

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

MAY 24, 1929.

I.—GENERAL; PLANT; MACHINERY.

Heat-conduction problems. E. GRIFFITHS (Proc. Physical Soc., 1929, 41, 151—179).—For the purpose of thermal conductivity measurements, materials may be divided into four classes: (1) those of low thermal conductivity, such as cold-storage insulators; (2) those in the form of thin sheets, and those employed in building construction; (3) refractories and materials employed in furnace construction; (4) pure metals and alloys. In testing materials of low thermal conductivity (baked slab cork can be obtained with $K = 0.00007$ c.g.s. unit) attention has to be given to heat leakage from corners and edges if the hot-plate method is used. The simplest procedure is to eliminate the effect by the use of a guard-plate. Substances in the form of thin discs can be tested by the divided-bar method, the correction for the thermal resistivity of the two mercury films being obtained by independent experiments using a thin disc of iron instead of the specimen. For the study of refractories a furnace is made up of "silit" rod heaters which can raise one face of the slab under test to any temperature up to 1000° . On the top of the slab is a water-flow calorimeter fitted with a guard-ring. For the study of metals and alloys the guard-tube method is recommended. The space between the guard-tube and specimen is packed with a powder of low thermal conductivity. In two groups of alloys, aluminium alloys and bronzes, the values of the Lorentz coefficient approximate to the values for the pure metals which form the principal constituents of the alloys. W. E. DOWNEY.

Pyrometer for measuring temperatures by means of a colour charge. G. NAESER (Stahl u. Eisen, 1929, 49, 464—466).—The pyrometer consists of two superimposed wedges filled with gelatin coloured red and green respectively, and fixed in a frame the edges of which are graduated in degrees. Along these edges slides an eyepiece through which the light from an object is observed after passing through the wedges. The eyepiece is moved along the scale until a neutral tint, neither red nor green, is observed. The pyrometer is accurate to $\pm 13^{\circ}$ between 900° and 2000° .

A. R. POWELL.

Purification of gases. WASMUHT.—See VII.

PATENTS.

Furnace. J. F. BAKER, Assr. to WESTINGHOUSE ELECTRIC AND MANUF. CO. (U.S.P. 1,705,704, 19.3.29. Appl., 27.7.26).—A continuously driven conveyor has a number of tiltable trays for receiving material which it moves through the annular heating chamber of a heat-treating furnace. The trays are periodically and successively caused, by the rotation of the conveyor, to

engage with a ramp so that they tilt and discharge their contents. J. S. G. THOMAS.

Dryer. R. RANSON, Assr. to FORD INSTRUMENT CO., INC. (U.S.P. 1,703,635, 26.2.29. Appl., 31.8.21).—The dryer consists of a rotary drum and a portable furnace, both having similarly shaped co-acting ends; the drum has a drying chamber, and the internal bore of the furnace is less in cross-sectional area than that of the chamber. Means are provided for removing the products of combustion. H. ROYAL-DAWSON.

Grinding, crushing, pulverising, mixing, and separating machine. D. J. REES (U.S.P. 1,706,254, 19.3.29. Appl., 6.1.27. U.K., 20.1.26).—See B.P. 264,324; B., 1927, 207.

Means for continuous drying or distillation of fine granular masses. L. HONIGMANN (U.S.P. 1,704,796, 12.3.29. Appl., 20.4.27. Ger., 5.11.25).—See B.P. 293,147; B., 1928, 658.

Separation of materials by [vacuum] flotation. F. E. ELMORE (U.S.P. 1,706,281, 19.3.29. Appl., 23.4.27. U.K., 16.7.26).—See B.P. 275,778; B., 1927, 800.

[Rotary drum] filter. H. NOTZ, Assr. to MASCHINEN-FABR. BUCKAU R. WOLF A.-G. (U.S.P. 1,705,226, 12.3.29. Appl., 8.3.28. Ger., 25.7.25).—See B.P. 301,541; B., 1929, 116.

Refrigerating apparatus of the absorption type. N. V. KODOWA REFRIGERATOR CO., and W. A. SLAGER (B.P. 308,898, 31.3.28).

Absorption refrigerating apparatus. Rectification of gases, vapours, or mixtures thereof in absorption refrigerating apparatus. ELECTROLUX, LTD., Assees. of PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAGET (B.P. 282,770—1, 23.12.27. Ger., [A] 31.12.26, [B] 28.12.26).

[Floating cover-plate for] filter presses. J. TETLEY & SON, LTD., and G. COOPER (B.P. 308,901, 3.4.28).

Photochemical gas reactions (B.P. 307,521 and 307,406).—See II.

II.—FUEL; GAS; TAR; MINERAL OILS.

Sp. gr. of Alabama coals. B. W. GANDRUD and S. A. BRITTON (Alabama State Mine Exp. Stat. Bull. No. 2, 1928, 57 pp.).—Samples of Alabama coal were taken from 19 mines of the Warrior and Cahaba fields. These coals on analysis had d 1.26—1.37, ash 2—15%, moisture 2—4.5%. Ordinarily the sp. gr. increases uniformly with the percentage of ash; the discrepancies observed may be due to change in the character of the ash-forming material, to variation in the volatile matter content, or to their combined effect. In those cases

where the seams consist of benches of coal separated by partings of shale etc. of high ash content, crushing will be necessary to eliminate the ash-forming impurities, and the resulting finer sizes of coal will furnish the most difficult problem in effecting improvements in the washing of Alabama coal.

C. B. MARSON.

Microscopical examination of fine coal-cleaning products by the method of relief-polishing. E. STACH and F. L. KUHLWEIN (Glückauf, 1928, 64, No. 25; Fuel, 1929, 8, 191—198).—The products obtained in the cleaning of fine coal have been examined microscopically by embedding the material in Schneiderhöhn's resin mixture (1 pt. of Venetian turpentine, 3 pts. of dammar resin, 2 pts. of shellac), which is then cast into small blocks, ground, and relief-polished. The characteristic appearance of the different constituents, vitrain, durain, fusain, and shale, is illustrated by photomicrographs. They can be recognised at once and their respective amounts determined. A. B. MANNING.

Properties of coking coals and their behaviour on coking. P. DAMM (Glückauf, 1928, 64, 1073—1080, 1105—1111; Fuel, 1929, 8, 163—177).—Six Silesian and Westphalian coals have been studied. The caking index (Meurice) increased with increasing oil bitumen content (Fischer, B., 1925, 656). More difficulty was experienced in correlating the solid bitumen content with the behaviour of the coals on carbonisation. The swelling and the swelling pressure, *i.e.*, the pressure just necessary to prevent swelling during carbonisation, have been determined in an apparatus similar to that used by Korten (B., 1920, 713 A); the fusion temperatures and yields of volatile matter before, during, and after the plastic period, respectively, have also been determined. With a high initial yield of volatile products from the coal there is risk of a premature loss of part of the bitumen essential to coking. The yield of distillation products during the plastic period gives some indication of the swelling pressure. The yield during the final distillation has an important bearing on the quality of the coke produced; the greater the yield, the more fissured is the coke. On the other hand, a low yield results in a small contraction and causes the coke to adhere to the walls. The mechanism of coking is discussed in the light of the experimental results. The reactivity of the coke increased with diminution in the caking properties of the coal. A. B. MANNING.

Swelling and expansive force of coals. P. DAMM (Brennstoff-Chem., 1929, 10, 65—67).—It is important to differentiate between the swelling of a coal, which is its increase in volume when heated so that it is free to expand, and the expansive force, which is the force it exerts when heated at constant volume. The former depends on the degree of softening of the coal and on the quantity of volatile matter evolved during plasticity, whereas the true cause of the latter is uncertain, although the coal bitumen plays a part. The "sticking" of a fully carbonised charge in a coke oven may be favoured by the exertion of a high expansive force by the parent coal, but is primarily caused by a relatively small liberation of volatile matter, and hence only a slight contraction of the coke results during the later stages of carbonisation.

W. T. K. BRAUNHOLTZ.

Reducing action of various coals in an aqueous medium. V. S. KRYM and S. J. PANTSCHENKO (Brennstoff-Chem., 1929, 10, 63—65). G. STADNIKOV and N. PROSKURNINA (*Ibid.*, 65).—The diminution in concentration of aqueous solutions of ferric chloride in contact with coals or cokes, observed by Stadnikov and Proskurnina (*cf.* B., 1926, 729; 1927, 864), is not due to adsorption of ferric hydroxide, but to the reducing action of the fuel. The latter depends on such factors as concentration of the ferric chloride solution, time of reaction, particle size of the fuel, etc.

Stadnikov and Proskurnina suggest that the presence of bivalent iron in the solutions is due to the solvent action of hydrochloric acid on the sample and to base exchange between ferric chloride and ferrous compounds in the fuel.

In reply, the authors point out that the quantity of bivalent iron present may greatly exceed that of the total iron in the coal. The reducing action of coke is ascribed to the liberation of hydrogen sulphide in acid medium.

W. T. K. BRAUNHOLTZ.

Determination of degree of decomposition of peat. Determination of cellulose. W. I. KOMAR-ELSKY (Z. angew. Chem., 1929, 42, 336—338).—Cellulose is the only plant component found unaltered in peat, and the degree of decomposition which the cellulose has undergone is taken as a measure of the age of the peat. Dried and powdered peat was successively extracted with ether, alcohol-benzene mixture, ether again, and twice treated with 1% soda solution in a centrifugal. It was then repeatedly extracted with sodium sulphite and chlorine dioxide solution. The crude cellulose remaining was dissolved in Schweizer's reagent and precipitated with acetic acid and alcohol. The weight of pure cellulose can also be determined by difference, the weight of the insoluble residue being known. A series of tests show the decrease of cellulose content with increasing depth of origin of the peat. At 2 m. it does not exceed 8—9%. Values are lower than those obtained with Cross and Bevan's method, in which, nevertheless, it is considered that some cellulose is destroyed by the use of chlorine.

C. IRWIN.

Developments in gasworks carbonising plant, with special reference to refractory materials. G. M. GILL (Trans. Ceram. Soc., 1929, 28, 7—17).—Recent developments in carbonising plant in America, Germany, and England are briefly discussed. A description is given of intermittent vertical ovens and their advantages are outlined. Hot gases from producer-gas burning in the lower section of these ovens pass upward, round the ovens, descend through recuperators, and finally through a waste-heat boiler. Good silica material is necessary for the walls of the ovens and retorts and for the combustion chambers. For the producer linings the toughest hard-burnt firebricks are essential. Vertical installations lend themselves readily to thermal insulation. Tunnel kilns for burning silica refractories are advocated. Much loss would be avoided if the shapes of the refractories were properly standardised.

F. SALT.

[Control of] water-gas manufacture. W. SCHWEDER (Gas- u. Wasserfach, 1929, 72, 261—263).—On account

of contamination of crude water-gas by steam and by coke particles, and of the big fluctuations in make etc., careful analysis of the gas at different stages is difficult without dislocation of routine operation. An apparatus is described to meet these difficulties, which consists of a battery of burettes fitted with cooling jackets and connected to each other and to an analysis apparatus by suitable taps. The burettes are calibrated from 0—25 c.c. in 0.1 c.c., and from 25 to 100 c.c. in 0.5 c.c., and they are filled in turn with gas over known time intervals. The accumulated samples can then be analysed, and in this way it is particularly easy to follow the formation of carbon dioxide, even at 10 sec. intervals. The results of two short tests on a water-gas plant are given, showing a gas-making efficiency of 62 and 67% respectively; the former gave a thermal efficiency of 76%. R. H. GRIFFITH.

Synthesis of higher hydrocarbons from water-gas. B. A. BUYLLA and J. M. PERTIERRA (*Anal. Fis. Quím. [Tecn.]*, 1929, 27, 23—38).—The low temperature of 254° has been maintained during the catalytic reduction by copper, cobalt, and manganous oxides of the carbon monoxide present in water-gas. Although the contraction is less at this temperature, a greater yield is obtained of liquid and solid hydrocarbons; thus by one passage over the catalyst 37.6 g. of organic products have been obtained from 1 m.³ of gas. The necessity of purifying the gas, in order that the catalyst may maintain its activity, has been demonstrated. H. F. GILLBE.

Commercial possibilities in the use of synthetic hydrocarbon processes in the gas industry. W. W. ODELL (*Fuel*, 1929, 8, 178—187).—The possibility of carburetting water-gas economically by means of hydrocarbons prepared synthetically from the water-gas itself is discussed as far as the available data permit. A desirable operating procedure for a gas plant would include the production of enriched water-gas in amounts equal to the demand for gas, using the off-peak water-gas for the production of condensable hydrocarbons, which can be used as solvents or motor fuel, or stored for future use in enriching gas without the deposition of carbon. Accurate estimates of cost of operation, equipment, etc. cannot yet be made, and the need for further investigation is emphasised. Data are required on such problems as the removal of traces of sulphur from water-gas, the production of suitable catalysts on a commercial basis, design of full-scale reaction chambers, etc. A. B. MANNING.

Recovery of phenol from coke-oven gas liquor. P. HOENING (*Z. angew. Chem.*, 1929, 42, 325—331).—Recovery of phenols from the gas liquor produced at a group of coke-oven plants in the Ruhr has been introduced, primarily owing to complaints arising from the disposal of the effluents. The liquors containing originally 2—3 g./litre of phenol are reduced to a content of 0.6—0.8 g./litre, which is considered the economic limit. The liquor is washed with benzol before distillation for ammonia, and the benzol freed from phenols by distillation or alkali treatment, the latter being preferred. Several methods of washing are in use. A preliminary wash for tarry matters is used, and the main washing is carried out by counter-current at 65°. The phenols

from which benzol has been removed by distillation contain 65—75% of tar acids and 4—5% of pyridine, the remainder being hydrocarbons of high b.p. A further washing of the water with a lignite wash oil to remove benzol entrained with the water has been added. If the alkali process is used, two washers are required which are worked in series and fed with 30—35% caustic soda; continuous working is not practicable. The benzol used for washing has b.p. 85—120°. Details are given of variation in the degree of stripping with proportion of benzol used, temperature, and type of tower packing. With alkali washing, oils of higher b.p. can be used instead of benzol, provided they do not emulsify with water, a more complete extraction is possible, and steam consumption is less. Costs of working are discussed. C. IRWIN.

Aluminium chamber oven for the [laboratory] low-temperature carbonisation of bituminous material. A. WEINDEL (*Brennstoff-Chem.*, 1929, 10, 67—69).—The apparatus comprises a horizontal chamber oven, made of aluminium of 15 mm. thickness, 60 cm. long, 10 cm. wide, and 16 cm. high (to crown). It is heated by means of three gas burners, and has a capacity of about 10 lb. of coal. One end is closed by a removable aluminium door, which is opened for filling and emptying the oven. Volatile products are led off by a delivery pipe at the top of the oven, tar being collected in a cooled flask, light oils adsorbed by activated carbon, and the gas burnt with or without previous sampling. Two thermometers are placed in holes bored in the wall of the oven. In general, 3 kg. of coal are carbonised, the temperature being raised rapidly to 400°, then more slowly so that 1½ hrs. are taken to reach about 500°, at which temperature the coal is maintained for a further 1½ hrs. Steam can be introduced into the oven during the test if required. W. T. K. BRAUNHOLTZ.

Softening points of pitches and asphalts. A. SPILKER (*Z. angew. Chem.*, 1929, 42, 263—264).—In order to avoid the use of mercury, a modification of the Kraemer-Sarnow method is proposed, in which a smooth rod of lead-antimony alloy (80:20) with the lower end rounded, having a cross-section 5 mm. in diameter, and weighing 8.0 g., is employed. The results obtained by this "Kraemer-Spilker" method agree with those obtained by the Kraemer-Sarnow method within the limits of experimental error. S. I. LEVY.

Cracking process. A. N. SACHANEN (SACHANOV) and M. D. TILITSCHÉEV (*Ber.*, 1929, 62, 658—677; cf. B., 1929, 84).—The thermal decomposition of the following substances has been investigated under pressure in an iron autoclave over varied periods at temperatures about 425—450°: paraffin, m.p. 53°, diisomyl, naphthalene, anthracene, cymene, tetrahydronaphthalene, and naphthenes. Paraffins are cracked into unsaturated and methane hydrocarbons. If the operation is protracted, the unsaturated compounds may become partly polymerised and transformed into a mixture of hydrocarbons of higher b.p. which consists of naphthenes, unsaturated hydrocarbons, paraffins, and, possibly, aromatic hydrocarbons. Coke may ultimately be produced from the last-mentioned compounds. Polymerisation of the olefines is favoured by high pressure and long

duration of the process; if, however, the products are removed rapidly from the sphere of action polymerisation of olefines and their transformation into naphthenes is slight. Under the customary conditions of cracking the reaction is unimportant. Thermal decomposition of aromatic hydrocarbons is influenced mainly by the side chains. With increasing length of the latter the compounds become less stable. Conversely, the aromatic hydrocarbons with short side chains are markedly more stable. Methyl groups are most permanent, and are scarcely affected under the usual conditions of cracking. The presence of aromatic hydrocarbons in the petroleum is due partly to dehydrogenation of naphthenes, more particularly to decomposition of complex into simpler hydrocarbons. The complex compounds have side chains of varying weight which are eliminated in very varied manner, thus rendering very improbable the production of appreciable amounts of unsubstituted aromatic hydrocarbons. This is confirmed by the absence of decomposition products of naphthalene from the corresponding fractions. The behaviour of naphthenes depends on the size of the ring. Hexamethylene derivatives lose their side chains and become dehydrogenated and converted into aromatic hydrocarbons, thus explaining the almost complete absence of six-membered naphthenes from the cracked products. Naphthenes with five-membered rings are mainly decomposed by partial loss of side chains, and then pass into the benzine and petroleum. The most unstable substances are the paraffins and cyclic hydrocarbons with very long side chains. These reactions cause a concentration of the aromatic hydrocarbons with short alkyl groups during the cracking process, and hence a marked increase in sp. gr. Accumulation of naphthalene derivatives and possibly of other condensed aromatic hydrocarbons is to be expected, as is confirmed by the high sp. gr. of the oils obtained. As the concentration of aromatic hydrocarbons with short alkyl chains increases the rate of decomposition falls. As cracking proceeds a point is generally reached at which the main components of the initial material are decomposed and the products consist mainly of aromatic hydrocarbons with short side chains. Small amounts of more highly condensed products are present. This concludes the first stage of the change, which appears to be characterised by large yields of benzine and petroleum and high sp. gr. of the oils or residues. Coke is not generally formed at this stage. The first process is characterised almost entirely by decomposition reactions and incipient condensations. With increasing concentration of aromatic hydrocarbons the condensation reactions assume predominance. The condensation products of higher b.p. pass into tarry products and ultimately into coke. Since the aromatic hydrocarbons at this stage have only short side chains, much gas is produced, mainly hydrogen and gaseous hydrocarbons. Liquid products are formed only in small amount. The second stage of cracking is characterised by the conversion of the residue into coke and formation of much gas. H. WREN.

Composition of heavy Sakhalin crude oils and their working up. A. N. SACHANOV (*Neft. Choz.*, 1928, 15, 53—54).—The characteristics of an Okhinski crude (Sakhalin) oil are recorded, together with those of the

mazout and of the fractions obtained on its vacuum distillation. The results of cracking experiments are also recorded.

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Determination of petrol or benzol vapour in air. P. ANDREJEV (*Chem. Fabr.*, 1929, 147—148).—Absorption methods for the determination of hydrocarbons in air scarcely permit of their subsequent analysis. This, however, can readily be carried out if condensation methods are used. A combined apparatus, in which after a preliminary condensation residual vapour is absorbed, consists of a glass tube (13 mm. diam.) containing two narrower inner tubes and surrounded by a glass worm. At the lower end is a collecting flask, and the air passes successively through the worm, the inner tubes, and the wide tube. The last-named is charged with absorbent. The whole is immersed in carbon dioxide snow or liquid air. The air is dried and freed from carbon dioxide, and if a liquid absorbent is used this must also be freed from moisture.

C. IRWIN.

See also A., April, 389, **Equilibria between benzene and (a) ferric oxide gel, (b) silica gel** (LAMBERT and CLARK). 403, **Inflammation of mixtures of olefines and air in a closed spherical vessel** (MAXWELL and WHEELER).

Hydrogen [from water-gas]. LARYUKOV. **Sulphur dioxide from waste gases.** WEISSENBERGER and PIATTI.—See VII. **Silica bricks for coke ovens.** KNUTH.—See VIII. **Insulating oils.** EDWARDS.—See XI. **Bleaching mineral oils.** ELAKOV.—See XII. **Decolorising carbons and molasses.** GARINO and REGÈ.—See XVII.

PATENTS.

Rotary retort. Distillation [of carbonaceous materials]. T. A. W. DWYER, Assr. to H. O. SCHUNDLER, W. H. BOTSFORD, and A. J. JAMES (U.S.P. 1,703,418—9, 26.2.29. Appl., [A] 15.8.24, [B] 20.1.26).—(A) A rotary retort of the horizontal type is formed of a casing in the shape of a frustum of a cone and is heated externally. The material is fed into the narrower end of the retort and discharged at the wider end. The vapours are drawn off through a conduit in the upper part of the discharge end of the retort. (B) The carbonaceous material is heated to successively higher temperatures as it progresses through the retort, evolving volatile matter of successively increasing density. The conditions within the retort are maintained as little disturbed as possible so that the vapours retain their stratified formation until they are withdrawn. A. B. MANNING.

Distillation and utilisation of carbonaceous materials, and manufacture of coke, briquettes, and solid fuel compositions. B. LAING and H. NIELSEN (B.P. 307,366, 4.10.27).—The solid residue obtained by distilling carbonaceous materials in a current of hot gas, preferably as described in B.P. 276,407, 287,037, and 287,381 (B., 1927, 867; 1928, 356, 395), is blended with coal or coke, and the mixture is carbonised or briquetted. A fuel of increased reactivity is produced, suitable for domestic or metallurgical purposes.

A. B. MANNING.

Utilisation of carbonaceous material. D. PYZEL, Assr. to SIMPLEX REFINING Co. (U.S.P. 1,699,989,

22.1.29. Appl., 25.8.20).—Asphalt is heated and sprayed into the top of a furnace stack down which inert non-combustible material in sufficiently large particles to allow ready passage of gases is continuously circulating. In the top, relatively cool zone the asphalt is subjected to distillation, and lighter constituents escape with gaseous products from an outlet at the top of the furnace. The heavier, less volatile material undergoes partial combustion in the middle zone, where a controlled air-blast is supplied and residual coke is finally converted into water-gas by steam-blast admitted through the base of the furnace. The inert material falls continuously over a grid to remove dust, and is returned to the charging chute. The water-gas escapes through the combustion and distillation zones, and after removal of distillation products is collected.

R. BRIGHTMAN.

Coke treatment and product. A. A. KOHR, Assr. to KOPPERS Co. (U.S.P. 1,705,020, 12.3.29. Appl., 25.9.25).—To enable coke to be identified when burned, it is quenched with a solution of a flame-colouring substance.

F. G. CLARKE.

Increasing the adsorptive power of charcoal. H. B. LEMON (U.S.P. 1,699,243, 15.1.29. Appl., 29.8.21).—Gaseous material is absorbed by the vegetable charcoal and removed by evacuating to low pressure at 450–900°. With permanent gases the absorption is preferably effected at low temperatures, *e.g.*, with liquid air; with steam, absorption at temperatures up to 450–900° is preferable.

R. BRIGHTMAN.

Gas-producing apparatus. H. F. SMITH, Assr. to GAS RES. Co. (U.S.P. 1,699,166, 15.1.29. Appl., 20.9.21).—Tar is extracted from producer gas and returned to the generating chamber either by uniform spraying over the fuel in the charging hopper, or by distribution on fuel discharging from a fuel conveyor, or by discharging through nozzles on to fuel in a mixing chamber provided with an agitating wheel and leading to a charging hopper operated by a rotating shaft. R. BRIGHTMAN.

Electrothermal gas producer. W. S. YARD and E. N. PERCY (U.S.P. 1,703,505, 26.2.29. Appl., 12.2.24).—The fuel bed in a gas generator is heated electrically, the generating chamber being provided with a number of downwardly extending legs, at the bottom of which are the heating electrodes. At the top of the chamber are inlets for air, steam, and oil, whilst gas offtakes are situated at the lower ends of the legs. A. B. MANNING.

Drying of fuel gases. CHEM. ENGINEERING & WILTON'S PATENT FURNACE Co., LTD., T. O. WILTON, and J. PARKER (B.P. 307,600, 10.2.28).—The gases are passed through hygroscopic substances and then through traps or packings, *e.g.*, pumice stone, magnesite, etc., adapted to retain any suspended liquid or deleterious gases produced in the drying process. Two different hygroscopic liquids, *e.g.*, calcium chloride solution and sulphuric acid, may be used in series, the diluted sulphuric acid being subsequently utilised for the manufacture of ammonium sulphate. A. B. MANNING.

Increasing the yield in photochemical gas reactions. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 307,521, 2.11.27).—Gas mixtures, in which

photochemical reactions are to be induced by the resonance radiation of metallic vapours, are circulated past the source of radiation in such a way that only relatively small yields of the required products are formed during each passage, and these are continuously withdrawn from the circulating gases. The reacting gases are preferably purified from all traces of deleterious impurities. Certain reactions, *e.g.*, the production of formaldehyde from water-gas, are advantageously carried out under increased pressures. A. B. MANNING.

Apparatus for carrying out photochemical gas reactions. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 307,406, 2.11.27).—In effecting gas reactions photochemically induced by resonance radiation of metal vapours, *e.g.*, mercury vapour, rays of resonance wave-length are radiated into the reaction chamber in maximum amount, and the spectral development of the linear width of the resonance lines is adjusted to the absorption capacity of the metal vapour mixed with the reacting gases by suitably arranging the radiating devices, and adjusting the current density and the vapour pressure in them. Thus, *e.g.*, the reacting gases may completely surround the radiating device.

J. S. G. THOMAS.

Distillation of tar. T. O. WILTON, and CHEM. ENGINEERING & WILTON'S PATENT FURNACE Co., LTD. (B.P. 307,577, 10.1.28).—The tar is circulated through a plant comprising a feed tank, an economiser, a coil still, and a vapour box. The vapours from the vapour box are condensed and the residual dehydrated tar is passed again to the feed tank into which crude tar is admitted as required. The temperature of the coil still is raised to 300°, or higher, until soft pitch can be withdrawn from the system, which thereafter functions continuously.

A. B. MANNING.

Treatment of low-temperature tar and its distillates. G. T. MORGAN and D. D. PRATT (B.P. 307,382, 6.12.27).—The low-temperature tar is treated with a solvent, *e.g.*, petrol, ether, or a low-boiling distillate of the tar itself, in order to precipitate the pitch, and the phenols are then extracted from the clarified solution by means of an alkaline solution saturated with common salt.

A. B. MANNING.

Still for use in oil refining and method of making same by electric arc welding. E. C. R. MARKS. From A. O. SMITH CORP. (B.P. 307,566, 24.12.27).—Annular sections, consisting of thick metal plates each bent to form a tube and electrically welded in the line of its meeting ends, are alined longitudinally with heads at each end, and their abutting ends are electrically welded into an integral tubular structure.

H. S. GARLICK.

Apparatus for combining natural gas and hydrocarbon oil for the production of gasoline. L. S. WORTHINGTON, Assr. to C. L. THOMPSON (U.S.P. 1,700,556, 29.1.29. Appl., 22.1.24).—The oil is fed from a supply tank to a mixing chamber provided with constant-level control device. Oil drawn from the bottom of the mixing chamber is circulated through a heating coil and discharged through a series of atomising nozzles in manifolds communicating with the mixing chamber. The natural gas, independently preheated, is

discharged in opposition in a series of nozzles directly above the oil-spray nozzles. The mixture is sprayed through the manifolds into the mixing chamber, the liquid settling and vapours escaping through a discharge pipe to a heating coil and condenser. R. BRIGHTMAN.

Safety appliance [for oil-cracking apparatus]. L. C. HUFF and A. G. BOGARDUS, Assrs. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,703,624, 26.2.29. Appl., 5.7.23).—Located above an outlet pipe adapted to be ruptured when the pressure exceeds a predetermined value is the funnel-shaped end of a steam line carrying a fusible plug. H. S. GARLICK.

