BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

JAN. 31 and FEB. 7, 1930.*

L-GENERAL; PLANT; MACHINERY.

Line-co-ordinate charts for representing chemical engineering data. E. A. RAVENSCROFT (Ind. Eng. Chem., 1929, 21, 1203-1210).-In the usual or Cartesian system of co-ordinates, a line represents an equation and a point a solution thereof. In the line-co-ordinate system, in which the x and y axes are parallel, a point represents a linear equation between x and y, and any straight line drawn through this point represents a solution. A series of equations between x and y each corresponding to a different value of a third variable z can be most simply represented by line co-ordinates in which they become points on a curve. Examples given are: a vapour-pressure chart in which the vapourpressure curves of 50 substances are indicated by points, a latent heat-temperature chart, and a humidity chart for air-water. The last-named is much simpler than the Cartesian chart from which it is derived, and enables humidity to be determined directly from wet- and drybulb temperatures. In this and in all other cases the Cartesian curves must be modified if necessary so that they become straight lines before conversion into line co-ordinates. C. IRWIN.

New method of heating chemical plant. A. ERNST (Chem. Fabr., 1929, 495—497).—Coils are wound on the external walls of the vessel to be heated, copper strips hammered in between the coils and the walls of the vessel, and the coils spot-welded to the walls. S. I. LEVY.

Locating the obstruction in a clogged line of the [ammonia] compressor. J. RATHBUN (Ind. Eng. Chem., 1929, 21, 1257—1258).—A trap on the suction line to an ammonia compressor became partly blocked with congealed oil, probably owing to the evaporation of liquid ammonia remaining in the trap during pumpingdown to effect a repair. The line on the other side of the obstruction remained under pressure, thus causing difficulty in locating the trouble. Such an obstruction can be identified by flooding the coils with liquid ammonia, when frost should disappear up to the point of blockage. Good oil and proper drainage are necessary.

C. IRWIN.

Correcting engine tests for humidity. D. B. BROOKS (Bur. Stand. J. Res., 1929, 3, 795-806).—Data obtained on a 6-cylinder automobile engine indicate a loss of engine power with increasing humidity proportional to the volumetric loss of oxygen content of the atmosphere. It is shown that power and fuel consumption may be corrected by subtracting observed watervapour pressure from atmospheric pressure and using the result in place of barometric pressure in the usual correction formula. Simple nomograms are given for obtaining the humidity correction at different altitudes. C. J. SMITHELLS.

Technique of practical lubrication. A. MOSSER (Petroleum, 1929, 25, Motorenbetrieb, 2, No. 12, 3-10).-The disadvantages of different types of greases, vaseline, and mineral and fatty acids as lubricants are discussed. An ideal lubricant is defined as one which has a low friction coefficient and a horizontal viscosity curve. Mineral oils usually vary greatly with temperature, whilst fatty oils tend to decompose and deposit metallic salts, and compounding of these oils does not eradicate such disadvantages. Experiments show that for hot-running machines, better results are obtained with clear, low flash-point cylinder oils than with black, asphaltic, high flash-point cylinder oils. In automobile engines, water emulsions give rise to more trouble than is caused by a dilution of the lubricant with fuel, but so long as the consistency of the emulsion is no thicker than cream, it seldom causes danger. Non-emulsifiable oils are unsatisfactory since the settled water is drawn in by the pump and delivered in place of oil. The addition of a topped mineral oil instead of rape-seed oil for compounding is recommended.

W. S. E. CLARKE.

Filtration. I. G. Bozza and I. SECCHI (Giorn. Chim. Ind. Appl., 1929, 11, 443-448, 487-492).-Experiments on the filtration of water, calcium chloride solutions, alcohol, benzene, petroleum, and petroleum-oil mixtures through beds of quartz and galena particles of different sizes show that: (1) Darcy's law is mostly rigorously obeyed, sensible deviations therefrom occurring only with very fine and non-homogeneous galena under rather high pressure-gradients. (2) With washed and very homogeneous quartz, the filtration constants found correspond satisfactorily with those given by King and Slichter (Principles and conditions of the movement of ground waters, 19th Ann. Rep. U.S. Geol. Survey, 1914), but do not agree with those calculated according either to Emersleben's theory (Physikal. Z., 1925, 26, 601) or to a simplified hypothesis in which the filter is likened to so many capillary tubes. (3) Through one and the same filter bed, a liquid of high surface tension passes more readily than one with a low surface tension. Thus water and aqueous solutions have filtration constants about 1.3 (1.5-1.8) times as great as those of alcohol, benzene, and oils with quartz (galena) beds. Considerable influence is hence exerted by the mutual characters of the solid and liquid, this being probably related to the inter-surface tensions between the two. T. H. POPE.

Apparatus for measuring the permeability of surfaces of membrane hide, leather, wood, etc. by liquids and gases. M. BERGMANN (Chem. Fabr., 1929, 527-529).—In the apparatus for liquids the material to be tested is stretched transversely to a downward

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

current of the liquid. A manometer and a regulator to compensate for the back-pressure are provided, and the volume of liquid passing is measured. The gas apparatus is kept under constant pressure by a given head of water in a tube with overflow, and the gas passing the membrane is measured by displacement.

C. IRWIN.

Simple volumenometer, and its employment for determining the porosity and the true and apparent sp. gravities of porous masses. R. WASMUHT (Chem. Fabr., 1929, 520—522).—A simple glass apparatus is described by means of which the volume of a solid may be read off directly. With porous substances, the fluid employed is water if the true volume is to be determined, and mercury if the total volume (solid + pores) is required. S. I. LEVY.

Distillation in heated pipes. MAYER.-See II.

PATENTS.

Furnaces. CARBORUNDUM Co., LTD. From CARBORUNDUM Co. (B.P. 321,281, 25.9.28. Addn. to B.P. 257,261; B., 1927, 753).—The invention described in the prior patent is extended to combustion spaces (of boilers or metallurgical furnaces) operating with a flame temperature in excess of 1400°, the fuel ash being cooled at least 100° below the flame temperature, but not lower than 400°, and caused to congeal on the walls. If aircooling alone is insufficient, water passages (carrying, *e.g.*, the boiler-feed water) may be inserted in the airjacket). B. M. VENABLES.

