquor and hydrogen is allowed to pass for $\frac{1}{2}$ hr., after which the electrode is immersed in tan liquor and an immediate reading is taken; the process is repeated until a constant *P.D.* is reached. The electrode was prepared by coating a platinum wire with palladium-black from a 1% solution of palladium chloride; it is then washed, placed as the negative pole in a 5% solution of sulphuric acid, and a current of 20 milliamp. passed until hydrogen bubbled freely from it. Palladium is used as it has greater absorptive power for hydrogen than platinum. The method is not applicable to sulphited extracts. A freshly palladised electrode should be used for each tan liquor.

D. WOODROFFE.

Functions of oils and fats in currying, fat-liquoring, oiling-off, and chamoising [of leather]. III. Report of a Committee of the Society of Leather Trades' Chemists. D. BURTON and G. F. ROBERTSHAW (J. Soc. Leather Trades' Chem., 1929, 13, 383–397).—Light leathers are fat-liquored to give them the desired softness, pliability, and increased tensile strength. The kind and amount of oil which gives the right pliability, minimum stretch, and maximum area should be determined, also the effect of the stability of the fat-liquor emulsion and the drying of the leather. Oiling-off prevents oxidation and reduces evaporation from the grain side to a minimum. The use of cod oil for oiling-off is discussed. Pieces of leather at different stages of tanning were divided into two portions, one of which was oiled-off with cod oil and dried and the other dried out without treatment. It was shown that a good colour could be obtained without oiling, and that it depended on the rate of drying and on the tannin content of the water-soluble matter. The chamoising properties of oils depend on the relative tanning properties of the fatty acids con-

tained in them. Greasiness in finished leathers may be caused by natural or added grease, mouldiness by moulds in the oils used, cracky grain by lack of grease or low moisture content, and springiness by excessive currying. Brittle fibres in belting leather have been produced by fatty acids. Some white spues have been traced to natural skin fat, fatty acids, stearins, or hydroxy-acids, respectively, of high m.p. The literature and previous work in the various processes are reviewed.

D. WOODROFFE.

Wearing quality and other properties of vegetable-tanned and of chrome-retanned sole leather.

R. W. FREY and I. D. CLARKE (Tech. U.S. Dept. Agric. Tech. Bull. No. 169, 1930, 17 pp.).—Six hides were cut in two, one half of each was vegetable-tanned for sole leather, the others were tanned with a one-bath chrome-tanning liquor, neutralised, washed, and retanned with a mixture of chestnut and sulphited quebracho extracts; one pair was then retanned lightly, another to a slightly greater degree, and the third pair fully retanned. From 100 lb. of green-salted cured hide were obtained 66 lb. of vegetable-tanned leather (showing a 4% increase in area and having d 1.044) and 32–51 lb. of chrome-retanned leather (6% decrease in area, d 0.70–0.84), respectively. A lower tensile strength was shown by the chrome-retanned than by the vegetable-tanned leather, the difference increasing as the degree of retannage increases. The stretch of the vegetable-tanned leather was 73% of that of the chrome-retanned leather at the breaking load. A larger volume of "voids" was observed in the chrome-retanned than in the vegetable-tanned leather, and 60–80% greater wear was obtained with the former, although it was thinner than the vegetable-tanned leather. The wear-resistance of the chrome-retanned leather decreased as the degree of retannage increased. No relationship was shown between the density or apparent density and the wear-resistance of the leathers. The chrome-retanned leather was quickly penetrated by water, was slippery in wet weather, and was not sufficiently solid to protect the foot against uneven surfaces in wear.

D. WOODROFFE.

Relationship between physical properties and chemical constitution. VI. **Waterproofness of different sole leathers.** D. WOODROFFE (J. Soc. Leather Trades' Chem., 1929, 13, 631–636; cf. B., 1926, 989).—The time taken to force water through pieces of sole leather was noted for different leathers before and after removal of the grain, but no appreciable difference was noted, thus contradicting Van der Waerden's results (B., 1928, 828). The water-soluble matter was determined in these leathers, and it is shown that there is no connexion between the water penetrability and the content of water-soluble matter. Four French leathers were impenetrable to water from the grain side, but they absorbed water readily by immersion in it. It is shown that there is no relationship between the water absorption and the water permeability of a leather, thus disagreeing with Bradley, McKay, and Worswick's suggestion (B., 1929, 446) to compare water permeabilities by determining the "diffusion constants." The results obtained afford further evidence of the difficulty of comparing simple

physical properties of leathers owing to other differences, e.g., the compacting of the fibres in French leathers.

D. WOODROFFE.

Analysis of vegetable-tanned leather. Method proposed by a Committee of the Society of Leather Trades' Chemists. P. CHAMBARD (J. Soc. Leather Trades' Chem., 1929, 13, 355—365).—The sample is cut into pieces of maximum length (2 cm.) and thickness (0.5 mm.). Moisture is determined at 110°, then total ash, and soluble ash by calcining the dried residues from the water-soluble matter determinations. The insoluble ash is the difference between this and the total ash. The grease is extracted with light petroleum (b.p. 40—65°) and the residue heated at 95—100° to constant weight. Water-soluble matter is determined either by the French method (cold) or by the Procter extractor at 45°. Glucose and hide substance are determined by the usual methods. D. WOODROFFE.

Analysis of [vegetable-tanned] leather. A. T. HOUGH (J. Soc. Leather Trades' Chem., 1929, 13, 637—639).—Results of analyses of various leathers show that a larger figure is sometimes obtained for the soluble ash, as determined by the proposed official method (cf. preceding abstract), than for the total ash. The insoluble ash should be determined by ashing the residual leather after removal of the grease and water-soluble matter. The soluble ash should be sulphated and the figure obtained used in calculating the combined tannin. The grease extract should be ashed and weighed, since it sometimes contains metallic soaps. D. WOODROFFE.

Effect of acidity on the dyeing of leather. D. WOODROFFE and S. J. HILL (J. Soc. Leather Trades' Chem., 1930, 14, 203—206).—Pieces of sumac-tanned skiver were dyed with solutions of a number of acid dyes at different p_H values. Maximum depth of shade was obtained in most cases at p_H 2.0. Sulphuric acid is more effective than acetic acid in producing this p_H , and hence for obtaining fuller shades in dyeing leather with acid dyes. A full shade was obtained with a few dyes at higher p_H values. Variations in the shade of leather dyed with mixed dyes may be due to variations in the acidity of different portions of the skins arising from variations in texture or from incomplete neutralisation after chrome-tanning. D. WOODROFFE.

PATENTS.

Preparation of leather. A. EHRENREICH (U.S.P. 1,758,564, 13.5.30. Appl., 31.1.28. Belg., 23.9.27).—See B.P. 299,599; B., 1929, 30.

Production of structural forms of small dimensions of colloidal material, especially of glue or gelatin. A. MAREK (B.P. 328,623, 31.12.28).

Coating composition (B.P. 297,681).—See XIII. **Adhesive from rubber** (U.S.P. 1,744,880).—See XIV.

XVI.—AGRICULTURE.

Physical properties of soil. V. Hysteresis effect in capillary properties, and modes of moisture distribution associated therewith. W. B. HAINES (J. Agric. Sci., 1930, 20, 97—116; cf. B., 1927, 588).—A discussion of the physics of the moisture

distribution in an ideal soil followed by a description of experiments with bronze balls and paraffin oil to determine suction values. Certain differences of opinion with R. A. Fisher are resolved (*ibid.*, 1928, 18, 406).

E. HOLMES.

Laterite and lateritic soil in Sierra Leone. II. F. J. MARTIN and H. C. DOYNE (J. Agric. Sci., 1930, 20, 135—143; cf. B., 1928, 28).—Laterites, lateritic soils, and non-lateritic soils are defined as soils having a molecular silica/alumina ratio of less than 1.33, between 1.33 and 2, and above 2, respectively. The detrital soils of Sierra Leone contain a higher ratio of alumina to silica than the residual soils. They are all acid in reaction, have a definite lime requirement, and mineral constituents, particularly potash and exchangeable calcium, are low. Such soils readily remove soluble phosphorus from solution. E. HOLMES.

Purdue technique for taking and mounting monolithic soil profile samples. T. M. BUSHNELL (Soil Sci., 1930, 29, 395—399).—Samples are obtained from the profile face by glueing to it strips of cloth etc. and subsequently breaking away the strips with adhering soil. A. G. POLLARD.

Approximate size of soil particles at which the heat of wetting is manifested. L. C. KAPP (Soil Sci., 1930, 29, 401—412).—Heat of wetting is exhibited by soil particles of mean diam. up to 0.005—0.01 mm. The size limit of powdered mineral particles which show heat of wetting is lower than that of soils. Soil organic matter may affect the heat of wetting, but to no great extent. Soil particles of mean diam. <0.00005 mm., the heat of wetting property of which was lost after ignition at 830°, were subsequently found to contain approx. 90% of particles of mean diam. 0.02 mm. Regrinding after ignition partially restored the heat of wetting phenomenon. A. G. POLLARD.

Equipment and procedure for obtaining the displaced soil solution. J. P. CONRAD, E. L. PROBSTING, and L. R. MCKINNON (Soil Sci., 1930, 29, 323—329).—The soil sample is packed in a specially-designed metal cylinder, and covered with water. Air pressure is applied at the water surface. A. G. POLLARD.

Translocation of calcium in soils as measured by electro dialysis and plant growth. B. D. WILSON (Soil Sci., 1930, 29, 331—337).—Soils, limed at the surface and subsequently leached with water for a lengthy period, were examined. The fixation of calcium by the lower soil layers, from the drainage water passing through them, was very small but sufficient to influence the growth of clover for a brief period. A. G. POLLARD.

Rôle of humus in the absorption complex [in soils]. L. KOTZMANN (Landw. Forsch. Ungarn., 1929, 12, 537; Bied. Zentr., 1930, 59, 200—202).—Recorded equivalent weights of humic acid vary with the methods of examination adopted. Humus "fixes" bases both by chemical combination and by physical adsorption. The latter process is governed by the concentration of bases in the solution with which the humus is in contact. By repeated evaporation of ammoniacal humus extracts free ammonia is eliminated and residual ammonia is

determined as being chemically combined. Hissink's baryta method for examining humus does not eliminate adsorption. The determination of the ($T-S$) value by di Gléria's method indicates combined ammonia only. By repetition of this method with a soil treated with hydrochloric acid (sufficiently dilute to avoid decomposition of the humus) the chemical value T is obtained. Only a portion of the total humus content of soils exhibits adsorptive properties, and this portion approximates closely to that determined by the Grandeau-Hilgard method. A. G. POLLARD.