Treatment of oil shale. M. J. TRUMBLE (U.S.P. 1,704,956, 12.3.29. Appl., 2.9.24).—Raw shale is preheated by indirect heat-exchange with spent shale and distilled by contact with highly superheated steam, the volatile products being recovered. Any residual carbon in the spent shale is burnt during the period of heat exchange, and the resultant products of combustion are passed through the raw shale. H. S. GARLICK.

Treating shale and other bituminous solids. W. H. HAMPTON (U.S.P. 1,703,192, 26.2.29. Appl., 30.12.21. Renewed 28.6.28).—The solid material is intimately mixed with an ammonia-liberating base and a mineral oil, and heated at not above 370°, the volatile products being recovered. H. S. GARLICK.

Preparation of hydrocarbons. F. A. HOWARD, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,702,899, 19.2.29. Appl., 28.5.23).—Carbonaceous material, e.g., low-grade coal of high ash content, is ground to a slurry in water, levigated, agitated with 25–30% of hydrocarbon oil and additional water if necessary to improve the separation of ash particles from the plastic mass of oil and disseminated carbonaceous material, and the plastic mass is hydrogenated at high temperatures and pressures in presence or absence of hydrogenation catalysts. R. BRIGHTMAN.

Treatment of petroleum oils. J. C. BLACK, Assr. to PAN AMERICAN PETROLEUM Co. (U.S.P. 1,704,588, 5.3.29. Appl., 6.2.28).—Crude petroleum is prepared for distillation by being heated with sufficient of an alkaline solution to convert corrosive metallic salts into non-corrosive compounds. After separation under pressure the remaining water is removed by mixing with enough hot residual oil to raise the temperature to the b.p. of water under the pressure employed. J. A. SUGDEN.

Recovery of oil from emulsions. S. W. COLE (U.S.P. 1,700,627, 29.1.29. Appl., 17.12.24).—Crude petroleum emulsions, e.g., "cut oil," "bottom settlings," are broken up by agitation with calcium carbide and sodium and subsequent settling for 3–24 hrs. R. BRIGHTMAN.

Manufacture of by-products from inactive and inert oils or gases. C. S. PALMER (U.S.P. 1,699,627, 22.1.29. Appl., 28.9.21).—Inert oil or gas, e.g., saturated or paraffin hydrocarbons, is cracked, mixed with air or oxygen, and partly ignited in presence of a catalyst (platinised or vanadium asbestos) at 300–700°, preferably in presence of saturated or superheated steam, the partly oxidised products being passed over heat-

regulating surfaces in countercurrent with water for the steam supply, and after precipitation of the tar the products are recovered in a series of condensers. The tail gases are burnt for carbon-black, and the oxidising gas is preheated by heat from the cracking process. R. BRIGHTMAN.

[Anti-knocking] fuel and its manufacture. G. HAMMOND, Assr. to FUEL DEVELOPMENT CORP. (U.S.P. 1,699,355, 15.1.29. Appl., 6.8.25).—About 95% of liquid fuel, e.g., commercial gasoline, is heated in a retort with 4–7% of commercial alcohol at about 65° and 25 lb./in.² for $\frac{1}{2}$ –1 hr. On cooling, the product is decanted from separated water. R. BRIGHTMAN.

Automobile motor cooling oil. R. E. WILSON, Assr. to STANDARD OIL Co. (U.S.P. 1,700,392, 29.1.29. Appl., 21.4.25).—Hydrocarbon oil having flash point 93–99°, b.p. 230–290°, and viscosity below 36 sec. (Saybolt) at 38° is used. R. BRIGHTMAN.

Production of mineral lubricating oils. A. G. BLOXAM, From ALLGEM. GES. F. CHEM. IND. M.B.H. (B.P. 307,649, 14.4.28).—A lubricating oil fraction is treated with liquefied sulphurous acid, and the insoluble portion is distilled over alkali under reduced pressure with or without the use of steam. H. S. GARLICK.

Lubricating composition and its manufacture. J. W. FINLAY, Assr. to PIERCE PETROLEUM CORP. (U.S.P. 1,699,961, 22.1.29. Appl., 13.4.27).—73.5% by wt. of mineral (cylinder) oil (viscosity [Saybolt] 150–200 sec./99°), 16.5% of animal fat, 2.5% of lime, 2.5% of sodium hydroxide, and 5% of asphaltum or heavy tar (viscosity [Saybolt] > 2000 sec./99°) are mixed and heated above 150° to give a grease, the m.p. of which may exceed 200°. R. BRIGHTMAN.

Refining of mineral oil. H. BLUMENBERG, JUN. (U.S.P. 1,700,347, 29.1.29. Appl., 12.1.27).—Cracked gasoline or mineral oil (*d* 0.829–0.8235) is circulated through a tank in which it is subjected to an electric current, e.g., 10 amp./ft.² at 3–7 volts, in presence of 2–7% of hydrochloric acid, using aluminium anodes. The anode may be surrounded with a layer of bauxite or other finely-divided aluminium compound. R. BRIGHTMAN.

Refining of mineral oil. A. S. RAMAGE, Assr. to GYRO PROCESS Co. (U.S.P. 1,702,313, 19.2.29. Appl., 3.11.24).—Mineral oil is mechanically agitated in succession with measured quantities of sulphuric acid, sodium hydroxide solution, and with water, and the mixtures are delivered to the lower part of settling tanks in which the sludge separates out and the clear oil overflows slowly and continuously to the next agitator in the series, and finally to the still or storage. R. BRIGHTMAN.

Refining of [hydrocarbon] oil. E. T. HESSLE (U.S.P. 1,702,540, 19.2.29. Appl., 12.3.26).—The preheated oil is directed at 200–350° under 3–8 atm. from a nozzle in countercurrent with hydrocarbon vapour under pressure from a similar nozzle to produce fog within the reaction vessel, and the fog is passed through a molten decomposition catalyst of tin containing a small percentage of antimony at 250–400°. The cracked vapours are passed through fractionating columns, the first of which contains iron and manganese

oxides or other desulphurising agents, and the tail gases uncondensed by compression are circulated to gas burners under the still and the opposition nozzle in the cracking vessel.

R. BRIGHTMAN.

Treating hydrocarbon oil. F. W. HALL, Assr. to TEXAS CO. (U.S.P. 1,700,479, 29.1.29. Appl., 23.2.26).—Absorbent clay is used to refine successively two or more hydrocarbon oils of increasing colour and viscosity, the exhausted clay from each treatment being partly revived by treatment with steam after solvent-washing from excess oil, and used at consecutively higher temperatures. The exhausted clay from the final treatment is fully revived and used again for treating the lightest coloured oil in the cycle.

R. BRIGHTMAN.

Splitting of coal, oils, and other hydrocarbons. A. DEBO, Assr. to INTERNAT. BERGIN-COMP. VOOR OLIE EN KOLEN-CHEMIE (U.S.P. 1,704,792, 12.3.29. Appl., 15.5.25. Ger., 23.5.24).—See Can. P. 258,201; B., 1927, 273.

[Hydrocarbon oil] distilling apparatus. M. F. DE BAJLIGETHY (Re-issue 17,233, 12.3.29, of U.S.P. 1,542,864, 23.6.25).—See B., 1925, 749.

Bleaching of montan wax. W. PUNGS, Assr. to I. G. FARBENIND. A.-G. (U.S.P. 1,699,250, 15.1.29. Appl., 8.3.28. Ger., 11.3.27).—B.P. 303,080; B., 1929, 198.

Means for [magnetically] cleansing or filtering lubricating oils. F. R. SIMMS and B. C. JOY (B.P. 307,547, 14.11.27).

Hydrogen and gas mixtures (B.P. 307,529).—See VII. **Bituminous emulsions** (B.P. 308,051 and U.S.P. 1,699,536—7).—See IX. **Conversion of hydrocarbons** (B.P. 288,193).—See X.

III.—ORGANIC INTERMEDIATES.

Fusel oil reaction [of the German pharmacopœia] for absolute alcohol and spirit. K. R. DIETRICH and H. JEGLIŃSKI (Pharm. Ztg., 1929, 74, 436—437).—The coloration with sulphuric acid and salicylaldehyde obtained with alcohol containing fusel oil is not specific for the latter, but may be due to the presence of aldehydes. Previous treatment with hydroxylamine or *m*-phenylenediamine and distillation separates all substances likely to be present in alcohol, other than fusel oil, which give the coloration with salicylaldehyde.

S. I. LEVY.

[Preparation of] 2-aminoanthraquinone from chlorobenzene and phthalic anhydride. P. H. GROGGINS and H. P. NEWTON (Ind. Eng. Chem., 1929, 21, 369—375).—A detailed investigation of the effect of conditions on purity and yield in the preparation of 2-aminoanthraquinone from chlorobenzene and phthalic anhydride through *p*-chlorobenzoylbenzoic acid and 2-chloroanthraquinone. For details of the effects produced by stipulated changes in conditions the original must be consulted, but the technique outlined below gives almost theoretical yields of commercially pure 2-chloroanthraquinone with over 90% conversion into 2-aminoanthraquinone of 95—96% purity. The Friedel-Crafts condensation is effected with 3 pts. of chlorobenzene to 1 pt. of phthalic anhydride and at least 10% excess

of aluminium chloride at 50° for 5 hrs. with thorough agitation. Hydrolysis of the reaction mass is effected with dilute sulphuric acid below 50°, almost the whole of the excess of chlorobenzene being recovered by steam distillation. The cooled, filtered solution of the sodium salt of the crude acid, after further steam treatment, precipitates pure chlorobenzoylbenzoic acid (m.p. 147·8°) when slowly delivered under the surface of a large quantity of dilute sulphuric acid with violent (non-swirling) agitation. Ring closure to 2-chloroanthraquinone is best effected with a 10 : 1 ratio of 95% sulphuric acid at 135° for 6 hrs., followed by a 10% dilution with water after cooling. The primary product (90—95%) thus obtained has m.p. 210·5—210·8°, the remainder being obtained by further dilution of the mother-liquors. Increase in the proportion of sulphuric acid used is conducive to increase in gross yield, the purity of the primary product varying directly with the acid ratio and inversely with the dilution. Satisfactory results for the amination of the 2-chloro- to the 2-aminoanthraquinone are obtained either with 28·5% aqueous ammonia with addition of nitrobenzene (which considerably inhibits the formation of hydroxyanthraquinone) for 7 hrs. at 215° (which ensures the necessary removal of all the 2-chloro-compound) or with 40—50% ammonia, the latter procedure involving higher pressures, but generally producing a purer product in higher yields. The product is discharged from the autoclave into dilute sodium hydroxide solution. Purification of the 2-aminoanthraquinone from accompanying dianthraquinonylamine and hydroxyanthraquinone is effected by dissolution in 96% sulphuric acid at 125°, dilution with hot dilute (about 50%) sulphuric acid to the required degree of acidity, and vigorous agitation at 125° for a further 30 min. After cooling, the product is filtered by suction, the black, acid mother-liquors being completely removed by washing first with the acid used for dilution and finally with hot water. A product of 95—96% purity, suitable for the preparation of vat dyes, is thus obtained.

J. W. BAKER.

See also A., April, 405, **Action of atomic hydrogen on hydrocarbons** (VON WARTENBERG and SCHULTZE). 406, **Catalysts for formation of alcohols from carbon monoxide and hydrogen** (FROLICH and others). 436, **Nitration of substituted anilines** (RIEGEL and others). 439, **2-Substituted derivatives of *p*-cresol** (COPISAROW). 448, ***ms*-Alkylanthracenes** (BARNETT and GOODWAY). 459, **Analysis of easily carbonisable organic liquids** (SEVAG). 460, **Determination of formaldehyde** (LIPPICH).

Phenol from coke-oven gas liquor. HOENING.—See II. **Synthetic tannins.** BERKMANN.—See XV.

PATENTS.

Manufacture of sulphonic acids of *N*-acetoacetylated arylamines [acetoacetic sulphonylamides]. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 307,531, 7.12.27).—Acetoacetic arylamides are sulphonated with oleum containing more than sufficient sulphuric anhydride to combine with the water formed. *E.g.*, acetoacetanilide or acetoacetic *o*-chloroanilide is treated at about 10° with 3—5 pts. of 20% oleum.

C. HOLLINS.

Manufacture of 2-hydroxy-3-carboxynaphthalene [β -hydroxynaphthoic acid] and its metallic salts.

E. SCHWENK (U.S.P. 1,700,546, 29.1.29. Appl., 1.6.27. Ger., 2.4.27).—Alkali salts of 2-hydroxy-1-naphthoic acid are converted (yield 90%) into the corresponding salts of β -hydroxynaphthoic acid by heating above 200°, e.g., at 260° for 6 hrs. under 4 atm. R. BRIGHTMAN.

Apparatus for refining raw carbon disulphide.

P. SIEDLER and E. SCHULTE, Asssts. to I. G. FARBENIND. A.-G. (U.S.P. 1,699,255, 15.1.29. Appl., 5.11.27. Ger., 24.10.25).—See B.P. 260,236; B., 1927, 907.

Production of acetic acid. H. DREYFUS (U.S.P. 1,704,965, 12.3.29. Appl., 21.5.24. U.K., 22.6.23).—See B.P. 226,248; B., 1925, 148.

Photochemical gas reactions (B.P. 307,406 and 307,521).—See II.

IV.—DYESTUFFS.

See A., April, 395, **Reactions between colloids.**

I. Dyes and proteins (PAULI and WEISS).

Testing antiseptic dyes. REDDISH.—See XX.

PATENTS.

Manufacture of vat dyes. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 307,364, 3.9.27).—A halogenated *meso*-benz- or -naphtho-dianthrone (B.P. 303,184 and 303,095; B., 1929, 238, 251) is condensed with a primary or secondary amine, especially amino- and diamino-anthraquinones, to give vat dyes. Examples are: α -aminoanthraquinone with tribromo-, tetrabromo-, trichloro-, and dichlorodimethyl-*ms*-benz-dianthrones (violet), tribromo-, tetrabromo-*ms*-naphtho-dianthrones (red-violet), dichloro-*ms*-naphtho-dianthrone (claret), di- and tetra-bromo-*allo-ms*-naphtho-dianthrone (navy-blue), and dibromo-*ms*-anthradianthrone (violet); β -aminoanthraquinone with tribromo-*ms*-benz-dianthrone (copper-red), tetrabromo-*ms*-naphtho-dianthrone (yellow-brown), dichloro-*allo-ms*-naphtho-dianthrone (copper-red), and chloro-*ms*-anthradianthrone (brown); 1-amino-4-methoxyanthraquinone with tribromo-*ms*-benz-dianthrone (grey-blue), dibromodimethyl-*ms*-naphtho-benz-dianthrone (olive-green), tetrabromo-*ms*-naphtho-dianthrone (dark-blue), dichloro-*allo-ms*-naphtho-dianthrone (black), and dibromo-*ms*-anthradianthrone (grey-blue); 1-amino-2-methylantraquinone with tetrabromo-*allo-ms*-naphtho-dianthrone (dark blue); 1 : 5-diaminoanthraquinone with dichloro-*allo-ms*-naphtho-dianthrone (violet-black). Diamines which are violet vat dyes are obtained by condensing dichloro-*allo-ms*-naphtho-dianthrone and dibromo-*ms*-anthradianthrone with *p*-toluenesulphonamide and hydrolysing the products. C. HOLLINS.

Manufacture of vat dyes. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 307,328, 3.9.27. Cf. B.P. 307,364, preceding).—A halogeno- or nitro-dibenzanthrone or *iso*dibenzanthrone is condensed with an aminoanthraquinone to give violet-grey to black vat dyes. Examples are: α -aminoanthraquinone with dibrominated dibenzanthrone (blue-black); 1 : 4-amino-methoxyanthraquinone with dichlorinated dibenzanthrone (blue-grey to blue-black), or dibrominated *iso*-dibenzanthrone (violet-grey). C. HOLLINS.

Manufacture of [azo] dyes containing chromium, and their application.

SOC. CHEM. IND. IN BASLE (B.P. 282,783, 24.12.27. Switz., 24.12.26).—Pre-chromed dyes of the type *o*-aminophenols \rightarrow 3-methyl-5-pyrazolone, give level orange to red shades on wool and silk. As first components are mentioned 3-amino-*p*-cresol-5-sulphonic acid, 1 : 2 : 4-aminonaphtholsulphonic acid, *o*-aminophenol, and others. C. HOLLINS.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Elastic properties of wool in water at high temperatures. J. B. SPEAKMAN (Trans. Faraday Soc., 1929, 25, 169—176; cf. B., 1929, 277).—The ability of strained Cotswold wool fibres to return to their original lengths in water at 18° decreases continuously with increasing degree, temperature, and duration of the strain. Set realised in water below 90° is permanent in cold but not in hot water, whilst above 90° strained fibres still contract if reheated in the absence of tension, though the process of recovery is incomplete, and a truly permanent set, *i.e.*, permanent at both high and low temperatures, is realised. The slow rate of recovery and the fact that it occurs to the same extent at 60° and 100° indicate that dissolution of the fibrillæ does not occur. The disappearance in hot water of set permanent in cold water is probably due to some form of internal rearrangement (recrystallisation) in fibres rendered more amorphous by plastic flow. J. GRANT.

Cellulose from cereal straws. S. D. WELLS (Ind. Eng. Chem., 1929, 21, 275—278).—Cereal straws are capable of purification by very mild processes; the action of dilute caustic soda, sodium carbonate with or without sulphur compounds, milk of lime, and chlorine on wheat straw is described. Milk of lime, which is commonly used in technical operations, yields only a crude product unless further purification with chlorine is employed. By alternate chlorine and soda treatments, yields of 43% of pentosan, lignin, and ash-free cellulose may be obtained. 6% caustic soda extracts about 15% of xylan from straw, whilst a further 9% of substances yielding furfuraldehydes are obtained by a second soda extraction after chlorination. The spent cooking liquors from the sodium carbonate and sulphur treatment yield appreciable amounts of lactic and acetic acids on hydrolysis and fermentation. F. R. ENNS.

Cellulose from corn [maize] stalks. H. A. WEBBER (Ind. Eng. Chem., 1929, 21, 270—275).—A summary of the economics of the production of maize stalks, their chemical composition, and methods of preparing cellulose therefrom. The stalks contain about 35% of cellulose; although bulkier than wood, they are more easily delignified. Commercial applications will probably develop along two distinct lines, *viz.*, utilisation of the entire stalk as crude fibre for wall-board etc., and of the purified cellulose as raw material for paper, artificial silk, etc. F. R. ENNS.

Pulping of flax straw. VI. **Properties of flax-straw cellulose and its value in the cellulose industries.** E. R. SCHAFER and M. W. BRAY (Ind. Eng. Chem., 1929, 21, 278—280).—Analyses are given of seed flax straw and its principal components—the bast

fibre and the shives—and also of a number of pulps suitable for paper-making which were obtained by various methods of cooking. Calculated on the oven-dry weight of material, the entire straw contains rather more than 50% of cellulose; the yield of dry pulp varies between 33 and 48%, the highest being obtained by digestion with caustic soda. F. R. ENNOS.

New materials for the manufacture of artificial silk. ANON. (Bull. Imp. Inst., 1929, 27, 1—9).—An investigation as to the suitability of bagasse, sulphite pulp prepared from Tasmanian stringy-bark, and *Phormium tenax* fibre as sources of cellulose for artificial silk. After a preliminary separation of the fibrous portion from the useless pithy material by mechanical and chemical means, bagasse yields on suitable treatment about 24% of a dry bleached pulp similar in chemical composition to wood pulp employed in the manufacture of artificial silk. From the results of analysis Tasmanian stringy-bark pulp and that from *Phormium tenax* fibre also appear suitable, but in all cases a manufacturing trial would be necessary to decide the question. F. R. ENNOS.

Viscose. XXII. Viscosity of viscose. G. KITA, S. IWASAKI, T. NAKASHIMA, S. MASUDA, and K. MATSUYAMA (J. Cellulose Inst., Tokyo, 1929, 5, 59—71).—It is generally acknowledged that the viscosity of viscose solution falls during the first stages of ripening, reaches a minimum, rises very slowly, and, shortly before coagulation, suddenly rises quickly. The authors, working with a viscose from cotton paper, did not, in general, observe the slow increase referred to. This variation in behaviour is ascribed to the fact that they used a diluted viscose solution instead of the usual concentrated solution, and measured its viscosity in an Ostwald viscosimeter instead of by the falling-sphere method. Under the latter conditions the normal behaviour is found. The ripening process was studied for different cellulose materials by means of both methods, and the fibre-forming capacity of the viscose was also measured. The change of viscosity as found by the falling-sphere method is always the same, whereas that found by means of the Ostwald viscosimeter varies with the kind of cellulose used. The change in the fibre-forming capacity follows the viscosity as measured by the former method, and Schuster's theory (B., 1926, 398) as to the fall of viscosity during ripening is not upheld; it is thought more likely to be due to the increased dispersion produced by the dissolution of the cellulose xanthate. From the present work it is concluded that the change of viscosity is due to two factors, viz., dispersion and structure formation, and that the former effect is completed during the first days of ripening. This would explain the differences obtained when the viscosity is measured in the above two ways. Measurements of the viscosity of viscose under a range of pressures in the Ostwald viscosimeter have been carried out, and the results may be tolerably well expressed by means of the Ostwald equation. Results of fibre thickness measurements for different pressures also show good agreement with this equation. It is deduced that fibre thickness is not directly proportional to the pressure—which is actually the case. B. P. RIDGE.

Viscose silk. (MISS) J. C. MEISS (Chem. Weekblad, 1929, 26, 170—176).—An account of the preparation of the viscose solution and the spinning for silk.

S. I. LEVY.

Influence of air in the manufacture and preparation of pure cellulose for high-quality viscose rayon. W. A. DYES (Chem.-Ztg., 1929, 53, 185—186).—Whilst the process of mercerisation changes only the physical characteristics of cellulose, the presence of air or oxygen during this treatment influences the decomposition of the cellulose and the pure cellulose content of the final product. Various patents are quoted in which precautionary measures are described for avoiding the decomposition of the cellulose during the manufacture of alkali-cellulose, and others are described in which advantage is taken of the use of air or oxygen to accelerate the ripening. With definite quantities of oxygen the reaction may be so controlled as to give the required decrease of viscosity of the viscose without causing a considerable reduction in the α -cellulose content of the product. The importance of the content of chemically unchanged pure cellulose in viscose rayons and of maintaining as high a value as possible for this content in high-quality materials is discussed.

B. P. RIDGE.

Influence of liquids on manufactured cellulose hydrate. W. LÜDKE (Kolloid-Z., 1929, 47, 341—351).—The problem considered is that of increasing the tenacity of moist artificial threads of cellulose hydrate by the addition of another substance to the thread. This was investigated by measuring the tenacity of the thread under various organic liquids. Reproducible results were obtained when the liquids were dried by sodium acetate, and for each liquid a characteristic alteration in the tenacity was found. The results show that the tenacity under most liquids is not only greater than that under water or aqueous electrolytes, but is also greater than that of the air-dried thread containing the normal amount of moisture. The swelling of cellulose hydrate in organic liquids is less than in water. The tenacity falls rapidly on addition of small quantities of water to the organic liquid, soon reaching the value obtained under water itself. Films of cellophane show a similar behaviour to the threads of cellulose hydrate. In general, the influence of a given liquid depends on its water content, its behaviour towards water, and its swelling effect. As a first approximation, the lowering of tenacity produced by a liquid is parallel with its surface tension. The greatest tenacity is therefore obtained with liquids such as ethyl ether, ethyl alcohol, and acetone, and the least with water. E. S. HEDGES.

Acetolysis of cotton cellulose. C. C. SPENCER (Cellulosechem., 1929, 10, 61—73).—The influence of temperature, duration of treatment, and sulphuric acid content of the reaction mixture on the yield of cellobiose octa-acetate in the acetolysis of cotton has been investigated. For each concentration of sulphuric acid used there is an optimum temperature which corresponds with the greatest yield. The maximum yield was obtained by the treatment of 2 g. of cotton (98.6% of α -cellulose) with 0.2 c.c. of sulphuric acid and 8 c.c. of acetic anhydride at 50.4° for 14 days; the mean yield

from nine experiments was 42.3% of the theoretical. The product had $[\alpha]_D +41^\circ$ to $+41.8^\circ$ and m.p. 227.5—228°. With the exception of a 50% yield referred to by Hess and Friese (A., 1927, 44), the present is the highest value so far recorded in the literature. Hess and Friese's method was also used in this investigation, but the yield obtained was only 37% of the theoretical. On the contrary, in place of the cellobiose octa-acetate mentioned by these authors, under certain conditions a quantity of glucose penta-acetate is obtained.

B. P. RIDGE.

Plasticity and solvation of cellulose esters. S. E. SHEPPARD, E. K. CARVER, and R. C. HOUCK (5th Coll. Symp. Mon., 1928, 243—252).—A discussion.

CHEMICAL ABSTRACTS.

Rags and their preparation for papermaking. R. H. CLAPPERTON (Proc. Tech. Sec. Papermakers' Assoc., 1928, 9, 34—48).—The various grades of rags used in the papermaking industry are described and an outline is given of the preliminary treatment which each grade requires and the classes of paper for which the resulting bleached pulp is most suitable.

D. J. NORMAN.

Dissection of wood fibrils by chemical means. G. J. RITTER (Ind. Eng. Chem., 1929, 21, 289—290).—Treatment of delignified spruce and elm fibres with 68—77% phosphoric acid at 60—65° for 15—20 min. causes separation of the fibrils (cf. A., 1928, 1162) into spindle-like bodies termed "fusiform bodies," which appear to be the smallest building units visible with the microscope.

F. R. ENNOS.

Bleaching of wood pulp. P. K. BAIRD and R. H. DOUGHTY (Pulp & Paper Mag., 1929, 27, 223—225).—A study of the effect of varying rates of agitation on the bleaching of wood pulp at consistencies of 2, 5, and 7% indicates that the rate of agitation, providing that it is sufficient to ensure a uniform reaction mixture, does not appreciably affect the total time of bleaching. The final whiteness of the pulp is, however, slightly lower at higher rates of agitation at the lower consistencies. It is concluded that the best results in the bleaching of wood pulp would be obtained if the pulp and bleaching solution were rapidly and efficiently mixed at the beginning of the process and were subsequently agitated but slightly or even not at all.

D. J. NORMAN.

Testing of wood pulps for strength. J. L. A. MACDONALD and G. A. CRAMOND (Proc. Tech. Sec. Papermakers' Assoc., 1928, 9, 130—146).—The problems associated with the evaluation of the strength of wood pulp are discussed and apparatus is described which permits of the preparation of test sheets from pulps both in the beaten and unbeaten states under standard conditions. Duplicate tests show a sufficiently close agreement for the purposes of mill control.

D. J. NORMAN.

Retention of clay in paper. F. W. BAILEY (Proc. Tech. Sec. Papermakers' Assoc., 1928, 9, 80—84).—A series of mill tests made during the manufacture of medium-sized super-calendered printing papers containing 50% of mechanical wood pulp indicate that clays of widely different degrees of "fatness" (as indicated by the bulk of a 5 or 10% aqueous suspension

of the clay after settling for varying periods of time) show no appreciable differences in retention.

D. J. NORMAN.

Quality control in the sulphite pulp industry. A. LAMPEN (Proc. Tech. Sec. Papermakers' Assoc., 1929, 9, 4—33).—See B., 1928, 564.

Evaluation of wood pulp. J. W. BERRIMAN (Proc. Tech. Sec. Papermakers' Assoc., 1929, 9, 114—119).

See also A., April, 383, **Deformation of fibrous materials** (HERZOG and JANCKE). 394, **Effect of temperature on viscosity and ease of precipitation of cellulose acetate** (WHITBY and GALLAY). 430, **Lignin and cellulose** (FREUDENBERG). **Alkylcelluloses** (SAKURADA). **Celluloseglycollic acid** (SAKURADA). **Cellulosexanthoacetic acid** (NAKASHIMA). **Cellulose-xanthamides** (NAKASHIMA).

Cellulose in peat. KOMAREVSKY.—See II.

PATENTS.

Treatment of stem fibres. C. E. BAHRE (B.P. 307,128, 14.12.27).—Flax straw or other stem fibres are treated in the field by mechanical means, with or without previous drying or fermentation, so as to remove the woody or foreign material covering the fibrous layer; the latter is then baled and subsequently treated by chemical means or by natural retting to obtain the 50% of spinning tow corresponding to 40% of cellulose fibre which it contains. [Stat. ref.] F. R. ENNOS.