Muffle furnace. F. C. GREENE and O. H. HERTEL (U.S.P. 1,730,570, 8.10.29. Appl., 13.6.25).—A furnace suitable for heating a vertical retort as described in U.S.P. 1,730,569 (B., 1930, 91) is divided vertically into a number of zones. On one side is a long, vertical, heatsupplying chamber, and on the other a similar exhaust chamber. The transference of heat can be individually regulated through each zone by means of dampers.

B. M. VENABLES.

Rotary kiln. A. J. BRIGGS, Assr. to INDUSTRIES OF AMERICA, INC. (U.S.P. 1,734,417, 5.11.29. Appl., 27.1.27). —A rotary kiln is provided with telescopic joints at one or more intermediate points, the outer ends being fixed axially. B. M. VENABLES.

Heating and controlling chemical reactions at high temperatures. C. FIELD, ASST. to CHEM. MACHIN-ERY CORP. (U.S.P. 1,734,329, 5.11.29. Appl., 15.7.22).— Mercury vapour is used both in a jacket and in direct contact with the liquid, which must not react with the mercury. B. M. VENABLES.

Heat exchangers. R. C. CROSS and H. M. WARE (B.P. 321,833, 21.11.28).—A form of heat exchanger having three concentric tubes with thin walls and narrow annular spaces is described. B. M. VENABLES.

Drying, waste-heat recovery, and cooling system. F. S. BOLTZ (U.S.P. 1,731,290, 15.10.29. Appl., 19.12.27).—In a laundry or similar plant the humid air from the drying cylinders is treated with water sprays, and the water caused to give up its heat to the cold water entering the plant. B. M. VENABLES.

Desiccation apparatus. W. H. DICKERSON, Assr. to INDUSTRIAL WASTE PRODUCTS CORP. (U.S.P. 1,734,289, 5.11.29. Appl., 9.3.23).—A spraying device for the liquid is situated at the top of a tower, and is supplied from a feed tank by a pump. Between the pump and sprayer a by-pass, with pressure regulator, is taken back to the feed tank; besides serving to keep the pressure constant, the by-pass permits rapid circulation in the feed tank and prevents sedimentation. The portion of the conduit beyond the by-pass (*i.e.*, the net feed) is heated. B. M. VENABLES.

Washing of materials such as ores, coals, etc. L. HOYOIS (B.P. 294,210, 12.7.28. Belg., 20.7.27).—The apparatus comprises a stratifying trough with upwardcurrent separating columns below. When cleaning coal, the large lumps of coal and shale will stratify in a sloping feed-trough, with mixed smaller-size particles between and among the large lumps. The large shale passes through adjustable openings in the bottom of a horizontal continuation of the trough and meets upward currents of water ; part of the latter flows through the ports into the trough, thereby largely preventing any coal from passing, but any coal that does get through is carried off through a horizontal passage below the trough by the other portion of the upward-current water. There are about as many columns as there are openings in the trough, and the horizontal product from one column B. M. VENABLES. may flow into the next.

Impact pulveriser. W. R. WOOD, ASST. to INTERNAT. COMBUSTION ENG. CORP. (U.S.P. 1,734,661, 5.11.29. Appl., 1.8.23).—A pair of oppositely revolving wheels have intercalating U-shaped rims, the flanges being provided with apertures through which the material passes by centrifugal force. On leaving any aperture the material is projected tangentially against the flange rotating in the opposite direction. B. M. VENABLES.

Shear surface ring [hammer] for pulverising machines. R. J. WILLIAMS and C. A. WETTENGEL, Assrs. to SOUTHERN MANGANESE STEEL Co. (U.S.P. 1,733,637, 29.10.29. Appl., 11.12.26).—Hammers for use in disintegrators are formed as discs with wavy edges and having central holes larger than their supporting pins. B. M. VENABLES.

Centrifugal mixing machines for sand etc. G. SAMM (B.P. 321,899, 19.3.29).—A plain disc and an annular disc are spaced apart by radial arms and provided with a shaft which may be either horizontal or vertical. The whole is rotated at centrifugal speed while the material to be mixed is fed through the centre of the annular disc. B. M. VENABLES.

Separation of dry materials. BIRTLEY IRON Co., LTD., and C. W. H. HOLMES (B.P. 321,670, 7.5.28).—A shaking table with riffles and upward air currents is described. Among other points, all the material is delivered over an edge (or both edges in a twin table) which is (or are) parallel with the axis of reciprocation. B. M. VENABLES.

Separator. [Stream-line slime settler.] M. SPROCKHOFF (U.S.P. 1,732,386, 22.10.29. Appl., 6.8.27. Ger., 9.8.26).—A liquid containing solids in suspension is caused to flow continuously between a number of inclined plates, which are closely spaced so that the flow is stream-line. The slime collected on the plates slides off at the bottom into a worm conveyer or other means

TAL OILS.

of removing it as thick pulp. Baffles are provided so that there is no flow of liquid through the lower ends of the plates, and these portions, at least, of the plates are imperforate. B. M. VENABLES.

Centrifugal machine. L. D. JONES, ASST. to SHARPLES SPECIALTY CO. (U.S.P. 1,733,266, 29.10.29. Appl., 27.10.27).—A centrifugal basket of the strainer type is driven by a sleeve shaft, within which is a solid shaft driving (at a different speed) a helical scraper to discharge the solids; the strain on the scraper is reduced by making the basket conical. The walls of the basket are formed from a number of rings which nearly touch each other and are supported by an external spider. The discharge of liquid (and fine solids) is through the continuous annular slits between the rings, and these are kept clear by thin plates extending into them and attached to the scraper. B. M. VENABLES.

Tubular filter press. H. H. CANNON, ASST. to OLIVER UNITED FILTERS, INC. (U.S.P: 1,734,325, 5.11.29. Appl., 28.5.28).—A number of tubular filter elements are nonleakably secured in tube plates and surrounded by a shell from which the filtrate is withdrawn. The domed ends of the shell form headers for the ends of the tubes, one header being divided into two compartments. The prefilt is supplied to one of the compartments and passes longitudinally through one group of tubes and back through the other, being exhausted as thick pulp through the other compartment of the divided header.

B. M. VENABLES.

Filter. E. J. SWEETLAND, ASST. to UNITED FILTERS CORP. (U.S.P. 1,734,652, 5.11.29. Appl., 17.5.24).—The filter has a fixed casing with short, hollow, rotating shafts through each end, and inside the casing the shafts expand into a rectangular framework which supports the filter leaves. B. M. VENABLES.