Inaccuracy of the quinhydrone electrode in [determinations of p_H of] many Kentucky soils. P. E. KARRAKER (J. Amer. Soc. Agron., 1930, 22, 171—180).—Higher values (max. p_H 1.5) than those given by the hydrogen electrode or colorimetric methods were obtained. Soils giving incorrect values in suspensions afforded filtrates giving correct values; the inaccuracy is attributed to the presence of manganese. The colorimetric method is preferred for routine determinations. CHEMICAL ABSTRACTS.

Significance of the volume-weight for soil science and plant nutrition. L. SMOLÍK (Bull. Czechoslov. Acad. Agric., 1929, [v], 460; Proc. Internat. Soc. Soil Sci., 1930, 5, 32—33).—The expression of soil analyses on a basis of "volume-weight" (Kopecky) instead of the customary dry-matter basis is discussed and recommended. A. G. POLLARD.

Relationship between the nutrient content and reaction of soil. H. WIESSMANN and E. SCHRAMM (Pflanzenbau, 1929, 6, 97; Bied. Zentr., 1930, 59, 195—197).—Acid soils are more frequently deficient in phosphates than neutral ones, since their phosphate content consists largely of iron and aluminium phosphates of low assimilability. Applications of phosphatic fertilisers to such soils are often ineffective, but the phosphate may be mobilised by liming. Chalk-bearing soils with an alkaline reaction are frequently poorer in assimilable phosphate than neutral soils, their phosphate being largely tricalcium phosphate, which is not freely available to plants. On such soils phosphate manuring is made successful by the conjoint use of physiologically acid fertilisers, especially ammonium sulphate. In both acid and alkaline soils the adjustment of the "lime condition" must be considered in determinations of their phosphate requirements. The available potash contents of neutral soils is higher than that of acid ones. Liming the latter mobilises potash as a result of base exchange, thereby increasing the rate of availability, and, in soils poor in potash, leading subsequently to more acute deficiency. Among chalk-bearing soils little difference is apparent in the assimilable potash contents of neutral and alkaline samples. A. G. POLLARD.

Determination of the nutrient requirement of soils by means of field and pot experiments. E. A. MITSCHERLICH (Landw. Jahrb., 1930, 71, 445—467).—Numerous comparative determinations are recorded of the nutrient contents and fertiliser requirements of soils by means of field trials and by the author's method. The errors to which the two methods are subject are discussed. The first approximation to the

"effect law" offers a satisfactory means of examination of soils for the above values. A. G. POLLARD.

Practical significance of soil research with special reference to phosphates and the methods of Neubauer and Lemmermann. H. ELLEDER (Z. Pflanz. Düng., 1930, 9B, 145—161).—Results of determinations of the phosphate requirements of soils by the two methods are discussed in comparison with field trials, and the relative values of these methods to the practical agriculturist examined. A. G. POLLARD.

New hypothesis of the mode of action of potash [in plants]. A. BRUNO (Sci. Agric., 1930, 10, 422—425).—In the process of carbon assimilation by plants, energy supplied by direct solar radiation is supplemented by, or transformed into, radioactive emissions from potash (associated particularly with the isotope 41) present in the cell-sap. A. G. POLLARD.

Effects of raw phosphate on the soil. A. N. LEBEDIANZEV (Fertilisers and Yields, Russia, 1929, 26—30).—Raw phosphates are effective on chernozem and chestnut as well as podsol and degraded chernozem soils. Raw phosphate is beneficial also on ameliorated alkali soils. CHEMICAL ABSTRACTS.

Forms of phosphorus in the soil and response of soils to phosphate fertilisers. A. I. DUSHECHKIN (Fertilisers and Yields, Russia, 1929, No. 4, 195—201).—Response to phosphate fertilisation diminishes in the order: chernozem, degraded chernozem, chernozem-like loam, grey forest loam. In chernozem soil (which is richest in phosphorus) the amount of organic phosphorus is greater than in other soil types. The soils which did not respond to phosphorus fertilisation responded to treatment with nitrogen. CHEMICAL ABSTRACTS.

Mineralogical characteristics of Russian phosphate deposits and their agronomic utilisation. M. P. FIVEC and S. N. ROZANOV (Fertilisers and Yields, Russia, 1929, 201—211).—Russian phosphate deposits containing no apatite consist of kurskite and staffelite. The three petrographic types are: glauconitic clay, sandy, and glauconitic. Amorphous kurskite is as good as soluble phosphate in sand or soil cultures, whilst crystalline staffelite gives negative results. CHEMICAL ABSTRACTS.

Influence of peat on the utilisation of phosphoric acid from phosphates. Z. V. LOGVINOVA (Fertilisers and Yields, Russia, 1929, 211—216).—On podsol soils mixtures of raw phosphate and peat gave a more prolonged increase in yield (clover) than phosphate alone. Composting did not affect the availability of phosphate; the hydrogen-ion exchange appears to take place immediately. With meadow peat, where composting is advantageous, the influence was not so marked. CHEMICAL ABSTRACTS.

Improved quality of crops manured with phosphates and potash. O. NOLTE (Ernähr. der Pflanze, 1929, 25, 306—309; Bied. Zentr., 1930, 59, 210—211).—The importance of a consideration of the quality as well as quantity of crops produced in fertiliser trials is emphasised. A. G. POLLARD.

Determination of the lime requirement of soils.

DENSCH and STEINFATT (Landw. Jahrb., 1930, 71, 433—444).—The lime requirement of light soils cannot be based on determinations of exchange acidity alone. There is no parallelism between the exchange and hydrolytic acidities in the soils examined. Light soils with < 3 c.c. of hydrolytic acidity are but little harmful to barley. As the hydrolytic acidity increases beyond 4 c.c. injurious effects steadily increase. With oats there is no serious damage until the hydrolytic acidity reaches 8 c.c. On heavy soils these limiting values are higher. *Azotobacter* are inactive in soils having a hydrolytic acidity in excess of 1.4 c.c. Kappen's views as to the relative toxicity of hydrolytic and exchange acidities towards acid-sensitive plants are not confirmed. Numerous pot and field experiments indicate that soils should be grouped in three classes according to whether their hydrolytic acidities are within the ranges 0.4, 4.8, and > 8 c.c. Such grouping forms the basis of determinations of lime requirement. A. G. POLLARD.

Manurial action of magnesium sulphate and its dependence on the lime condition of soils.

A. GEHRING (Prakt. Blät. Pflanzenbau u. Pflanzenschutz, 1929, 6, [12]; Bied. Zentr., 1930, 59, 209—210).—Field trials indicated that the manurial effect of magnesium sulphate is primarily dependent on the lime status of soil and on the manner of application. On soils poor in lime magnesium sulphate principally affects the physical condition, but in lime-rich soils its nutrient effect is predominant. In laboratory experiments soils treated with increasing proportions of calcium hydroxide showed steadily increasing contents of easily soluble magnesia (0.05% HCl) which, however, declined when the amount of lime added exceeded the soils' absorption capacity. A. G. POLLARD.

Effect of cropping with various fertiliser, manure, and lime treatments on the exchangeable bases of plot soils.

C. J. SCHOLLENBERGER and F. R. DREIBELBIS (Soil Sci., 1930, 29, 371—394).—Continuous cropping of unlimed soils increases the proportion of exchangeable hydrogen and aluminium and decreases that of manganese, calcium, magnesium, potassium, and sodium. On limed soils the effects are reversed. In unlimed but fertilised soils the exchangeable hydrogen content is increased by the use of ammonium sulphate, increased slightly by superphosphate, dried blood, and oil-cake meal, not affected by potassium chloride, and decreased by sodium and calcium nitrates, bone meal, and basic fertilisers generally. The effect of farmyard manure is indefinite. In general, variations in the p_H values of soils follow those of the exchangeable-hydrogen content. Changes in the exchangeable-aluminium content follow those of hydrogen, but the actual amounts concerned are insignificant. The exchangeable-manganese content is not markedly affected by fertilisers, being increased slightly by ammonium sulphate and farmyard manure. Fertilisers containing calcium, and also sodium nitrate and organic manures, increase the proportion of exchangeable calcium, whilst ammonium sulphate decreases this value and potassium chloride is without effect. Organic manures cause an increase, and ammonium sulphate a heavy decrease,

in the exchangeable-magnesium content of the soil. Exchangeable potash is increased by potash fertilisers and to some extent by farmyard manure. Of the total potassium applied to soils and not removed in cropping, about one quarter appears in the exchangeable form in the surface soil. Sodium nitrate slightly increases the exchangeable-sodium content of soils. Liming increases the proportion of exchangeable calcium and magnesium and decreases that of manganese. Ground limestone is as effective as quicklime in this respect. The presence of chalk in soils does not prevent the exchange of manganese, magnesium, etc. for ammonium during leaching with ammonium acetate solution, but may delay the completion of the exchange.

A. G. POLLARD.

Utilisation of nitrogenous organic compounds and sodium salts of organic acids by certain soil algæ in darkness and in light.

C. E. SKINNER and C. G. GARDNER (J. Bact., 1930, 19, 161—179).—Citric, lactic, malic, succinic, tartaric acids, but not oxalic acid (all neutralised to p_H 6.0), glucose, gelatin, peptone, albumin, and casein increased the growth of several species of soil algæ. Glucose and the nitrogenous substances served as sole sources of energy for some algæ grown in total darkness in liquid media.

A. G. POLLARD.

Relative fertilising action of sodium nitrate, calcium nitrate, and Chile saltpetre.

HUPPERT (Fortschr. Landw., 1929, 4, 452—457; Chem. Zentr., 1929, ii, 2814—2815).—All the observed variations were within the limits of experimental error.

A. A. ELDRIDGE.

Calcium cyanamide as a nitrogen fertiliser.

E. I. RATNER (Fertilisers and Yields, Russia, 1929, 71—76).—Calcium cyanamide with superphosphate or precipitated phosphate gave higher yields than either nitrates or ammonium sulphate. Results obtained with fresh and old samples were compared. The amount of soil moisture does not affect the calcium cyanamide; sandy soils are more likely to be injured than clay soils.

CHEMICAL ABSTRACTS.

Action of nitrogen, and nitrogenous fertilisers.

KLEBERGER and RUDEL (Fortschr. Landw., 1929, 4, 441—444; Chem. Zentr., 1929, ii, 2814).—A question of relative cost.

A. A. ELDRIDGE.

Nitrogenous fertilisers. E. HOFFMANN (Fortschr. Landw., 1929, 4, 478—482; Chem. Zentr., 1929, ii, 2814).—A discussion of chemical considerations relating to the economic value of nitrogenous fertilisers.

A. A. ELDRIDGE.

Fertilisation experiments with stable manure, their evaluation and interpretation.

H. VON RATHLEF (Fortschr. Landw., 1929, 4, 411—415; Chem. Zentr., 1929, ii, 2814).—A discussion.

A. A. ELDRIDGE.

Effect of alfalfa [lucerne] and sweet clover roots and tops on the carbon dioxide evolution and nitrate accumulation of soils. T. L. MARTIN (Soil Sci., 1930, 29, 363—369). The rate of decomposition of lucerne and sweet clover tissue in soil is examined by means of the carbon dioxide and nitrate produced. Results generally may be correlated with the C:N ratio of the material, except in soils where certain *Mucors* occur in vigorous

colonies. The activity of these fungi appears to vary with the nature of the organic matter supplied.