Operation of pulp digestors. E. MORTERUD (U.S.P. 1,703,745, 26.2.29. Appl., 25.2.27).—In order to utilise economically the heat from the hot gases liberated in the digestion of wood pulp under pressure, the digesting liquor is conducted to a separate gas- and steam-liberating vessel, or a series of these, under reduced or gradually decreasing pressure, in which the gases are liberated in stages and the heat therefrom is accumulated in suitable apparatus such as a series of surface condensers; the digesting liquor is then returned to the digester.

F. R. ENNOS.

Production of [white sodium-]cellulose. E. HÄGGLUND (B.P. 292,534, 15.6.28. Ger., 21.6.27).—In order to increase the yield and strength of the cellulose produced, the raw material (wood) is first incompletely opened up by boiling with alkali so that separation of the fibre is just possible. It is then treated with chlorine and afterwards with bleaching powder, the bleaching being completed after washing with water and alkali by a further addition of bleaching powder. F. R. ENNOS.

Isolating cellulose. J. O. PEIRCE and W. T. REDDISH, ASSRS. to TWITCHELL PROCESS CO. (U.S.P. 1,703,830, 26.2.29. Appl., 14.10.26).—Used paper is re-pulped, treated with a sulphonated mineral oil reagent (sodium salt) to remove foreign matter such as ink, size, etc., washed, and made into new paper.

F. R. ENNOS.

Production of artificial threads by the cuprammonium stretch-spinning process. J. P. BEMBERG A.-G. (B.P. 283,923, 9.12.27. Ger., 20.1.27).—While under treatment in the acid channels, the threads are conducted through one or more V-shaped thread guides, which are adjustable in position in the channels, and are

made of wire or strip material, so that they can be produced accurately to a predetermined size and shape.

F. R. ENNOS.

Treatment of sulphite-pulp waste. J. T. TRAVERS, ASSR. to TRAVERS-LEWIS PROCESS CORP. (U.S.P. 1,699,258, 15.1.29. Appl., 21.6.27).—The sulphite-pulp waste-liquor is settled from suspended matter, passed through porous calcium carbonate, and treated with a mixture of either 1.6 lb. of calcium sulphate, 2.4 lb. of slaked lime, and 0.6 lb. of ferrous sulphate, or of 4.2 lb. of "solid waste" (from alkali plant), 1.5 lb. of calcium sulphate, 1.3 lb. of slaked lime, and 0.5 lb. of ferrous sulphate per 1000 gals. Waste dust from the precipitators in cement manufacture may be substituted for "solid waste" or for calcium sulphate in the first mixture, and dicalcium phosphate may replace the ferrous sulphate.

R. BRIGHTMAN.

Treatment of waste sulphite[-cellulose] liquor. G. C. HOWARD (U.S.P. 1,699,845, 22.1.29. Appl., 22.11.26).—The sulphite liquor is treated with an alkaline reagent to afford successively an inorganic precipitate practically free from organic matter, and a precipitate comprising the major part of the lignin content, and is finally treated with fresh lime or pulverised ash from combustion of the lignin precipitate, the fluid sludge separated at this stage being used in treating a fresh quantity of sulphite-liquor.

R. BRIGHTMAN.

Manufacture of paper. J. A. DE CEW (U.S.P. 1,704,728, 12.3.29. Appl., 21.2.28).—The paper stock is freed from gases before it is converted into paper.

F. G. CLARKE.

Treatment of waste [sulphite-cellulose] liquor. E. L. RINMAN (U.S.P. 1,699,808, 22.1.29. Appl., 15.4.26. Swed., 17.4.25).—See F.P. 627,752; B., 1929, 50.

[Continuous] treatment of [unretted] flax for spinning. M. WADDELL and H. C. WATSON (B.P. 308,667, 17.9.27).

Manufacture of [subdivided] artificial fibres. F. FERRAND (B.P. 308,645, 24.12.27).

Spinning pump for conveying viscose or other liquids. G. ARENDT and O. WEICHER (B.P. 293,801, 11.7.28. Ger., 12.7.27).

Insulating material (B.P. 293,293).—See XIII. **Fibres from skins.** (B.P. 290,154). **Fabrics resembling wash leather** (B.P. 307,189).—See XV. **Yeast** (U.S.P. 1,703,272).—See XVIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Colouring of small glass beads and of Christmas tree ornaments with aniline dyes. W. HANNICH (Chem.-Ztg., 1929, 53, 265—266).—The colouring mixture used consists of an emulsion of gelatin, gum arabic, gum tragacanth, or Senegal gum, with or without starch, in a solution of an aniline dye. Application of the mixture may be made by spraying or dipping.

A. R. POWELL.

Bleaching of wood pulp. BAIRD and DOUGHTY.—See V. **Tizerah extract.** VOGEL.—See XV.

PATENTS.

Dyes containing chromium (B.P. 282,783).—See IV. **Coloured building material** (B.P. 307,448).—See IX.

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

Vapour pressure of some salt solutions of importance in the ammonia-soda process. B. NEUMANN, R. DOMKE, and E. ALTMANN (Z. angew. Chem., 1929, 42, 279—283).—The vapour pressures at 0—40° of saturated solutions of ammonium hydrogen carbonate alone and in admixture with sodium hydrogen carbonate, or ammonium chloride, or both, have been determined. In solutions containing all three salts the vapour phase in equilibrium at 30° contains 12.9 mg./litre of ammonia in air and 6.9 mg./litre in carbon dioxide. At temperatures below 35° in air and 30° in carbon dioxide the vapour phase contains ammonium hydrogen carbonate which is completely dissociated above 40°. Under a pressure of 1.2 atm. of carbon dioxide there is a well-marked point at 25.9° at which the solution contains only sodium hydrogen carbonate and ammonium chloride; under 2.5 atm. pressure this point is at 27.8°. Below these points sodium chloride, and above them ammonium hydrogen carbonate, is found in the solution. Theoretically, no ammonia should exist in the gas phase below these points, but actually there is also a minute amount which is shown to be due to dissociation of ammonium chloride. The partial pressure of ammonia over saturated ammonium chloride solution at 20° is 7.5 mm. of mercury. The results of this work indicate that the most favourable temperature for conducting the ammonia-soda process is 30°. A. R. POWELL.

Iodometric determination of chromic oxide in potassium chromium alum. J. E. S. HAN (J. Amer. Leather Chem. Assoc., 1929, 24, 124—129).—Sodium peroxide (2 g.) is added gradually, with stirring, to 20 c.c. of a 2% solution of the sample mixed with 125 c.c. of water; the mixture is boiled for 30 min., filtered to remove ferric hydroxide and insoluble matter, and the filtrate titrated with 0.1N-sodium thiosulphate after adding potassium iodide and excess of acid. The ferric hydroxide may be dissolved in hot dilute sulphuric acid and determined colorimetrically or volumetrically.

D. WOODROFFE.

Composition of fluorides and fluosilicates sold as insecticides. R. H. CARTER and R. C. ROARK (J. Econ. Entomol., 1928, 21, 762—774).—Samples of commercial sodium fluoride contained: total F 40.3—43.9, NaF 89.2—98.8, NaHF₂O 0.04, Na₂SiF₆O 2.17, Na₂CO₃ 0—4.39, moisture 0.004—1.02, impurities 0.4—6.5%, p_H of 2% solution 6.8—10.5, cub. in. per lb. 21.9—51.2. Samples of commercial sodium fluosilicate contained: total F 57.1—60.3, Na₂SiF₆ 94.4—99.8, NaHF₂O 0.02—0.14, moisture 0.04—0.21, impurities 0.14—5.5%, p_H of 0.5% solution 3.1, cub. in. per lb. 22.6—28.5. The p_H of a 0.5% solution of commercial magnesium fluosilicate (100%) was 3.0—3.1. Results are also given for calcium fluosilicate, copper fluoride, barium fluoride, cryolite, and various

mixtures and dusting powders. The acidity of fluosilicate solutions may account for the burning of foliage. The addition of a small quantity of lime or sodium carbonate to fluosilicate to decrease the acidity converts some of the soluble fluosilicate into fluoride without increasing the p_H of the solution. The effect of crystal size on biological action is considered. CHEMICAL ABSTRACTS.

Influence of shaking on various precipitation reactions. G. THANHEISER and P. DICKENS (Arch. Eisenhüttenw., 1928—9, 2, 575—581; Stahl u. Eisen, 1929, 49, 430—431).—The use of the shaking apparatus previously described (cf. Bardenheuer and Dickens, Stahl u. Eisen, 1927, 47, 762) increases the grain size of barium sulphate and calcium oxalate precipitates, thereby increasing the rate of filtration, and accelerates the rate of precipitation of magnesium ammonium phosphate. In all cases shaking for 10 min. is sufficient. The grain size and rate of precipitation of ammonium phosphomolybdate are unaffected by agitation.

A. R. POWELL.

Wet purification method for hydrogen. I. LARYUKOV (Masloboino Zhir. Delo, 1928, No. 2, 6—7).—Hydrogen sulphide is removed from hydrogen obtained from water-gas by scrubbing with 5—10% sodium or potassium carbonate solution. The carbonate is regenerated by blowing hot air through the liquid.

CHEMICAL ABSTRACTS.

Purification of gases, especially chlorine, by repeated liquefaction. R. WASMUHT (Chem. Fabr., 1929, 145—147, 158—159).—No laboratory method exists for the preparation of chlorine, quite free from oxygen, on a reasonably large scale, or for its purification by chemical methods. Commercial chlorine containing 0.8% of impurities is best purified by liquefaction at -70° under atmospheric pressure using a mixture of solid carbon dioxide and acetone. The gas is first passed through sulphuric acid and further dried by freezing at -15° ; it then passes through a short steel cooling coil into a steel collecting vessel, these two being surrounded by the freezing mixture. Uncondensed impurities are drawn off by a filter pump. The apparatus is filled with chlorine gas before immersion in the freezing mixture. It is then suspended within a cooled Dewar flask against a counterpoise. The apparatus described yields 2.2 litres of liquid chlorine in 10 hrs. with a consumption of 20 kg. of carbon dioxide.

C. IRWIN.

Behaviour of carbon dioxide under pressure, and its possible industrial applications under moderate pressure. N. W. KRASE and J. B. GOODMAN (Chem. Met. Eng., 1929, 36, 162—163).—The reaction $\text{Ca}(\text{OAc})_2 + \text{H}_2\text{CO}_3 \rightleftharpoons \text{CaCO}_3 + 2\text{HOAc}$ was studied to ascertain whether higher pressures of carbon dioxide would move the equilibrium further to the right. Four experiments were undertaken at 800 and 2400 lb. pressure at temperatures varying from 20° to 200° on solutions with a fixed concentration of calcium acetate. The precipitated calcium carbonate was filtered off without releasing the pressure, and the amount of acetic acid liberated titrated after eliminating dissolved carbon dioxide. The experiments indicated that the concentration of acetic acid increased with temperature and

pressure, reaching 10% at 2400 lb. and 115° . Thus it may be possible to employ carbon dioxide under pressure in many chemical industries where a low concentration of hydrogen ions is required; the use of such a process would obviate neutralisation and subsequent filtration. Its possible application in, e.g., the conversion of starch into glucose is indicated. C. B. MARSON.

Recovery of sulphur dioxide from waste gases. G. WEISSENBERGER and L. PIATTI (Chem.-Ztg., 1929, 53, 245—247, 266—267).—The quantity of sulphur dioxide absorbed by methylcyclohexanone depends on the partial pressure of the gas in the waste gases and on the temperature. At 25° a maximum absorption of 0.25% of the weight of the absorbent is obtained from gases containing 0.3% of sulphur dioxide; with increasing concentration of sulphur dioxide the maximum absorption rises sharply up to 10%, then more slowly. With very dilute gas mixtures the presence of mercury accelerates absorption below and decreases it above 20° . Practically all the absorbed gas is expelled at 80° . The presence of sulphur trioxide in the gas mixture results in a slow sulphonation with the formation of a large proportion of lower-boiling compounds and some compounds of very high b.p., the liquid becomes dark brown in colour and fluorescent, and, on heating, a black flocculent precipitate forms. cycloHexanone behaves similarly to its methyl derivative, but the action of sulphur trioxide on it is much more severe. A. R. POWELL.

See also A., April, 399, **Two forms of crystalline beryllium hydroxide** (FRICKE and HUMME). 400, **System NaNO_2 — Na_2SO_4 — MgCl_2 — H_2O at 0° , 10° , 25° , 75° , and 100°** (LEIMBACH and PFEIFFENBERGER). 404, **Decomposition of nitrous oxide in the silent electric discharge** (JOSHI). 406, **Quantitative electrolytic reduction of nitric acid** (NIETZ). **Formation of hydrazine from ammonia by electrical discharge** (BREDIG and others). 407, **Electrolysis of cyanogen halides** (CLARK and STREIGHT). 411, **Nitrosylsulphuric acid** (JONES and others). **Preparation of pure hydrogen fluoride** (FREDENHAGEN and CADENBACH). 412, **Quantitative analysis with the spectrograph** (NITCKIE). 413, **Detection of bromide and iodide** (MURMANN). 414, **Micro-determination of iodine in organic materials** (REITH). **Determination of nitrous oxide gasometrically** (MENZEL and KRETZSCHMAR). **Determination of nitrite ion** (GERMUTH). 431, **Synthesis of cyanamide** (KADLEC-FLECK). 473, **Fixation of atmospheric nitrogen by Azotobacter** (MEYERHOF and BURK).

Washing powders. PHILLIPS and others.—See XIX.

PATENTS.

Manufacture of a colloidal absorption [product] of hydrogen chloride. V. A. LAPENTA (U.S.P. 1,699,596, 22.1.29. Appl., 17.8.27).—An infusion of agar-agar, e.g., 20 g. in 1 litre of hot water, is autoclaved for 25 min. at 30 lb. and filtered warm through asbestos wool. 250 c.c. of hydrochloric acid are added and kieselguhr or purified siliceous earth containing 5% of tricalcium phosphate is stirred in to give a stiff paste. The resulting cake is pulverised when dry, the free hydrochloric acid content being determined by extraction with 0.1N-sodium hydroxide. R. BRIGHTMAN.

Production of hydrocyanic acid. M. J. BROWN, Assr. to PACIFIC R. & H. CHEM. CORP. (U.S.P. 1,702,761, 19.2.29. Appl., 11.1.24).—Sulphuric acid and cyanide solution or slurry are run continuously into a shallow bowl with propeller agitator. Hydrogen cyanide is evolved through the heat of the reaction and dilution and escapes through a liquid trap to the receiver or absorbent. The liquid is immediately thrown over the edge of the bowl into the conical container, down which it passes into a vessel heated by a live-steam manifold. Spent liquor is discharged at one end of the heater and hydrogen cyanide escapes by a pipe through the liquid trap to the receiver. Liquid from the trap is by-passed to the mixing vessel.

R. BRIGHTMAN.

Complex hydrofluoric acids. M. BUCHNER (Austral. P. 1355, 8.4.26).—Hot complex fluorides or mixtures thereof are treated either with hydrogen or hydrogen compounds or with mixtures yielding hydrogen or hydrogen compounds.

J. S. G. THOMAS.

Manufacture of alkali cyanides. H. B. KIPPER (U.S.P. 1,699,362, 15.1.29. Appl., 7.5.26).—An intimate mixture of an alkali metal salt, carbon, and iron or iron and manganese, *e.g.*, manganese ore, as catalyst is charged into a rotating drum heated at 1000—1500°, to which air or producer gas, preheated to 500—1000°, is simultaneously admitted. The alkali cyanide is discharged and falls through a housing box into an externally heated stationary drum with rotating beating and pulverising and movable scraper bars wherein the conversion is completed in a nitrogen atmosphere. The reaction products are discharged to a closed chamber from which the gases escape; the cyanide, after cooling, is removed. Gases from the rotating drum escape upwardly from the housing box, and, after scrubbing, the carbon monoxide is mixed with air and used to preheat the air or producer gas supply. R. BRIGHTMAN.

Production of water-glass solutions. I. G. FARBENIND. A.-G. (B.P. 299,763, 1.8.28. Ger., 31.10.27).—Alkali lyes containing alkali chlorides, obtained by the electrolysis of alkali chloride solutions, are heated in autoclaves under a pressure of, *e.g.*, 20—30 atm., with silica or siliceous material.

L. A. COLES.

Manufacture of sodium hydrogen pyrophosphate. J. N. CAROTHERS and C. F. BOOTH, Assrs. to FEDERAL PHOSPHORUS CO. (U.S.P. 1,699,093, 15.1.29. Appl., 13.1.26).—61% phosphoric acid solution, containing less than 0.6% of iron and aluminium phosphates, is neutralised to methyl-orange with sodium carbonate, and the solution (d^{25} 1.56) is filtered and crystallised, the sodium dihydrogen phosphate being dehydrated with air at 150° and converted into sodium hydrogen pyrophosphate by heating at 240° for about 8 hrs.

R. BRIGHTMAN.

Manufacture of metallic nitrates. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 306,998, 1.12.27).—A nitrite obtained by the action of nitrous gas on the metal oxide or carbonate is treated with oxygen or gases containing oxygen in the presence of water at a pressure of 15 atm. or higher and above 150°, a catalyst, *e.g.*, an alkali hydroxide, being employed.

W. G. CAREY.

Manufacture of anhydrous metallic chlorides. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 307,524, 7.11.27 and 14.7.28).—Material containing metal oxides, *e.g.*, bauxite or kaolin in the manufacture of aluminium chloride, is treated in a well-insulated shaft furnace with a current of carbonyl chloride freshly prepared by the action of chlorine on carbon monoxide in the presence of a catalyst and heated to about 550° by its heat of formation. Coal is preferably mixed with the furnace charge, so that the issuing gases contain a high proportion of carbon monoxide and are thus suitable for the manufacture of fresh supplies of carbonyl chloride.

L. A. COLES.

Production of calcium molybdate. A. KISSOCK (B.P. 280,240, 7.11.27. U.S., 6.11.26).—Molybdenum ores, concentrated to contain about 80—90% of molybdenum sulphide, are roasted to convert the sulphide into the trioxide and, on completion, sufficient lime is added to convert the trioxide into calcium molybdate. The two processes are preferably effected in a single roasting furnace, *e.g.*, of the multiple-hearth type, the lime being fed on to one of the lower hearths and the temperature during the formation of the molybdate being maintained at about 760°.

L. A. COLES.

Production of cobalt carbonyl. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 307,112, 3.12.27).—Increased yields are obtained in the manufacture of cobalt carbonyl from cobalt and carbon monoxide by excluding oxidising agents during the preparation of the metal and by passing the carbon monoxide over a catalyst of an oxide of manganese or copper or a mixture of these oxides to remove free oxygen.

W. G. CAREY.

Production of hydrogen and gas mixtures containing the same. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 307,529, 2.12.27).—Mixtures of air, oxygen, or carbon dioxide, and steam, if desired, with gaseous, liquid, or solid carbonaceous material, *e.g.*, methane, gases obtained in the distillation of coal, tars, oils, etc., but excluding products obtained in the conversion of saturated into unsaturated hydrocarbons, are subjected to the action of the electric arc, and the gas mixtures obtained are treated with steam to convert carbon monoxide into carbon dioxide and hydrogen, the carbon dioxide and other impurities being removed from the product. A mixture of nitrogen and hydrogen suitable for the synthesis of ammonia is obtained by using air as the oxidising gas, and subsequently adding hydrogen, prepared, *e.g.*, by a similar process using carbon dioxide instead of air, to adjust the mixture to the correct proportion.

L. A. COLES.

Production of hydrogen sulphide. R. F. BACON (U.S.P. 1,700,578, 29.1.29. Appl., 5.5.27).—Hydrogen is passed through molten sulphur at 250—300° under 5—10 atm. with thorough agitation, volatilised sulphur being subsequently condensed.

R. BRIGHTMAN.

Sulphur composition and its manufacture. G. ELLIS, Assr. to ELLIS-FOSTER Co. (U.S.P. 1,699,694, 22.1.29. Appl., 4.4.25).—Sulphur is dispersed with starch, gum tragacanth, and highly colloidal clay; *e.g.*, 9 pts. of sulphur, 1 pt. of bentonite, and 20 pts. of water in a ball mill give a dispersion 40 pts. of which

incorporated with 60 pts. of wood flour and hot-moulded at 130–140° and 1000 lb. gives a product of 35–65% greater transverse strength than is obtained from undispersed sulphur.

R. BRIGHTMAN.

Manufacture of alkali nitrate. W. WILD and C. BECK, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,699,643—4, 22.1.29. Appl., 12.5.27. Ger., 8.7.26).—See B.P. 283,771—2; B., 1928, 230.

Purification of solutions of metal [zinc] salts. A. VOHL and W. WACHTENDORF (U.S.P. 1,706,196, 19.3.29. Appl., 3.1.27. Ger., 24.12.25).—See B.P. 263,809; B., 1928, 124.

Disintegrated alumina. C. VON GIRSEWALD, H. SIEGENS, and M. MARSCHNER, Assrs. to METALLGES. A.-G. (U.S.P. 1,704,599, 5.3.29. Appl., 28.5.27. Ger., 8.5.26).—See B.P. 284,131; B., 1928, 231.

Production of salt from brines and solutions. F. B. DEHN. From MARTIN-COLVIN Co. (B.P. 308,746, 28.12.27).—See U.S.P. 1,657,633; B., 1928, 230.

Treatment of iron pyrites (B.P. 307,188 and 307,190). **Separation of metals from cyanide solution** (U.S.P. 1,699,350).—See X. **Granular fertilisers** (B.P. 307,575). **Non-hygroscopic phosphates** (U.S.P. 1,706,101).—See XVI.

VIII.—GLASS; CERAMICS.

Devitrification of glass. P. VILLARD (Compt. rend., 1929, 188, 969–972).—Devitrification of glass is not produced by the individual action at 750–950° of any one of the furnace gases (illuminating gas, air, hydrogen, carbon dioxide, etc.), and in certain cases these gases may restore devitrified glass to its polished state. Hydrogen containing 1% of oxygen, however, produces devitrification owing to the removal of sodium or potassium by reduction of the silicate by atomic hydrogen, and the flame of the emergent gas is coloured by the alkali metal. Devitrification may therefore be avoided by the use of gases burnt as completely as possible, e.g., by addition of air or oxygen at a high temperature.

J. GRANT.

Kilns and kiln firing. I. S. R. HIND (Trans. Ceram. Soc., 1929, 28, 26–52).—A general summary is presented of the results of an extensive investigation of a number of industrial kilns firing ceramic building materials, refractory materials, and pottery. Exhaustive numerical data are given in tabular form. The characteristics of the different types of kilns—round down- and up-draught, continuous chamber, continuous ring, continuous tunnel (muffle and open-fire)—are discussed in detail. Attention is directed to the effect of setting density on the fuel consumption, and to the relative merits of gas firing and direct coal firing.

F. SALT.

Effect of substituting high-silica sand for some grades in lime-bonded silica bricks. W. HUGILL and W. J. REES (Trans. Ceram. Soc., 1929, 28, 62–64).—Three series of bricks bonded with 2% of lime were prepared, the first containing only Totley ganister, the second 9.6% of Lynn sand between 20- and 100-mesh and 90.4% of ganister, of which 51% passed through a 100-mesh sieve, and the third, in which all the ganister

grades smaller than a 30-mesh were replaced by sand. The bricks were fired to cone 16, and the sp. gr., porosity, and mechanical properties were determined. The sand was more readily inverted than the ganister, and its use, up to 10%, may be advantageous. The third series of bricks was unsatisfactory; they showed a lower bulk density and a higher porosity.

F. SALT.

Properties and specifications of silica bricks for coke ovens. H. KNUTH (Feuerfest, 1929, 5, 21–26).—The requirements which silica bricks for coke ovens are expected to fulfil are outlined, and the physical and chemical properties and methods of testing which determine or give an indication of the quality of the bricks are critically reviewed. Theoretical considerations and practical experience indicate that sufficient criteria of the quality of a brick are given by tests determining the refractoriness under load, the sp. gr., and the porosity. Ten buyers' specifications are quoted and discussed in detail. On the basis of the data presented, it is suggested that a specification prescribing a minimum silica content of 93%, a minimum refractoriness of cones 32/33, a refractoriness under a load of 2 kg./cm.² of 1500–1600°, a maximum sp. gr. of 2.38, and a total porosity of 26–28% by vol. (maximum) would suffice for industrial purposes.

F. SALT.

Application of colloid chemistry to the study of clays. I. A. E. J. VICKERS (Trans. Ceram. Soc., 1929, 28, 91–100).—A bibliographical review is presented, the object of which is to re-state problems confronting the student of clays in terms of colloid chemistry. Modern views on the nature of colloids are outlined.

F. SALT.

Selenium-red as a ceramic colour. J. H. POLGREAN (Trans. Ceram. Soc., 1929, 28, 87–90).—The selenium-red colour was produced successfully with a mixture of 20% of selenium oxide and 80% of cadmium sulphide. The colour was destroyed at temperatures above 800°. A suitable borax flux which fused at about 700° was developed. The best results were obtained on a biscuit surface and on a matte glazed surface. It was not successful as an on-glaze colour.

F. SALT.

See also A., April, 400, **Reduction of fused silicates by carbon monoxide** (BOGITCH). 411, **Action of silica, alumina, and kaolin on barium sulphate** (MARCHAL). 419, **Collapsing temperature of laboratory glass tubing** (LAUBENGAYER). 420, **Pink kaolin, and ruthenium as minor constituent of Tanokami kaolins** (IMORI and YOSHIMURA).

Heat-conduction problems. GRIFFITHS.—See I. **Gasworks carbonising plant.** GILL.—See II. **Colouring of glass beads etc.** HANNICH.—See VI.

PATENTS.

Sealing or jointing of glass and quartz. S. G. S. DICKER. From N. V. PHILIPS' GLOEILAMPENFABR. (B.P. 307,994, 22.12.27).—Use is made of a glass free from alkali metals and containing at least 75% SiO₂, more than 6% B₂O₃, and small amounts of alumina, lime, or magnesia.

J. A. SUGDEN.

Ovens for ceramic products. O. MOLLE, and ATELIERS J. HANREZ, Soc. ANON. (B.P. 307,815, 14.12.27).

—A labour-saving kiln operation is described. The products are set on a slab, which is then conveyed to and from its position in the chamber or gallery by a system of special trucks.
J. A. SUGDEN.

Refractory material. J. G. DONALDSON and H. L. COLES, Assrs. to GUARDIAN METALS Co. (U.S.P. 1,703,662, 26.2.29. Appl., 4.2.26).—A mixture of zirconia, silica, and an excess of graphite is fused and cooled. This material is then heated and molten metal poured round it. A union is effected between the two.

J. A. SUGDEN.

Refractory coating material for furnace installations. C. LEAN. From VEREIN F. CHEM. U. MET. PROD. (B.P. 307,580, 16.1.28).—Finely-divided material such as alumina, zirconia, zirconium silicate, thoria, etc. is mixed with a plastic refractory clay or bauxite together with small quantities of water-soluble salts (e.g., sulphates, phosphates, fluorides, borates). The product is plastic, burns on at low temperatures, and, being very dense, resists slag attack. Hydraulic binders may also be used, and give great strength in the unburnt state.

J. A. SUGDEN.

Refractory building material. G. KNUDSEN, V. M. GOLDSCHMIDT, and R. KNUDSEN (B.P. 307,391, 3.9.27. Addn. to B.P. 260,298; B., 1928, 232).—Hydrated magnesium silicates, more especially serpentine, may replace the talc in the process whereby the material is heated with magnesia in the presence of small amounts of accelerators to form magnesium orthosilicate. (Cf. also B.P. 301,547; B., 1929, 131.)

J. A. SUGDEN.

Manufacture of solid bodies of high density [from refractory materials]. GEN. ELECTRIC CO., LTD., Asses. of PATENT-TREUHAND GES. F. ELEKTR. GLÜHLAMPEN M.B.H. (B.P. 292,997, 14.6.28. Ger., 29.6.27).—Powdered material (first compressed) is sintered at high temperature. The porous body is then compressed at a lower temperature between members which offer no resistance to lateral expansion. A body is obtained with a density 85% of that attained by fusion.