Methods and means for evaporation or distillation. A. E. WHITE. From SWENSON EVAPORATOR Co. (B.P. 321,698, 18.5.28).—The evaporator is of the vertical tubular type with forced circulation. The upper outlet ends of the tubes extend some distance into the vapour chamber and are never allowed to become drowned, and the weak liquor must enter the lower ends of the tubes with a velocity of at least 5 ft./sec. Though, to avoid the vapour chamber, the inlet pipe for heating steam or vapour is below the ends of the tubes, a baffle is provided in the steam space to cause the actual first contact of the steam to be at the top of the bundle of tubes. B. M. VENABLES.

Evaporation of liquids. A.-G. KUMMLER & MATTER (G.P. 455,101, 9.1.23).—Steam-heated tube evaporators are provided with a series of closed supply tanks the capacity of which is several times as great as that of the evaporator. Means are provided for preventing the mixing of the more and the less concentrated solutions in the tanks and for filtering the solution while passing through the tanks. The evaporator is so arranged that a separation of liquid and vapour takes place in such a manner that the vapour can be compressed and returned to the heating chamber of the apparatus while the solution is returned to the supply tanks. A. R. POWELL.

Multi-stage evaporation process. ATLAS-WERKE A.-G., Assees. of S. von Le Juge (G.P. 455,070, 12.6.25). —The liquid to be evaporated passes through a series of closed preheating vessels and is then sprayed successively into vertical cylindrical vessels through perforations in the bottom. The upper diameter of the cylinders is greater than the lower, and every cylinder is provided with apparatus for drying the vapours and passing the heated gases back through the earlier preheaters.

A. R. POWELL.

Continuously-operating saturation vessel. R. EHRHARDT (Austr. P. 108,260, 11.3.26. Ger., 31.12.25). —An apparatus for saturating liquids with gases comprises a cylindrical vessel, the top diameter of which is greater than the bottom. The gas passes into the bottom of the vessel and is thoroughly mixed with the downwardly flowing liquid by means of a series of revolving paddles. The liquid is fed into the top of the vessel and passes out through an overflow tube in the bottom connected with a trough surrounding the upper rim and serving as a regulator for the height of the liquid in the vessel. Means are provided for observing and controlling the height of the froth which forms on the surface of the liquid and for taking continuous samples.

A. R. POWELL.

b

Air washer. H. KREISINGER, ASST. to INTERNATIONAL COMBUSTION ENG. CORP. (U.S.P. 1,734,677, 5.11.29. Appl., 4.12.25).—The gas is projected tangentially into the upper part of a cylindrical chamber, the flow being assisted and the gas humidified by jets of steam. After entering the chamber the whirling mixture of gas and steam is washed and condensed by means of water sprays. B. M. VENABLES.

Centrifugal liquid purifier. J. W. ADAMS (U.S.P. 1,738,553, 10.12.29. Appl., 22.6.28. U.K., 27.7.27).— See B.P. 296,178; B., 1928, 773.

Method and apparatus for removing vapours. H. W. Cowan (U.S.P. 1,738,641, 10.12.29. Appl., 4.4.27. Can., 29.10.26).—See B.P. 279,816; B., 1929, 267.

Furnace walls [with fluid-cooled panels]. AMER. ENG. Co. (B.P. 308,342, 26.6.28. U.S., 22.3.28).

[Absorption] refrigerating systems. C. A. MASTERMAN, and GAS LIGHT & COKE Co. (B.P. 322,226, 1.9.28 and 25.6.29).

Continuously working absorption refrigerating machines. SIEMENS-SCHUCKERTWERKE A.-G. (B.P. 298,603, 20.9.28. Ger., 12.10.27).

Refrigeration apparatus. A. E. WHITE. From WALTHAM SYSTEM, INC. (B.P. 322,324, 21.11.28).

Treating waste liquors (B.P. 321,413).-See V.

II.—FUEL; GAS; TAR; MINERAL OILS.

Coal-testing problems. N. PARTINGTON (Gas J., 1929, 188, 720-722).—The necessity for correct sampling is emphasised and a method suitable for a gas works which receives most of its coal by rail is described. A high moisture content in the coal increases the amount of coke consumed in the producers, thereby decreasing the amount of coke available for sale, increases the carbon dioxide content of the gas, lowers the liquor strength, and tends to decrease the working life of the retort and coal-handling plants. The moisture content of many washed coals varies more than the ash content,

and a sudden fall in retort-house efficiency can often be traced to increased moisture in the coal; daily moisture tests are recommended, also the sheeting of trucks containing small coal and which are likely to be several days en route. The ash content of washed coals is more consistent than that of dry cleaned coals; as coke is likely to be increasingly used for domestic purposes it is suggested that 5% of ash in the coal should be regarded as the limit. The Lessing test is used to determine the volatile matter and the swelling properties of coals and coal blends. A modified shatter test is described for estimating the liability of a coke to form breeze. Laboratory carbonisation tests on coal, as carried out by the Lessing test, show that the yields of tar and gas thereby obtained compare favourably with those of a works' experimental plant, carbonising 24 cwt. of coal per diem. C. B. MARSON.

Examination of coal and coke by X-rays. C. N. KEMP (J. Roy. Soc. Arts, 1929, **78**, 114–136).—After a brief account of previous investigations of the application of X-rays to the examination of coal, the author's own work in this field is summarised (cf. B., 1924, 931; 1925, 656; 1926, 937; 1927, 641; 1928, 916).