A. G. POLLARD.

Fungicidal properties of certain spray-fluids. VI.

W. GOODWIN, H. MARTIN, and E. S. SALMON (J. Agric. Sci., 1930, 20, 18—31).—Tests of ground sulphur or flowers of sulphur against hop powdery mildew, *Sphaerotheca humuli*, showed that when wetted by soft soap solutions the materials were completely effective at a concentration of 5 g. per 100 c.c. of 0.5% soap solution. Commercial colloidal sulphur (Ialine) was completely effective at 0.3 g. per 100 c.c. of 0.5% soap solution. Spreaders of an acid nature (gelatin and saponin) inhibited, and alkaline spreaders (lime-casein and soda-casein) favoured fungicidal action.

E. HOLMES.

Hydrolysis of sulphur in relation to its fungicidal activity. H. MARTIN (J. Agric. Sci., 1930, 20, 32—44).—It is suggested that the fungicidal action of sulphur on the *Erysiphaceae* is due primarily to hydrolysis, which action should be accelerated by the presence of alkalis, and should afford an explanation of the action of acid and alkaline spreaders (cf. previous abstract).

E. HOLMES.

Sulphur as a soil fungicide against the potato-wart disease organism. W. A. ROACH [with appendix by R. P. HOBSON] (J. Agric. Sci., 1930, 20, 74—96).—Thiosulphuric acid, which has been shown to exist in a free state, is sufficiently stable in dilute solution to account for the fungicidal action of acidified thiosulphate solutions in terms of the liberated thiosulphuric acid. The toxicity of the minimum quantity of sulphur found effective against wart disease of potatoes may be accounted for by assuming only 6% of the applied sulphur as being converted into thiosulphuric acid over a period of ten days. Pentathionates were found in sulphur-treated Rothamsted soils, but not in Ormskirk soils at 30°, and in neither at 0° and 15°. No evidence of accumulation of appreciable quantities of thiosulphuric acid in the soil was obtained, but this negative evidence is not final. The pentathionates found were probably derived from thiosulphuric acid previously formed.

E. HOLMES.

Effect of seed-potato treatment on yield and *Rhizoctonia* in N.E. Maine in 1925—1928. E. S. SCHULTZ, L. O. GRATZ, and R. BONDE (Phytopath., 1930, 20, 47—64).—Treatment of potatoes with mercuric chloride, formaldehyde, and various mercury organic preparations is described. In general, sprouting and vigour were improved, stem lesions and sclerotial infection with *Rhizoctonia* inhibited, and yields increased. Dipping of seed in 1 : 1000 mercuric chloride solution for 1½ hrs. proved most effective.

A. G. POLLARD.

Linseed oil as an adhesive for Bordeaux mixture. M. J. N. (J. Mysore Agric. Exp. Union, 1929, 9, No. 3; Trop. Agriculturist, 1930, 74, 115).—Linseed oil in the proportion of 10 fl. oz. per 25 gals. of 5 : 5 : 25-Bordeaux mixture proved an effective adhesive.

A. G. POLLARD.

Relation of green manures to the carbon and nitrogen contents and reaction of soils at Peradeniya. A. W. R. JOACHIM and D. G. PANDITSEKERE

(Trop. Agriculturist, 1930, 74, 10—14).—Losses of carbon and nitrogen from green-manured soils were small in comparison with those of similar but uncultivated soils. Green manuring reduced soil acidity.

A. G. POLLARD.

Biological decomposition of some types of litter from North American forests. E. MELIN (Ecology, 1930, 11, 72—101).—The rate of decomposition of the leaves of a number of forest trees is examined by means of the carbon dioxide produced. In any one species the rate of primary decomposition is proportional to the nitrogen content of the leaves, but this relation is not applicable to leaves of all species. The rate of decomposition is affected to varying extents by the proportion of lignin and water-soluble matter in the leaves and by the nature of the leaf proteins. The effect of these factors is probably characteristic for a given species.

A. G. POLLARD.

Seasonal fluctuations in numbers of micro-organisms and nitrate-nitrogen in an Alberta soil. J. D. NEWTON (Sci. Agric., 1930, 10, 361—368).—Nitrate accumulation was generally greatest in fallow soils, least under grass, with cropped soils in an intermediate position. Although variations in nitrate content and bacterial numbers in soils were not closely related, there was a general parallelism between them. Variations in fungal numbers were smaller than, but similar to, those of bacteria. The numbers of *Actinomyces* fluctuated irregularly.

A. G. POLLARD.

Explanation of the action of the so-called accessory substances in the association of *Azotobacter* and cellulose-decomposing organisms. C. E. SKINNER (J. Bact., 1930, 19, 149—159).—*Azotobacter chroococcum* increased the rate of change toward acidity of media containing ammonium sulphate and cellulose during decomposition by *Spirochaeta cytophaga*. In similar media containing potassium nitrate the change toward alkalinity was similarly accelerated. When *Trichoderma Koningi* was used to decompose the cellulose, *A. chroococcum* had no effect on the reaction changes. The amounts of cellulose decomposed by these organisms were unaltered by the presence of *A. chroococcum*. The postulation of the secretion of growth-promoting substances by *A. chroococcum* is unnecessary, since its effect on the reaction of the media may be explained by the utilisation of the intermediate products of decomposition of the cellulose.

A. G. POLLARD.

Influence of soil reaction and manuring on the composition of a mixture of various grasses and clovers. K. NEHRING and A. KELLER (Landw. Jahrb., 1930, 71, 487—503).—In mineral soils exhibiting exchange acidity, soil reaction has no very marked effect on the yield of grasses nor on the utilisation of physiologically different fertiliser mixtures. Liming of these soils increases the calcium content of the grasses. In moorland pastures clover was present although the soils were acid. Liming increased the yields on these soils. Physiologically acid fertilisers largely affected the clover yields, but with physiologically alkaline mixtures the ratio clover:grasses was independent of the soil reaction. Potash-phosphate fertiliser mixtures pro-

duced larger proportions of clover in the herbage than did complete fertilisers. Variations in the proportion of ash, calcium, and nitrogen in the herbage, following fertiliser treatment, were mainly the outcome of changes in the proportion of clover produced.

A. G. POLLARD.

Early versus late ploughing of sweet clover for green manure. D. H. JONES and E. H. GARRARD (*Sci. Agric.*, 1930, **10**, 419—422).—Changes in the nitrogen content of sweet clover during the growth period are recorded and used as a basis for discussion of the best period of ploughing-in.

A. G. POLLARD.

Effect of soil type and fertiliser treatment on the composition of the soya-bean plant. R. H. AUSTIN (*J. Amer. Soc. Agron.*, 1930, **22**, 136—156).—The calcium, magnesium, and nitrogen contents decreased with the age of the plants, the sulphur content underwent little change, the phosphorus content tended to increase, whilst the potassium content was irregular. The effects of moderate fertiliser treatments were small, the soil type exerting a greater influence.

CHEMICAL ABSTRACTS.

"Lime antagonism" of lupins. DENSCH and STEINFATT (*Z. Pflanz. Düng.*, 1930, **9B**, 161—174).—Characteristic lupin sickness (as distinct from injury from acid soil conditions, or lack of nutrients) is not directly attributable to calcium carbonate, but is due to the presence in soil of alkali carbonates or conditions favourable to their production, *e.g.*, the presence of excessive proportions of chalk.

A. G. POLLARD.

Utilisation of certain nitrogen compounds by the sugar cane. J. H. PARDO (*Internat. Sugar J.*, 1930, **32**, 11—18).—Results of experiments are given showing that sugar cane is able to obtain its nitrogen requirements from compounds other than nitrates, *e.g.*, by the direct utilisation of ammonium compounds. In the case of absorption of ammonium compounds the total nitrogen content of the cane plants is well above that of plants fed on nitrates and nitrites. There is a greater assimilation of nitrogen by sugar cane when this element is present in the form of ammonium compounds than when given as nitrates. The author's experiments have shown that the nutritive value to the young cane plant of one unit of nitrogen as ammonia is superior to that of the same unit given in the form of nitrate.

J. P. OGILVIE.

Sugar-beet trials in 1929. T. REMY [with E. OHLY and F. WEISKE] (*Landw. Jahrb.*, 1930, **71**, 345—432).—Numerous field trials are recorded and discussed from the point of view of the effects of cultural methods, fertilisers, and general treatment on the yield, sugar content, and growth characteristics of sugar beet.

A. G. POLLARD.

System of proximate chemical analysis of plant materials. S. A. WAKSMAN and K. R. STEVENS (*Ind. Eng. Chem. [Anal.]*, 1930, **2**, 167—173).—Whilst it is impossible for any method of analysis of plant materials to give results having a total of 100%, unnecessary errors are caused by ignoring water-soluble constituents, by confusion in the methods used for

pentosans and lignins, and by high results in the determination of cellulose by Cross and Bevan's method. Known methods are criticised in detail. The present authors' system divides plant constituents into (1) ether- and alcohol-soluble fractions, (2) cold- and hot-water-soluble fractions, (3) hemicelluloses, (4) celluloses, (5) lignins, (6) proteins, (7) ash. Part of the organic nitrogen is always water-soluble and a correction must be made. Extractions are made successively with ether, cold water, hot water, and alcohol. The water-soluble portions are tested for reducing sugars, total organic matter, ash, and nitrogen. The residue from the alcohol extraction is boiled with 2% hydrochloric acid for 5 hrs. and the hemicellulose determined as reducing sugar. The dried residue from this treatment is subjected to the action of cold 80% sulphuric acid for 2½ hrs., which converts cellulose into hydrocellulose. On diluting and boiling, the last-named is converted into reducing sugar. The residue is washed, dried, and weighed as (lignin and ash and organic nitrogen compounds). The nitrogen content of the residue is determined. Examples of analyses of plants and peat by this system give results totalling 88—95%.

C. IRWIN.

Chemistry and certain problems of applied mycology. H. MARTIN (*J.S.C.I.*, 1930, **49**, 11—14 T).—A discussion of the chemistry of Bordeaux and Burgundy mixtures and of the fungicidal properties of sulphur and of the products of the alkaline hydrolysis of sulphur.