J. A. SUGDEN.

Polishing and grinding material. B. SZILARD (U.S.P. 1,704,308, 5.3.29. Appl., 14.6.24. Fr., 18.6.23).—A colloidal solution prepared from titanium oxide and a titanium salt is precipitated to obtain a very fine powder.

J. A. SUGDEN.

Treating glass plates and the like to prevent moisture affecting their transparency. O. DEMARET (U.S.P. 1,705,453, 12.3.29. Appl., 19.4.27. Belg., 27.4.26. Renewed 12.10.28).—See B.P. 267,428; B., 1927, 365.

[Refractory linings in] furnace construction. W. ROHN, Assr. to VACUUM-SCHMELZE GES. M.B.H. (U.S.P. 1,704,902, 12.3.29. Appl., 12.12.24. Ger., 24.12.23).—See B.P. 226,801; B., 1925, 850.

Manufacture of splinterless glass. G. F. BASTER (B.P. 308,482, 3.4.28).

Enamelling metal (U.S.P. 1,704,586). Castings to be enamelled (B.P. 307,674).—See X.

IX.—BUILDING MATERIALS.

Hydrated Portland cement as a colloid. A. H. WHITE (5th Coll. Symp. Mon., 1928, 349—360).—Only the exterior surfaces of cement particles react with water; on drying and re-wetting, fresh colloid is formed before swelling of the gel previously formed prevents the penetration of more water. The swelling and shrinking of cement blocks which were alternately wetted and dried have been followed over a number of years. It is computed that the water is compressed to about half its volume.

CHEMICAL ABSTRACTS.

Density of wood substance, adsorption by wood, and permeability of wood. A. J. STAMM (J. Physical Chem., 1929, 33, 398—414).—The apparent density of wood substance in water, organic liquids, and various aqueous solutions has been determined at 25° by means of a Gay Lussac pycnometer and compared with the true density at 25° determined by displacement of helium. The heartwood of seven different soft woods and two hard woods in the form of wood meal, dried to constant weight at 105°, was the material used. Particle size is without effect on density. The values of d obtained by means of helium are slightly less than those obtained with water, and are greater than those obtained with non-polar organic liquids. Alaska cedar wood gives values of d which increase with an increase in polarity of the displaced liquid, the density, viscosity, and compressibility of which are without effect on the apparent density. The true density of the heartwood of the Sitka spruce in helium, and the apparent densities in water and benzene, decrease with a rise in temperature over the range 10° to 40°, the coefficient of cubic expansion being $3.7 \times 10^{-4}/1^\circ$, approximately three times the expansion in external dimensions shown by a block of the same wood. The densities of the constituents of wood substances are also compared. The presence of solutes such as glycerin, acids, alkali, and chlorides in the displacement medium depresses the apparent density, the depression increasing exponentially with an increase in concentration. This effect with potassium hydroxide is abnormally large, and a slight permanent depression remains after its removal. Hydrogen, nitrogen, and oxygen are only slightly adsorbed by wood; chlorides are selectively and apparently hydrolytically adsorbed to a slight extent from aqueous solution. Potassium hydroxide is considerably adsorbed. The finer structure of wood is apparently impermeable to non-polar liquids.

L. S. THEOBALD.

Compressive and transverse strength of brick. J. W. MCBURNEY (J. Amer. Ceram. Soc., 1929, 12, 217—229).

See also A., April, 388, Solubility of calcium sulphate from 0° to 200° (PARTRIDGE and WHITE). 410, Reactions between colloidal silica and lime (JOLIBOIS and CHASSEVENT).

Heat-conduction problems. GRIFFITHS.—See I.

PATENTS.

Roasting cement in a rotary kiln. O. LELLEP (B.P. 288,192, 2.4.28. Ger., 2.4.27).—Raw pulverised material is granulated by sprinkling with water while

in motion (cf. B.P. 292,987; B., 1929, 306), and falls upon a travelling grate. Here it is dried and partially sintered by the waste gases from the rotary kiln which are drawn through the grate. The material then falls into the rotary kiln, which may be much shorter than is usual. The thermal efficiency is much increased.

J. A. SUGDEN.

Manufacture of cement and the like. A. C. DAVIS (B.P. 307,763, 11.10.27).—A new type of kiln is described. A vertical kiln is heated by four burners (coal, oil, etc.) at the bottom. The raw material in the form of powder or slurry is projected from jets placed below the burners through and upward with the flames. The velocity of the hot gases is adjusted so that the spray is kept suspended until drying and clinkering is complete. The consequent increase in density causes the particles to fall back through the flames and collect in the bottom of the kiln. The waste heat of the gases and clinker is utilised by boilers or for preheating the air. The flame temperature and gas velocity are adjusted so that the material is suspended sufficiently long to attain the clinkering temperature of 1400°. The flames may be given a swirling motion to concentrate them at the bottom of the kiln. The clinker produced is already in a fine state of division and facilitates subsequent grinding.

J. A. SUGDEN.

Cementitious material. E. H. S. BROWNE and A. M. SARGINT (B.P. 307,625, 5.3.28).—Powdered glass is mixed with zinc sulphate and sufficient potassium silicate solution to give working consistency. With choice of suitable zinc salt it is acid-resistant. After setting, treatment with certain solutions (e.g., calcium chloride) promotes further hardening.

J. A. SUGDEN.

Packing of cement. K. CHRISTENSEN (B.P. 307,970, 16.12.27).—The dry cement is compressed into a solid block and wrapped in paper.

J. A. SUGDEN.

Manufacture of moulded pieces by using hydraulic binding material. J. C. SEAILLES and SOC. LAP (B.P. 307,638, 23.3.28).—Liquid hydraulic mixture is poured into the mould which is rapidly vibrated. Excess of water collects on the surface and is run off. The material is then in such a state that it may be removed immediately (before it has set) and allowed to set apart from the mould.

J. A. SUGDEN.

Insulating material and its manufacture. C. E. HITE, ASSR. to UNIVERSAL GYPSUM & LIME Co. (U.S.P. 1,702,729, 19.2.29. Appl., 21.4.24).—Starch material is converted into an aqueous paste by agitating and heating, e.g., to 87°, and the paste is mixed with 0.5% of sulphuric acid and transferred to a lead-lined storage tank, whence it is mixed continuously with comminuted calcined gypsum containing 10–12% of carbonates, silicates, or similar impurities. The plastic mixture may be discharged direct on to the surface of paper liners for the production of wall-board.

R. BRIGHTMAN.

Manufacture of bricks. F. BANDINI (B.P. 307,550, 12.12.28).—The wet clay containing not less than 20% of moisture is heated to about 95°, extruded through a heated machine, and cut up into bricks. These may then be dried in a humidity dryer in

10 hrs. Abrupt changes of temperature are avoided throughout.

J. A. SUGDEN.

Coloured building material. G. H. HADFIELD, and SAND & SHINGLE, LTD. (B.P. 307,448, 8.12.27 and 4.9.28).—Sand or finely-divided stone, granite, etc. is mixed with a colouring matter (minerals such as glauconite or aniline dyes) together with sufficient Portland cement to bind to a weak, friable mass. This is then broken down again. The colour-retaining properties of this material may be enhanced by the incorporation of a small amount of oily matter.

J. A. SUGDEN.

Plaster. J. E. UNDERWOOD and C. A. CABELL, ASSRS. to NAT. LIME ASSOC. (U.S.P. 1,703,125, 26.2.29. Appl., 21.4.26).—A mixture of hydrated lime, hydrated calcium aluminate, a carbonate, a sulphate, and a retarder is claimed.

H. ROYAL-DAWSON.

Manufacture of marble plaster (artificial marble). L. E. CHASSEVENT (U.S.P. 1,703,097, 26.2.29. Appl., 26.4.27. Fr., 7.5.26).—A mixture of plaster and water is compressed so that the amount of water remaining in the product corresponds to that necessary for the conversion of plaster into gypsum.

H. ROYAL-DAWSON.

Fireproofing and preservation of wood. F. S. VIVAS, ASSR. to INTERNAT. FIREPROOF PRODUCTS CORP. (U.S.P. 1,702,285, 19.2.29. Appl., 11.3.27).—Green wood is treated with 5% sodium hydroxide solution at 100° for about 1½ hrs. to remove resins. The container is evacuated and the wood is treated at 150 lb./in.² and 80° with an aqueous solution of, e.g., 2.5 pts. of calcium chloride, 0.5 pt. of ammonium chloride, and 0.5 pt. of boric acid in 10 pts. of water. The wood is dried with hot air, treated at 150 lb./in.² with a solution of, e.g., 2.5 pts. of zinc sulphate and 2.5 pts. of aluminium sulphate in 100 pts. of water, and finally treated for 6 hrs. with hot water.

R. BRIGHTMAN.

Bituminous or like emulsions. J. A. MONTGOMERIE (B.P. 308,051, 16.2.28).—A small amount (1–5%) of fatty acid pitch of vegetable and/or animal origin is added to the material, which is poured into a hot dilute alkaline solution. In some cases a solution of the material in a suitable solvent (e.g., naphtha) is used. A soap (e.g., 0.25% of sodium laurate) may be added to the emulsion to increase the spreading or wetting power.

J. A. SUGDEN.

Manufacture of water pastes of bituminous emulsions. L. C. JONES, C. C. LOOMIS, and H. W. BANKS (U.S.P. 1,699,536—7, 22.1.29. Appl., 8.8.24).—(A) Disintegrated bituminous material, e.g., 150 pts. of crude Trinidad asphalt, is ground with 135 pts. of water in a ball mill and 15 pts. of gasoline or other volatile hydrocarbon solvent for the bitumen are added, grinding being continued to produce a smooth paste. A small quantity of soap or other alkaline dispersing agent may be added. (B) The bituminous material is dispersed, e.g., by melting 54 pts. of blown asphalt (softening pt. 55°) containing 7% of soft coumarone resin, and pouring intermittently into the thin paste obtained from 10 pts. of China clay and 13.5 pts. of denatured alcohol, further alcohol being added to maintain the creamy viscous condition of the mix.

R. BRIGHTMAN.

Wood-preserving means. K. H. WOLMAN (U.S.P. 1,700,010, 22.1.29. Appl., 9.11.23. Ger., 25.9.23).—See B.P. 229,179; B., 1925, 284.

Production of floor, roof, and wall coverings [of fabric, rubber, and bitumen]. M. H. TATE (B.P. 308,504, 1.5.28).

Drying and/or otherwise treating timber. C. GOODALL (B.P. 308,743, 28.12.27).

Treatment of sulphite-pulp waste (U.S.P. 1,699,258).—See V. **Refractory building material** (B.P. 307,391).—See VIII.

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

Properties of Thomas rail-steel. E. H. SCHULZ and A. WIMMER (Stahl u. Eisen, 1929, 49, 385—388).—The mechanical and wearing properties of Thomas steel are shown by a review of the literature and by comparative tests on two steels to be at least equal to those of Siemens-Martin steel for the manufacture of rails. A. R. POWELL.

Brittleness in mild steel. G. R. BOLSOVER (Iron and Steel Inst., May, 1929. Advance copy. 15 pp.).—Mild steel rods which have been extended 15% or more become brittle on tempering at about 250°, whereas undeformed rods after similar heat-treatment remain ductile. At the room temperature the impact resistance of tempered deformed rods falls from 90 to 10 ft.-lb., but increases again with rise of testing temperature to a maximum at 25° with steel quenched and tempered prior to cold work, at 80° with normalised steel, and at 100° with steel very slowly cooled from 950°. With increasing phosphorus content the extent to which the impact resistance is decreased in any of the above conditions is increased, especially if the steel has been reheated after cold-working. A. R. POWELL.

Experiences with the Lurgi sinter apparatus. M. BLAU (Stahl u. Eisen, 1929, 49, 388—392).—Experiments on the briquetting of iron ore from the Geier mine containing 25—27% Fe, 16—17% Mn, 13—15% SiO₂, 8% Al₂O₃, 8—10% of combined water, and 24% of moisture are described. The ore is ground to 10 mm., without drying, in a special mill and mixed with 10% of coke in an Erko mixer. The mixture is conveyed by mechanical means to a charging bin where it is moistened with 4—5% of water and discharged on to a layer of previously sintered ore in the Lurgi sinter apparatus. Ignition is effected by means of gas from an anthracite gas-producer, and sintering proceeds by drawing a current of air through the mass the thickness of which should not exceed about 30 cm. Full working details and cost data are given. A. R. POWELL.

Magnetic roasting of iron ores. W. LUYKEN and E. BIERBRAUER (Arch. Eisenhüttenw., 1928—9, 2, 531—543; Stahl u. Eisen, 1929, 49, 466—467).—Reduction of ferric oxide ores at 500° for 30 min. or at 700° for 10 min. in coal gas or producer gas affords a highly magnetic ferrosferric oxide, but for good results on a commercial scale close grading of the particle size is essential. By continuing the reduction

to obtain ferrous oxide and then roasting this product at 500° in the air a highly magnetic form of ferric oxide is obtained which is readily separated from the gangue by means of a weak magnetic separator; in this case no grading of the ore is necessary, and there is no danger of oxidation or reduction proceeding too far as is possible in the first case. A. R. POWELL.

Dimensions, working conditions, and efficiency of German electric steel furnaces. S. KRIZ (Stahl u. Eisen, 1929, 49, 417—425).—The results of a questionnaire to German steel smelters are summarised, and data are given for numerous types of electric steel furnaces. A. R. POWELL.

Economics of various refining agents in the Siemens-Martin process. S. SCHLEICHER (Stahl u. Eisen, 1929, 49, 458—462).—The efficiencies and costs of various types of iron ore and of rolling-mill scale in reducing the carbon content of iron during the refining process in the open-hearth furnace are compared. The rate of decarbonisation of the iron is not affected by oxygen content of the ore, which is of importance only in determining the amount of ore required. A high content of silica in the ore necessitates a larger addition of lime and results in greater losses of iron in the slag. On the basis of the analysis of the ore, the cost of ore and lime, and the loss of iron in the slag the costs of the various types of ore for removing 100 kg. of carbon from the iron are calculated. A. R. POWELL.

Case-hardening [of steel] in cyanide baths. F. RAPATZ (Stahl u. Eisen, 1929, 49, 427—429).—Steel takes up both nitrogen and carbon from a fused cyanide bath, the outer surface layers being richer in nitrogen than in carbon, but the rate of diffusion of carbon into the interior is much greater than that of nitrogen. The best results are obtained at 850°, the depth of penetration being about 0.6 mm. in 2 hrs.; at 950° the amount of carbon taken up is only about half that absorbed at 850° in the same time, but the nitrogen absorption is only slightly less. The process is particularly adapted to the treatment of small articles and for replacing carbon lost from the surface layers during heat-treatment. A. R. POWELL.

Determination of hydrogen in steel. T. E. ROONEY and G. BARR (Iron and Steel Inst., May, 1929. Advance copy. 8 pp.).—An apparatus is described in which the determination is made by heating the metal in pure nitrogen in an electrically heated silica tube and measuring the volume of hydrogen evolved by means of the Shakespear katharometer. A. R. POWELL.

Molybdenum steels and their use in permanent magnets. A. F. STOGOFF and W. S. MESSKIN (Arch. Eisenhüttenw., 1928—9, 2, 595—600; Stahl u. Eisen, 1929, 49, 429—430).—Steel with 0.9—1% C and 2—2.5% Mo has considerably better magnetic properties than the usual tungsten and chromium magnet steels, but the decrease in the magnetic moment by ageing is approximately the same. The highest values for the remanence and coercivity are obtained by quenching in water from 800°; a slightly lower temperature gives much lower values for these properties, whereas a slightly higher temperature has little effect. Complete

dissolution of the molybdenum carbide into solid solution does not occur below 1100°; at 800° the alloy has a granular pearlitic structure. A. R. POWELL.

Tungsten in the chemical industry. H. ALTERTHUM (*Z. angew. Chem.*, 1929, 42, 275—278, 308—314).—A review of recent journal and patent literature showing the many new uses of tungsten in alloys resistant to wear and corrosion and in various products for the chemical industry. A. R. POWELL.

Rise of the break in the tensile strength curve of metals due to strain and ageing. GALIBOURG (*Compt. rend.*, 1929, 188, 993—995).—The curves representing the variation of the rise for extra-soft steel as a function of time are hyperbolæ of the form $x = ay/(b - y)$, where x is the time of ageing, y the difference between the final load of the first strain and the load corresponding with the break in the second strain curve, and a , b are constants. The rate of rise increases with the temperature, the temperatures of ageing between the first and second strains being 12.5—14.5°, 50—53°, and 175—180°. Pure nickel aged at 175—180° also showed the phenomenon.

J. GRANT.

Influence of the dimension of the test pieces in viscosity tests of metallurgical products. J. COURNOT (*Compt. rend.*, 1929, 188, 995—997; cf. B., 1926, 161).—Experiments at 15—200° and 200—350° on aluminium (99.9%) and commercial duralumin wire, respectively, annealed at 350°, showed that the practical limit of viscosity increases with the diameter (1—2.8 mm.) at a rate which is rapid for the fine wires, but appears to approach an asymptotic value for the thicker wires. In the latter case the temperature has only a slight influence on the rate of increase. The phenomena are more marked for duralumin.

J. GRANT.

See also A., April, 384, **Properties of copper-antimony alloys** (STEPHENS and EVANS). **Recrystallisation of aluminium** (VAN ARKEL and VAN BRUGGEN; BURGERS and BASART). 388, **Properties of iron-copper alloys** (KUSSMANN and SCHARNOV). **Influence of rate of cooling on structure of eutectics** (TAMMANN and BOTSCHWAR). 398, **Activities of molten alloys of thallium with tin and with lead** (HILDEBRAND and SHARMA). **System magnesium-zinc** (HUME-ROTHERY and ROUNSEFELL). **Cadmium-rich alloys of system cadmium-gold** (DURRANT). 399, **Silver-copper eutectic** (LEROUX and RAUB). 406, **Catalysis by metals of platinum group** (LEVI). 412, **Quantitative analysis with the spectrograph** (NITCKIE).

Heat-conduction problems. GRIFFITHS.—See I. **Metals and brewing.** MATTHEWS.—See XVIII.

PATENTS.

Furnace. T. T. SCOTT, ASS. to SCOTT FURNACE Co. (U.S.P. 1,703,460, 26.2.29. Appl., 21.8.26).—In a furnace of the reverberatory type air conduits are formed between the bridge and the end wall, this space being partially arched to the level of the bridge walls. Fuel is blown into the end of the furnace to meet the air passing over the bridge. C. A. KING.

Furnace treatment of metal and metalliferous material. AMER. RADIATOR Co., Assees. of D. H. MELOCHE (B.P. 289,007, 26.3.28. U.S., 19.4.27).—The bottom of a metal-melting furnace of cupola type is packed with broken refractory material which supports the charge to be melted. Powdered fuel is burned in one or more tubular combustion chambers, which are attached to the cupola and downwardly inclined so that the combustion gases pass through the bed of refractory material and upwards around the metal in the furnace.

C. A. KING.

Apparatus for melting and casting. H. L. COLES and J. G. DONALDSON, ASSRS. to GUARDIAN METALS Co. (U.S.P. 1,703,658, 26.2.29. Appl., 3.7.26).—An electric melting furnace comprises a heating chamber provided with a passage way through which a series of material-conveying troughs pass continuously in such a way that their contents are brought below a single series of arc electrodes which are positioned to melt simultaneously all of the material in each trough as it passes below them.

A. R. POWELL.

Annealing furnace. T. CARTWRIGHT (B.P. 307,522, 3.11.27).—A tunnel furnace having two lines for trucks is divided by arches and baffle walls into six chambers of which only the two middle chambers are heated to maximum temperature. Material for annealing, e.g., metal plates, is conveyed in opposite directions so that heat transference will take place in the end portions of the furnace. The furnace is suitable also for roasting ores.

C. A. KING.

Sheet-steel annealing. P. A. MEEHAN, ASSR. to AMER. DRESSLER TUNNEL KILNS, INC. (U.S.P. 1,703,630, 26.2.29. Appl., 11.8.27).—A layer of diatomaceous material is placed between each pair of superposed layers of sheet metal.

H. ROYAL-DAWSON.

Reduction of iron ores. M. LAMBOT (B.P. 301,011, 22.3.28. Belg., 23.11.27).—A mixture of iron ore and excess of carbonaceous material is fed into a rotary chamber heated externally so as to reduce the ore and partially carbonise the reduced metal. The mixture is discharged continuously into a vertical furnace chamber in which carbonisation is completed, and from the lower end of which the outlet of material to a fusion furnace can be regulated by means of a slide valve. C. A. KING.

Obtaining iron from ores. VEREIN. STAHLWERKE A.-G. (B.P. 297,097, 29.5.28. Ger., 16.9.27).—Iron ores are chlorinated with ammonium chloride with or without calcium or magnesium chloride in a current of hydrogen chloride, and the product is subjected to fractional sublimation to obtain pure ferric chloride, which is reduced to iron by heating in a current of hydrogen, the hydrogen chloride so formed being used for the regeneration of ammonium chloride by interaction with the ammonia liberated in the first stage.

A. R. POWELL.

Reduction of ore and conversion of hydrocarbons. W. H. SMITH (B.P. 288,193, 26.8.27. U.S., 4.4.27).—Iron ore is passed in fine streams through a retort into which a stream of heavy hydrocarbon oil is injected preferably above the reduction zone. Cracking takes place with the deposition of carbon on the ore particles and the production of vapours of lower hydrocarbons

and a gas relatively rich in methane and hydrogen. As the carbon-coated particles fall through the hot zone of the retort they are reduced to sponge iron, in the presence of which the excess of hydrogen and carbon react to produce methane. Several modifications of the process are described.

A. R. POWELL.

Treatment of iron pyrites. S. I. LEVY and G. W. GRAY (B.P. 307,188 and 307,190, 10.2.28).—(A) Iron pyrites containing copper, lead, and zinc is heated at 700° out of contact with the air so as to expel sulphur and leave a residue of ferrous sulphide, which is digested with hydrochloric acid to obtain ferrous chloride solution, hydrogen sulphide, and an insoluble portion with a high copper content. The filtered solution is electrolysed to remove lead and evaporated to recover ferrous chloride crystals, which are dehydrated and heated in air and/or steam to obtain ferric oxide and hydrochloric acid. This acid is mixed with the mother-liquors from the crystals and the mixture used for decomposing further quantities of ferrous sulphide, the cycle being repeated until the mother-liquors are sufficiently rich in zinc to repay treatment for its recovery. The copper residues are roasted and leached to extract copper and zinc, and the sulphur dioxide formed is allowed to react with the hydrogen sulphide produced earlier, the excess of the latter being burnt in a Claus burner to obtain sulphur. (B) Pyrites is heated in chlorine under conditions which ensure expulsion of sulphur and arsenic and sublimation of the zinc and lead as chlorides. The residual copper and ferrous chloride are extracted with boiling water and the filtered solution is cooled to obtain ferrous chloride crystals. The mother-liquor and washings from the crystals are treated with scrap iron to separate the copper, then electrolysed to remove lead, and returned for the extraction of further quantities of the chlorinated ore. The ferrous chloride crystals are dissolved in water and the solution is electrolysed to obtain pure iron and chlorine for further chlorination.

A. R. POWELL.

Roasting of pyritic ores. NAT. PROCESSES, LTD.; and S. ROBSON (B.P. 307,439, 8.11.27).—Raw pyrites is mixed with 3—5 times its weight of previously roasted ore, and the mixture is roasted in a Dwight-Lloyd blast-roasting apparatus to obtain a gas rich in sulphur dioxide.

A. R. POWELL.

Manufacture of lined metal containers. W. E. BALLARD (B.P. 307,573, 7.1.28).—Iron or steel drums are lined with lead by the usual method; the bottom is also provided with a lead lining, then fixed into position and, after filling the container with a cooling liquid, is welded on so that, by maintaining the liquid under slight pressure, a water-tight joint is obtained.

A. R. POWELL.

Enamelling metal. W. J. BECK and J. A. AUPPERLE, ASSTS. to AMER. ROLLING MILL Co. (U.S.P. 1,704,586, 5.3.29. Appl., 16.11.23).—A steel very similar to mild steel, but containing an amount of silicon which, though insufficient to spoil the deep drawing and spinning property, forms a bond with the enamel, is used in the process.

J. A. SUGDEN.

Treatment of castings to be enamelled. W. ECKHOFF and L. DEUSSENER (B.P. 307,674, 23.6.28).—

Development of pinholes is avoided by mixing the dry enamel or treating the surface with a highly inflammable material such as petrol, thus preventing moisture from entering pores in the metal surface.

J. A. SUGDEN.

Ingot mould. D. J. GILES, ASST. to LATROBE ELECTRIC STEEL Co. (U.S.P. 1,703,442, 26.2.29. Appl., 6.12.26).—A mould for casting steel ingots is formed from a cast-iron alloy containing 0.25—3% Cr.

H. ROYAL-DAWSON.

Separation of copper from nickel. I. W. WILENCHIK (U.S.P. 1,703,329, 26.2.29. Appl., 16.4.28).—Copper-nickel alloys are fused with sulphur, sodium sulphate, calcium sulphate, and coke, whereby, on settling, two layers are obtained the lower of which consists of nickel sulphide and the upper of sodium copper sulphide.

A. R. POWELL.

Separation of precious metals and copper from cyanide solution. L. H. DUSCHAK, ASST. to OLIVER CONTINUOUS FILTER Co. (U.S.P. 1,699,350, 15.1.29. Appl., 1.10.25).—The solution is treated with an amalgam, e.g., zinc or sodium amalgam, containing a metal electropositive with regard to copper till most of the precious metals are removed. The copper is then removed by further treating with a fresh portion of amalgam and the solution used in treating fresh ore.

R. BRIGHTMAN.

Smelting of manganese [ore]. A. G. BETTS (U.S.P. 1,703,657, 26.2.29. Appl., 23.11.25).—Manganese silicate ore is smelted with a sulphide of iron to obtain metallic iron, manganese sulphide, and a ferrous silicate slag. The manganese sulphide layer is converted into oxide, which is reduced to metal in the usual way.

A. R. POWELL.

Anti-friction metal. R. J. SHOEMAKER, ASST. to S. & T. METAL Co. (U.S.P. 1,703,212, 26.2.29. Appl., 23.12.27).—A lead alloy containing 1—5% Sn, 0.1—1% Ca, 0.02—0.3% Mn, and 0.02—0.1% Al is claimed.

H. ROYAL-DAWSON.

Preparation of refractory metals. J. W. MARDEN, T. P. THOMAS, and J. E. CONLEY, ASSTS. to WESTINGHOUSE LAMP Co. (U.S.P. 1,704,257, 5.3.29. Appl., 12.2.23. Renewed 8.2.27).—The oxides of metals such as uranium, thorium, etc. are reduced by heating with a mixture of an alkaline-earth metal and halide.

J. A. SUGDEN.

Refractory [metal] article. C. F. LORENZ, ASST. to WESTINGHOUSE LAMP Co. (U.S.P. 1,704,256, 5.3.29. Appl., 24.4.22).—A crucible is composed of tungsten powder sintered to tungsten wool.

J. A. SUGDEN.

Compound for hardening metals. W. MORRELL (B.P. 307,233, 5.4.28).—A carburising mixture consists of equal parts of rock salt and potassium ferrocyanide, together with naphthalene or camphor.

C. A. KING.

Manufacture of lead-antimony alloys for use in sheathing electric cables etc. STANDARD TELEPHONES & CABLES, LTD. From MATÉRIEL TÉLÉPHONIQUE (B.P. 307,543, 10.12.27).—An alloy containing 98.5—99% Pb, 1.2%—0.8% Sb, and 0—0.5% Cu is claimed. The copper and antimony are added in the form of an alloy containing 86% Pb, 13% Sb, and 1% Cu.

A. R. POWELL.

Production of grey cast iron. H. HANEMANN, Assr. to EDELGUSSVERBAND G.M.B.H. (U.S.P. 1,705,972, 19.3.29. Appl., 27.5.26. Ger., 25.11.25).—See B.P. 262,043; B., 1927, 819.

Production of zinc. C. MATZEL, Assr. to F. KRUPP GRUSONWERK A.-G. (U.S.P. 1,705,128, 12.3.29. Appl., 13.7.26. Ger., 20.7.25).—See B.P. 255,482; B., 1927, 448.