A. B. MANNING.

Low-temperature carbonisation : continuation of tests on Canadian bituminous coals. R. A. STRONG (Canada Dept. Mines Fuel Invest., 1927, No. 696, 32-45).-Experiments are described in which four coals have been examined in a laboratory low-temperature carbonisation assay apparatus at 600° (cf. B., 1929, 41). The cokes obtained varied considerably in appearance, two being very much swollen and fairly porous and the other two dense and hard. All the cokes were high in ash $(16 \cdot 2 - 19 \cdot 8\%)$, and it would be necessary to reduce the ash content of the coals by washing before they could be considered suitable for the production of domestic coke; the volatile matter varied from $6 \cdot 2$ to $7 \cdot 4\%$; the calorific values of all the cokes were less than those of the corresponding coals and, on account of the high ash, they are considerably lower than those of average gas and by-product cokes usually sold for domestic purposes. Tar yields of 8.1, 14.1, 18.5, and 22.1 gals. per ton of coal carbonised, respectively, were obtained, and these, with one exception, are low; the light oils, which were stripped from the gas with activated carbon, gave yields of 1.3-2.5 gals./ton. The gas yield varied from 3450 to 4250 cub. ft./ton, with calorific values of 570-650 B.Th.U. per cub. ft.; the ammonium sulphate equivalent varied from 4.3 to 19.1 lb./ton of coal. The results of a detailed examination of the tars are also given. It is concluded that owing to the low tar yields of these and the 10 other coals previously examined (loc. cit.), the field for low-temperature carbonisation, from the viewpoint of oil yield, is decidedly limited in Canada. C. B. MARSON.

Gasification of lignite, peat, and wood. E. MAR-COTTE (Chim. et Ind., 1929, 22, 877–889).—An Austrian lignite (moisture 50%) could not compete with coal as a fuel in its raw state, in spite of low first cost, nor was briquetting profitable. It might be possible to burn it at a power station placed close to the working, but gasification and long-distance transmission of gas is con-

sidered preferable. If electricity is also to be produced it should be generated by gas engines, not by turbines. The residue from high-temperature carbonisation is to be used for making bricks. The treatment of lignite in gas producers, as practised in Germany, is discussed, and attention is called to the device for distilling intractable producer-gas tar by mixing it to a paste with lignite dust. The gasification of peat or wood necessarily produces a low-grade gas on account of the high oxygen content of these materials. No advantage is obtained by passing the gas through a heated fuel bed for the reduction of carbon dioxide, as other reactions occur as well, and removal of carbon dioxide with milk of lime is expensive. The coke produced from peat or wood requires an excessive amount of water for quenching, and dry-cooling is desirable. The author concludes that the choice between carbonisation in various forms of retort and gasification as a means of utilising lignite depends on the character and location of the deposit. C. IRWIN.

Benzene-pressure extraction of coal. J. D. DAVIS and D. A. REYNOLDS (Ind. Eng. Chem., 1929, 21, 1295-1298).-A series of six coals each representative of a distinct type as regards industrial carbonisation were subjected to the Fischer benzene-pressure-extraction process. With continued extraction both the solidity of the extract and the ratio of solid bitumen to oily bitumen increase. A bitumen was observed that is soluble in benzol under the conditions of the extraction, but which precipitates as a brown powder from the solution on cooling. Removal of soluble substance from a coal with either pyridine or benzene under pressure may cause its swelling properties either to increase or decrease, depending on the character of the coal. The authors' previous conclusions (B., 1926, 859) that solid bitumen causes swelling and is more strongly coking H. S. GARLICK. than oily bitumen are confirmed.

Carbon black. II. Rôle of oxygen. C. R. JOHNSON (Ind. Eng. Chem., 1929, 21, 1288—1290).—The oxygen adsorbed on the surface of carbon black (as found by ultimate analysis or from the volatile matter content, to which it bears a fixed ratio) was not reduced by storage under nitrogen, but was somewhat increased by exposure to pure oxygen. It was increased by heating in air to 500° and decreased by heating with zinc dust, zinc oxide being formed. There is no definite connexion between iodine adsorption and oxygen content, but the adsorption of organic accelerators varies directly with the latter. This indicates the reason why carbon black of high volatile content gives poor physical properties when vulcanised with rubber. C. IRWIN.

Modern coke ovens as gas producers in large gas works; their sphere of application and economic principles. R. MEZGER (Gas- u. Wasserfach, 1929, 72, 1189—1197, 1222—1227).—Various types of coke-oven plant are briefly described with the aid of diagrams. The problem of uniform heating of the oven walls receives attention, coke ovens gaining in this respect by comparison with other forms of gas retorts. A discussion of the economic aspects of coke-oven operation, with the aid of tables and curves showing the effects of various factors, including capital and working costs, leads to the conclusion that gas supply from regional grouped gas undertakings is more economical than would be the supply of gas over the whole of Germany from centralised plant situated in the Ruhr area. D. G. MURDOCH.

Review of the Koppers "C.A.S." process as applied to British conditions. E. W. SMITH (Gas J., 1929, 188, 767-768).-The "C.A.S." process, which has been devised for the removal of ammonia, hydrogen sulphide, and cyanogen compounds from coke-oven gas with the recovery of ammonium sulphate and sulphur, without introducing sulphuric acid from outside, is reviewed. It is concluded that (i) the "C.A.S." process is capable of being worked technically satisfactorily; (ii) the process will not enhance the value of ammonia in the carbonising industries; (iii) the process is not satisfactory for the removal of hydrogen sulphide to comply with British standards, which are markedly severe; (iv) even if the process as a whole can show a financial advantage on paper, the chemical complication and specialised technical supervision render the process unsuitable for British practice; (v) discrepancies in the claims made for this process may be attributed to differences between British and German conditions and practice. C. B. MARSON.

Recovery of ammonia [in gas manufacture] by the semi-direct process. G. E. FOXWELL (Gas J., 1929, 188, 768-770) .- Parker's conclusions (cf. B., 1930, 43) as to the flexibility, the difficulty of producing high-quality sulphate, and the economic costs of the direct and semi-direct processes, together with the necessity for modification of the last-named at a gas works, are examined and criticised. It is contended that (i) whilst the direct process is not so flexible as the indirect process, in that it can only produce ammonium sulphate, this is only partly true of the semi-direct process; (ii) there is no difficulty in making sulphate of the highest quality by the semi-direct process ; (iii) although it is not possible to make sulphate at a profit by the indirect process as operated at a gas works, it is possible to make it at a profit by the semi-direct process ; (iv) the semi-direct process would not require modification for installation at a gas works, provided that the gas works were of a reasonable size. C. B. MARSON.