Wetting, spreading, and emulsifying agents for use with spray fluids. I. Wetters and spreaders. II. Emulsifiers. R. M. WOODMAN (*J.S.C.I.*, 1930, **49**, 93—98 T, 193—197 T).—I. The terms "wettters" and "spreaders" are critically defined, and the importance of wetting and spreading with all classes of spray fluids is demonstrated. A laboratory examination is made of several well-known and possible wettters and spreaders, the tension fluid/air being measured; drawbacks to this method of estimating the wetting and spreading powers of a fluid are pointed out. Barium caseinate will probably serve the dual purposes of an internal poison insecticide and a wetter (or spreader). Traces of various liquids may act as wettters and spreaders; solutions of some liquids may also be insecticidal at the same time. The use of emulsions as wettters and spreaders is discussed. Sodium resinate is slightly more effective as a wetter and spreader in moderately concentrated salt solutions than in water alone. The differences existing between the practical and theoretical conceptions of adequate wetting and spreading are discussed, and methods of conferring these properties other than by lowering the tension spray fluid/air are advocated to some extent. The problem of the retention of the maximum amount of spray fluid by the plant is also mentioned.

II. The rules to be obeyed by an emulsifier used in the preparation of spraying emulsions for insecticidal purposes are discussed. The influence of hard and pseudo-hard waters on certain emulsifiers is demonstrated; results are given for the emulsification of oils, embracing all the known types used as spraying oils,

by various emulsifiers. Oil solutions of naphthalene and mixtures of oils of possible horticultural value have been emulsified.

Tests of various aliphatic compounds as fumigants. R. C. ROARK and R. T. COTTON (U.S. Dept. Agric. Tech. Bull. 162, 1929, 52 pp.).—Of 309 aliphatic compounds tested against the rice weevil in wheat, iodides, bromides, mercaptans, thiocyanates, isothiocyanates, disulphides, oxides, epichlorohydrin, halogenated ethers and esters, and formates showed the greatest toxicity. Examination of the most toxic and least toxic compounds indicated that there was no apparent relation between their b.p. and toxicity, except that most compounds with b.p. above 150° have too low a vapour pressure at ordinary temperatures. Branched-chain are more toxic than straight-chain compounds, and whilst compounds relatively inert chemically have little toxicity, others of high reactivity may not kill weevils, probably owing to their absorption by the wheat. In general, chlorides, formates, disulphides, thiocyanates, isothiocyanates, and mercaptans, in applications lethal to the insect, do not injure seed germination, but the other materials mentioned may injure germination. Ethylene dichloride with carbon tetrachloride in the ratio of 3:1 by vol., at a rate of 6 lb. per 1000 cub. ft. of stored grain, appeared to be the most promising fumigant.

E. HOLMES.

Rôle of vitamins and minerals in stock feeding.
II. Minerals. J. B. ORR (J. Min. Agric., 1930, 37, 115—129).—A review of the mineral requirements of farm animals and poultry, the mineral contents of common feeding stuffs, and simple methods of adjusting deficient rations.

E. HOLMES.

Effect of green manures and cover crops on soil moisture. A. W. R. JOACHIM and S. KANDIAH (Trop. Agriculturalist, 1930, 74, 3—9).

Method of studying the activity and rate of diffusion of protozoa and bacteria in the soil. L. LOSINA-LOSINSKY and P. F. MARTINOV (Soil Sci., 1930, 29, 349—362).

Soils of Logan, Whiteside, Henry, Morgan, Douglas, and Coles Counties. R. S. SMITH, E. E. DE TURK, F. C. BAUER, and L. H. SMITH (Illinois Agric. Exp. Sta. Soil Rep., 1929, Nos. 39—44).

Analyses of commercial fertilisers, fertiliser supplies, and home mixtures for 1928. C. S. CATHCART (New Jersey Agric. Exp. Sta. Bull., 1928, No. 479, 1—39).

Analyses of commercial fertilisers and ground bone; analyses of agricultural lime, 1928. C. S. CATHCART (New Jersey Agric. Exp. Sta. Bull., 1928, No. 481, 1—29).

Spray residues on fruit. STREETER and HARMAN; SHEER.—See XIX.

PATENT.

Appliances for spraying liquids [for agricultural purposes]. A. H. BURGESS (B.P. 328,707, 14.2.29).

XVII.—SUGARS; STARCHES; GUMS.

Electrodialysis of exhausted molasses. II. N. KAMEYAMA and Y. MAYEDA (J. Soc. Chem. Ind., Japan, 1929, 32, 206 B).—In the process previously described (B., 1930, 478) the anode compartment becomes acidic owing to the preferential transfer of solution cations through the anode membrane. It is advisable, therefore, to use for the anodic membrane a silk membrane which has been soaked in dichromated gelatin and exposed to sunlight. A certain amount of sugar is, however, lost with this membrane.

S. K. TWEEDY.

Heat capacity of pure sugar solutions. V. V. YUANOVSKI and P. A. ARKHANGELSKI (J. Appl. Chem., Russia, 1929, 2, 614—618).—The heat capacity at constant temperature decreases linearly with increasing concentration, and at definite concentration is a linear function of the temperature. $C^{20} = 1 - 0.00567p$; $C^{50} = 1 - 0.00510p$; $C^{80} = 1 - 0.00456p$, where p is the percentage of sugar in solution (Brix) and C is the sp. heat.; $M^{20} = 148.2$, $M^{50} = 167.7$, $M^{80} = 185.9$, $C_y^{20} = 0.433$, $C_y^{50} = 0.490$, $C_y^{80} = 0.544$, where M is the mol. heat.

CHEMICAL ABSTRACTS.

Errors of weight and polarisation arising from the pulping of [sugar] beet. O. KOPECKÝ (Z. Ver. deut. Zucker-Ind., 1930, 80, 139—154).—A study of the losses by evaporation occurring when 1-g. portions of beet tissue are ground in a small mortar for 3 or 5 min. and afterwards exposed to the air for 40 min. The losses of weight during actual grinding were 0.4—1.24%, and the final losses after 40 min. were 1.14—2.5%.

J. H. LANE.

Temperature coefficient in the polarisation of raw cane sugars. K. D. DEKKER (Archief, 1929, 37, 909—914; Internat. Sugar J., 1930, 32, 202—203).—Using the so-called Java method (dissolving 26.048 g. in a flask calibrated at 17.5°, making up to 100 c.c. at 30°, and polarising the solution at 30°), 16 raw cane sugars were found to polarise from 0.05° to 0.50° lower than when the procedure of the International Commission was followed. The differences between the two sets of readings were very irregular, due to the varying amounts of reducing sugars present in the samples and to the relative proportions of dextrose and lævulose they contained.

J. P. OGILVIE.

Molar coefficient of impurities and coagulating method for purifying [sugar] diffusion juices. P. V. GOLOVIN (Zhur. Sakh. Prom., 1929, 3, 409—410).—The purity of sugar is conveniently expressed as mols. of non-sugar per mol. of sugar. The diffusion juice at 40° is treated with milk of lime (0.5% CaO) and freshly precipitated calcium carbonate (1—2% CaO); the filtered juice is treated at 95—100° for 20 min. with lime (1%) and then saturated with carbon dioxide.

CHEMICAL ABSTRACTS.

[Sugar] juice of first and second carbonatations and optimal conditions in saturation. N. V. ALEINIKOV (Nauch. Zapiski, 1929, 8, 401—417).—A temperature of 90°, fractional defecation, addition of milk of lime and filter cakes from the second

carbonatation are recommended. The juice of the first defecation is carbonatated to the lowest optimal point, heated at 100°, and filtered; after addition of milk of lime the heating and filtration are repeated. At the second defecation the juice is submitted at a high temperature to the prolonged action of lime (about 0.25%), carbonatated to the lowest optimal point, and filtered without preheating.

CHEMICAL ABSTRACTS.

Sweet sorghums for syrup and forage. C. K. McCLELLAND (Ark. Agric. Exp. Sta. Bull., No. 241, 1929, 1—24).—"Honey sorghum" yields 15—238 (average 75) gals. of syrup per acre; 30—45% of the weight of the cane is obtained as juice. The sugar content varies from 5.7 to 14.7%.

CHEMICAL ABSTRACTS.

Methods of preparing quickly-soluble lactose. R. W. BELL (Ind. Eng. Chem., 1930, 22, 51—54).—The fact that β -lactose anhydride, though unstable at temperatures below 93°, is more soluble than the commercial α -hydrate was applied to the preparation of an apparently "sweeter" lactose for commercial purposes. Under suitable conditions a high yield of β -anhydride was obtained by vacuum-drum or atmospheric double-drum dryers. By the Gray-Jensen spray process a powder was obtained having $[\alpha]_D^{20} + 55^\circ$, indicating an equilibrium mixture. E. B. HUGHES.

Influence of cold on the tenacity of potato starch. SCHULZ and PARLOW (Z. Spiritusind., 1930, 53, 135—136).—Potatoes which were frozen at 18—20° below zero showed the characteristic soft and sponge-like texture after thawing, but gave none of the reactions showing the formation of sugar. The tenacity, which was measured according to the Wolff standards, was determined on the starch of the original potatoes and on that of the potatoes immediately after freezing and after the frozen potatoes had been thawed for eight days. Similar measurements were made on free potato starch containing various amounts of moisture. Both the free starch and that from the potatoes showed an increase of tenacity after freezing which, in the case of the potatoes, diminished again after thawing, but did not completely return to its original value.

C. RANKEN.

Analysis of starch formate. TOCCO and NYSENS.—See V. **Sugar-beet trials.** REMY and others.—See XVI. **Determination of sucrose in condensed milk.** ANON.—See XIX. **Waste-waters from sugar-beet.** GARNER and WISHART.—See XXIII.

PATENTS.

Continuous washing of tricalcium saccharate. C. STEFFEN, JUN. (U.S.P. 1,757,979, 13.5.30. Appl., 21.2.24. Austr., 28.2.23).—See G.P. 406,060; B., 1925, 466.

Fermentation of starch etc. (B.P. 328,723).—See XVIII.

XVIII.—FERMENTATION INDUSTRIES.

Poisonous action of grain meal on yeast. J. FUCHS (Woch. Brau., 1930, 47, 171—174, 183—186).—From the results of staining and fermentation experi-

ments it is claimed that no substance poisonous to yeast is present in normal meals. Wheat and barley meals exhibited apparent harmful effects, but only after the yeast had been exposed to the action of distilled water or of sugar dissolved in distilled water (cf. Fink and Weinfurtner, B., 1930, 526). When the distilled water is replaced by supply water or the sugar solution by wort the yeast is unaffected by the addition of meal; further, the yeast cannot be accustomed to the supposed poison. F. E. DAY.