Hydrometallurgically treating material containing lead and zinc values. W. H. CORBOULD (U.S.P. 1,706,143, 19.3.29. Appl., 31.3.26. Austral., 28.7.25).—See B.P. 273,420; B., 1927, 658.

[Gyratory] fore-hearths for cupola furnaces. L. F. C. GIRARDET (B.P. 286,295, 21.2.28. Fr., 4.3.27).

Electrodeposition of chromium (U.S.P. 1,705,954).—See XI.

XI.—ELECTROTECHNICS.

Behaviour and effects of chlorine as an impurity in the lead accumulator. J. T. CRENNELL and A. G. MILLIGAN (Trans. Faraday Soc., 1929, 25, 159—165).—The addition of hydrochloric acid corresponding with 0.8 g. of chlorine to a lead accumulator results in the reduction of the lead peroxide of the positive plate to lead sulphate. The chlorine liberated then diffuses to the negative plate, the spongy lead of which is oxidised to lead sulphate while the chlorine is reduced to hydrochloric acid and is available for another cycle (cf. B., 1927, 528). The rate of self-discharge thus produced was calculated approximately from Fick's diffusion law on the above assumptions, but the value obtained (0.03 amp.-hr./hr.) was only half that observed, probably on account of the capacity loss due to the formation of lead sulphate on the surface of the plates. The chlorine is removed slowly by evaporation, or rapidly by charging for about 3 cycles. Wooden sheet separators may be bleached or disintegrated, but the effect on the life of the plates is small though perceptible. J. GRANT.

Effect of copper as an impurity in the lead accumulator. J. T. CRENNELL and A. G. MILLIGAN (Trans. Faraday Soc., 1929, 25, 165—168).—Additions of up to 0.1 g. of copper (as copper sulphate dissolved in 7.5*N*-sulphuric acid) to the lead accumulator have only negligible effects on the rates of sulphation and capacity loss. Comparison of the hydrogen overvoltage at a pure copper surface with the *E.M.F.* of the lead-lead sulphate reaction indicates that local action at the negative plate in the presence of copper is negligibly slow. J. GRANT.

Interfacial tension measurements in the examination of insulating oils. J. C. EDWARDS (J. Sci. Instr., 1929, 6, 90—95).—A semi-automatic device is described for obtaining relative values of the interfacial tension between oils and dilute acid solutions. Drops of acid, formed under a constant-pressure head, at the end of a capillary tube dipping under the surface of the oil, fall through the oil, making contact on the way between a pair of lead electrodes. The electrodes are connected, through a relay, to an automatic counter, so that the number of drops of the acid formed from a given volume may be determined, and hence the interfacial tension between the oil and acid solution. It was

found that the electrical stress between the electrodes was without effect on the results, which were reproducible to within 1.5%. Subject to the elimination of kinetic energy effects in the formation of the drops, the pressure head was not critical. The method has been applied to a study of the deterioration of oils through heating to 115° in an open vessel. The interfacial tension falls in a curve roughly hyperbolic over a period of 7 days. F. G. TRYHORN.

See also A., April, 385, **Superconductors** (DE HAAS). 388, **Magnetic properties of iron-copper alloys** (KUSSMANN and SCHARNOV). 402, **Potential of the nickel electrode** (HARING and BOSCHE). **Hydrogen overvoltage of alloys** (RAEDER and EFJESTAD). 404, **Decomposition of nitrous oxide in the silent electric discharge** (JOSHI). 406, **Formation of hydrazine from ammonia by electrical discharges** (BREDIG and others). **Quantitative electrolytic reduction of nitric acid** (NIETZ). 413, **Simple reference electrode for potentiometric titrations** (WILLARD and BOLDYREFF).

Steels for magnets. STOGOFF and MESSKIN.—See X.

PATENTS.

Electric furnaces. J. C. WOODSON [A], and O. A. COLBY [B], Assrs. to WESTINGHOUSE ELECTRIC & MANUF. Co. (U.S.P. 1,705,697 and 1,705,717, 19.3.29. Appl., [A] 20.10.27, [B] 7.11.27).—(A) Means for handling a sinuous resistance heating element for insertion into or removal from an electric furnace are described. (B) Resistance elements covering the floor and side walls are supported upon a frame having wheels running upon a track, so that the resistors can be removed as a unit from the furnace. J. S. G. THOMAS.

Electric furnace. R. J. WALKER (U.S.P. 1,706,010, 19.3.29. Appl., 11.6.28).—A grid, having adjacent plane sides at right angles and opposite plane sides parallel, is arranged with its sides inclined to the furnace wall. J. S. G. THOMAS.

Electric resistance furnace. BIRMINGHAM ELECTRIC FURNACES, LTD., and A. G. LOBLEY (B.P. 308,009, 11.1.28).—Zig-zag or flat-coil resistance units are directly supported by integral or attached ribs or beadings projecting from the faces of the lining bricks or blocks of the furnace, and form channellings or housings to contain the resistance units, in such manner that practically the whole surface of the resistance units radiates heat. J. S. G. THOMAS.

Temperature-responsive magnetic material. I. F. KINNARD, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,706,172, 19.3.29. Appl., 11.11.25).—The temperature-permeability characteristic of a copper-nickel alloy containing 40—20% Cu, 60—80% Ni, and a small amount of iron approaches unity at about 100° and increases almost uniformly with decrease of temperature below 100°. J. S. G. THOMAS.

Electrical insulating material. W. S. SMITH, H. J. GARNETT, and H. C. CHANNON (B.P. 307,390, 2.9.27).—Cable insulation is prepared by dissolving gutta-percha and/or balata in a suitable solvent and removing dirt by decantation or filtration. If desired, resins may be

extracted by means of a solvent, and an antioxidant, *e.g.*, tannin, may be added to the purified product.

J. S. G. THOMAS.

Insulating materials [for under-water cables etc.] and their production. W. E. BEATTY. FROM BELL TELEPHONE LABS., INC. (B.P. 307,966, 15.12.27).—Rubber is treated with water at above 100°, *e.g.*, 125°, for sufficient time to cause at least 99.9% of the nitrogenous matter in the rubber to be removable by subsequent washing. A sample of the heat-treated material, 1.27 mm. thick, after immersion for 4 weeks in a 3.5% solution of sodium chloride, should have a dielectric constant not less than 3 and a specific conductance not more than 20×10^{-6} microhm⁻¹ cm.⁻¹ when subjected to an alternating current of 1000 cycles/sec.

J. S. G. THOMAS.

Preparation of luminescent tubes. P. F. J. LEBRUN (U.S.P. 1,704,981, 12.3.29. Appl., 26.8.27).—A high-tension current is passed through a rarefied mixture of air and a conducting alcoholic vapour before the tube is filled with luminescent gas.

J. S. G. THOMAS.

Röntgen tube. F. ECKERT, Assr. to SENDLINGER OPTISCHE GLASWERKE G.M.B.H. (U.S.P. 1,703,391, 26.2.29. Appl., 5.8.24. Ger., 13.8.23).—To enable Röntgen tubes to be easily fashioned, they are made of easily fusible glass containing a rare earth.

F. G. CLARKE.

Process for securing good electrical contact with crystalline cuprous oxide. A. K. CROAD. FROM HANOVIA CHEM. & MANUF. CO. (B.P. 307,962, 14.12.27).—Finely-divided surfacing metal or metals, *e.g.*, silver, copper, nickel, is deposited on the surface of the crystal from a solution or an anode composed of the metal to be deposited. Thus, *e.g.*, the crystal covered with iron dust is placed in a solution of copper sulphate whereby copper is deposited on the crystal. Alternatively, metallic nickel may be deposited on the electrolytically reduced surface of the crystal to form a nickel bronze.

J. S. G. THOMAS.

Electrolytic deposition of chromium. R. AUERBACH, Assr. to CHROMEPLATE, INC. (U.S.P. 1,705,954, 19.3.29. Appl., 6.1.27).—Freshly made silicic acid is added to a solution of chromic acid and the solution electrolysed.

J. S. G. THOMAS.

Electrolytic cell. W. E. KERSHAW and J. L. WOODRIDGE (B.P. 307,452, 8.12.27).—Electrodes of nickel or nickel alloy, devoid of active material, are immersed in a solution of an alkaline hydroxide, *e.g.*, sodium hydroxide, to which a soluble chromate may be added.

J. S. G. THOMAS.

[Cleaning electrodes of] electrolytic devices. H. O. SIEGMUND, Assr. to WESTERN ELECTRIC CO., INC. (U.S.P. 1,705,944, 19.3.29. Appl., 2.9.26).—Electrodes, after immersion in an unsaturated solution of potassium hydroxide and rinsing with water, are immersed in a bath composed of equal parts of dilute nitric and hydrofluoric acids and rinsed in water.

J. S. G. THOMAS.

Preparing lead electrodes for electric storage batteries. I. G. FARBENIND. A.-G. (B.P. 291,032, 23.5.28. Ger., 24.5.27).—Admixed metal is eliminated from plates consisting of lead alloy supported in a lead

grating, by electrolysis at ordinary temperatures in sulphuric acid of *d* 1.10, employing a current density of about 1.2 amp./dm.²

J. S. G. THOMAS.

Preventing explosive gas mixtures from being formed in the casings of electrical apparatus enclosed in an insulating medium. M. BUCHHOLZ (B.P. 307,570, 2.1.28).—Vapours or gas mixtures formed within the casings actuate electrical devices which control plant for supplying air to, or exhausting air from, the casing, switch off the current, and actuate a visible or audible signal.

J. S. G. THOMAS.

[Apparatus for] lead-covering of electric cables etc. by extrusion. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., and E. E. JUDGE (B.P. 308,521, 2.6.28).

Electric discharge tubes. S. G. S. DICKER. FROM N. V. PHILIPS' GLOEILAMPENFABR. (B.P. 307,982 and 308,879, 21.11.27 and 5.3.28).

Electric luminous tubes. Devices for production of ultra-violet radiation. N. V. INTERNAT. OCTROOIBUREAU, Assees. of F. MEYER, H. J. SPANNER, and E. GERMER (B.P. 282,064, 6.12.27, and 285,068, 7.12.27. Ger., [A] 10.12.26, [B] 11.2.27).

Negative secondary battery plates. D.P. BATTERY CO., LTD., and J. WADDELL (B.P. 308,283, 21.9.27).

Gas producer (U.S.P. 1,703,505). Photochemical gas reactions (B.P. 307,406 and 307,521). Refining mineral oils (U.S.P. 1,700,347).—See II. Apparatus for melting (U.S.P. 1,703,658). Treatment of iron pyrites (B.P. 307,188 and 307,190). Alloys for cables etc. (B.P. 307,543).—See X. [Liquid] insulating material (B.P. 293,293).—See XIII.

XII.—FATS; OILS; WAXES.

Splitting of fats. G. PETROV and N. SOKOLOV (Oil Fat Ind., Russia, 1928, No. 1, 28—30).—After agitation with steam in presence of sulphuric acid (5%, 25% of the fat) and zinc, aluminium, and sodium sulphates (total, 10% of acid), linseed oil, sunflower oil, animal fat, and hydrogenated vegetable oil were saponified with "kontakt" (2%) and sulphuric acid (0.2%), the emulsions being broken up by adding 0.2—0.5% of calcium sulphate and agitating with steam for 10—15 min. For linseed and sunflower oils the transparency is increased by the preliminary treatment, but the colour is not improved; for animal fat and hydrogenated vegetable oil the colour was improved.

CHEMICAL ABSTRACTS.

Bleaching vegetable and mineral oils and animal fats with clay. I. S. ELAKOV (Trans. State Exp. Inst. Silicates, Moscow, 1927, No. 21, 67—72).—The adsorptive power of clay is unconnected with the presence of magnesia. Crystalline clays are less efficient than colloidal clays; fine clays have a high decolorising power. Clays suspended in water are more efficient than the original clays. The water in clays is a hindrance in their use as decolorising agents.

CHEMICAL ABSTRACTS.

Fats. X. Thiocyanometric examination of fats containing linolenic acid. Analysis of linseed oil. H. P. KAUFMANN and M. KELLER (Z. angew. Chem.,

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1929, 42, 73—76; cf. B., 1929, 135).—Addition of thiocyanogen takes place at only two of the three double linkings of linolenic acid, the end-point being, however, sharp, and unaffected by excess of thiocyanogen or prolonged reaction. For the analysis of linseed oil, the sample is hydrolysed in absence of oxygen, and after removal of unsaponifiable matter the pentane solution of the fatty acids is dried and the iodine value (I) of the total fatty acids is determined by the bromometric method using 2 hrs.' and 24 hrs.' reaction. The thiocyanogen value (T) is similarly determined, using 0.1—0.2 g. and a large excess (200%) of acetic acid-thiocyanogen solution but no solvent. For fats containing linolenic acid $N/7.5$ -thiocyanogen solution is recommended. The proportion of saturated acids (S) is now determined by Bertram's method, and the composition of the total fatty acids is calculated from the approximation equations: Oleic acid (O) = $(100 - S) - 1.104(I - T)$; linoleic acid (L) = $(100 - S) - 1.104 \times (2T - I)$; linolenic acid (Ln) = $-(100 - S) + 1.104T$, in which $S + O + Lo + Ln = 100$. Similarly, the proportion of saturated acids in a mixture of oleic acid, linoleic acid, and saturated acids is given by $S + 100 - 1.108T$, or $S = 100 - 1.120T + 0.008I$, and the oleic and linoleic acids are given by $O = 1.112(2T - I)$, $Lo = 1.104(I - T)$. The mixture of linoleic acid and linolenic acid obtained from Calcutta linseed oil after separating oleic acid as lithium oleate from the liquid fatty acids and fractionation of the remaining lithium salts gave iodine value 235 and thiocyanogen value 146, from which the composition of the mixture was calculated as linolenic acid 58.2%, linoleic acid 41.8%, and linolenic acid 60.3%, linoleic acid 39.7%, respectively; isolinolenic acid also appears to combine with only 2 mols. of thiocyanogen. R. BRIGHTMAN.

Rapid determination of water in fats and glycerin. V. TSCHERNUISHEV (Oil Fat Ind., Russia, 1928, No. 1, 17—18).—The fat is pressed on a weighed filter paper, when the water is absorbed; the sample and paper are dried at 105°. Glycerin is poured on to a weighed filter paper, dried at 80°, powdered sodium sulphate is added, and the whole is extracted in a thimble with dry acetone. CHEMICAL ABSTRACTS.

Iodine value in relation to origin and age of olive oil. E. DE'CONNO and D. RAGO (Annali Chim. Appl., 1929, 19, 98—107).—Of olive oils from three different sources, those from Lucca have higher iodine values (103) than those from Sorrento (102), and still higher than those from Bari (97). Thus the proportion of glycerides of unsaturated acid in the oil varies with the quality of the soil and with the climatic conditions. The iodine value falls if the oil is kept, the diminution being marked during the six months following extraction, there being a tendency to assume a stable limiting value. T. H. POPE.

Fruits and seeds of *Aleurites Fordii* from Kenya Colony. ANON. (Bull. Imp. Inst., 1929, 27, 10—12).—The seeds produced in Kenya from those of Chinese origin closely resemble the latter and give a similar or slightly higher yield of tung oil of the same character. F. R. ENNOS.

Fruits and seeds of *Hydnocarpus Woodii* from

North Borneo. ANON. (Bull. Imp. Inst., 1929, 27, 12—16).—The oil from *Hydnocarpus Woodii* seeds contains the glycerides of both hydnocarpic and chaulmoogric acids, in this respect resembling the oil from the seeds of *H. Wightiana*. F. R. ENNOS.

Oil from *Carthamus tinctoris* (safflower oil). J. ZUKERVANIK (Acta Univ. Asiæ Med., 1928, 6, 3—19).—The unshelled seeds from *C. tinctoris* grown in Mid-Asia contain up to 25% of oil having the following composition: linolenic and isolinolenic (0.0—0.5%), linoleic (39—50%), oleic (34—37%), palmitic (5—6%), and stearic (3—4%) acids, glyceryl residue (C_3H_2) 4.6%, and unsaponifiable matter (0.5—1.0%). The physical and chemical constants differ only slightly from those of safflower oils from other parts of the world, and the oil can be put to the same economic uses. Oil from the shelled seeds is suitable for edible purposes. Detailed experiments on exposure of the oil to air and light under varying conditions showed that the iodine value decreased; the acetyl value, acid value, and refractive index increased; the viscosity increased; and the colour was bleached. Oxidation is slower in the dark, in the absence of air, and at low temperatures. The Meigen-Neuberger thallium salt method for the separation of fatty acids gave much better results than the Varrentrapp process. E. H. SHARPLES.

Antirachitic factor in burbot-liver oil. B. CLOW and A. MARLATT (Ind. Eng. Chem., 1929, 21, 281—282).—Burbot-liver oil is an excellent source of the antirachitic vitamin, being eight times as potent as cod-liver oil. It is not known whether this difference is due to the inherent property of the oils or to a variation from one sample to another. F. R. ENNOS.

Application of castor oil in soap manufacture. N. SPASSKI (Masloboino Zhir. Delo, 1928, No. 2, 34—35).—The use of castor oil increases the lathering power of soap and its solubility in cold water. The necessary increase in the concentration of the salting-out electrolyte decreases the proportion of water in the soap. CHEMICAL ABSTRACTS.

Oxidation and polymerisation of ethyl esters from linseed acids. G. PETROV and N. SOKOLOV (Oil Fat Ind., Russia, 1928, No. 2, 35—36).—Ethyl esters of the products of the splitting of linseed oil with "kontakt" were distilled with steam. The fraction 210—230° had acid value 14.0, iodine value 194.7, saponif. value 188.44, and d 0.8921. Comparative drying experiments were performed with linseed oil, fatty acids, and ethyl esters. The formation of a linoxyn skin is due to the presence of glycerol and unsaturated acids. CHEMICAL ABSTRACTS.

Sulphonated oils. II. Hydrolysis of ricinoleo-sulphuric acid or its sodium salt. K. NISHIZAWA and K. WINOKUTI (Chem. Umschau, 1929, 36, 97—102).—The hydrolysis of the pure sodium ricinoleo-sulphate (cf. B., 1929, 363) was systematically studied. 0.1M-Aqueous solutions of the salt are hydrolysed to the extent of 2.86% and 18.54% after 5 hrs. at 75° and 100° respectively. 0.1M-Aqueous solutions were quite stable for 24 hrs. in the presence of equal volumes of solutions of hydrochloric acid of 0.1N—10N at 25°;

physical differences in appearance, viscosity, etc. were, however, noticed. At 100° the salt is fairly rapidly attacked by hydrochloric acid, the rate depending on the concentration; complete hydrolysis was effected by equal volumes of *N*- and *2N*-hydrochloric acid in 35 and 20 min. respectively; the corresponding times of hydrolysis by sulphuric acid were 50 and 30 min., and the use of this acid for the determination of the organic sulphate by the volumetric method is recommended as satisfactory provided suitable concentrations are chosen and the boiling is sufficiently prolonged. Solutions of the sodium ricinoleosulphate are stable to aqueous alkali at the ordinary temperature; at 100° the stability decreases with dilution of the alkali; the degree of saponification, however, produced by alcoholic caustic soda increases with increasing concentration of the reagent.

E. LEWKOWITSCH.

Determination of organically combined sulphur in sulphonated oils. K. H. BAUER (Chem. Umschau, 1929, 36, 102). Further experiments confirm that determinations of organic sulphate in sulphonated oils by the American volumetric method agree with those made by Herbig's gravimetric method; sulphuric acid effects complete hydrolysis, but the boiling must be more prolonged than when hydrochloric acid is used, corresponding to the difference in hydrogen-ion concentration of the two acids (cf. Nishizawa and Winokuti, preceding abstract).

E. LEWKOWITSCH.

Determination of neutral fat in sulphonated oils. R. HART (J. Amer. Leather Chem. Assoc., 1929, 24, 120—121).—The neutral fat may be calculated from the saponification value determined in the usual way. The alcoholic solution of a weighed amount of the sulphonated oil is rendered neutral to phenolphthalein before saponification. The amount of organically combined sulphur trioxide eliminated by this saponification is negligible. The neutral fat is expressed as oleic acid. Good agreement is shown by comparative tests on 10 samples using the saponification method and the difference method.

D. WOODROFFE.

See also A., April, 417, **Extraction apparatus** (GAŠPERÍK). 423, **Products of partial hydrogenation of higher mono- and poly-ethylenic esters** (HILDITCH and VIDYARTHI). 440, **Reactions of cholesterol** (BAHL). 476, **Oxidative capacity and peroxidic-oxygen content of cod-liver oil** (DELORE). 477, **Jute seed oil** (SEN). [Fat from] **rind of California oranges** (MATLACK). 478, **Microscopical differentiation of neutral and hydrolysed fat** (HEUPKE).

Sunflower seed as feeding-stuff. WEISER and ZAITSCHEK.—See XVI. **Germicidal soaps.** HAMPIL.—See XXIII.

PATENTS.

Treatment of heavy vegetable oil. H. S. ADAMS and L. MEUSER, Asss. to NAUGATUCK CHEM. Co. (U.S.P. 1,697,337, 1.1.29. Appl. 13.1.26).—Castor oil flows slowly and continuously in a thin stream through an inclined nichrome tube heated at 450—500°. Yields of 25% of crude 85% heptaldehyde are obtained. Other material inert to heptaldehyde at 450° may be used for the cracking tube. Undecenoic acid is separated by steam-distillation of the condensate. R. BRIGHTMAN.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Nitrocellulose finishes. B. CAMPBELL (J. Oil & Colour Chem. Assoc., 1929, 12, 61—81).—A comprehensive dissertation on nitrocellulose lacquers, their historical development, raw materials used therein, considerations involved in their formulation, and the effects on related chemical fields of their development.

S. S. WOOLF.

Relation of composition to properties of lacquer solvents. R. CALVERT (Ind. Eng. Chem., 1929, 21, 213—215).—Nitrocellulose solvents are usually oxygen-compounds containing carbonyl, hydroxyl, and ether groups, and these are increasingly incompatible with resins with increase in oxygen content. Blending with hydrocarbon resin solvents and oxidation of the resin are expedients adopted to surmount this difficulty. The hydrolysis of esters is discussed from the viewpoint of the liberation of undesirable acid content in lacquers, and it is pointed out that an ester of a strong acid may be expected to hydrolyse more rapidly in a lacquer than an ester of the same alcohol with a weaker acid.

S. S. WOOLF.

Lifting of varnishes by lacquer solvents. H. E. HOFMANN and E. W. REID (Ind. Eng. Chem., 1929, 21, 247—249).—The lifting effects of one-, two-, and three-component solvent and diluent mixtures on varnish films of various types and ages were noted. In the hydrocarbon group, petroleum distillates cause least lifting, whilst of alcoholic solvents the lower members are the most desirable from this point of view, but small quantities of less volatile members of lifting tendency have nevertheless to be used. Short-oil varnishes are less affected by lacquer solvents than are long-oil varnishes. Little difference was noted between the lifting of linseed oil and tung oil varnishes by lacquer solvents, although linseed oil varnishes were more readily lifted by alcoholic solvents and less readily affected by hydrocarbons and ester solvents than tung oil varnishes. Over a period of three months, ageing was not found to have the anticipated effect of decreasing lifting by lacquer solvents, but more prolonged tests are deemed advisable. A brushing lacquer incorporating a solvent mixture of very little lifting tendency is formulated.

S. S. WOOLF.

Pyroabietic acid from French rosin. E. FONROBERT and A. GRETH (Chem. Umschau, 1929, 36, 93—97).—French rosin was heated at 250° for 168 hrs. and then distilled *in vacuo* (cf. Dupont and Dubourg, Bull. Inst. Pin, 1928, 51, 181), giving a 50% yield of crude pyroabietic acid (distilling at 200—225°/2—2.5 mm.) in the form of a pale yellow resin, which crystallised from acetone in white prismatic needles, m.p. 172—177°, rising continuously on recrystallisation. By careful repeated recrystallisations from acetone and alcohol this product was separated into two isomerides (about 90% of *d*-acid). The less soluble acid (*l*-pyroabietic acid) showed the properties of a monocarboxylic acid, and had m.p. 194°, $[\alpha]_D^{20} -15.2^\circ$, saponif. value 184.3, and a constitution corresponding to $C_{20}H_{30}O_2$. The more fusible, more soluble dextrorotatory "*d*-pyroabietic acid" corresponded closely with Dupont and Dubourg's pyroabietic acid and had m.p. 156—158°, $[\alpha]_D^{20} +37.5^\circ$,

aponif. value 184.4. The iodine value (Hanus) of a mixture of the acids (m.p. 168°) was 137.4. The m.p. of mixtures of the *d*- and *l*-acids lie between the values for the pure individuals, and since only very small, or no, depression of the m.p. was observed in mixtures of these acids with ordinary abietic acid from French rosin, these three acids must have similar structures. Examination of specimens of Dupont's acid and of the crystalline deposit from old rosin oils (French) revealed the presence of some *l*-pyroabietic acid.

E. LEWKOWITSCH.

Turpentine oil from larch turpentine. SCHIMMEL & Co. (Ber. Schimmel, 1928, 101; Chem. Zentr., 1928, ii, 1827).—Turpentine from *Larix decidua*, Miller, yielded on distillation in steam an oil (14.6%) having d^{15} 0.8661, $\alpha_D -9^\circ 32'$, n_D^{20} 1.47220, acid value 0, ester value 7.5. A larch turpentine oil from the Tyrol had d^{15} 0.8637, $\alpha_D -12^\circ 3'$, n_D^{20} 1.46717, acid value 0, ester value 1.9.

A. A. ELDRIDGE.

Elemi oil. SCHIMMEL & Co. (Ber. Schimmel, 1928, 24; Chem. Zentr., 1928, ii, 1827).—The oil (15.9%) from Columbian Carana-elemi resin had d^{15} 0.9683, $\alpha_D +18^\circ 34'$, n_D^{20} 1.50448, acid value 5.0, ester value 22.4, ester value after acetylation 42.9. The first runnings of the oil contained phellandrene.

A. A. ELDRIDGE.

Nature and constitution of shellac. I. W. H. GARDNER and W. F. WHITMORE (Ind. Eng. Chem., 1929, 21, 226—229).—The best solvents for shellac are the alcohols, organic acids, and ketones, indicating the presence of hydroxyl, carboxyl, and carbonyl groups in the resin. The apparent tendency to give colloidal solutions in these solvents and the lack of solubility in most other solvents suggest a complex molecular aggregation in the solid state and a high mol. wt. The colloidal nature of shellac and its solutions is manifested by swelling that accompanies preliminary dissolution with many solvents, the rapid rise in viscosity with concentration of solution, its adhesive properties, etc.

S. S. WOOLF.

See also A., April, 449, **Indian turpentine from *Pinus longifolia*, Roxb.** (GIBSON and SIMONSEN).

Selenium-red as ceramic colour. POLGREAN.—See VIII. Hop resins. WINDISCH and others; also WÖLLMER.—See XVIII.

PATENTS.

Manufacture of varnish. B. F. WILLIAMSON and W. H. BEISLER (U.S.P. 1,699,646, 22.1.29. Appl., 30.12.25).—The strained gum thus, e.g., 100 pts., is mixed with 3 pts. of glycerol and 150 pts. of tung oil or other drying oil and heated in about 3 hrs. to 150°. Steam or other non-oxidising gas is then passed through the mixture and heating is continued at 275—335° until the proper consistency is obtained, the passage of steam being maintained until the temperature reaches 200°, when 200 pts. of turpentine or other solvent or thinner are added and any desired drier.

R. BRIGHTMAN.

Removal of paint and varnish. J. H. GRAVELL (U.S.P. 1,700,491, 29.1.29. Appl., 15.4.26).—A mixture, by vol., of 55 pts. of cresylic acid and 10 pts. of sulphuric acid, alone, or mixed with 10 pts. of butyl alcohol or

with 10 pts. of butyl alcohol and 25 pts. of tetrachloroethane, is used at 120—125°.

R. BRIGHTMAN.

Insulating material [resistant to heat, moisture, and electricity]. ELEKTRA-LACK-WERKE G.M.B.H., SYSTEM DR. KRONSTEIN (B.P. 293,293, 3.1.28. Ger., 2.7.27).—Substantially liquid insulating material, e.g., oil varnish, rubber solution, celluloid varnish, artificial resin, is applied to a solid carrier of transparent, regenerated cellulose obtained from viscose and the coating is dried and solidified at any desired temperature.