Lubrication of gas mains by means of oil fog. O. H. BLACKWOOD and P. G. EXLINE (Ind. 'Eng. Chem., 1929, 21, 1258-1260).-A persistent oil fog suitable for the internal lubrication of gas mains is composed of particles 1 micron or less in diam. and falling at speeds of about 12.2 cm./min. Such a fog, though difficult to control, may be produced cheaply and in large quantities by condensation methods, e.g., by injecting a stream of hot, saturated gas into a current of colder gas. Atomisation is simpler and more easily controlled, but is subject to limitations, since about 99% of the oil blown out of the atomiser is too coarse for use, and only a relatively small quantity of fog is produced by a single spraying unit. Oil fog may be detected and its density measured by aspirating samples through weighed filter papers, or the oil may be dyed and the tint produced on a filter paper in a tar camera compared with laboratory standards. The persistence of a fog is

determined by measuring its density at various periods subsequent to its formation. H. S. GARLICK.

Primary tars obtained with the "Italian system" furnace. D. MENEGHINI (Giorn. Chim. Ind. Appl., 1929, 11, 433-438; cf. B., 1929, 1037).-When distilled in a current of superheated steam in a special apparatus, the tar obtained in this furnace from Thornley gas coal (and Valdarno lignite) gives the following results (in kg.): Tar obtained per metric ton of the dry coal, 125 (43); oils obtained in a first distillation to remove the pitch, $52 \cdot 7$ (22 $\cdot 8$); phenolic (acid) compounds, $7 \cdot 9$ (7 $\cdot 4$); redistilled neutral oils, $26 \cdot 3$ (12.8); total residue, comprising hard pitch and distillation residue, $85(19 \cdot 6)$; light neutral fractions, b.p. below 170° , $2 \cdot 2$ (0 · 2); medium fractions, b.p. 170-230°, 5.8 (2.4); heavy fractions, b.p. 230-270°, 6.3 (3.7); oils, b.p. above 270°, 12 (12.8). Normal tar from the same Thornley gas coal (50 kg. per metric ton) gives : oils from first distillation to separate the pitch, 27.5; these give: redistilled neutral oils 21, containing naphthalene and anthracene 6.3 and phenolic compounds 1.2. The pitchy residues of the primary tars exhibit excellent agglomerating properties, that from the lignite especially having marked plasticity. The fractions with high contents of acid compounds should be of value for impregnating timber, but there seems no convenient means of utilising directly the neutral oils. The heavy oils are unfit for use as lubricants, owing to their ready alterability, this being due to the presence of a large proportion of unsaturated compounds. T. H. POPE.

Chemistry and physics of road tar. H. MALLISON (Gas- u. Wasserfach, 1929, 72, 1215-1222).-Methods for determining the physical properties and chief chemical constituents of the tar are summarised, and their significance is discussed. It is anticipated that the British Road Tar Association's tar viscosimeter will be adopted in Germany as the official apparatus for the determination of viscosity. The addition of more than 20% of petroleum bitumen to tar is held to produce considerable flocculation of the free carbon and to yield a mixture lacking in homogeneity; addition of Trinidad asphalt produces no coagulation of free carbon. Tar emulsions are briefly considered, and simple tests of their suitability for road purposes are described. One such test consists in pouring 10 g. of emulsion evenly over the surface of a glass plate (10×10 cm.) edged with pitch, and then dusting with 25 g. of specially selected fine sand. The plate is allowed to dry in the air until a definite proportion (about 80%) of the known amount of water originally present has evaporated and is then immersed in an inclined position in water for 12 hrs. Inspection of the plate after this period yields a valuable indication of the breaking properties of the emulsion and of the tendency of the separated tar to become re-emulsified.

D. G. MURDOCH.

Treatment of pyroligneous acid and extraction of acetic acid and alcohol. C. MARILLER (Chim. et Ind., 1929, 22, 868-876).—It is now usual in the wood-distillation industry to remove tar separately by partial cooling. The vapours are then either condensed and further worked (indirect process), or treated directly. The Brégeat cresol process does not appear

to have been anywhere adopted. The indirect process necessarily involves a greater steam consumption, but this has been reduced in America by multiple-effect evaporation. One possible means of avoiding the production of calcium acetate may be the catalytic oxidation of acetic acid vapour to acetone by barium or magnesium acetate. The Suida process effects the direct production of acetic acid by the use of a woodtar distillate of b.p. above 210°. The pyroligneous acid is first freed from alcohol in the usual way, and is then distilled in a tubular heater connected to an absorption column. The enriched solvent from the latter is freed from water in an auxiliary column, and passes to the stripping column, which is operated under a vacuum of 720 mm. at 155-160°. The product of this contains 85-95% of acid, and can be rectified if desired. The apparatus has not yet been adapted to the direct process. The steam consumption is estimated at 13-15 kg./kg. of 100% acid and the acid recovery at 95%. The process is being widely adopted both at wood-distillation plants and acetate silk works.

C. IRWIN.

Pyrolysis of the paraffins. E. N. HAGUE and R. V. WHEELER (Fuel, 1929, 8, 512-524, 560-587).-Previous work is reviewed. Experiments have been carried out to study (i) the effect of heating methane, ethane, propane, and butane in a silica or hard-grass bulb; (ii) the effect of allowing these gases to flow through a heated tube in a circulation apparatus; and (iii) the effect of passing the same gases, and also pentane and hexane, in the form of vapour, as a stream through a heated tube. From the first series of experiments the decomposition points of the gases were found to lie within the ranges : methane 650-685°, ethane 450-485°, propane 425-460°, and butane 400-435°. At temperatures below 500° the decomposition of the gases, as measured by the rate of increase of pressure, appeared to be unimolecular. Above 500° there was a rapid initial change of pressure, followed by a period of constant rate of increase. With propane and butane carbon deposition and tar fog were observed at 575-600°. In the second series of experiments similar pressure-time curves were obtained to those in the first. With propane and butane liquid decomposition products were observed at 700° and appeared in quantity at 800°. From an examination of the products obtained in the third series of experiments it is concluded that the primary decompositions, occurring below 700-750°, involve a rupture of the chain at any position with the production of an olefine and the complementary paraffin or, at the limit, hydrogen. Following these primary decompositions many complicated reactions occur during "pyrosynthesis" at the same or higher tempera-tures. With ethane at temperatures above 700°, the hydrogenation of fugitive "residues," : CH2, appears to take place (cf. Bone and Coward, B., 1908, 886). At comparatively low temperatures, subsequent to the formation of ethylene, butadiene is produced from each of the paraffins (cf. Norton and Andrews, A., 1886, 604). Above 700-750° benzene and other aromatic hydrocarbons are produced from each gas, methane included, probably through the intermediate formation of ethylene and butadiene. The first step in the forma-

tion of benzene from methane may be represented by $CH_3 \cdot H \rightarrow :CH_2 + H \cdot H$, two of the $:CH_2$ residues then combining to form ethylene. The optimum yield of benzene from methane is obtained at 1000—1100°.