Influence of carbon dioxide on yeast fermentation. HOFMANN (Woch. Brau., 1930, 47, 228—230).—When 20% sucrose solution is fermented in an autoclave with 10% of yeast, fermentation ceases when the pressure reaches about 40 atm., the liquid then containing about 4.2 g. of alcohol per 100 c.c. When the vessel was connected to a cylinder of carbon dioxide for 1 hr., at the beginning of the experiment the initial pressure was 56 atm., which fell to 32 atm. and then increased to 38 atm., 2.7 g. of alcohol per 100 c.c. being produced. After 2 hrs. connexion and occasional shaking the alcohol produced (per 100 c.c.) was 1.7 g., and after 6 hrs. it was 0.74 g. Under the latter conditions the same result was obtained when the yeast was forced into the autoclave by hydrogen after treatment of the culture medium with the carbon dioxide. It is suggested that the small amount of fermentation which occurs under high pressure of carbon dioxide is due to the enzyme already present in the yeast, and that the favourable influence of low pressure of that gas, noted by Stockhausen and Windisch (B., 1928, 685), are due to the well-known activating effect of small amounts of inhibiting substances. The suggestion of Windisch (B., 1930, 479) that the inhibiting effect of high pressure of carbon dioxide is due to lowering of the p_H , is considered unlikely as the degree of dissociation decreases with increasing concentration. The addition of alcohol increases the inhibiting effect of carbon dioxide; after an initial addition of 3.6%, the final pressure was 28 atm. and 1.8% of alcohol was formed (cf. A., 1929, 1199). F. E. DAY.

Physical aspects of fermentation and their relation to brewery practice. A. C. DOULL and S. E. BARNETT (J. Inst. Brew., 1930, 36, 215—220).—Although the fermentation loss varies according to the original gravity of the wort and the range of attenuation, a figure can be obtained which may be considered as normal for the different types of beer brewed in a particular brewery. The change in volume of the wort which occurs from the commencement of fermentation till the beer is ready for racking is not appreciably affected either by the change of temperature or by the production of alcohol during fermentation. The evolution and loss of carbon dioxide causes a slight but definite loss of volume which is compensated by a prior increase due to the loss or fall in density of the wort during the first few hours of fermentation. The amount of yeast reproduction may be rapidly ascertained by calculating the weight of that volume of beer, which is the difference between the dip at collection and the dip after skimming. C. RANKEN.

Iodine value and degree of luminescence of fermentation vinegar and its content of the products of bacterial metabolism. A. JANKE and H. LACROIX (Biochem. Z., 1929, 215, 460—467).—Fermentation vinegar and "essence" vinegar may be differentiated in terms of the degree of fluorescence in ultra-violet light, but for differentiation of mixtures of these the iodine value is the more useful. The degree of fluorescence does not run parallel with the iodine binding power. The fluid obtained by the growth of pure cultures of *B. ascendens* on alcoholic solutions of mineral salts shows luminescence, has an iodine-binding power, and stimulates the growth of yeast cells. It would appear therefore that substances giving rise to these properties in fermentation vinegar are products of bacterial metabolism. P. W. CLUTTERBUCK.

Time and temperature of kilning [malt]. J. BOLDT (Woch. Brau., 1930, 47, 174—177).—A discussion of kilning conditions, with special reference to the production of pale (Pilsener) malt on a two-stage kiln. Periods of 12 hrs. on each floor are recommended, also thin loading and a good draught. On the upper floor the temperature should begin at about 35°, and rise, slowly at first, to about 45°. The moisture should be 10—12% after 8—10 hrs. A temperature of about 62° on the lower floor is favourable to head retention. Rapid and sufficient drying in the earlier stages allows pale malt to be finished at about 80° during the last 3 hrs., and such malt gives better flavoured and more stable beers. F. E. DAY.

Fluorescence of malt and beer. V. BERMAN (Woch. Brau., 1930, 47, 215—217).—Malt extracts and beers exhibit a faint green to blue-green fluorescence which is caused neither by the mineral constituents nor by the products of hydrolysis of starch and protein. It is considered to be due to melanoidins, and to indicate the presence of a ring-structure in their constitution. F. E. DAY.

Volatility of acid and ester in brandy manufacture. E. WALTER (Deut. Dest.-Ztg., 1929, 50, 401—402; Chem. Zentr., 1930, i, 141).—The esters are much more readily volatile than the acids. A. A. ELDRIDGE.

Determination of p_H values in provincial distilleries. J. DEHNICKE (Z. Spiritusind., 1930, 53, 133—135).—The determination of p_H values in provincial distilleries is of little assistance as a control of the fermentation processes. In the mashing of the sweet wort and during the primary fermentation and preparation of the lactic acid yeast the usual technical methods yield worts with a high buffer content which prevents any great variation in the p_H values, and retains them well within the range of optimum action of the yeast enzymes and after-saccharification. For these processes the determination of the acidity by titration with normal sodium hydroxide is more important, since it permits the detection of undue formation of the undesirable butyric and acetic acids resulting from infection of the wort or yeast. Only in the preparation of the sulphuric acid yeast is the p_H determination a valuable supplement. It allows the control of the added sul-

phuric acid, so that the optimum p_H of 3.6—3.8 is not exceeded. Although the titrated acidity may be normal during addition of this acid, the buffer content is so low that the p_H value may easily be diminished to such an extent that the action of the yeast enzymes is inhibited. C. RANKEN.

Wheat glutenin. BLISH and SANDSTEDT.—See XIX.

PATENTS.

Fermentation of starch, sugar, or the like containing materials. DEUTS. HYDRIERWERKE A.-G. (B.P. 328,723, 28.2.29. Ger., 22.10.28).—Butyl alcohol and acetone are produced by incubating starch, sugar, etc. for 1—2 hrs. under pressure, and then inoculating with *Butylobacter*. The latter is a new type of bacteria characterised by the Gram-positive, young cells becoming later Gram-negative, and finally changing to Gram-positive after 48 hrs. The cells, which are 2—3 μ in length and 0.25—0.3 μ in diam., form neither chains nor threads under normal conditions. C. RANKEN.

Apparatus for production of carbon monoxide [from fermenter gas]. W. C. ARSEM, Assr. to COMMERCIAL SOLVENTS CORP. (U.S.P. 1,740,139, 17.12.29. Appl., 6.5.25).—Fermenter gas, evolved during butyl alcohol-acetone fermentation of carbohydrates and modified so that the carbon dioxide and hydrogen are present in molecular proportions, is led into a converter shell in which is suspended a heating element containing a catalyst. A series of baffles is placed to cause the gas passing through the reaction chamber to make contact alternately with the heating element and the internal walls of the shell, which provide the condensing surfaces for the resulting water vapour. C. RANKEN.

Leuco-indigo preparations (B.P. 327,864).—See III. **Articles resistant to wear etc.** (B.P. 307,011).—See X.

XIX.—FOODS.

Milk products. II. Report of the Milk Products Sub-Committee to the Standing Committee on Uniformity of Analytical Methods. **Determination of sucrose in sweetened condensed milk** (Analyst, 1930, 55, 111—124; cf. B., 1927, 613).—The methods examined for the reduction of sucrose in sweetened condensed milk comprised (a) copper reduction, (b) iodometric and chloramine-T, and (c) polarimetric methods. Of these, method (a) was rejected, and method (b) of Hinton and Macara (B., 1928, 66) was found promising for lactose, but not sufficiently accurate for sucrose. Polarimetric methods (c), all based on the principle of the Clerget inversion, were investigated in regard to the following details: **Clarification.**—The Dutch Codex method, using zinc acetate and potassium ferrocyanide, was adopted with phosphotungstic acid as a reagent suitable in certain circumstances. **Mutarotation.**—Although use of water at 80—90° is sufficient to destroy the effects of mutarotation, ammonia followed by neutralisation is recommended. **Effect of non-sugars.**—The direct reading should be taken on the clarified filtrate without further

treatment, and the invert reading without neutralisation. *The inversion process.*—The principle of the Jackson and Gillis process (B., 1920, 634 A), slightly modified, has been adopted. *Inversion divisor factor.*—Factors for both clarifying reagents with sodium light, mercury-green line, and International sugar scale (*j*) light are given. *Correction for volume of precipitate.*—The actual determination of the volume correction should be made, and details are given. Various results are given both in the report and in an appendix thereto; in each set of tabulated results, at least one obtained by the use of each of the three types of polarimeter, viz., saccharimeter with International sugar scale, polarimeter with sodium light, and polarimeter with mercury-vapour lamp, is included. The Committee recommend that for the determination of sucrose in sweetened condensed milk, the polarimeter method with zinc acetate-potassium ferrocyanide clarification should be employed, and that for the purpose of the Public Health regulations the percentage of total milk solids should be determined by subtracting the percentage of sucrose found by this method from the percentage of total solids as determined by the process described in Report I (*loc. cit.*). D. G. HEWER.

Evaporated and condensed milk from the chemical and nutritional point of view. F. E. RICE (Ind. Eng. Chem., 1930, 22, 45–48).—A description is given of the manufacture of evaporated and sweetened condensed milk from the chemical viewpoint, with comments on the causes leading to the production of faulty material and a discussion of the effect of condensation on the nutritional value of the milk.

E. B. HUGHES.

Irradiated milk. P. BAMBERGER (Deut. med. Woch., 1929, 55, 1547–1550; Chem. Zentr., 1929, ii, 2473).—Milk irradiated by the Hanauer or Scheidt method was not injurious to infants; it possessed marked antirachitic properties. 100 c.c. of Hanauer milk correspond with 5–6 g. of commercial cod-liver oil; Scheidt milk is less active.

A. A. ELDRIDGE.

Lipase in raw, heated, and desiccated milk. J. H. NAIR (Ind. Eng. Chem., 1930, 22, 42–45).—The work of Rice and Markley (J. Dairy Sci., 1922, 5, 64) that raw milk contains lipase has been repeated and the results are confirmed. Pasteurisation was found to cause destruction of the enzyme to an extent depending on the temperature used and the time of holding. No lipase was detected in dried whole or skim milk made from milk pasteurised at 63–64.5° for 30 min.

E. B. HUGHES.

Attempt to apply the cryoscopic method to the analysis of altered milk. C. MANICARDI (Giorn. Chim. Ind. Appl., 1930, 12, 115–118).—The cryoscopic test of milk is generally regarded as valueless when the milk has “turned.” The results now given show, however, that the difference between the f.p. of genuine and watered milks when fresh is approximately maintained if the two samples are allowed to undergo spontaneous acidification to the same extent, provided that such acidification does not proceed too far.

T. H. POPE.

Some recent advances in the chemistry of milk. L. S. PALMER (Ind. Eng. Chem., 1930, 22, 39–42).—The results of work carried out by various experimenters during the last 2 years on milk, its analysis, and by-products are reviewed.

E. B. HUGHES.

Rising of fat in milk; percentage of fat in cream. G. D. ELSDON and J. R. STUBBS (Analyst, 1930, 55, 124–125).—The milk from samples of milk allowed to remain in a separator for varying times was drawn off and the cream layer examined; it was found that a very considerable separation of fat may take place in a comparatively short time in milks that have once been separated. A standard of 30% of fat for cream and 45–50% of fat for thick cream is regarded as desirable.