J. S. G. THOMAS.

Synthetic resins. GRINDLEY & Co., LTD., and R. L. YEATES (B.P. 306,924, 30.11.27).—A mixture of polyhydric alcohols, polybasic acids or their anhydrides, acid resins, and/or fatty acids derived from non-drying oils, drying oils, or fats is heated, e.g., at 200—270°. If products of low acid value are required, basic materials, e.g., oxides, hydroxides, or suitable salts of aluminium, calcium, zinc, etc., are added.

S. S. WOOLF.

Production of condensation products from phenols and aldehydes. KUNSTHARZFABR. DR. F. POLLAK GES.M.B.H. (B.P. 288,228 and 290,963, [A] 15.11.27, [B] 3.11.27. Austr., [A] 6.4.27, [B] 21.5.27).—(A) The condensation of phenols and aldehydes is carried out in the presence of protective colloids, e.g., gum arabic, gelatin, at a dilution favourable to the formation of a powdery precipitate. (B) The colloidal resin solution prepared in accordance with B.P. 267,901 (B., 1928, 720) is freed from water by distillation in the presence, if desired, of organic solvents, e.g., glycerin, glycol, to such an extent that a transparent, opalescent material results. Glass-clear materials may be obtained if the bases in the initial condensation are neutralised by suitable acids, e.g., polycarboxylic acids, hydroxy-acids, sulphonic acids, of dissociation constant 10^{-2} — 10^{-5} and having alkali salts easily soluble in water.

S. S. WOOLF.

Manufacture of phenolic condensation products. A. J. WEIPE, Assr. to BAKELITE CORP. (U.S.P. 1,699,727, 22.1.29. Appl., 25.5.23. Renewed 11.4.28).—Fusible phenolic-methylene resin is incorporated with phenol to give a ratio of 9—12 phenol groups to 6 methylene groups, and formaldehyde or other substance containing methylene (with preferably 0.1% of ammonia or other basic catalyst) is added to establish a phenol/methylene ratio of 1:1.

R. BRIGHTMAN.

Manufacture of white lead pigment. S. W. KENDALL (U.S.P. 1,706,301, 19.3.29. Appl., 24.9.24).—See B.P. 240,424; B., 1925, 999.

Production of condensation products of [hydroxymethyl] methylol compounds of a urea. M. LUTHER and C. HEUCK, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,699,245, 15.1.29. Appl., 2.3.27. Ger., 27.2.26).—See B.P. 266,752; B., 1928, 762.

Preventing discoloration of canned foods (U.S.P. 1,699,274).—See XIX.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

See also A., April, 394, **Effect of temperature on viscosity and ease of precipitation of rubber** (WHITBY and GALLAY). 415, **Determination of barium**

sulphate by solutions of sodium carbonate (WOLESENSKY). 434, Polymerisation of α -methylstyrene (STAUDINGER and BREUSCH).

PATENTS.

[Rubber] mucilage for uniting bodies or pieces of material of the same or of different kinds. H. O. BRUHN (B.P. 306,864, 24.11.27 and 29.6.28).—A solution of rubber in a chlorinated hydrocarbon is incorporated with a perfume and sufficient of a saturated solution of an inorganic or an organic salt, e.g., aluminium sulphate or sodium propylnaphthylsulphonate, to increase the viscosity of the paste. F. R. ENNOS.

Insulating material (B.P. 307,390 and 307,966).—See XI.

XV.—LEATHER; GLUE.

Tizerah wood and extract. W. VOGEL (Collegium, 1929, 68—74).—Tizerah (*Rhus pentaphylla*) is a thick bushy tree about 10 ft. high and 16—20 ft. in circumference, found chiefly in Northern Africa. Both bark and leaves are used by the natives for tanning and dyeing morocco leathers, but their tannin content is less than that of the wood derived from the upper parts of the root and the main branches. About 65,000 tons of tizerah wood are produced annually. The flesh portion is dark reddish-brown and the heartwood leather-brown in colour. On analysis, the wood and liquid and solid extracts, respectively, gave (%): tans 22.4, 32.1—41.3, 69.9; non-tans 2.2, 4.0—4.7, 5.4; insoluble matter 60.9, 0.3—1.0, 2.7; water 14.5, 53.3—62.7, 22.0; ash 1.8, —, 1.0. Bright coloured root wood contains most tannin. Tizerah is a pyrocatechol tannin, containing dark brown phlobaphens and closely resembling quebracho in its reactions (cf. B., 1927, 853). It yields a slightly darker coloured leather than quebracho. Tizerah liquors are not so readily clarified as those of quebracho, and should not be sulphited. Tizerah can be used to replace quebracho.

D. WOODROFFE.

South African tanning materials. Black wattle. C. O. WILLIAMS (Union S. Africa Dep. Agric. Sci. Bull., 1928, No. 63, 68 pp.).—The composition and properties of the bark of *Acacia mollissima* have been investigated. Bark from the larger branches of mature trees or the top portion of the main stem contains about 30%, whilst the twigs and leaves contain only about 4%, of tannin. The effects of drying, exposure to rain, and moulds are described. Solid wattle extract contains about 60% of tannin. The ash of spent wattle bark contains approx. 70% CaCO_3 , 4% K_2O , and 1% P_2O_5 .

CHEMICAL ABSTRACTS.

Adsorption and tanning properties of synthetic tannins. J. BERKMANN (Collegium, 1929, 49—54).—Synthetic tannins contain sulphonic acids (completely absorbable), mineral salts (non-absorbable), and salts of sulphonic acids which are freely and characteristically absorbed by hide powder, the adsorption of which varies with different products and depends on the metal present in the following order of increasing adsorption: sodium, potassium, ammonium, barium, calcium, and magnesium. Iron, chromium, aluminium, and copper salts are adsorbed to a very much greater degree almost

equal to that of the free sulphonic acids. Solutions of salts of condensed aromatic sulphonic acids are semi-colloidal and do not readily ionise. Hide substance shows selective adsorption for the organic part of the sulphonic acid salt. The adsorptivity is almost proportional to the complexity of the product from which the synthetic tannin is derived. The actual condensation process has a greater effect on the adsorptivity of products derived from raw materials of high mol. wt. The adsorption by hide powder increases to a maximum and then diminishes as the amount of aldehyde used for the condensation process increases. Very little formaldehyde is required to produce maximum adsorption with the salts of sulphonated higher hydrocarbons. The adsorption diminishes more rapidly with dilution of condensed tannins than of uncondensed. Judged by the irreversibility of the tannage, synthetic tannins are good tanning materials. The adsorbed sulphonic acids cannot be washed out and render the leather quite stable, but their salts are more easily, though incompletely, removable by washing. Since synthetic tannins tan in acid solution only, it is evident that the desired mechanical properties are imparted by the sulphonic acids and not by their salts.

D. WOODROFFE.

Determination of insoluble matter in tanning extracts. A. TURNBULL (J. Amer. Leather Chem. Assoc., 1929, 24, 121—124; cf., B. 1928, 534).—A non-plastic clay is prepared by grinding white fireclay brick to pass 100-mesh, then digesting it with a mixture of 90 pts. of hydrochloric acid and 10 pts. of nitric acid. After thorough washing it is dried, and 90 pts. are mixed with 10 pts. of fine acid-washed natural kaolin. This mixture affords a suitable filtering layer on the porous septum previously described. An improved filtering apparatus is described in which a Schott funnel 17G with porous septum is used. To prepare the filtering layer, a mixture of 2 g. of the non-plastic clay with 75 c.c. of tan liquor is poured on to the septum and filtered till clear. The Schott funnel is fitted into the filtering funnel, tan liquor filtered through the latter into the flask until clear, and then 60 c.c. are collected. Comparative figures are given for insoluble matter determined by the porous septum and the old and new official methods respectively.

D. WOODROFFE.

Sanio's potassium dichromate test for tannins. C. M. FEAR (Analyst, 1929, 54, 227).—No reliance is to be placed on this test (cf. Botan. Ztg., 1863, 17).

D. G. HEWER.

Tannery waters. E. MEZEY (Collegium, 1929, 55—68).—Titration curves have been determined for five different waters, viz., (a) distilled, (b) river, (c) conduit, (d) well, and (e) water containing nitrogenous matter. Samples (b)—(e) were of waters used by tanneries, and of which (b) and (c) contained only 5° of hardness, respectively. The suitability of a water for tannery purposes can be judged from its buffering effect, as shown by these titration curves. The flatter are the curves, the greater is the buffering effect. The greatest buffering effect was shown by sample (e).

D. WOODROFFE.

Hydration of animal skin by the volume-change method. E. R. THEIS and H. A. NEVILLE (Ind. Eng. Chem., 1929, 21, 377—379).—Pieces of corium of fresh

and salted steer hide were placed in a dilatometer, covered with 0.1*N*-, 0.01*N*-, and 0.001*N*-hydrochloric acid and water, respectively, and the changes in volume noted over a period of 48 hrs. and also the time required to establish equilibrium. The order of increasing contraction of volume of fresh hide was 0.01*N*-acid, water, 0.001*N*-acid, and 0.1*N*-acid. There was an initial increase in volume with 0.1*N*-acid and then a gradual contraction. With cured hide there was first a contraction in volume with water and all acids (except 0.1*N*), then an apparent increase for 36 hrs., and finally a further decrease in volume. With 0.1*N*-acid an initial increase was followed by a gradual decrease in volume. The initial contraction in volume of cured hide is attributed to hydration. After several hours the proteins in cured hide degenerate, bacterial action sets in, and the hydration capacity is less than before, hence the increase in volume. Acid solutions of $p_H < 2$ diminish the bacterial action. Cured hide when soaked for 24 hrs. in water and then placed in milk of lime gave an initial contraction in volume in the soak, with subsequent increase. This diminution in volume was caused by the lime liquor checking bacterial action; equilibrium was attained in 24 hrs. These results show that *post mortem* changes and the effects of cure and of various anions on the hide can be studied by means of their hydration effects. D. WOODROFFE.

Properties of shoe leather. VII. Temper and break. J. A. WILSON (J. Amer. Leather Chem. Assoc., 1929, 24, 112—119).—Methods of measuring "temper" (flexibility and recovery after bending) and break (cracking by bending) are described. The flexibility was much less in the belly than in the butt, very low for kangaroo, kid, and suede leathers, and highest for heavy chrome hide. The percentage recovery varied from 45% to 72%. Splitting the leather reduced the flexibility very much, but had little effect on the recovery factor. "Break" values (number of wrinkles produced) for the belly regions were one half to two thirds of those for the butt regions. Vegetable and chrome-tanned calf skins had the greatest "break" figures 26—28, glazed kid 14, and patent 0. D. WOODROFFE.

Effect of neutralisation of chrome[-tanned] leather on fat absorption. H. B. MERRILL and J. G. NIEDERCORN (Ind. Eng. Chem., 1929, 21, 364—366).—Samples of one-bath chrome-tanned calfskin were neutralised with different amounts of borax and sodium bicarbonate solutions, the p_H value of each solution being noted; the samples were then washed, fat-liquored with soap and neat's-foot oil, dried out, and analysed. In both cases the percentage of fat absorbed decreased with increasing neutralisation. Neutralisation did not affect the penetration of the fat. The fat absorbed by the leather did not depend on the final p_H value of the neutralising solution, but decreased with increasing removal of sulphuric acid from the leather. The effect of the neutralisation on the fat absorption was less pronounced when the time of fat-liquoring was prolonged. D. WOODROFFE.

Consistency of casein glue. F. L. BROWNE and D. BROUSE (5th Coll. Symp. Mon., 1928, 229—242).—Casein solutions containing no lime have a more complex

flow (as determined with a modified Herschel consistometer) than jelly-forming glues containing lime. With the latter no change from viscosity to plasticity after mixing was observed. CHEMICAL ABSTRACTS.

Casein and some of its applications. L. L. VAN SLYKE (N.Y. Agric. Exp. Sta. Tech. Bull., 1928, No. 139, 1—41).—A summary of researches. CHEMICAL ABSTRACTS.

See also A., April, 413, **Colorimetric hydrogen-ion determination** (CAMERON). 458, **Nitrogen distribution of gelatin** (DAFT). **Fractionation of gelatin** (KUNITZ and NORTHROP).

PATENTS.

Manufacture of spinning and weaving fibres [from skins etc.]. R. TANDLER (B.P. 290,154, 6.3.28. Austr., 7.5.27).—Skins etc. are chemically treated with, e.g., lime liquor followed by a salt-hydrochloric acid pickle to loosen and disintegrate the fibres, then rolled or stamped, and/or further treated with chemical substances, e.g., two-bath chrome tanning liquors, aluminium sulphate, etc., greased, the epidermis or grain layer removed, and the product disintegrated by carding, tearing, or combing into the separate fibres. D. WOODROFFE.

Treating fabrics resembling wash leather. H. W. and F. H. TRELEAVEN and W. JANVIER (B.P. 307,189, 10.2.28).—Cloth or fabric, which may or may not have been previously impregnated or painted with a solution of albumin and afterwards treated with a solution of tannic acid, is steeped for 15 min. in a cold mixture of oil of *Pinus Siberica*, glycerin, and water, and then dried. D. WOODROFFE.

Manufacture of hardened casein products. I. G. FARBENIND. A.-G. (B.P. 279,863, 26.10.27. Ger., 26.10.26).—Casein is mixed with glyoxal or one of its homologues or a derivative capable of setting free the glyoxal under the conditions of treatment, to which a colouring or filling material and a clarifying or softening agent may be added. D. WOODROFFE.

Manufacture of mineral acid-free synthetic tanning material. J. SCHÄFER, Assn. to J. R. GEIGY Soc. ANON. (U.S.P. 1,706,325, 19.3.29. Appl., 8.8.27. Ger., 16.8.26).—See B.P. 276,014; B., 1928, 420.

Treatment of leather. A. O. T. BEARDMORE (U.S.P. 1,704,718, 12.3.29. Appl., 24.3.28).—See B.P. 300,077; B., 1929, 30.

XVI.—AGRICULTURE.

Phosphoric acid requirements of Czechoslovakian soils. E. G. DOERELL (Superphosphate, 1928, 1, 128—132).—A study of acidity, and of lime and phosphate requirements. CHEMICAL ABSTRACTS.

Lime and phosphoric acid in the soil. M. A. EGOROV (Trans. Sci. Inst. Fertilisers, Moscow, 1926, No. 34, 37—45).—The greater the amount of carbon dioxide in the soil, the smaller is the effect of acid phosphate. In certain loam soils the phosphate was parallel with iron, and not with calcium. CHEMICAL ABSTRACTS.

Action of water-soluble mono- and di-phosphates on permutite, in connexion with the fixation

of phosphoric acid in the soil. E. BERL and P. SCHMITTNER (*Z. angew. Chem.*, 1929, 42, 351—355).—Permutite takes up phosphoric acid readily from primary (dihydrogen) phosphates, to the extent of 25% of its own weight (as P_2O_5); the action is less in the case of secondary (monohydrogen) salts. The phosphoric acid is taken up mainly as aluminium phosphate, insoluble in water, but completely soluble in citric acid.

S. I. LEVY.

Does frost exert a "solubilising" effect on the phosphate and potash of soils? O. ENGELS (*Forts. Landw.*, 1928, 3, 96; *Bied. Zentr.*, 1929, 58, 52).—Examination by Neubauer's method of soils frozen once, and repeatedly, showed little or no increase in root-soluble phosphate or potash as a result.

A. G. POLLARD.

Actual acidity of the podzol soils and the influence of liming. N. P. REMEZOV (*Trans. Sci. Inst. Fertilisers, Moscow*, 1927, No. 42, 5—26).—Variations in p_H in the same field depend on meteorological and biological factors; the fallow plot was more acid. In unlimed plots the acidity increased with increase of nitrate; in limed plots the reverse held. In podzol soil the acidity increases with the depth of the horizons.

CHEMICAL ABSTRACTS.

Causes of plant suffering from over-liming. E. V. BOBKO, B. A. GOLUBER, and A. F. TYNLIN (*Zhur. Opuitn. Agron.*, 1927, 23, 165—202).—Over-liming of mineral soils, especially light forest virgin soils, may cause plant injury owing to intensified biological processes resulting in an increase of hydrogen carbonate, ammonia, nitrite, and nitrate. Similar effects were not observed with heavy soils.

CHEMICAL ABSTRACTS.

Soil respiration and fertility. E. H. REINAU (*Festschr. Stoklasa*, 1928, 305—318; *Bied. Zentr.*, 1929, 58, 107—108).—The intensity of the assimilation of carbon dioxide by green leaves from the air immediately surrounding them is such that practically the whole of the carbon dioxide produced within the soil can be absorbed. The interchange of layers of air at the soil surface with higher layers is small. Hence the view is propounded that carbon dioxide production in soils must control crop yields.

A. G. POLLARD.

Determination of the moisture equivalent of soils and the rôle of soil colloids on this moisture equivalent. G. J. BOUYOUOS (*Soil Sci.*, 1929, 27, 232—241).—Moisture equivalents are determined by placing the air-dried soil sample in a small Buchner funnel previously covered with a filter paper and connected by way of an ordinary filter flask with a filter pump. The soil is thoroughly moistened and then allowed to drain under suction for (say) 10 min. The funnel is covered with moist cloth to prevent evaporation by suction. Results so obtained are closely related to the colloidal content of the soils as determined by the hydrometer method. No relationship exists between the coarse silt and sand contents and the moisture equivalent. The hydrometer method may be used for the indirect determination of the moisture equivalent, and can give "single-value" factors concerning the physical properties of soils.

A. G. POLLARD.

Determination of the weight of carbon and combined water in the soils of the world. V. AGAFONOV (*Compt. rend.*, 1929, 188, 1000—1001).—Calculations based on Glinka's map of the total weight of carbon and combined water in the soil of various zones give the following figures (in millions of tons), the figures in parentheses being for water: Tundras 73 (314), podzolic 306 (1326), yellow-(Ramann)-brown soils 46 (158), tchernozem 286 (179), reddish-brown soils 80 (135), Sierozem 10 (42), red soil of the Steppe deserts 33 (46), red earth (warm temperate zone) 2 (21), laterites and lateritic soil 126 (15132), mountain soil 87 (377).

R. BRIGHTMAN.

Relation of temperature to the amount of nitrogen in soils. H. JENNY (*Soil Sci.*, 1929, 27, 169—188).—In the soils of the semi-acid, semi-humid, and humid regions of the United States there is a relationship between mean annual temperature and average total nitrogen content of upland prairie and timber soils and of terrace and bottom land soils. Nitrogen contents decrease with increasing temperature according to an exponential law. For every 10° decline in mean annual temperature there is an increase of 200—300% in average nitrogen content. The carbon : nitrogen ratio narrows with rising temperature.

A. G. POLLARD.

Determination of replaceable sodium in alkali and non-alkali soils. R. H. BRAY (*J. Amer. Soc. Agron.*, 1928, 20, 1160—1166).—Barber and Kolthoff's method is satisfactory. A test for replaceable sodium is proposed.

CHEMICAL ABSTRACTS.

Determination of barium in soils. G. BERTRAND and L. SILBERSTEIN (*Ann. sci. agron. franç.*, 1928, 45, 223; *Bied. Zentr.*, 1929, 58, 97).—20 g. of fine soil are ignited at dull red heat to destroy organic matter and then decomposed by heating with three times its weight of sodium potassium carbonate in two nickel crucibles. The melt is extracted with hot distilled water, filtered, and the residue containing alkaline earths, iron, and aluminium washed with sodium carbonate solution. After drying and igniting the filter paper the residue is treated with hydrochloric acid and evaporated to remove silica, again treated with hydrochloric acid, filtered, and washed. The residue, still containing some barium, is again treated with sodium potassium carbonate as before. The final acid filtrates from the two extractions are united and the barium is precipitated by the addition of 5—10 drops of 10% sulphuric acid. After keeping for two days with periodical shaking the barium sulphate is removed, treated twice with hydrochloric acid, and weighed. Results show soils to contain 0.083—1.717 g. Ba/kg. This is equivalent to 10—35% of the total sulphur of the soil.

A. G. POLLARD.

Flow of clay pastes through narrow tubes. G. W. S. BLAIR and E. M. CROWTHER (*J. Physical Chem.*, 1929, 33, 321—330).—A description is given of a modified plastometer of the Bingham and Green type (B., 1920, 495 A) suitable for use with small amounts of clay and soil pastes over a range of applied pressure equivalent to 0.05—50 cm. of mercury, and with rates of flow of 0.0002—2.0 cm.³/sec. The flow curves of suspensions prepared from a heavy Rothamsted clay

show four stages, viz., (i) no flow occurs, (ii) dv/dP is constant, (iii) dv/dP increases rapidly, and (iv) dv/dP becomes constant again. The corresponding movements are plug flow, plug flow with stream-line flow in an outer sheath, and stream-line flow. The ratio of the constants derived from the slopes of the plug and stream-line stages is found to be constant for a given clay over a wide range of concentration. Small, but probably significant, variations in this ratio are discernible in clays of different geological origin. L. S. THEOBALD.

Repair of soil filter tubes. G. J. LARSINOS and A. B. BEAUMONT (Soil Sci., 1929, 27, 243).—Breaks in Pasteur-Chamberland filter tubes are effectively repaired by sheathing the crack with rubber tubing.

A. G. POLLARD.

Drift in potential of the quinhydrone electrode [for soil measurement]. L. D. BAVER (J. Amer. Soc. Agron., 1928, 20, 1125—1140).—Unless stirred, the lower part of soil suspensions tended to be more acid than the upper part. The deviations in p_H obtained with different electrodes were not influenced by passing air free from carbon dioxide, or hydrogen, through the suspensions, or by keeping them overnight. The reading is taken preferably 1 min. after immersion of the electrodes in the soil suspension.

CHEMICAL ABSTRACTS.

Changes produced in plants on emasculation. V. G. TARANOVSKAYA (Zhur. Opuitnoi Agron., 1927, 23, 127—164).—Experiments with barley, lupins, maize, buckwheat, mustard, hemp, poppy, and soya beans showed that in general the grain crops suffered decrease in dry matter. Increase in leaf area causes an increased intensity of carbon dioxide assimilation, and there is a more successful utilisation of mineral substances of the soil. The nitrogen content decreased, but the percentage of protein-nitrogen increased. Most of the calcium did not combine with the oxalic acid. There was an increase in carbohydrates, especially sugars, and a decrease in cellulose.

CHEMICAL ABSTRACTS.

Disappearance of nitrate under timothy. L. G. JONES (J. Amer. Soc. Agron., 1928, 20, 1167—1175).—Nitrate disappears fairly rapidly when added to timothy sod; except for the largest application, the disappearance was accounted for by the nitrogen taken up by the crop. At certain stages of growth the crop contained considerably more nitrogen than was contained in the added nitrate.

CHEMICAL ABSTRACTS.

Relation between concentrations of potassium in culture solutions and optimum plant growth. R. P. BARTHOLOMEW and G. JANSSEN (Soil Sci., 1929, 27, 189—203).—The intake of potassium by oats, lucerne, Hubam clover, cow peas, soya beans, Sudan grass, and cotton was examined by means of water cultures in solutions having varying concentrations of potassium salts. The potassium requirements of the different plants varied considerably, optimum growth being attained at concentrations of 0.5 p.p.m. in the case of Hubam clover and 3 p.p.m. for Sudan grass. All plants made reasonably good growth, however, with 0.5 p.p.m. of potassium in the nutrient. No relationship existed between the total potash requirements of the plants and the optimum concentrations. The

bearing of this on the varying ability of different species of plants to utilise soil potash is discussed. Plants are able to take up more potash than is required for optimum growth.

A. G. POLLARD.

Influence of soil type on the calcium and magnesium content and other physiological characters of the lucerne plant. J. F. FONDER (Soil Sci., 1929, 27, 205—232).—Analyses of lucerne plants in varying stages of growth on seven different soils are recorded. The inter-relationships between the calcium and magnesium contents of the stems and leaves and the expressed juices of these, of the moisture content, and the sp. gr. of expressed juices are recorded and discussed from the point of view of their dependence on soil type. Changes during the period of the day are included.

A. G. POLLARD.

Copper content of the leaves of beet treated with copper preparations. M. FRIGERIO (Giorn. Chim. Ind. Appl., 1929, 11, 67—69).—The amount of copper salts retained by the leaves and tops of beet after lifting varies widely, being influenced not only by the number and intensity of the applications, but also by the weather conditions. The oxalates present in the material, which are also a source of danger to the cattle, were approximately constant in all un-siloed samples examined. About one third of the total copper present is dissolved by the gastric and pancreatic juices, this ratio being independent of the nature of the copper preparation administered. Preservation of the leaves and tops in silos does not sensibly influence the solubility or toxic activity of the copper compounds present, but results in almost complete destruction of the oxalates.

T. H. POPE.

Response of oats and soya beans to manganese on some Costal Plain soils. L. G. WILLIS (N.C. Agric. Exp. Sta. Bull., 1928, No. 257, 1—13).—Chlorosis in soya beans (but not stunted growth in corn) is remedied by application to the unproductive area of manganous sulphate. Injury to oats by lime or calcium phosphate applications to a soil deficient for soya beans in manganese can be prevented by addition of manganous sulphate.

CHEMICAL ABSTRACTS.

Calcium in lemon and orange leaves. A. R. C. HAAS and F. F. HALMA (Citrograph, 1928, 13, No. 3, 10).—The calcium content of the ash of lemon and valencia leaves is about 33%; of this, 18% in the former and 48% in the latter is soluble in water. The ratio of insoluble to soluble ash is 11:4 and 1:1, respectively. Correlation between the results and the sensitiveness of the leaves to freezing is suggested.

CHEMICAL ABSTRACTS.

Hexamethylenetetramine and formaldehyde as nutrients for the haricot bean. L. MARRASSÉ (Compt. rend., 1929, 188, 1006—1007; cf. Nicolas, A., 1923, i, 77, 427; 1924, i, 128; 1925, i, 623).—When separated from their cotyledons and deprived of starch by 5 days in darkness at 24° and 4 days in distilled water the embryos are nourished by contact with 0.02% hexamethylenetetramine and 0.016% formaldehyde solutions. The formation of the starch commences where the embryo is in contact with the impregnated paper and does not follow the reverse order of its disappearance in

hydrolysis. The starch granules are smaller than normal and yield violet to yellowish colorations with iodine, possibly in consequence of the transitory formation of dextrins. R. BRIGHTMAN.

Press- and extraction-processes in the treatment of sunflower seed [for feeding-stuff]. S. WEISER and A. ZAITSCHECK (Forts. Landw., 1928, 3, 926; Bied. Zentr., 1929, 58, 63—67).—In experiments with sheep fed with the residue from the solvent-extraction of sunflower seed, the digestibility of protein and fat appeared satisfactory, but the crude fibre and nitrogen-free extract not only showed poor digestibility itself, but markedly reduced the digestibility of hay mixed with it. The starch value of this residue was 35, the figure being higher if the proportion of husk was reduced during manufacture. With goats the press-cake from sunflower seed gave much greater live-weight increase than the solvent-extracted material. For the production of a satisfactory feeding material the removal of husks followed by pressure-extraction is necessary. A. G. POLLARD.

Intervarietal chemical differences in the mature potato tuber. T. P. McINTOSH (Scottish J. Agric., 1928, 11, 304—311).—A preliminary study of the value of various chemical tests for distinguishing between different varieties of mature potato tubers. In the alkali test, sections were immersed in *N*-potassium hydroxide solution and then laid in dishes, a yellow colour developing. For the oxidase test, sections are brushed with a 0.5% solution of benzidine in 50% alcohol and dried for 1 hr. at 5°, when a light brown to dark purplish-brown colour is produced. The blackening test is based on the oxidation of tyrosine to give a black coloration due to the formation of melanin. The tyrosinase reaction is based on the formation of a red colour due to the oxidation of tyrosine or of *p*-cresol by tyrosinase. CHEMICAL ABSTRACTS.

Examination of the "effect factors" of the three principal nutrients of cultivated plants and of the determination of the nutrient content of soils according to Mitscherlich. M. NOACK (Kühn-Arch., 1928, 19, 412—553; Bied. Zentr., 1929, 58, 109—114).—Numerous trials are recorded designed to examine the alleged constancy of the "effect factors" as applied to different plants and to different forms of fertilisers. In many cases the nature of the fertiliser and the kind of crop did not markedly affect the "effect factors." There were, however, notable exceptions in which different crops indicated different contents of assimilable nitrogen and phosphorus in identical soils. The Mitscherlich "effect factor" for potash in the presence of sodium varied considerably. A. G. POLLARD.