A. B. MANNING.

Principles of distillation in heated pipes in the petroleum industry. A. W. J. MAYER (Petroleum, 1929, 25, 1673—1679).—Mathematical. Previously published work of a large number of observers on the factors controlling stream-line and turbulent flow of liquids in pipes and on the effect on the flow of bends in the pipes is discussed, with special reference to its application to pipe stills and the pumping of hot oil.

W. S. E. CLARKE. Lubrication. Mosser.—See I. Fertilisers. MATIGNON.—See XVI. Fermentation of cellulose. Boruff.—See XVIII.

PATENTS.

Production of a fuel from pulverised coal. R. HADDAN. From TRENT PROCESS CORP. (B.P. 321,695, 14.5.28).—A pulverised fuel suitable for use in internalcombustion engines is formed by blending two or more pulverised coals, which may differ in degree of fineness (from 300-mesh upwards), in density, and in volatile matter content. The proportions and characters of the respective fractions are so chosen that the composite fuel gives the optimum engine performance.

A. B. MANNING.

Production of improved solid fuel from the distillation of carbonaceous materials. L. C. KARRICK (B.P. 321,969, 10.8.28. Addn. to B.P. 261,362; B., 1928, 218).—In modification of the process of the prior patent, the activated coke residue after dryquenching with steam is immersed in a vapour or solution so that it absorbs ingredients, *e.g.*, nitrates or chlorates, copper chloride, oil of pine or cedar, etc., which impart to it desirable kindling, light-giving, and/or odour-producing properties. A. B. MANNING.

Fuels [for internal-combustion engines etc.]. D. GARDNER (B.P. 321,701, 17.7.28).—Carbon produced as described in B.P. 292,798 (B., 1928, 631) is dispersed in 2—6 pts. of another combustible material. The latter may be a gas, e.g., methane or water-gas; a liquid, e.g., an aromatic, hydroaromatic, or terpenic hydrocarbon; or a substance, e.g., paraffin wax or naphthalene, solid at the ordinary temperature.

A. B. MANNING.

Manufacture of carbon black. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 321,402, 3.8.28).— Carbon monoxide, preferably under a pressure of 100— 200 atm., is passed over a catalyst which is solid under the working conditions and which comprises a metal or compound of the iron group to which is added a suitable activating material. The latter may consist of an oxide of manganese, vanadium, chromium, or uranium, etc., an alkali hydroxide or carbonate etc., or a molybdate or tungstate. The temperature of the reaction is preferably maintained between 300° and 400°. A. B. MANNING.

Coke ovens. DR. C. OTTO & Co. G.M.B.H. (B.P. 294,992, 3.8.28. Ger., 3.8.27).—Each of the vertical heating flues of a twin-flue coke oven is provided with two or more inlets for rich fuel gas at different levels. All the vertical pipes leading to the inlets at the same level in alternate flues communicate with a separate supply conduit which can be connected by means of a change-over valve to the gas supply as required. The gas supply can thus be immediately changed over from the high- to the low-level inlets, and, conversely, by a single adjustment of the valve, independently of the reversal of the gas supply from one set of flues to the other. If desired, the flues of one set only may be supplied with two or more gas inlets, each flue of the other set having a single inlet at a level intermediate between those of the first set. A. B. MANNING.

Obtaining more economical running of cokeoven plants etc. Soc. INTERNAT. DES COMBUSTIBLES LIQUIDES. From INTERNAT. BERGIN COMP. VOOR OLIE-EN KOLEN-CHEMIE (F.P. 630,329, 5.3.27. Ger., 19.11.26). —The carbonisation plant is run in co-operation with a hydrogenation plant. The distillation gases poor in hydrogen are mixed with the rich gases from the hydrogenation process and utilised in any suitable manner. The gases of high hydrogen content evolved during the later stages of the same distillation process are used for the hydrogenation of the tar in the berginising plant.

A. B. MANNING.

Retort for the low-temperature carbonisation of coal. G. BEGAS (G.P. 454,691, 27.1.25).—The walls of the retort are formed by two vertical, concentric cylinders; in the annular space between them is a helical grate, some of the bars of which are attached to the inner cylinder and the others to the outer, so that by giving a to-and-fro motion to the cylinders the coal in the retort is moved along the grate. The throughput of the retort is large, but regular and controllable; no dust is formed during the process. A. B. MANNING.

Apparatus for extracting values from coal and like materials. F. C. GREENE and I. F. LAUCKS, Assrs. to Old Ben Coal Corp. (U.S.P. 1,730,569, 8.10.29. Appl., 5.7.19).—An apparatus for the low-temperature distillation of coal comprises a number of units each consisting of a vertical, metallic, tubular retort within a vertical tubular furnace, and a spiral is provided on the outside of the retort to cause the heating gases to rotate while passing upwards through the annular space. The coal space within the retort is also annular owing to the presence of a hollow, rotating shaft which carries a worm to impel or regulate the travel of the coal (or coke) downwards. Vapour mains are provided both at the top and bottom of the retort beyond the heating zone and are maintained under suction. The tubular, hollow shaft is perforated within the retort and extended upwards beyond it; the top is closed by a valve which is held closed by the normal suction in the retort, but will open in the event of pressure developing in the B. M. VENABLES. retort.