D. G. HEWER.

Keeping quality of butter made from cream of various acidities. W. WHITE, C. S. TRIMBLE, and H. L. WILSON (U.S. Dept. Agric. Tech. Bull. No. 159, 1929, 1–7).—There was less deterioration when the cream contained 0.15–0.25% than when it contained 0.28–0.31% of acid.

CHEMICAL ABSTRACTS.

Application of physical chemistry to ice-cream. A. LEIGHTON (Ind. Eng. Chem., 1930, 22, 48–51).—The more recent information on the physico-chemical problems of ice-cream manufacture is reviewed, consideration being given to the following stages of manufacture: temperature of pasteurisation; homogenisation and its effect on texture; the ageing (ripening) process, with a study of the rôle of gelatin as a stabiliser; temperature of freezing, whipping, and hardening.

E. B. HUGHES.

Nutritive value of pasture. V. Pasture grass conservation: influence of artificial drying on the digestibility of pasture herbage. H. E. WOODMAN, J. W. BEE, and G. GRIFFITH (J. Agric. Sci., 1930, 20, 53–62; cf. B., 1929, 487).—Young grass does not suffer depression of digestibility either by drying at 100° or by direct heat in a kiln at temperatures rising from 50° to over 90° towards the end of the 3 hrs. drying period. Digestion coefficients are given for the organic matter (78.1%), crude protein (78.2%), ether extract (70.6%), nitrogen-free extractives (79.3%), and crude fibre (78.3%) of dried (100%) grass cake, showing them to be very similar to the figures for weekly-cut herbage in the fresh condition. Only the figure for ether extract differed materially—in favour of the dried grass cakes. Kiln-dried grass showed similar values.

E. HOLMES.

Nature and identity of wheat glutenin. M. J. BLISH and R. M. SANDSTEDT (J. Biol. Chem., 1929, 85, 195–206).—The discrepancies between the properties of different preparations of wheat glutenin as described by earlier workers have been due to the use of alkali in the extraction of the protein, since the properties of the latter are distinctly modified even by brief contact with dilute alkali. The protein is best prepared by kneading flour under tap-water and macerating the insoluble residue with a large volume of very dilute acetic acid; after keeping overnight, the solution is made 65–70% with respect to methyl alcohol and is

cleared from starch and other insoluble impurities on the centrifuge; the cautious addition of sodium hydroxide to p_H 7.0 (approx.) causes precipitation of the glutenin, gliadin remaining in solution. After two or three reprecipitations in a similar manner the glutenin is pure. The protein has a higher amide-nitrogen content (22%) and a greater molecular magnitude than glutenin prepared with the aid of alkali.

C. R. HARRINGTON.

Vitamin contents of Philippine foods. I. Vitamins-A and -B in *Basella rubra*, *Capsicum frutescens*, and *Vigna sinensis*. A. J. HERMANO (Philippine J. Sci., 1930, 41, 387—401).—Biological analyses of various Philippine foodstuffs show that the ether extract of crude rice bran contains the anti-sterility vitamin-E, that libato (*Basella rubra*) is rich in vitamins-A and -B, that the green pods of sitao (*Vigna sinensis*) contain vitamins-A and -B, but to a smaller extent than does alugbati, and that powdered chile leaves (*Capsicum frutescens*) are rich in vitamins-A and -B as shown by the curative effect on rats and pigeons. E. HOLMES.

Action of heat on preserved tomatoes. O. CARASCO and E. SARTORI (Giorn. Chim. Ind. Appl., 1930, 12, 119—121).—When heated at 100°, preserved tomatoes give carbon dioxide, furfuraldehyde, hydroxymethylfurfuraldehyde, etc., the proportions of reducing sugars and acid present undergoing marked diminution. Hence determination of the dry matter of the preserves by drying at 100° gives results considerably lower than those obtained by exposure in a vacuum in presence of fused potassium hydroxide and phosphoric anhydride, the differences being most marked with concentrated products. If the sugars are previously eliminated by fermentation, or the material is rendered alkaline, the two methods of drying give far more concordant results.

T. H. POPE.

Handling of sweet cherries with special reference to chemical and physiological activities during ripening. H. HARTMAN and D. E. BULLIS (Oregon Agric. Exp. Sta. Bull., 1929, No. 247, 1—38).—During ripening, the sugar, solids, and acidity of sweet cherries increase, and astringent constituents decrease. The fruit of later pickings yields a juice of higher sugar content. The juice of Napoleon cherries contained 18.8% of total sugars and 7.1% of solids-not-sugar; unripe fruit contained 0.166 and ripe fruit 0.08% of tannin.

CHEMICAL ABSTRACTS.

Washing fruit to remove spray residue in the Hudson Valley. E. V. SHEAR (N.Y. Agric. Exp. Sta. Bull. No. 575, 1929, 34 pp.).—The fruit is immersed for 1 min. in 0.2—1% hydrochloric acid and immediately rinsed in water. Alkalis, oils, and hand-wiping increase decay in storage. Rain is an important factor in reducing spray residue.

CHEMICAL ABSTRACTS.

Spray residues [on fruit]. L. R. STREETER and W. HARMAN (N.Y. Agric. Exp. Sta. Bull. No. 579, 1929, 1—12).—Arsenic is removed from apples in 1 min. at 13—21° by 1% hydrochloric acid. Only 3 of 94 samples of apples contained as much as 0.01 grain per lb.

CHEMICAL ABSTRACTS.

Use of sulphur dioxide in shipping grapes. H. E. JACOB (Calif. Agric. Exp. Sta. Bull. No. 471, 1929, 1—24).—The amount of sulphur dioxide absorbed by grapes exposed to an atmosphere containing 1.8—3.0% SO_2 is determined by the concentration and time. The preservative decreases the rate of activity of the normal life processes.

CHEMICAL ABSTRACTS.

First Report of the Sub-Committee on the determination of arsenic, lead, and other poisonous metals in food-colouring materials to the Standing Committee on the Uniformity of Analytical Methods. I. Determination of arsenic (Analyst, 1930, 55, 102—109).—The report deals with the determination of arsenic in synthetic dyestuffs, and after discussions on the destructive wet oxidation, distillation of the arsenic, and determination of arsenic in the prepared solution, the methods as adopted by the Sub-Committee are given in detail. The direct-distillation method is found to give a rapid and approximate idea of the amount of arsenic present, and as a rule the results are near to the truth, but in a few cases (e.g., nigrosine) low figures are obtained. In method A the sample is treated with nitric acid, followed by sulphuric acid and then by a further addition of nitric acid, the solution is boiled down in a special distillation apparatus without the condensing arm, diluted, again boiled down, and a chloride-hydrazine bromide mixture introduced, followed by hydrochloric acid. The resulting solution is then distilled into cooled dilute nitric acid, the distillate is evaporated to dryness, and the residue after being twice taken up with water, dissolved in sulphuric acid, and diluted is ready for transference to the arsenic apparatus. Method B is used for certain colours, particularly basic dyes, that are liable to violent deflagration in the oxidation process, and entails certain modifications in the first part of the process. The apparatus used for determination of the arsenic is that defined in the British Pharmacopœia, 1914, with the exception that the gas-exit tube of internal diam. 4 mm. shall not be widened out at the gas-exit end, but is to be ground smooth at right angles to the tube. Mercuric chloride test papers are used and the solution tested should contain 0.004—0.01 mg. As.

D. G. HEWER.

Arachidonic acid in lard. BROWN and DECK. **Babassu fat.** HEIDUSCHKA and AGSTEN. **Detection of fats in ultra-violet light.** LENFELD. **Grape-fruit seed.** JAMIESON and others.—See XII. **Minerals in feeding-stuffs.** ORR.—See XVI. **Sorghums for forage.** MCCLELLAND.—See XVII.

PATENTS.

Method and means for pasteurising milk. T. MELBALLE (B.P. 329,193, 7.6.29).

[Coating machines for] confectionery. M. M. GUGGENHEIM, G. R. BAKER, BAKER PERKINS, LTD., and ANC. ETABL. A. SAVY, JEANJEAN & CIE. SOC. ANON. (B.P. 328,607, 30.1.29).

Artificial foils etc. (B.P. 327,164).—See V. **Sodium glutamate** (B.P. 327,810).—See VII.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Determination of hydrogen cyanide in pharmaceutical preparations. G. VOGT (Pharm. J., 1930, 124, 475).—A current of air is drawn through the solution and the volatilised hydrogen cyanide is absorbed in silver nitrate solution. The results agree with those obtained by the B.P. method. It is shown that practically the whole of the hydrogen cyanide originally present in Tinct. Chlorof. et Morph., B.P. 1885, disappears after a short storage in closed vessels.

H. E. F. NOTTON.

Tests for peroxides [in ethyl ether]. C. C. PINES (Amer. J. Pharm., 1930, 102, 221—222).—The chromic acid test is preferred. Liberation of iodine from potassium cadmi-iodide or mercuri-iodide in presence of starch is a delicate test.

H. E. F. NOTTON.

Purification and testing of the paraldehyde of the German pharmacopœia. E. SCHULEK (Pharm. Zentr., 1930, 71, 177—179).—The test for per-compounds given in the German pharmacopœia is not sufficiently stringent, since samples which fulfil it liberate iodine from iodides. A more stringent test based on the iodine liberation is suggested. Purification may be effected by shaking with sodium hydroxide and silver nitrate solutions.

S. I. LEVY.

Determination of total iodine content of Tinct. Iodi with potassium bichromate. A. NEUMANN (Pharm. Ztg., 1930, 75, 532—533).—About 2 g. of the tincture are mixed with a few c.c. of chloroform, about 100 g. of water, 5 c.c. of 25% hydrochloric acid solution, and 20 c.c. of 0.1% potassium bichromate solution. After keeping for 2 min., 15 c.c. of alcohol are added and the mixture is kept for 15 min. The iodine liberated by the bichromate is titrated with 0.1N-sodium thiosulphate.

E. H. SHARPLES.

Determination of iron in Basham's mixture. J. C. KRANTZ (Amer. J. Pharm., 1930, 102, 220—221).—The iron is determined gravimetrically, after dilution and precipitation with ammonia.

H. E. F. NOTTON.

Determination of nicotine in tobacco and [tobacco] smoke. A. HEIDUSCHKA (Pharm. Zentr., 1930, 71, 305—306).—A discussion of Pfyl and Schmitt's method (B., 1927, 955) for the determination of nicotine, and of the necessity for determining both the dipicrate and iodo eosin values. The difficulty in obtaining nicotine-free tobacco is emphasised, and it is urged that alkaloid limits for the different varieties of tobacco (cf. B., 1930, 217) should be established.