Phosphate nutrition of plants and soil acidity. Rock phosphate fertilisation on chernozem soils. E. V. BOBKO and A. L. MASLOVA (Trans. Sci. Inst. Fertilisers, Moscow, 1926, No. 39, 5—38).—A forest loam (p_H 6.8) gave up phosphate soon after the addition of small quantities of hydrochloric acid; chernozem and podzolised loam (p_H 5.9—6.8) did not afford phosphate until p_H 4.0 was reached, and sandy soil only at p_H 2.5. All the soils released more calcium as the acidity increased, but practically no iron was

released by addition to 10 g. of 6 c.c. of 0.1*N*-hydrochloric acid. The soils which released the phosphorus most readily did not respond to phosphorus fertilisers. The phosphorus content of a soil, as indicated by the titration curves, may be an index of the phosphorus requirements of the soil. CHEMICAL ABSTRACTS.

Fertiliser requirement of the onion. M. GÓRSKI and M. KOZTOWSKA (Rocz. Nauk. Rolnicz., 1928, 20, 1—14; Chem. Zentr., 1928, ii, 1891).—The onion reacts chiefly to fertilisation with potassium, that to nitrogen and phosphate being very small. Rye, oats, and potatoes react chiefly to nitrogen; only potatoes reacted to potassium. The large potassium requirement of the onion is due to its small ability to utilise soil potassium. A. A. ELDRIDGE.

Absorption of nutrients by the onion. M. KOZTOWSKA (Rocz. Nauk. Rolnicz., 1928, 20, 15—24; Chem. Zentr., 1928, ii, 1891).—Two phases in the life of the onion are differentiated: that of absorption of mineral substances, and that of the transference of nutrient materials from the tops into the bulbs. A. A. ELDRIDGE.

Swedish fertiliser trials in 1927. G. SUNDELIN, C. LARSON, and E. MANELL (Med. Centralanst., försöks. jordbruks, No. 340; Bied. Zentr., 1929, 58, 114—115).—Summaries of the results of numerous field trials are recorded and classified according to crop, soil type, and reaction. A. G. POLLARD.

Citrus chlorosis as affected by irrigation and fertiliser treatments. P. S. BURGESS and G. G. POHLMAN (Ariz. Agric. Exp. Sta. Bull., 1928, No. 124, 183—232).—Following a study of the soil, fertiliser treatments have been applied, but irrigation with intermediate aeration, following soil-moisture studies, was more successful. CHEMICAL ABSTRACTS.

Comparing various quantities of mixture of "ammophos" and ammonium sulphate plus filler to make a 10:10 formula (10% N and 10% P₂O₅). C. L. LOCSIN, F. TABHAN, and E. PUNZALAN (Rep. Comm. Cane Var., Dis., Fert., 6th Conv. Philippine Sugar Assoc., 1928, 83—86).—Yields are correlated with fertiliser values. CHEMICAL ABSTRACTS.

Testing various quantities of "ammophos" 20:20 (or 16.5% N and 20% P₂O₅). C. L. LOCSIN (Rep. Comm. Cane Var., Dis., Fert., 6th Conv. Philippine Sugar Assoc., 1928, 86—89).—Yields are correlated with fertiliser values. Sufficiency of phosphate is a factor in the development of maturity of the sugar cane. CHEMICAL ABSTRACTS.

Comparative pot experiments with superphosphate, "reform phosphate," "plutophos," "moorphos," and two Polish raw phosphates. C. DREYSPRING and C. KRÜGEL (Superphosphate, 1928, 1, 62—72, 77—90).—Only superphosphate afforded an increase in grain and straw of oats grown on lowland moor soil. With barley on sandy loam the relative yields were: 100, 15, 10, 25, (a) 15, (b) 35. There was a close relation between the yield and the quantity of phosphate assimilated by the plants from the different phosphates. CHEMICAL ABSTRACTS.

Effect on soil reaction of nitrogenous fertilisers under the anaërobic conditions of rice production.

R. P. BARTHOLOMEW (J. Amer. Soc. Agron., 1928, 20, 1305—1313).—Nitrogenous fertilisers are differentiated as follows: (a) acid-producing: ammonium sulphate, Leuna saltpetre, "ammophos," and urea, (b) alkali-producing: sodium and calcium nitrates and calcium cyanamide, (c) those producing no change in hydrogen-ion concentration: cottonseed meal and blood meal. Increase or decrease in hydrogen-ion concentration is injurious, group (b) being the more harmful.

CHEMICAL ABSTRACTS.

Microbiology of soils in relation to liming and phosphate applications. E. E. UPENSKI (Trans. Sci. Inst. Fertilisers, Moscow, 1926, No. 34, 65—71).—Determinations of nitrate, nitrite, and other products of microbial metabolism are insufficient for the evaluation of the rôle of microbes. In a study of liming and phosphorus application, *Azotobacter*, denitrifiers, nitrifiers, and *Bacillus mycoides* are specially important. Protozoa are not important under field conditions. Liming beyond p_H 7.6 increases the activities of denitrifiers.

CHEMICAL ABSTRACTS.

Biological and chemical examination of stall manures. IV (Pt. 2). G. RUSCHMANN (Zentr. Bakt., 1928, 75, 405—426; Bied. Zentr., 1929, 58, 56—62).—Horse manure alone was used for the hot fermentation (Krantz) process. Less satisfactory results were obtained than with ordinary mixed yard manures. The compression of the stack did not check the initial fermentation sufficiently, and there was a relatively heavy loss of dry matter. Physically, too, the product was inferior. The active organisms in the fermenting stack were fewer than in the case of mixed manure. Details of the micro-flora are recorded. No definite relationships exist between the ammonifying power of hot-fermented manure and the nature of the micro-flora or the method of fermentation. The presence of nitrates and nitrites in the finished stack is accounted for by the number of the corresponding organisms contained therein. Yard and stall manure is normally free from these. In some cases the absence of nitrate in manure results from the activity of denitrifying organisms. In well-prepared hot-fermented stacks very few denitrifying organisms are found. Organisms surviving the hot-fermentation process have an enhanced vitality. Butyric fermentation may occur in manure stacks and lead to soil injury when applied. This is minimised by careful attention to the temperature of the fermenting stack, the bacteria concerned being largely reduced in number at higher temperatures. "Cold" manure stacks characterised by poor rotting-down of the litter have relatively high numbers of "butyric" bacteria. Satisfactory humification in the manure stack appears to correspond with the presence of small numbers of starch-splitting organisms. In the hot fermentation of horse manure the humification occurs relatively late in the process, and in this connexion the exclusion of oxygen, maintenance of sufficiently high temperature, and moisture content are important. (Cf. B., 1927, 395; 1928, 870.) A. G. POLLARD.

Hot fermentation of manure and weeds. C. FRUWIRTH (Forts. Landw., 1928, 3, 832; Bied. Zentr., 1929,

58, 83—84).—The vitality of seeds surviving the hot-fermentation process for manure was examined. Daily additions of weeds and manure were made to the stack in a concrete pit and seed samples inserted in fine-meshed packets. A small number of seeds germinated after the "cold" fermentation of the ordinary yard manure, but in the hot-fermentation process none survived. Similar results were obtained with undigested seed entering the stack with the dung. A. G. POLLARD.

Value of peat as a material for the preparation of composts and peat manure. D. N. PRIANISHNIKOV (Trans. Sci. Inst. Fertilisers, Moscow, 1927, No. 34, 72—75).—Peat, employed with potassium and phosphates, supplied nitrogen to plants. The phosphorus of raw phosphates, when the latter are composted with peat, becomes water-soluble. Alkaline composting of peat rendered 12% of nitrogen soluble in 72 days.

CHEMICAL ABSTRACTS.

Use of dextrin in the isolation or identification of *Azotobacter chroococcum*. C. E. SKINNER (Soil Sci., 1929, 27, 245—246).—A dextrin-nitrate-agar medium renders the dissolution of *A. chroococcum* more easy than Ashby's or similar media poor in nitrogen. The appearance of apparently non-chromogenic strains is also avoided. A. G. POLLARD.

Carbon dioxide, a chemical accelerating the penetration of respiratory insecticides into the tracheal system by keeping open the tracheal valves. E. H. HAZELHOFF (J. Econ. Entomol., 1928, 21, 790).—A small quantity of carbon dioxide will probably accelerate the penetration of hydrogen cyanide, carbon disulphide, etc. into the tracheal system of insects.

CHEMICAL ABSTRACTS.

Magnesium and calcium chlorates as substitutes for sodium chlorate for killing field bindweed. W. L. LATSHAW and J. W. ZAHNLEY (J. Amer. Soc. Agron., 1928, 20, 1328; cf. B., 1928, 102).—The above substances are equally effective; the magnesium and calcium salts possess certain advantages over the sodium salt.

CHEMICAL ABSTRACTS.

Experiments with lime and phosphates on the Kriukovo and Volokolamsk experimental plots in 1925. S. V. SHCHERBA (Trans. Sci. Inst. Fertilisers, Moscow, 1927, No. 41, 39—84).

Determination of the nutrition requirement of the vine by chemical examination of the leaves. A. JACOB (Z. angew. Chem., 1929, 42, 257—262).

See also A., April, 420, Calcareous soils of Bavaria (NIKLAS and others). Weathering of sandstone, limestone, and basalt in red-earth areas (REIFENBERG). 431, Synthesis of cyanamide (KADLEC-FLECK). 478, Sodium nitrate and development of chlorosis in rice (METZGER and JANSSEN).

Fluorides and fluosilicates as insecticides. CARTER and ROARK.—See VII. Germicidal soaps. HAMPIL.—See XII. Tobacco. HALEY and others.—See XX.

PATENTS.

Production of granular fertilisers. W. J. WORBOYS, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 307,575, 9.1.28).—Gelatinous phosphates, e.g., colloidal iron and/

or aluminium phosphates, which may be added to an aqueous paste of the fertiliser or formed during the manufacture of, e.g., ammonium phosphates from rock phosphate containing iron and aluminium compounds, are used as binding agents in the production of fertilisers. Solidification in granular form is effected by compressing the pasty mixture, or by extrusion, cutting off in small lengths, and drying. L. A. COLES.

Production of non-hygroscopic phosphates [fertiliser]. H. BLUMENBERG, JUN., ASSR. to STOCKHOLDERS SYND. (U.S.P. 1,706,101, 19.3.29. Appl., 30.4.25).—Crude, ground phosphate rock is mixed with sufficient phosphoric acid to give acid calcium phosphate and up to 20% excess acid, calculated on the acid phosphate. The product is fused at 600°, cooled, and ground.

F. G. CLARKE.

Artificial fertiliser. H. HEIMANN, ASSR. to I. G. FARBENIND. A.-G. (U.S.P. 1,698,793, 15.1.29. Appl., 27.8.21. Ger., 29.1.18).—Non-deliquescent fertiliser is obtained by mixing hot ammonium nitrate solution, e.g., 85–88%, with potassium chloride or sulphate, ammonium sulphate, or other fertilising salt, the product being recovered in the solid state by evaporation of the water through the heat present.

R. BRIGHTMAN.

Manufacture of fertiliser material. G. P. WALTON and R. F. GARDINER, ASSRS. to U.S.A. (U.S.P. 1,703,504, 26.2.29. Appl., 19.7.27).—Perishable organic material is mixed with sufficient of an acid salt to preserve the mixture, which is then air-dried. A. B. MANNING.

Manufacture of [high-grade] mixed fertiliser. W. GAUS, R. GRIESSBACH, and O. SCHLIEPHAKE, ASSRS. to I. G. FARBENIND. A.-G. (U.S.P. 1,699,234, 15.1.29. Appl., 17.1.28. Ger., 21.1.27).—See B.P. 295,477; B., 1928, 765.

[Manufacture of] mixed fertiliser. E. SCHWARTZ, ASSR. to I. G. FARBENIND. A.-G. (U.S.P. 1,699,254, 15.1.29. Appl., 15.1.26. Ger., 19.1.25).—See B.P. 255,726; B., 1926, 843.

XVII.—SUGARS; STARCHES; GUMS.

Viscous fermentation of frozen [sugar] beet. H. COLIN and M. SIMONET (Compt. rend., 1929, 188, 943–945).—A Gram-negative *Coccus* has been isolated from frozen beet, which is probably responsible for the typical fermentation. From the juice of such beet, alcohol precipitates a white carbohydrate, darkening at 200° and softening at 250°, which is slowly hydrolysed by hot acids to afford dextrose exclusively.

G. A. C. GOUGH.

Colouring matters of beet molasses. M. GARINO, A. REGÈ, and F. RUBINO (Giorn. Chim. Ind. Appl., 1929, 11, 61–63; cf. B., 1929, 372).—Caramelan, caramelen, glucic and apoglucic acids all impart to their solutions brown colours, which are difficult to distinguish by the naked eye, but may be differentiated with the help of Wood's light (3650 Å.) if the materials are prepared from pure sugars. With molasses, however, this is difficult owing to the marked luminescence characteristic of the molasses itself. The colouring

power varies from a minimum of about 800 units (Stammer) for caramelan to a maximum of 18,000 for caramelen. The colouring substances formed by the action of lime on invert sugar are acid, and may form salts with the lime or with ammonia derived from the aminic groups of the nitrogenous constituents of the beet and so give rise to substances of high colouring power. T. H. POPE.

Decolorising carbons and their action on the colouring matters of beet molasses. M. GARINO and A. REGÈ (Giorn. Chim. Ind. Appl., 1929, 11, 64–67).—Results are given of the action of a number of active carbons on the colouring matters of beet molasses, both singly and mixed, in presence and in absence of sugar. The coefficient of adsorbability diminishes with increase in the sugar content of the solution, and the adsorption of mixtures of the colouring matters cannot be calculated beforehand. The coefficients of adsorbability of these colouring matters depend principally on their surface tensions, but specific affinities for carbons activated in different ways are also observed. Of the carbons examined, carboraffin adsorbs the most caramelan and the most calcium gluconate, whilst appula adsorbs most caramelen and polycarbon most calcium apogluconate. Indications are obtained that not only the extent, but also the quality, of the surface of the active carbon exerts an influence on the adsorption. Replacement of the mineral framework of animal charcoal by water by treatment with hydrochloric acid results in increase in the surface of contact between the carbon and the solution, so that the carbon becomes more active towards the colouring matters investigated, the activity increasing with the proportion of water left in the material. Much of the decolorising power is lost if the carbon is dried to such an extent that air is able to penetrate the pores. T. H. POPE.

Inversion of sucrose in beet-house syrups. R. J. BROWN and H. W. DAHLBERG (Ind. Eng. Chem., 1929, 21, 282–285).—A method for the determination of small quantities of invert sugar in beet syrups is described, a process based on the work of Quisemburg and Thomas (B., 1921, 899 A) being used. Although the invert sugar content of a high-purity syrup may be taken as a measure of the inversion of the sucrose, that of low-purity products is of no value in calculating the loss of sucrose owing to destruction of invert sugar during heating. The rate of destruction of the invert sugar depends on the concentration of the impurities, variations in p_H value between 6 and 9 having no appreciable effect. The rate of loss of sucrose by inversion increases with fall in p_H value and with rise of temperature, decreases with decreasing purity, and is constant with beet syrups from different sources under the same conditions or with solutions of varying concentration. The observed rate of inversion of sucrose in these syrups is higher than that calculated from the inversion constant of sucrose with hydrochloric acid. This discrepancy may be due either to the influence of other ions, or most likely to the difference between the hydrogen-ion concentration of the cold solutions in which the p_H is measured and of syrups heated to the temperature at which inversion is allowed to proceed. F. R. ENNOS.

Unknown losses of sugar during saturation.

L. O. SNAJDMAN (Nauch. Zapiski, 1928, 5, 322—328).—If calcium carbonate is precipitated in an aqueous alkaline sugar solution, adsorbed sugar and alkali are returned to the solution as the amorphous precipitate becomes crystalline. CHEMICAL ABSTRACTS.

Applications of the nitrile method. III. The cyanide and formaldehyde values of sugar and their analytical value. F. LIPPICH (Z. anal. Chem., 1929, 76, 401—408; cf. B., 1929, 414).—The common sugars have characteristic cyanide and formaldehyde values; using 5 g. of the sugar in 100 c.c. of solution and a contact time of 10 min., the following figures were obtained for the cyanide values: dextrose 9.14, levulose 16.77, invert sugar 13.41, lactose 3.54, and maltose 5.10; the corresponding formaldehyde values were 2.91, 6.71, 5.15, 1.94, and 2.22, respectively. For different quantities of sugar the values are not linearly proportional, but lie on a smooth curve concave to the axis of concentration. By determining the cyanide value of a solution containing any one of the above sugars its concentration can be read sufficiently accurately from a graph previously constructed from the values obtained with solutions of known concentration. If a definite quantity of a syrup (e.g., 5 g.) is dissolved in 100 c.c. of water and the cyanide value determined as previously described for milk (*loc. cit.*), the percentage of sugar present may be ascertained to within $\pm 1\%$ by reference to the graph. A. R. POWELL.

Water content of potato starch. SPROCKHOFF (Z. Spiritusind., 1929, 52, 110).—When potato starch with a moisture content of 20% is exposed to ordinary air, it does not appreciably gain or lose moisture. This is due to the constitution of the starch grains, which are built up of infinitely small particles loosely packed together and leaving spaces in which moisture is retained by adsorption and capillarity. The vapour pressure of this water is lower than that of water in an open vessel, and varies according to the water content of the starch. Starch with 20% of moisture has a vapour pressure of approx. 75% of that of normal water at the same temperature. The actual humidity of the air is a fraction of its maximum capacity, and the average yearly value at ordinary temperature is slightly above 75%. Accordingly, the air and starch with a moisture content of 20% are in equilibrium, and the transference of moisture from one to the other is negligible. C. RANKEN.

Destruction of the oxidising enzymes of gum arabic. L. ROSENTHALER (Pharm. Ztg., 1929, 74, 317).—The gum solution is treated with acid or alkali, and neutralised after 24 hrs. S. I. LEVY.

See also A., April, 427, **Degradation of l-arabinose** (DEULOFEU and SELVA). 428, **Acetylation of carbohydrates** (TSUZUKI). **Influence of hydrogen sulphite solutions on sugars at higher temperatures** (HÄGG-LUND). 459, **Volumetric determination of dextrose** (AMICK). 462, **Determination of reducing sugars** (HAWKINS and VAN SLYKE). 476, **Determination of starch in vegetable tissue** (BISH).

Carbon dioxide under pressure and its application. KRASE and GOODMAN.—See VII. **Honey.** FABIAN and QUINET, also FABIAN.—See XIX.

PATENTS.

Purification of liquids [sugar solutions]. A. B. RAY, ASSN. to CARBIDE & CARBON CHEMICALS CORP. (U.S.P. 1,699,449, 15.1.29. Appl., 3.5.22).—Solutions containing dissolved salts and organic colouring matters, e.g., sugar solutions, are treated, separately or together, with activated carbon and a precipitated tricalcium or other alkaline-earth phosphate. R. BRIGHTMAN.

Cooling devices for mashing vessels for crystallisable material, more particularly for the sugar industry. A. ROLZ (B.P. 291,035, 24.5.28. Ger., 24.5.27).

Waste waters from sugar factories (B.P. 284,267 and 307,587).—See XXIII.

XVIII.—FERMENTATION INDUSTRIES.

Analysis of the bitter substances of hops. W. WINDISCH, P. KOLBACH, and M. WINTER (Woch. Brau., 1929, 46, 101—106, 111—117, 124—131).—Lupulone is prepared from commercial lupulin by a modification of the methods of Walker (J. Inst. Brew., 1924, 30, 570) and Espe (Diss., Berlin, 1925). Since the yield was only 15% from a soft resin fraction the iodine value of which indicated nearly 45% of lupulone, it is concluded that owing to its liability to change, published figures for the lupulone content of hops are valueless. An investigation of the lead precipitation method for determining humulone shows that the lead compound is more readily redissolved by excess of lead acetate when much hard resin is present. To avoid such excess small portions of the resin solution should be treated with varying quantities of the reagent and tested for lead after filtration. The precipitate, conveniently collected and weighed in sintered glass crucibles, consists of unaltered lead humulate, as shown by the proportion of lead and the iodine value of the recovered humulone. The latter was found to be 147.1—149.7 against 151.4 for pure humulone, and both values tended to be lower in presence of much (e.g., 20%) hard resin. Old or badly kept hops thus require special treatment, and the following methods are worked out. For fresh samples, containing less than 12% of the total resin in the form of hard resin, direct precipitation of the methyl-alcoholic solution of the total resin is suitable. In the case of older samples the soft resin should first be extracted by light petroleum or hexane, and, after evaporation, the residue dissolved in methyl alcohol and the lead humulate precipitated. Very altered samples fail to be precipitated except with much excess of lead acetate and give erroneous results. This may be corrected by washing the light petroleum extract with a phosphate buffer solution of p_H 6.4, the interfering substance, which is shown to be derived from humulone, being thus removed. The use of hexane in place of light petroleum gives satisfactory results and is to be preferred. The iodine value of the total resins is of little value, but that of the hexane-soluble portion, from which that of the soft resin minus humulone may safely be calculated by subtracting the value due to humulone, is a good guide to the changes which the resins have suffered. The original con-

stituents appear to be only humulone and lupulone, and their alteration products to have low iodine values, if any. It will, however, only occasionally be required to supplement the results of the humulone and hard resin determinations, since these suffice in the usual case of new hops. Electrometric titrations of solutions of humulone, lupulone, and resins show that their proportions cannot be determined by titration in stages over various p_H ranges. Since they are not in molecular solution in water, their buffering ranges vary with the concentration. Humulone and lupulone are equally strong acids in methyl alcohol, but humulone is markedly stronger in water.

F. E. DAY.

Analysis of hops. W. WÖLLMER (Woch. Brau., 1929, 46, 121—124).—Details of the modifications of the usual methods used for convenience and speed at the Sternburg Brewery, Leipzig, are given. Cold-extraction for 3 hrs. with shaking gives very slightly lower results for total resin, but, if anything, slightly higher results for humulone and soft resin as compared with Soxhlet extraction. Treatment of 15 c.c. of the methyl-alcoholic solution of the resins with 50 c.c. of light petroleum and 25—50 c.c. of water gives results for soft resin agreeing with those obtained by extracting the dried total resin with light petroleum. Where comparative analyses are to be made, the substitution of hexane for light petroleum is suggested.

F. E. DAY.

Frozen yeast. STAIGER and GLAUBITZ (Z. Spiritusind., 1929, 52, 116).—Yeast which was frozen at -10° to -25° for 24, 48, 72, and 96 hrs. and subsequently thawed by being stored for 24 hrs. either at room temperature ($17-20^\circ$) or at 5° showed little change in its properties. The stability and nitrogen content were unaltered, but there was a slight increase in the time taken for the fermentation of dough by the yeast which had been thawed at 5° . The water content was lower than that of the normal yeast, more especially where the yeast after being frozen for the longer periods was thawed at room temperature, in which case the difference approximated to 4%. Although in biological appearance the frozen and normal yeasts were identical, the frozen yeast yielded the very slight increase of less than 1% in the number of dead cells.

C. RANKEN.

Metals in connexion with wort and beer. C. G. MATTHEWS (J. Inst. Brew., 1929, 35, 181—188).—The use of an iron yeast press may introduce iron into the barm ale and give rise to an astringency. This tends to produce later an iron haze and an undesirable colour when the barm ale is added to the brew in the fermentation vessel. Zinc or galvanised containers dissolve in appreciable amount and produce an unpleasant metallic effect on the palate. Copper can be safely used for mashing vessels, but may be corroded by fermenting worts with a consequent reduction in the amount of yeast reproduction. The corrosion is more intense when the metal is scoured than when it is simply mopped over and allowed to form a natural film of oxide or sulphide. Copper, especially when of high purity, may become pitted at points where particles of foreign substances are situated, and which determine small galvanic cells.

Copper alloys, such as gunmetal, are less subject to this action. Aluminium of 99% purity is superior and is hardly attacked by fermenting wort, but is corroded by prolonged contact with water. Aluminium vessels should, therefore, be kept dry if they have to remain empty for any length of time. Tin, which is seldom pure, is affected by drastic methods of cleansing and is likely to produce hazes. Stainless steel, monel metal, and, to a smaller extent, pure nickel appear suitable for all types of brewing vessels, but are relatively dear compared with copper and aluminium. Although there is a tendency for a protective coating to form, pure lead piping is attacked by beer. Lead alloys containing 15% Sn are much more resistant.

C. RANKEN.

The nitrogen question [in brewing]. J. H. OLIVER (J. Inst. Brew., 1929, 35, 191—200).—The amount of soluble nitrogenous compounds in a wort made by mashing malt at approx. 67° increases as the concentration of the mash becomes greater and as the diastatic activity of the malt becomes higher. The nitrogen content of the wort is also augmented by the acidification of the mash, but the results under conditions of thick mashing, such as brewery mashes, are not so marked as with the 10% laboratory mash (thin mashing), since the increased concentration of the salts and proteins of the thicker mashes exerts a greater buffering effect. The maltose content of the wort tends to be similarly influenced by the concentration of the malt mashes.

C. RANKEN.

Substance responsible for the bitter taste formed in the amertume of wines. E. VOISENET (Compt. rend., 1929, 188, 941—943).—A substance, b.p. 198° , with an intensely bitter taste has been isolated from Burgundy wine (3 c.c. from 4 litres of wine); it is possibly a derivative of acraldehyde.

Limiting factors in lactic fermentation. L. O. ROGERS and E. O. WHITTER (J. Bact., 1928, 16, 211—229).—Lactic fermentation continues for a time after the bacterial cells cease to multiply. The optimal p_H for bacterial population is 5.8—6.0; mechanical stirring with air or, preferably, nitrogen further increases the population. The concentration of undissociated lactic acid is the principal factor in limiting growth and metabolism. A substance which is diffusible through a colloid membrane limits the growth of *Streptococcus lacticus*.

CHEMICAL ABSTRACTS.

See also A., April, 405, Kinetics of hydrolysis of trehalose, α -methylglucoside, and tetramethyl- α -methylglucoside (MOELWYN-HUGHES). 470, Dextrose-oxidase (MÜLLER). 471, Determination of catalase in barley-malt (CHARMANDARIAN). Sporulation of yeast (STANTIAL). 472, Giant yeast cells (HOLT). Extraction and purification of co-zymase from yeast (MYRBÄCK). Formation of citric and oxalic acids by *Aspergillus niger* (KOSTYTSHEV and TSCHES-NOKOV). 473, *Bacterium gluconicum* in tea fungus (HERMANN). Fixation of atmospheric nitrogen by *Azotobacter* (MEYERHOF and BURK).

Fusel oil reaction of alcohol. DIETRICH and JEGLENSKI.—See III. Stall manures. RUSCHMANN.—Hot fermentation of manure and weeds. FRU-

WIRTH.—See XVI. **Viscous fermentation of frozen beet.** COLIN and SIMONET.—See XVII.

PATENTS.

Yeast and its manufacture. G. O. W. HEIJKENS-KJÖLD, Assr. to AKTIEBOLAGET BÄSTA (U.S.P. 1,703,272, 26.2.29. Appl., 13.6.27. Swed., 14.6.26).—Hot sulphite liquor obtained from digestion of wood is treated with limestone and lime to neutralise the acid and render the liquor slightly alkaline, the whole being continuously aerated. After removal of the precipitates, the liquor is added gradually to a yeast-propagating wort, aeration being continued to remove alcohol formed, and the mixture maintained slightly alkaline throughout.

F. R. ENNOS.

Food from lower vegetables (U.S.P. 1,702,303).—See XIX. **Waste waters from distilleries etc.** (B.P. 284,267 and 307,587).—See XXIII.

XIX.—FOODS.

Comparison of some properties of normal and frosted wheat. A. H. JOHNSON and W. O. WHITCOMB (Mont. Agric. Exp. Sta. Bull., 1927, No. 204, 1—66).—No marked difference was observed in the crude protein content; the crude gluten is decreased only if the moisture content on freezing was greater than 44—46%. The amino-nitrogen content of frosted wheat is high. During auto-digestion the protein of frosted-wheat flour is broken down, and reducing sugars are formed, more rapidly than with normal flour. The reducing sugar content of frosted wheat is above the normal value, particularly if the wheat was immature when frosted.