Vertical retorts. C. W. TOZER (B.P. 321,708, 16.8.28). —Separate charging and discharging means are provided for each chamber of a multiple-chambered retort. The former comprises a vertically movable ram, and the latter a curved or sloping portion of the chamber which, while preventing discharge by gravity, permits free discharge of the carbonised material in quantities determined by the displacement of the charge caused by the movement of the ram. A. B. MANNING,

Apparatus for carbonising coal and other fuel. A. CHABOT (B.P. 321,827, 14.11.28).-The fuel is carbonised in moulds forming part of an endless conveyer which carries the fuel through a horizontal, externally heated, tunnel retort. The fuel is fed from a hopper into the moulds and is compressed therein by means of a reciprocating piston. The retort is divided into two longitudinal compartments by a horizontal, perforated plate, or by a number of juxtaposed, transverse rollers. The conveyer fits in the lower compartment; the upper is provided with outlet pipes and forms a collecting chamber for the distillates. The upper compartment may be subdivided by baffles into chambers from which tars and gases of various qualities may be separately collected. The retort may be heated by the combustion gases from a furnace, the gases travelling in the direction opposed to the motion of the fuel, so as to heat consecutively the portion of the tube forming the carbonisation chamber, the portion forming the distillation chamber, and the portion forming the drying chamber.

A. B. MANNING.

Treatment of peat. E. VON SPRINGBORN (B.P. 321,411, 4.8.28).—The peat is cut into thin layers transversely to the general run of the fibre, and then pressed through an apertured plate on to a movable carrier. It is dried thereon by natural or artificial means and is then carbonised in the presence of a minimum quantity of steam and evolved gases, which are withdrawn from the retort as they are formed.

A. B. MANNING.

Apparatus for production of combustible gases from granular and dust fuels. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 321,422, 2.6. and 17.8.28).-Granular fuel containing fuel dust is introduced near the bottom of a generator and part of the gasifying agent is admitted in an upward direction in order to support the fuel and keep it in suspension in the gasification chamber, into which the other part of the gasifying agent is admitted at different levels. The hot gaseous mixture which still contains fuel dust is then conducted through a large secondary gasification chamber. Producer-gas and water-gas may be produced alternately if a suitable heat accumulator, consisting, e.g., of a chequer work of fireclay bricks, is provided in the generator. A. B. MANNING.

Gas-generating apparatus. E. L. FISCHER (U.S.P. 1,736,586, 19.11.29. Appl., 2.2.26).—A setting of retorts is placed above a water-gas generator, the passage between the two forming a combustion zone. Water-gas is withdrawn from, and air and steam are admitted to, both the top and bottom of the generator. B. M. VENABLES.

Water-gas generators. J. PINTSCH A.-G. (B.P. 295,717, 13.8.28. Ger., 19.8.27).—An apparatus for the continuous generation of water-gas from powdered fuel has a reaction chamber in the form of a vertical cylindrical pipe, which is surrounded by the heating apparatus wherein a current of steam and water-gas is raised to the temperature necessary to react with the fuel. The powdered fuel is introduced continuously, preferably

as described in B.P. 292,669 (B., 1928, 632), by removing an additional quantity of hydrogen sulphide in the first stage so that the ammonia available in the second stage completely suffices for combining with the remaining hydrogen sulphide and hydrocyanic acid. After boiling the spent liquor, the ammonium sulphate and thiocyanate are separated by fractional evaporation. A. B. MANNING.

Removal of ammonia from coal-distillation gases. D. TYRER, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 322,049, 13.10.28).—The condensed gas liquor, heated to 90—100° if necessary, is brought into intimate contact with a portion of the hot gases, and is thereby deprived of its free ammonia. The de-ammoniated liquor is then cooled and used to wash the cooled gas in the usual scrubbers. The final liquor, which is of substantially higher concentration than usual, is then distilled or otherwise treated in known manner.

A. B. MANNING.

Extracting benzene hydrocarbons from distillation gases. C. STILL (B.P. 300,964, 15.11.28. Ger., 21.11.27. Addn. to B.P. 293,702; B., 1929, 916).-To recover the benzene from the wash oil used for the extraction, the latter is preheated to 130° by heat exchange with hot residual oil and by means of a steam coil. It is then discharged into a column still where, by means of open steam, the benzene and some naphthalene are removed. The residual oil, after cooling, is returned to the top of the scrubbing tower. The vapours from the still, after condensation and separation of water, are fed into a fractionating column heated by closed steam coils and the benzene is distilled from the naphthalene residue. The residue, not sufficiently cooled to cause separation of naphthalene, is returned to the scrubbing tower at a point below the exit of the scrubbed gas. The quantity being small, its elevated temperature is of little importance, and difficulty owing to its possible benzene content is overcome by not feeding it into the top of the scrubbing T. A. SMITH. tower.

Porous masses for the storage of explosive gases or fuels. J. HAUSEN (F.P. 627,753, 18.1.27. Ger., 20.1.26.).—Before introducing the porous material, powdered pumice, or carbon, etc. into the container it is impregnated with inorganic or organic substances, *e.g.*, ammonium sulphate, oxalate, or carbonate, which are vaporised or gasified by partial decomposition of the explosive gas, *e.g.*, acetylene. A. B. MANNING.

Production of aqueous dispersions of pitch, bitumens, resins, etc. F. B. DEHN. From FLINTKOTE Co. (B.P. 321,721, 21.5.28).—An insoluble mineral powder, *e.g.*, clay or bentonite, is used as a dispersing agent, and the $p_{\rm H}$ of the dispersion is adjusted to give the optimum emulsification. The $p_{\rm H}$ may be controlled by suitable choice of the mineral powder used as dispersing agent, by the addition of acidic or basic materials to the pitch, bitumen, etc., or by the addition of an acid, an alkali, or a buffer salt to the emulsion.

A. B. MANNING.

Refining of crude mineral oils. W. McI. CRANSTON (B.P. 322,167, 24.8.28).—Crude oil, mixed with an equal weight of fine bituminous material containing not

at the top of the reaction chamber, the bottom of which is widened in order to reduce the velocity of the gases and allow the ash to settle out. The annular heating apparatus is divided into two chambers which are alternately heated and used for heating the current of gas and steam. A. B. MANNING.

Continuous generation of water-gas [from powdered fuel]. GAS- U. TEER GES.M.B.H. (B.P. 296,064, 23.8.28. Ger., 24.8.27).-The apparatus consists of a central chamber situated between two regenerator chambers. A part of the water-gas produced together with the powdered coal or coke and steam is passed to one regenerator wherein the mixture is raised to the temperature necessary for the production of gas, while the other regenerator is being heated by the combustion therein of another part of the gas produced. The central chamber is designed to act as an ashseparating means. If desired, each regenerator may be divided by means of a partition, whereby the currents of gas and steam are raised separately to the gas-producing temperature. A. B. MANNING.