E. H. SHARPLES.

Pharmacology of ergot: biological assay and standardisation. VI. Preparation of purified fluid extract of ergot: pharmacological studies. M. R. THOMPSON (J. Amer. Pharm. Assoc., 1930, 19, 221—228).—Intravenous injection of official fluid extract of ergot causes in dogs an initial decrease, due to non-specific amines, followed by an increase in blood pressure. When the de-fatted ergot is percolated at a low temperature with 5% sodium hydrogen carbonate and subsequently with water until all the amines are removed,

only about 20% of the alkaloids is dissolved. The extract prepared in the usual way from the residue produces a persistent rise in blood pressure and is therapeutically equivalent to the normal extract.

H. E. F. NOTTON.

Extract of witch hazel. S. L. HILTON (J. Amer. Pharm. Assoc., 1930, 19, 232—235).—The resorcinol-sulphuric acid test for formaldehyde is not applicable to the extract, since a positive reaction is given by pinene, a normal constituent.

H. E. F. NOTTON.

Jalap tuber and scammony root. W. PEYER and K. ROSENTHAL (Apoth.-Ztg., 1929, 44, 1329—1332; Chem. Zentr., 1930, i, 102).—The characteristics of the drugs, and of their resins and glucosides, are described.

A. A. ELDRIDGE.

Sixth Report of the Essential Oil Sub-Committee to the Standing Committee on Uniformity of Analytical Methods. Determination of citral in lemon oil (Analyst, 1930, 55, 109—110).—The method recommended, and given in detail, requires 10 g. of oil to which 0.5N-hydroxylamine hydrochloride with methyl-orange indicator (0.2% in 60% alcohol) is added and titrated with 0.5N-alcoholic potash; the completed titration liquid with a slight excess of potash is used as a colour standard for the end-point of a subsequent titration. A correction factor is necessary as the end-point of the titration occurs at a p_H different from that of neutral hydroxylamine hydrochloride. (Cf. B., 1929, 622.)

D. G. HEWER.

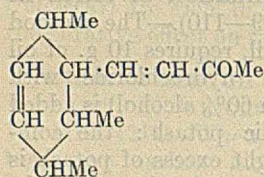
Citrus by-products research: orange oil. F. J. DE VILLIERS (Farming in S. Africa, Jan., 1930; S. Afr. Dept. Agric., 1930, Reprint 9, Series 105, 5 pp.).—Orange oils from 7 typical samples of S. African Valencia and Navel oranges have characteristics falling within the following limits: d^{20}_4 0.8465—0.8493, n^{20}_D 1.4723—1.4732, α^{20}_D +107° 48'—114° 54', b.p. 174.6—174.8°/760 mm., evaporation residue 4.35—5.47%, citral 1.7—2.31%, iodine value 302—314, Reichert-Meissl value 0.3—0.7, Polenske value 0.5—1.0, free alcohols 1.4—1.8%, total alcohols 2.6—3.3%, acid value 1.1—1.7, ester value 4.2—6.5, saponif. value 5.3—8.1, aldehydes 1.7—2.3%, and the yields of oil are (on the peel) 0.93—1.72%. These constants compare favourably with four other commercial oils examined, including one prepared from Italian Navels by the same method. The S. African oils seemed to have a more penetrating and pleasing aroma. Oranges should not be stored for longer than 2 months before extracting the oil, otherwise the resultant oil has higher density, refractive index, iodine and saponification values, and a lower aldehyde content. Unless the oil is stored in a cool, dark place it deteriorates and at the same time the refractive index, saponif. value, and total alcohol content increase and the rotary power and iodine value decrease.

E. H. SHARPLES.

Drugs containing phloroglucotannides or similar tanning substances; red coloration caused in the lignified elements by concentrated acids. E. LORTZ (Apoth.-Ztg., 1929, 44, 1342—1345; Chem. Zentr., 1930, i, 102).

PATENTS.

Manufacture of ketones [perfumes]. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 325,669, 28.1.29).—Ketones possessing floral odours are obtained by condensing a methyl ketone with a Δ^7 -hydro-aromatic aldehyde or an *endo*-derivative thereof (cf. B.P. 300,130; B., 1930, 549), other than the aldehyde obtained from $\alpha\alpha$ -dimethylbutadiene and crotonaldehyde. Acetone is condensed, *e.g.*, with the trimethyltetrahydrobenzaldehyde prepared from $\alpha\gamma$ -dimethylbutadiene and crotonaldehyde to give an oil, b.p. 256° or $108^\circ/4$ mm., with an intense odour of violets. Acetone and the product from $\alpha\gamma$ -dimethylbutadiene and acraldehyde give a rose-scented oil, b.p. 102 – $103^\circ/4$ mm. Other scented oils are obtained by condensing acetone with: butadiene-crotonaldehyde (b.p. 122 – $123^\circ/15$ mm.); $\alpha\delta$ -dimethylbutadiene-crotonaldehyde (b.p. 133 – $133.5^\circ/12.5$ mm.; annexed formula); Δ^1 -cyclohexadiene-crotonaldehyde (b.p. 131 – $134^\circ/11$ – 12 mm.); Δ^1 -cyclohexadiene-acraldehyde (b.p. 134 – $136^\circ/15$ – 16 mm.); $\beta\gamma$ -dimethylbutadiene-acraldehyde (b.p. 135 – $137^\circ/11$ – 12 mm.); $\beta\gamma$ -dimethylbutadiene-crotonaldehyde [stereoisomerides (a) m.p. 52° , (b) b.p. $120^\circ/4$ mm.]; piperylene-crotonaldehyde (b.p. 124 – $125^\circ/15$ mm.); $\alpha\delta$ -dimethylbutadiene-acraldehyde (b.p. 128 – $129^\circ/13$ mm.); Δ^1 -cyclohexadiene-acraldehyde (b.p. 122 – $126^\circ/3$ – 5 mm.); $\beta\gamma$ -dimethylbutadiene-crotonaldehyde (b.p. $176^\circ/2$ mm.).



C. HOLLINS.

Preparation of ketones of the pyridine and quinoline series. A. BOEHRINGER (B.P. 311,387, 10.5.29. Ger., 10.5.28).—2-Methyl-pyridines or -quinolines are condensed with aromatic aldehydes, and the dibromides of the resulting styryl derivatives are converted into acetylenes, which by treatment with hot 65% sulphuric acid yield 2-phenacyl derivatives of the pyridine or quinoline. 2-Styrylpyridine, m.p. 175° , is thus converted by way of the dibromide and α -2-pyridyl- β -phenylacetylene, b.p. $152^\circ/1$ mm., into 2-phenacylpyridine, m.p. 59° , b.p. $159^\circ/1$ mm. (*oxime*, m.p. 120°). C. HOLLINS.

Colloidal monosodium tetraiodophenolphthalein. NAT. ANILINE & CHEM. CO., INC., Assees. of E. F. ELLZEY (B.P. 304,589, 31.12.28. U.S., 21.1.28).—For rendering the gall bladder opaque to X-rays the monosodium salt of tetraiodophenolphthalein is prepared in colloidal form by adding citric acid to the aqueous disodium salt in presence of gelatin or other suitable protective colloid.

C. HOLLINS.

Manufacture of organic stibinic acids and salts thereof. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 327,996, 15.1.29).—The nuclear amino-group in aminoarylcaramides is diazotised and converted by the usual methods into a stibinic acid group. The stibinic acids from *p*-aminophenylcaramide and *o*-chloro-*p*-aminophenylcaramide are described.

C. HOLLINS.

Manufacture of solutions of cinchona alkaloids. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P.

327,428, 3.1.29).—Non-irritant solutions up to 40% concentration are obtained by mixing together water, sarcosine anhydride, and a cinchona alkaloid (quinine, dihydroquinine) in the form of a neutral salt. A sarcosine homologue, *e.g.*, 1:4-diethyl-2:5-diketopiperazine, may be used.

C. HOLLINS.

Preparations for immunising against diphtheria.

E. LOEWENSTEIN (B.P. 314,854, 18.4.29. Austr., 3.7.28).—Formaldehyde sufficient to give a 0.6% concentration is added to a 10 days' whole-culture broth of diphtheria bacilli, and after 40 days' incubation at 38° the whole is concentrated at 40° in a vacuum to 5–7% of the original volume and made neutral or slightly alkaline with ammonia, whereby the excess aldehyde is converted into hexamethylenetetramine. The resulting salve is applied by simple inunction.

C. HOLLINS.

Manufacture of therapeutic substances from the pituitary gland. WELLCOME FOUNDATION, LTD., S. SMITH, and V. J. WARD (B.P. 328,347, 5.2.29).—The

posterior lobe of the pituitary gland, or the crude principle obtained by precipitation with ammonium sulphate of the aqueous extract of the gland, is treated with liquefied phenol or cresol or alcoholic solutions thereof, which extract the active constituents. From these solutions the active material can be precipitated by addition of ether and light petroleum mixture. The pressor and oxytocic principles can be separated by redissolving the precipitate in the phenolic solvent followed by addition of ether. The precipitate so obtained contains mainly the pressor constituent; the oxytocic principle can be obtained from the filtrate by precipitation with light petroleum. If an aqueous pituitary extract is concentrated and treated with picric, picrolonic, or flavianic acids, a precipitate is formed from which the protein matter can be separated by known methods. It can be dissolved in phenol and treated as above.

E. H. SHARPLES.

[Dental] pestles and mortars. DENTAL MANUFG. CO., LTD., and L. H. NEWBALD (B.P. 328,801, 6.5.29).

Esters of dihydric alcohols as perfumes (B.P. 327,705). **Hydroxycarboxylic acids of carbazole** (B.P. 303,901). **Substituted quinazolines** (B.P. 327,450).—See III. **Articles resistant to wear etc.** (B.P. 307,011).—See X.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Determination of silver in photographic emulsions. J. P. LAWRIE (J.S.C.I., 1930, 49, 28 r).—Four methods of determining silver in coated photographic emulsion are critically discussed, and a table is given showing three of these methods (excluding the assay) applied to a solution containing a known amount of silver. The cyanometric method of Eggert is shown to give consistent results; the author advises, contrary to the experience of other investigators, using the maximum amount of ammonia consistent with accuracy, *i.e.*, not more than 8% of the total bulk of reacting liquids.

Detection of traces of gold chloride in photographic salts. L. SETTIMI (Giorn. Chim. Ind. Appl., 1930, 12, 118—119).—This method is based on the solubility of gold salts, and the insolubility of all other salts used in photography, in alcohol. After being heated for 2 hrs. in an oven at 100—125°, 50 or 100 g. of the material are mixed with 100 c.c. of cold alcohol, then set aside for a short time, and the supernatant alcohol is filtered off. After treatment with a second similar quantity of alcohol, the whole is transferred to the filter. The total alcoholic solution is distilled to small volume, and this is evaporated to dryness in a porcelain dish and calcined. The residue is carefully heated over a small flame with 4 or 5 c.c. of aqua regia and afterwards evaporated to dryness, the acid residue being then dissolved in 1 or 2 c.c. of water and treated with a few drops of stannous chloride solution. In presence of gold the characteristic violet coloration appears. T. H. POPE.

PATENTS.