CHEMICAL ABSTRACTS.

Relations between acidity and freezing point of milk. A. J. PARKER and L. S. SPACKMAN (Analyst, 1929, 54, 217—221).—The f.p. and acidity of a number of genuine and watered milks were determined on the fresh milks and after varying lapses of time. The normal acidity of fresh milk is suggested as 0.14% of lactic acid, and a temperature correction factor of 0.003° for each 0.01% excess acidity is shown to hold for acidities of 0.17—0.6%. The cryoscopic method only gives accurate results for added water in watered milks when applied to the fresh milks. Pasteurisation raises the f.p. 0.01°.

D. G. HEWER.

Cryoscopic method for detection of added water in milk. R. L. ANDREW (Analyst, 1929, 54, 210—216).—Analysis of 270 genuine milks in New Zealand showed a wide range in fat (2.35—5.9%) and of solids-not-fat (8.06—9.43%), but the maximum variation of f.p. was only from -0.545° to -0.565° , and in the case of 264 of the samples was between -0.550° and -0.560° . Beckmann's f.p. apparatus was used. This is filled with crushed ice and salt, and a strong freezing mixture is placed in another vessel. The zero point of the thermometer is found in water, and then a similar volume of milk is cooled in the strong freezing mixture, when supercooling usually occurs. Immediately the mercury begins to rise the tube is removed, placed in the apparatus, and stirring continued until the mercury reaches the highest point, which is taken as the f.p. If there is more than 1° of supercooling, the reading is

0.01° too low for every extra degree of supercooling. If no supercooling occurs the tube is removed at the stationary point of the mercury, and the lowest point of the subsequently falling mercury taken as the f.p. If the same conditions are adhered to no corrections need be applied. By this method added water which is not sufficient to bring the solids-not-fat below the legal limit may be readily detected. Naturally poor and adulterated milk may be distinguished. If the f.p. rises to -0.530° watering may be suspected, and if to -0.520° it is certain with approximately 5% of added water. The f.p. of normal milk is taken as not above -0.550° .

D. G. HEWER.

Direct determination of chloride in milk by conductivity titration. H. SCHORSTEIN, G. JANDER, and O. PFUNDT (Z. angew. Chem., 1929, 42, 335—336).—To 10 c.c. of milk 50 c.c. of water and 1 c.c. of 0.1N-nitric acid are added and the mixture is titrated conductometrically with silver nitrate. The result is in agreement with that obtained by ordinary titration of excess silver nitrate with thiocyanate, but increase of nitric acid gives lower results. If the nitric acid is replaced by acetic acid the variation is more complicated and the result unsatisfactory, but when the above quantity of nitric acid is used the method is reliable.

C. IRWIN.

Guaiacum reaction of milk. G. SCHROETER (Milch. Forsch., 1928, 6, 533—537; Bied. Zentr., 1929, 58, 72—74).—The guaiacum test is modified to ensure more reliable results and greater convenience in operation. The guaiacum reagent and the "activated" acetone should be stored separately. In a suitably marked tube is placed the 10 c.c. sample of milk, followed by 0.5 c.c. of guaiacum solution and 1 c.c. of the activated acetone, and the mixture is well shaken. A positive reaction is obtained with fresh or sour milk, but not with heated milk. The reaction with a mixture of fresh and heated milk is much weaker than with fresh milk and water. Cooked milk may contain an anti-catalyst. The rapidity of appearance and depth of colour produced is a measure of the peroxidase present. The species and method of feeding of the cow affect the intensity of the colour produced. Milk from diseased cows gives sometimes a positive and sometimes a negative reaction. Standard tints for comparison are made from artificial milk (tetralin-casein) coloured with Prussian-blue or acid-violet.

A. G. POLLARD.

Use of the nitrile method. II. Action of hydrocyanic acid on milk and its analytical value. F. LIPPICH (Z. anal. Chem., 1929, 76, 321—335; cf. A., 1929, 460).—The number of c.c. of 0.1N-potassium cyanide which react with 100 c.c. of milk is approximately a constant under standard conditions; for normal milk this "cyanide value" is 9.3—9.6, according to the sp. gr. of the milk. The value is increased by increasing the excess of cyanide added in the test, the time of contact, and the temperature, and it varies slightly with the casein:lactose ratio. The determination of the cyanide value of a milk is made as follows: 100 c.c. of milk are centrifuged to remove fat, raised to 19° in a water-bath, and poured into 20 c.c. of 0.25N-potassium cyanide solution at 19°; after 10 min. 40 g. of tartaric acid in 80 c.c. of water are added, the

mixture is heated to boiling, and a current of air passed through for 2—2.5 hrs. to expel free hydrocyanic acid, which is collected in 50 c.c. of 10% potassium hydroxide solution and determined as previously described (*loc. cit.*). This determination in combination with the sp. gr. is sufficiently accurate to detect 2% or more of added water, the decrease in cyanide value being roughly proportional to the dilution of the milk. By treating the milk with a known volume of standard formaldehyde solution before making the cyanide test and then conducting this test as above, a "formaldehyde value" may be obtained by subtracting the true cyanide value from the cyanide value for the formaldehyde-milk mixture and then subtracting the result from the c.c. of 0.1*N*-formaldehyde solution added. For normal milk the formaldehyde value is about 4.2.

A. R. POWELL.

Washing powders for dairy use. A. W. PHILLIPS, M. J. MACK, and J. H. FRANSEN (Mass. Agric. Exp. Sta. Tech. Bull., 1928, No. 13, 179—187).—Washing powder preferably contains anhydrous sodium carbonate (60%) and sodium phosphate dodecahydrate (40%), the total alkali content being 58%. The properties, for dairy use, of sodium carbonate, phosphate, and hydroxide (the commonest ingredients of washing powders) are discussed.

CHEMICAL ABSTRACTS.

The Schmid-Bondzynski-Ratzlaff method for determining fat in cheese. B. C. VAN BALEN WALTER (Chem. Weekblad, 1929, 26, 164).—Details of manipulation and results of control tests are given. The method is declared to be more accurate than that of Smetham.

S. I. LEVY.

Cause of the fermentation of honey. F. W. FABIAN and R. I. QUINET (Mich. Agric. Exp. Sta. Tech. Bull., 1928, No. 92, 1—40).—The critical moisture point for fermentation is 21%. The moisture content of extracted honey increased by absorption at 20° from 5 to 12%. Comb honey stored for 7 yrs. over calcium chloride lost 7.5%; when stored in a moist place it gained 3.5—5.7% of water. Honey may be pasteurised at 62.5° in 30 min.

CHEMICAL ABSTRACTS.

Cause of fermented honey and its control. F. W. FABIAN (Fruit Prod. J., 1928, 8, No. 2, 18—19, 22).—In a moist atmosphere, honey may absorb water, becoming sufficiently dilute to permit the growth of yeasts. Unripe or improperly cured honey contains an excessive amount of water and tends to become fermented. Comb honey loses and absorbs water very slowly.

CHEMICAL ABSTRACTS.

Extraction of apple juices in the manufacture of jelly. C. R. FELLERS (Mass. Agric. Exp. Sta. Res. Bull., 1928, No. 15, 218—251).—Optimal conditions are described, and the characters of the product are correlated with the sugar content and percentage of pectin.

CHEMICAL ABSTRACTS.

Influence of sugar inversion on gel formation. K. FIEDLER (Konserven-Ind., 1928, 15, 405—407, 427—428; Chem. Zentr., 1928, ii, 1831).—The conversion of sucrose into invert sugar reduces and may prevent gelation in jellies, marmalades, etc. Pectin remains as

an active gelatinising agent, without, however, exercising its effect on account of the inversion.

A. A. ELDRIDGE.

Detection, determination, and oxidation of sulphur dioxide [in foods]. D. HENVILLE (Analyst, 1929, 54, 228—231. Cf. B., 1927, 502; 1928, 346).—The apparatus used consists of two bulbs, the lower one preventing liquid being drawn back into the flask and acting as an absorption bulb, and the upper one containing the bulk of the liquid by which the sulphur dioxide is absorbed. Sulphuric acid (10 c.c.) is placed in the lower bulb, then two drops of bromphenol-blue and 0.1*N*-sodium hydroxide until the liquid is just blue; the vent is then closed. The apparatus is fitted into the top of a reflux condenser, and the flask at the bottom contains 150 c.c. of air-free water and is connected to a carbon dioxide cylinder. When air is expelled the sample is introduced, followed by 50 c.c. of 16 vol.-% solution of hydrochloric acid, and the flask is heated. The indicator in the lower bulb will change to yellow before the b.p. is reached if much sulphur dioxide is present, and traces of sulphur dioxide show a colour change within 5 min. from the commencement of boiling. The sulphur dioxide is entirely absorbed in the two bulbs and the test may be made quantitative. An extra bulb may be used to ensure retention of sulphur dioxide.

D. G. HEWER.

See also A., April, 413, **Determination of iodine in vegetables** (McCLENDON and REMINGTON).

Sunflower seed as feeding-stuff. WEISER and ZAITSCHEK.—See XVI.

PATENTS.

Yeast-saving composition in bread-making. C. B. HILL and M. H. GIVENS, ASSNS. to NORTHWESTERN YEAST Co. (U.S.P. 1,702,259, 19.2.29. Appl., 10.1.27).—A mixture of 2 pts. of ammonium sulphate, 1 pt. of calcium sulphate, and 1 pt. of tricalcium phosphate is added either to the dough batch or to the yeast prior to making the dough.

F. R. ENNOS.

Cream separator. A. J. SQUIRE and J. J. LINDVART (B.P. 307,635, 20.3.28).—An air fan of disc-plate shape is arranged within the cream chamber and connected with the separator bowl spindle so as to aerate and deodorise the cream.

W. J. BOYD.

Treatment of tea in course of manufacture. J. P. CHALIKA (B.P. 307,591, 6.2.28).—Drying and/or conditioning prior to withering is effected by placing the leaf in a chamber maintained under reduced pressure and at 71—99° so as to cause the moisture to evaporate rapidly with minimum loss of aroma. A suitable water-jacketed chamber is described which also serves in the fermentation of the rolled leaf etc.

W. J. BOYD.

Manufacture of food etc. from lower vegetables. A. KAHN, ASS. to SOC. FRANÇ. DES PROD. ALIMENTAIRES AZOTÉS (U.S.P. 1,702,303, 19.2.29. Appl., 16.12.25).—Distillery yeast free from alcohol is kept at 40—55° for a few hours, and after addition of 5—20% of sodium chloride the whole is autolysed for 1—5 days above 40°, but below the minimum temperature at which the enzymes are destroyed. The autolysate is separated from

the cellulose residue, the former on concentration *in vacuo* affording a palatable food product whilst the latter is an efficient emulsifying agent. F. R. ENNOS.

Preventing the discoloration of canned foods. G. S. BOHART, Assr. to NAT. CANNERS ASSOC. (U.S.P. 1,699,274, 15.1.29. Appl., 13.3.26).—Zinc oxide or phosphate or other insoluble oxides or salts of metals which do not yield coloured sulphides are incorporated in a baking lacquer, which is applied to the inner surfaces of the container. R. BRIGHTMAN.

Cereal food preparation. L'AUGMENTINE S.A. (B.P. 289,060, 19.4.28. Ger., 21.4.27.)

Apparatus for ultra-violet ray treatment of flour. S. BONSOR (B.P. 308,390, 7.1.28).

Alimentary [chocolate] substance. C. MAGAT (B.P. 308,552, 28.9.28.)

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Acetylsalicylic acid. D. B. DOTT (Pharm. J., 1929, 122, 355).—Addition of the theoretical quantity of sodium bicarbonate to an aqueous solution of aspirin caused decomposition, after 4 hrs., equivalent to the formation of 4.27% of salicylic acid, and after 24 hrs. to 14.14% of salicylic acid. E. H. SHARPLES.

Ammonium salt of acetylsalicylic acid. M. N. DVORNIKOFF (J. Amer. Pharm. Assoc., 1929, 18, 213).—Following Woldman's procedure (B., 1929, 263) only aspirin contaminated with ammonium salts was obtained. Aspirin dissolves in ammonia solution, and is readily hydrolysed by the excess of ammonia giving ammonium acetate and salicylate. The consumption of ammonia approaches the ratio of 2 mols. of ammonia to 1 mol. of aspirin. When all the ammonia is neutralised more aspirin dissolves in the warm liquid and separates unchanged on cooling. E. H. SHARPLES.

Action of peroxidase on glycerophosphates. J. RAE (Pharm. J., 1929, 122, 354—355).—A 5% solution of sodium glycerophosphate containing 0.05% of phosphate after contact with a 10% potato extract for 2 months showed a phosphate content of 2.4%. With 10% mucilage of acacia the phosphate content increased to 5.0% in 14 days, and with a sterilised mucilage of acacia the change was retarded, but a content of 1.9% of phosphate was noted after 2 months. It is possible that deposits in Syrup. Glycerophos. Co. may be partly due to the action of peroxidase in the cudbear. The effect of sodium hydroxide, sulphuric acid, dextrose, and sucrose on sodium glycerophosphate is recorded. E. H. SHARPLES.

Determination of camphor in camphorated oil. L. DÁVID (Pharm. Ztg., 1929, 74, 437—438).—The solution of camphor in sesamé oil is treated with aqueous calcium hydroxide suspension to saponify the oil, the camphor distilled out of the resulting mixture with steam, extracted from the distillate, and weighed. S. I. LEVY.

Ergot and ergot extract. L. VAN ITALLIE [with (FRL.) HARMSMA] (Schweiz. Apoth.-Ztg., 1928, 66, 423—425; Chem. Zentr., 1928, ii, 1916—1917).—Various methods for the evaluation of ergot have been

examined; the absorption curves of ergotinine, ergot-oxin, ergotamine, and ergotaminine in the ultra-violet have been studied. Optical methods are suitable for the evaluation. Extraction of ergot according to the Dutch pharmacopœia with 0.25% tartaric acid is incomplete. The alkaloid content of well-preserved ergot falls less rapidly than that of extracts. A. A. ELDRIDGE.

Determination of total alkaloid content of *Lobelia inflata* and its preparations. L. DÁVID (Pharm. Ztg., 1929, 74, 419—420).—The filtered solution of the alkaloids is made alkaline and extracted with ether; the ethereal solution is clarified and an aliquot proportion evaporated in a tared flask. S. I. LEVY.

Determination of theobromine in diuretin and its derivatives. H. BOBE and A. LINDNER (Pharm. Ztg., 1929, 74, 418—419).—An excess of iodine in potassium iodide solution is added to the material dissolved in sodium hydroxide solution, the mixture acidified, the precipitated theobromine periodide removed by filtration, and the excess of iodine in the filtrate determined by titration. S. I. LEVY.

Detection of extracts and powders of medicinal plants in pharmaceutical preparations. F. DI STEFANO (Annali Chim. Appl., 1929, 19, 107—109).—A pharmaceutical preparation made from a solution of the active principles of a drug will not contain cell residues or cellulose, which will, however, be present if the powdered plant product itself has been used. To determine the cellulose, about 0.5 g. of the preparation is mixed in a 200—300 c.c. Kjeldahl flask with 50 c.c. of pure glycerol (*d* 1.23) containing 20 g. of sulphuric acid per litre, the liquid being then gently boiled under reflux for 30 min. with occasional shaking. When the flask has cooled to 90—100°, 100 c.c. of boiling distilled water are added and the solution is heated to boiling and filtered while hot through an alundum crucible. The residue is washed with about 400 c.c. of boiling water, then with alcohol at 80—90° until the washings are colourless, and finally with alcohol-ether. After being dried at 110° for 1 hr. and weighed, the crucible is heated in a Bunsen flame and weighed again, the difference between the two weights giving ash-free cellulose. The cellulose contents of a number of drug powders are given. If only detection of the cellulose is required, the precipitate obtained as above is collected on a glass crucible with porous base and dissolved in Schweitzer's reagent, acidification with dilute sulphuric acid yielding a flocculent precipitate of hydrocellulose. T. H. POPE.

Examination of some drugs according to D.A.B. VI. R. DIETZEL and F. SCHLEMMER (Apoth.-Ztg., 1928, 48, 907—909; Chem. Zentr., 1928, ii, 1918—1919).—The official methods for the following determinations have been examined, and certain modifications are suggested: potassium hydroxide, white (mercury) precipitate, sodium diethylbarbiturate and phenylethylbarbiturate, magnesium peroxide, ferrous sulphate, arsenious acid, "chloramine." Sodium thiosulphate is standardised by means of potassium bromate, and the effect of atmospheric oxidation in iodometric titrations is discussed. A. A. ELDRIDGE.

Determination of alkaloids in admixture with vegetable drugs. G. E. ÉWE (*J. Amer. Pharm. Assoc.*, 1929, 18, 241—243).—The disturbing influence of the presence of oily and resinous material other than alkaloids which may be included with the alkaloidal residue separated during analysis when fatty acids or soaps are present has been investigated. Modifications of the usual ammonia-chloroform extraction methods applicable to the determination of small proportions of alkaloids in complex admixture with vegetable drugs are described. E. H. SHARPLES.

Testing antiseptic dyes. G. F. REDDISH (*J. Amer. Pharm. Assoc.*, 1929, 18, 237—240).—A method developed by Himebaugh for the control and testing of antiseptic dyes is described. The test simulates actual conditions of use of such materials in that it measures the penetrating power and antiseptic action, and it has given very satisfactory results over a period of two years. E. H. SHARPLES.

Certain constituents of the leaf and their relation to the burning qualities of tobacco. D. E. HALEY, E. S. NASSET, and O. OLSON (*Plant Physiol.*, 1928, 3, 185—197).—The organic acids are combined almost entirely with alkali and alkaline-earth metals. The burning quality is more closely related to the alkalinity of the ash than to the amount of ether-soluble organic acids. The alkalinity of the ash depends on the season and on the potassium salt employed; the sulphate is preferred to the chloride. The "burn" and composition of tobacco depend on base exchange in soil with the removal of "active substances," e.g., calcium chloride, and the ability of the plant to secure sufficient potassium. CHEMICAL ABSTRACTS.

Production of cigarette tobacco by flue-curing. F. J. F. SHAW and K. RAM (*Agric. Res. Inst., Pusa*, 1928, Bull. No. 187, 19 pp.).—The cultivation, flue-curing, and economics of production of Adcock tobacco in India are fully described. It can be grown successfully. E. H. SHARPLES.

See also A., April, 439, Chloro- and bromo-derivatives of 2:4-dihydroxydiphenylmethane (KLARMANN and VON WOWERN). 441, Synthesis of ephedrine (MANSKE and JOHNSON). 449, Indian turpentine from *Pinus longifolia*, Roxb. (GIBSON and SIMONSEN). 450, Contact transformations of nopinene, terpinene, and terpinolene (ZELINSKI and LEVINA). Individuality of humulene (CHAPMAN). Sylvestrenes and carenes (KONDAKOV). 453, Alkylbarbituric acids (LYONS and DOX). 455, Porphyrins (KÜSTER and others). Protoporphyrin (HAMSÍK). 457, Opium alkaloids. Synthesis of *dl*-apomorphine dimethyl ether (SPÁTH and HROMATKA; AVENARIUS and others). *Strychnos* alkaloids (LEUCHS). Derivatives of mono- and di-aminohydroxyphenylarsinic acids (FISHER and RAIZISS). 468, Syntheses of guanidine derivatives (KUMAGAI and others). 474, Micro-determination of adrenaline (CHIKANO). 475, Behaviour of insulin on irradiation with X-, radium, and ultra-violet rays (DEN HOED and others). 477, *l*-Asparigine in *Ulex europæus* (BRIDEL). Alkaloids of *Corydalis ambigua* (CHOU and CHOU). Alkaloids of *Bocconia frutescens* (MILLER). Action of thorium-X

on active principle in certain medicinal plants (AVERSENQ and others). 478, Determination of organic arsenic acids (URBSCHAT).

PATENTS.

Process for arresting the glycolysis of living cells and its application to manufacture of technical or commercial products. SCHERING-KAHLBAUM A.-G. (B.P. 284,643, 5.1.28. Ger., 2.2.27).—Glycolysing cells (yeast cells, anaerobic bacteria, tumour cells) are treated with an organic fluoro-compound. The glycolytic action of yeast cells is reduced by $M/10^5$ -sodium *p*-fluorobenzoate to the extent of 62%, whilst respiration is increased by 11%. C. HOLLINS.

Composition for therapeutic uses. K. CONNELL (U.S.P. 1,704,727, 12.3.29. Appl., 17.1.25).—A briquette, which generates chlorine on treatment with acid, is partially coated with an inert material, so that the whole is not decomposed immediately. F. G. CLARKE.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Bleaching action of desensitisers. LÜPPO-CRAMER (*Z. wiss. Phot.*, 1929, 26, 344—351).—Curves are given showing the effect of concentration of desensitisers, alone and in presence of potassium bromide, on the photochemical bleaching action of Pinacryptol Green and phenosafranine. These reveal that the sensitivity of a photographic plate is largely influenced by the particular concentration of the desensitiser used. The desensitising action of phenosafranine with potassium bromide on an old Agfa portrait film is illustrated, and experiments with Isoquinoline Red, Orthochrome T, and Ethyl Red, each in conjunction with potassium bromide, are briefly described. H. T. S. BRITTON.

See also A., April, 408, Lattice energies and photochemical decomposition of silver halides (SHEPPARD and VANSELOW). Intermediate regressions (LÜPPO-CRAMER). Limiting short wave-length for the Herschel effect (MAUZ).

PATENT.

Preparation of photosensitive photographic emulsions. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 307,716, 7.11.27).—Processes are described for the preparation of photographic emulsions similar in type to the ordinary print-out, gaslight, and bromide emulsions, containing mercuric oxalate or its insoluble complex ammine compounds as the light-sensitive substances. Such emulsions may be sensitised by the addition of salts of the heavy metals, mercury, silver, thallium, gold, and platinum, or by dyes such as eosin, erythrosin, etc. J. W. GLASSETT.

XXII.—EXPLOSIVES; MATCHES.

Cellulose nitrates. J. CRAIK (5th Coll. Symp. Mon., 1928, 273—286).—The results of experiments on nitrating, denitrating, and "nitrating-up," and on the solubilities of the products, are consistent with the view that there are three cellulose nitrates.

CHEMICAL ABSTRACTS.

Falling-ball method for measurement of the apparent viscosity of cellulose nitrate solutions. J. K. SPEICHER and G. H. PFEIFFER (5th Coll. Symp. Mon., 1928, 267—272).—Mutually consistent results

were obtained. For low-, but not for high-, viscosity types the same relation obtains between the results with the falling-ball and capillary-tube methods as is observed for castor oil.

CHEMICAL ABSTRACTS.

PATENT.

Percussion caps and the like. W. DICKSON, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 307,560, 19.9.28).—The exposed surface of the priming composition of percussion caps is protected from moisture and from damage during insertion into the cartridge by being coated with a film of non-explosive esters or ethers or mixed esters and ethers of cellulose. S. BINNING.

XXIII.—SANITATION; WATER PURIFICATION.

Activated sludge process. A. KUFFERATH (*Z. angew. Chem.*, 1929, 42, 65—67).—Sewage containing phenols etc. from tar works can be dealt with in the activated-sludge process by the addition of selected micro-organisms. In Germany the aeration surface is only 6% of the bottom surface as compared with 16% in England. Ferroconcrete is used for the bottom and walls and supports; for the aeration vats and air-tubes iron coated with zinc is used. Special porous filter plates are used. A p_H of 7.2 appears to give the most favourable results, and a small addition of ferrous sulphate or chloride on the first day is advantageous.

R. BRIGHTMAN.

Effect of pure soaps on the bactericidal properties of phenolic germicides. B. HAMPIL (*J. Bact.*, 1928, 16, 287—300).—Sodium oleate, sodium myristate, potassium palmitate, and potassium stearate inhibit the bactericidal properties of phenol, *m*-cresol, *sec*-butylphenol, butylresorcinol, and hexylresorcinol; hence it is impossible to produce a germicidal soap by the addition of small quantities of a phenolic compound. The germicidal activity of phenol is affected by soaps in the dispersed phase more than by soaps in the gel phase, apparently by removal of phenol from solution.

CHEMICAL ABSTRACTS.

Operation of the calcium hydroxide process [of water treatment]. M. GROECK (*Gas- u. Wasserfach*, 1929, 72, 319—324).—Bücher's method of treating water to prevent corrosion in pipes and the report on its operation at the Remscheider installation are discussed and criticised. It is pointed out that the theoretical basis advanced is inadequate, since the concentration of hydroxyl ions is too low to inhibit corrosion. The lime process is not new, and the figures given in the report are not conclusive.

S. I. LEVY.

Investigation of soda water for lead. H. W. PETHERICK (*Bull. Hyg.*, 1928, 3, 402).—Samples (in Brisbane) contained lead originating from the solder in carbonators. Material free from lead was then employed, although in some cases chemical treatment of the water was necessary.

CHEMICAL ABSTRACTS.

Tannery waters. MEZEY.—See XV.

PATENTS.

Plant for dealing with sewage. PULSOMETER ENGINEERING CO., LTD., and J. BJÖRNSTAD (B.P. 307,561, 20.12.27).—The sewage is passed through a suitable screen and any matter deposited thereon is regularly removed and periodically disintegrated into pieces of

sufficiently small size to pass through the screen prior to discharge along with the sewage. C. JEPSON.

Treatment of sewage. E. VON SPRINGBORN (B.P. 307,582, 19.1.28).—Sewage is passed through a series of tanks containing combustible material, *e.g.*, bituminous coal, which is reduced in size in successive tanks from about a 4 in. to $\frac{1}{4}$ in. cube, and finally through a straining filter of coke. When the filtering material is loaded with sludge it is removed and burned at a dull red heat with a limited air supply, and the steam and gases thus generated are condensed and collected with recovery of ammonia, methane, light oils, and grease.

C. JEPSON.

Biological purification of waste waters from yeast and sugar factories, distilleries, and other factories. A./S. DANSK GAERINGS-IND., Assees. of LESIENICKA FABR. DROZDY PRASOWANYCH I SPIRYTUSU SPOLKA AKCYJNA (LESIENITZER SPIRITUS U. PRESSHEFE-FABR. A.-G.) (B.P. 284,267, 25.1.28. Austr., 26.1.27).—The wastes from such factories are approx. 20 times the strength of normal sewage and contain mainly betaine substances, albumin, volatile vegetable acids, humin substances, and sulphur compounds. It is proposed to decompose the organic material by means of pure cultures of bacteria specifically suitable for the purpose and preferably in the zoögloea state, each group to be dealt with separately unless the organisms responsible are capable of working harmoniously together. The success of the process largely depends on the maintenance of the bacteria etc. in pure culture, and hence the waste should be sterile; as that from yeast factories and spirit distilleries consists largely of waste water from the stills, this condition is readily fulfilled, otherwise it would be necessary to sterilise, *e.g.*, with chlorine. In the sterile waste the decomposition of sulphates into sulphides does not occur, and so a frequent cause of nuisance is avoided.

C. JEPSON.

Biological purification of waste water. H. WADE. From A./S. DANSK GAERINGS-IND. (B.P. 307,587, 25.1.28).—The biological purification of waste water may be divided up into stages corresponding to the groups of organic impurities contained therein. In each stage the water is inoculated with a specific organism preferably in pure culture and in the form of zoögloea. When the reaction is complete the organisms are removed, and the degradation is carried a stage further by another organism in a similar way, the process being repeated until the desired stage of purification is attained. The process may be applied on sand or other filters, in tanks, or by a variation of the activated sludge process using an inorganic precipitate inoculated with the desired organism.

C. JEPSON.

Treatment of polluted waste water. J. T. TRAVERS, ASSR. to TRAVERS-LEWIS PROCESS CORP. (U.S.P. 1,703,373, 26.2.29. Appl., 25.3.27).—Alkaline liquids containing polluting organic matter are treated with 1%, by vol., of a solution of sulphuric acid (1%) containing 9% of clay in suspension.

C. JEPSON.

Softening of water. S. A. SANFORD (U.S.P. 1,705,589, 19.3.29. Appl., 30.11.26).—A mixture containing barium fluoride, but no other precipitant, is added.

F. G. CLARKE.