Production of light-sensitive layers. KALLE & Co. A.-G. (B.P. 306,408, 18.2.29. Ger., 16.2.28).—Diazo-types are stabilised by adding to the light-sensitive layer containing the diazo compound either colloidal sulphur or a derivative of bivalent sulphur. Thiocarbamide is used in the examples with diazotised 1:2:4-aminonaphtholsulphonic acid or 5-ethylamino- or 4-dimethylamino-*o*-toluidine and phloroglucinol and the usual acidic ingredients. C. HOLLINS.

Printing photographic gelatin layers. I. G. FARBENIND. A.-G. (B.P. 308,693, 26.3.29. Ger., 26.3.28).—Films are marked with serial numbers, maker's name, etc. by printing with a concentrated solution of dye in an organic solvent (glycol monomethyl or monopropyl ether) to which an equal quantity of water has been added. The water may contain a second dye in solution. A suitable dye is Direct deep black EW extra in glycol monomethyl ether, with or without addition of Magenta. C. HOLLINS.

Development of diazo types. KALLE & Co. A.-G. (B.P. 308,653, 25.3.29. Ger., 24.3.28).—Borax, disodium phosphate, or an alkali bicarbonate may be used in place of caustic soda or ammonia in the preparations of the alkaline solutions of the coupling agents for the development of diazo-types, and afford much more stable solutions; good results, however, are obtained only in conjunction with those diazo compounds which unite rapidly with the coupling agent, *e.g.*, diazotised aminodiphenylamine, aminocarbazole, dianisidine, and their derivatives. J. W. GLASSETT.

Manufacture of light-sensitive layers. M. P. SCHMIDT and W. KRIEGER, Assrs. to KALLE & Co. A.-G. (U.S.P. 1,758,676, 13.5.30. Appl., 12.7.28. Ger., 21.7.27).—See B.P. 294,247; B., 1929, 1033.

Production of pictures consisting of dyes in photographic manner. F. LIERG (U.S.P. 1,758,572, 13.5.30. Appl., 15.8.28. Austr., 18.10.27).—See B.P. 298,979; B., 1930, 487.

Development of photographic materials and

developer therefor. G. REDDELEIN and W. MÜLLER, Assrs. to AGFA ANSCO CORP. (U.S.P. 1,758,762 and 1,758,892, 13.5.30. Appl., [A] 19.7.28, [B] 2.11.27. Ger., [A] 18.8.27, [B] 19.11.26).—See B.P. 295,939 and 280,873; B., 1930, 395; 1929, 38.

Photographic half-tone printing processes. V. C. ERNST (B.P. 326,519, 11.10.28).

[Tri-packs for] colour photography. A. B. KLEIN, and COLOUR SNAPSHOTS (1928), LTD. (B.P. 326,559, 20.11.28).

[Embossing roller for lenticular] films for colour photography. KODAK, LTD., Asses. of O. WITTEL (B.P. 329,214, 27.6.29. U.S., 29.10.28).

[Two-ply] photographic films or plates. KODAK, LTD., and J. H. LAWRENCE (B.P. 328,762, 8.4.29).

Artificial foils etc. (B.P. 327,164).—See V.

XXII.—EXPLOSIVES; MATCHES.

Thermodynamic treatment of explosive reactions. III. A. SCHMIDT (Z. ges. Schiess- u. Sprengstoffw., 1930, 25, 97—101, 144—148; cf. B., 1929, 379).—The explosion temperature, heat of explosion, composition and volume of the explosion gases, and the value of *F* in Abel's formula have been calculated for nitroglycerin explosives containing insufficient oxygen to ensure complete oxidation to carbon dioxide and water, but sufficient to convert the carbon wholly into gases. Results are given for rifle cordite M.D., cordite Mark I containing collodion cotton, Maxim ordnance powder, English ballistite, prismatic powder, English blank powder, nitropentaerythritol, Italian filit powder, and for a powder differing from the last-named only in the omission of the diphenylamine. Increase of the efficiency of a powder is obtained by increasing the oxygen content, lowering the heat of formation, and securing as high a value as possible for the ratio *b*:*a* in the formula $C_aH_bO_cN_d$. The oxidation of iron by explosion gases is discussed; it may be ascertained from a consideration of the thermodynamic reactions. W. J. WRIGHT.

Apparatus for the 75° stability test for smokeless powders and nitrocellulose. (FRH.) VON MEERSCHIEDT-HÜLLESSEM (Z. ges. Schiess- u. Sprengstoffw., 1930, 25, 141—143).—In an improved form of the Lenze and Pleus apparatus (B., 1920, 281 A) a double-walled oven is employed, the space between the walls being filled with kieselguhr. The burner is almost entirely outside the oven, which prevents the blowing back of the flame due to the burner becoming hot. Instead of carbon tetrachloride, which is liable to attack the bath, a mixture of methyl alcohol and water (2:1) is used, and in order to ensure uniform heating the bath containing it is surrounded by a water-bath. W. J. WRIGHT.

Explosion limits of gases. LÖFFLER.—See II.

PATENTS.

Blasting cartridges. D. HODGE (B.P. 328,716—7, [A, B] 20.2.29. Addn. [A] to B.P. 320,226).

XXIII.—SANITATION; WATER PURIFICATION.

Application of respiratory devices, especially carbon monoxide filters, in mines. G. RYBA, SEN. (Z. ges. Schiess- u. Sprengstoffw., 1930, 25, 128—130).—Modern types of carbon monoxide filters are efficient even in atmospheres containing 6% CO, provided that the oxygen content is 21%. After mine fires and explosions, however, this amount of oxygen is seldom present; it is usually below 15%. The lack of oxygen in the inspired air therefore constitutes an actual risk to the worker, and the use of these carbon monoxide filters in mines is condemned by various authorities.

W. J. WRIGHT.

Absorption of mercury and mercuric chloride vapours by wood charcoal. M. A. RAKUSIN (Münch. Med. Woch., 1928, 75, 1881—1882; Chem. Zentr., 1930, i, 115).—The volatility of mercury salts at the ordinary temperature is small; mercury vapour in the factory or laboratory atmosphere is more toxic. The toxic substances may be removed with wood charcoal.

A. A. ELDRIDGE.

Initial operation of Imhoff tank and contact beds at Blacksburg, Va. F. H. FISH (Ind. Eng. Chem., 1930, 22, 511—513).—This sewage-disposal plant, which consists of an Imhoff tank, four contact beds, three final settling tanks, and three glass-covered sludge beds, was designed to deal with the sewage from a population of 5000. It was placed in commission in August, 1928, and during 1929 dealt with 316,000 gals. of sewage per day. The gas from the Imhoff tank is collected in cast-iron bells sealed with road tar. It has a calorific value of 610 B.Th.U. and contains 16% CO₂. Difficulties due to foaming and the presence of a 10-ft. layer of scum have been overcome and an odourless final sludge is being produced which dries readily and contains 2.5% N. Analysis of crude sewage, effluents, and water supply are given.

C. JEPSON.

Relation of direct *B. coli* and *B. aerogenes* counts to sources of [faecal] pollution. F. O. TONNEY and R. E. NOBLE (J. Amer. Water Works Assoc., 1930, 22, 488—500).—The separate *B. coli* and *B. aerogenes* indices obtained by direct plating of human and animal faeces, soil, decaying wood, etc., on a cyanide-citrate medium (cf. B., 1928, 318) confirm the general opinion that *B. coli* is obtained exclusively from faeces, and that *B. aerogenes*, though present to only a small extent in faeces, is widely distributed in nature. The ratios in which they are present in water is a valuable guide to the possibility of dangerous pollution. The presence of *B. aerogenes* apart from *B. coli* suggests extraneous contamination of non-faecal origin; a considerable excess of *B. aerogenes* over *B. coli* points to surface contamination rather than to direct faecal pollution, though when *B. coli* is present the possibility of such pollution must not be overlooked. The use of a preliminary enrichment broth which may vary the proportions in which the organisms were originally present is deprecated and the advantage of direct plating is emphasised.

C. JEPSON.

Determination of p_H of sewage sludge. G. M. FAIR

and E. W. MOORE (Sewage Works J., 1930, 2, 1—7).—For dilutions not greater than 1 in 20 the colorimetric method is satisfactory unless the p_H has been appreciably changed by addition of an acid or a base.

CHEMICAL ABSTRACTS.

[Disinfecting action of] *N*-chlorosuccinimide. ANON. (U.S. Naval Med. Bull., 1929, 27, 235).—For the disinfection of water in small quantities, *N*-chlorosuccinimide is more efficient than bleaching powder, and is less affected than the latter by organic matter.

CHEMICAL ABSTRACTS.

Purification of waste waters from sugar-beet factories. J. H. GARNER and J. M. WISHART (West Riding Yorks. Riv. Bd. 1st Suppl. Rep.).—The methods used are described. The raw and treated wastes contained, respectively, 950—4080 and 80—280 pts. of suspended matter in 10⁶. The corresponding values for oxygen absorbed were: 53.7—175.4 and 9.7—17.1.

CHEMICAL ABSTRACTS.

Sterilisation of sea-water by means of chlorine. D. R. WOOD and E. T. ILLING (Analyst, 1930, 55, 125—126).—Bromine was found to be at least as efficient as its equivalent of chlorine for sterilisation of sea-water, and was not perceptibly more objectionable in taste and in its effect on the eyes.

D. G. HEWER.

Manganese dioxide in the aqueduct of the Catskill water supply. F. E. HALE (J. Amer. Water Works' Assoc., 1930, 22, 462—469).—Manganese dioxide was found to be present in large amounts in a slimy deposit, up to 1" thick, on the walls of an aqueduct forming part of the water supply system of New York City. Following the addition of chlorine to the water before it passes through the aqueduct, it was observed that the formation of new deposits ceased along the first 37 miles of its length and that old deposits became detached. There was no evidence of microscopical plant life, or organic structure, or of specific bacteria and moulds capable of causing the deposition of manganese. The action of the chlorine is considered to be a chemical one, and not due to a sterilising effect, as an alkaline reaction produced by dissolution of cement from the walls (which were observed to be roughened) would be reduced thereby, with a corresponding reduction in the amount of manganese precipitated.

C. JEPSON.

Lactose-broth fermenters [from filtered and chlorinated water]. H. E. JORDAN (J. Amer. Water Works' Assoc., 1930, 22, 544—546).—The paper by Spray and Laux (cf. B., 1930, 488) on a peculiar lactose-fermenting anaerobe is discussed. It is suggested that the results obtained may be due to two or more organisms acting symbiotically, and that pre- as well as post-chlorination, adjusted on a definite "excess" basis, would probably prove effective in removing the source of disturbing laboratory results.

C. JEPSON.

PATENTS.

Substituted quinazolines (B.P. 327,450).—See III.
Diazonium fluorosulphonates (B.P. 303,527).—See IV.