Continuous production of water-gas and hydrogen from gaseous hydrocarbons. Soc. INTERNAT. DES COMBUSTIBLES LIQUIDES. From DEUTS. BERGIN-A.-G. F. KOHLE- U. ERDÖLCHEMIE (F.P. 630,327, 5.3.27. Ger., 22.11.26).—The gaseous hydrocarbons are incompletely burnt with air or oxygen, and the resulting gases are freed from water vapour and carbon dioxide.

A. B. MANNING.

Apparatus for the purification of gas. W. WILSON (B.P. 321,536, 26.10.28).—The gas is passed transversely through a travelling column of oxide moving down a louvred structure. Two such structures are enclosed within corresponding vertical chambers connected by upper and lower gas conduits; one of the latter is provided with a change-over valve having a gas inlet and a gas outlet. Baffles are provided within each chamber, whereby the gas is constrained to pass and repass through the oxide. The oxide-feeding and -discharging connexions are preferably in the form of gas locks. A. B. MANNING.

Washing of gas. R. NORGATE (B.P. 321,252, 20.8.28). —The gas is passed through a series of chambers each containing an ejector which produces a fine spray of the washing liquid and is operated by part of the gas to be treated, under a pressure of about 5 atm. The washing liquid is maintained at a constant level in each chamber. Each ejector has a submerged liquid inlet, an inlet for the pressure gas, and a second gas inlet opening in the chamber above the level of the liquid therein. A. B. MANNING.

Purification of industrial gases with the recovery of by-products. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 321,982, 23.8.28).—Industrial gases are freed from ammonia, hydrogen sulphide, and hydrocyanic acid by washing with a solution containing ammonium polythionate, ammonium thiosulphate, and sufficient ammonia to absorb completely the hydrogen sulphide and hydrocyanic acid, the excess of ammonia being subsequently converted into sulphate by the addition of the requisite amount of sulphur dioxide. If desired, the process may be carried out in two stages, less than 20% of volatile matter, is distilled at ordinary pressure up to 180° in a still fitted with agitators. The pressure is then raised to 200 lb./in.², and the distillation carried up to 320° with the admission of steam for hydrogenation purposes. Cracking takes place, and the residual pitch and coke are obtained as a fine powder or in coherent form. The residue is a useful fuel which can be stored without danger of spontaneous combustion. Access of moisture should be prevented.

T. A. SMITH.

Manufacture of lighter-coloured products from earth-oil residues, asphalt, and/or similar substances. N.V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 313,433, 30.8.28. Holl., 11.6.28).-Light-coloured asphalts are prepared from ordinary asphalts or cracking-plant residues by the removal of asphaltenes. A solution of the asphalt is treated with sulphuric acid, or with decolorising earths, or the asphaltenes are precipitated by the addition of light hydrocarbons poor in aromatic constituents, or a combination of these treatments may be used. Molten Java asphalt, to which 200% of benzine has been added, is stirred with 2% of sulphuric acid. After settling and tar removal the solution is treated with 3% of bleaching earth at 60° and filter-pressed. The asphalt is recovered from the solution by steam-distillation until the required penetration is obtained. The light-coloured asphalt is suitable for the preparation of emulsions, lacquers, varnishes, asphalt paints, etc. T. A. SMITH.

Gasifying of heavy oils. C. Chrowsky (B.P. 296,785, 4.9.28. Fr., 8.9.27).—The gasification of heavy oils, particularly for use in internal-combustion engines, is brought about by partial combustion of the oil in the presence of steam. The air and steam are heated to 500-900° before coming in contact with the oil spray. The apparatus consists of a perforated mass of catalytic material in which the final gasification is brought about at temperatures up to 1100°. The hot gases produced pass through an annular space surrounding the catalyst, the outer wall of this space being a thin sheet of non-corrosive metal through which heat is transmitted for preheating the air and steam used in the partial combustion. A variety of designs of apparatus to give good heat transfer between the hot gas and the air are given. The apparatus is surrounded by heat-insulating material. T. A. SMITH.

Production of light oils by cracking of lowtemperature tar. ZECHE M. STINNES (G.P. 454,764, 12.8.21).—The gases and tar vapours leaving the retort at temperatures above the dew point of the tar are mixed with superheated steam and passed over heated porous material, *e.g.*, low-temperature coke. In addition to light oils, ethylene, propylene, butylene, and butadiene are produced. A. B. MANNING.

Treatment [cracking] of heavier hydrocarbons. C. A. JENSEN. From JENKINS PETROLEUM PROCESS Co. (B.P. 321,929, 20.8.28).—A horizontal cylinder, situated above an inclined bank of heated tubes, is connected in closed circuit with the tubes. Circulation along the cylinder and through the tubes is brought about by means of a suitable piston. Contact material is added to the oil to be cracked, and assists in keeping the tubes free of deposited carbon. Cracked vapours are taken from the top of one end of the cylinder to a dephlegmating column and are scrubbed by the addition of the cracking stock to which contact material has been added. The cracking stock is thus preheated and the insufficiently cracked fractions are returned to the circuit. The pipe carrying the cracking stock from the dephlegmating column to the cylinder is divided and carried along the bottom of the cylinder to the farther end, where it delivers in an upward direction and along the flow of the circulating oil. The apparatus works under any desired pressure. The addition of cracking stock and the withdrawal of distillate and of a proportion of the uncracked residual oil are continuous.

T. A. SMITH.

Treatment of hydrocarbon gas or the like. EMPIRE GAS & FUEL CO., Assees. of J. C. WALKER (B.P. 290,613, 5.5.28. U.S., 17.5.27).-Hydrocarbons, particularly gaseous paraffin hydrocarbons, are converted into oxygenated compounds, such as alcohols and aldehydes, by partial oxidation at an elevated temperature, e.g., 420-480°, and, if desired, under pressure, preferably above 200 lb./in.², and in the presence of a suitable catalyst, the oxygen-supplying material, e.g., air, being added in an amount equivalent to less than 0.1 vol. of free oxygen to 1 vol. of hydrocarbon. The hydrocarbon may be preheated to within 100° of the reaction temperature and the amount of oxygen added so regulated that the heat of reaction just brings the mixture to the required reaction temperature. The products may be cooled by heat interchange with the mixture entering the reaction zone ; after condensation of the liquid oxidation products the residual gas may be subjected to a further partial oxidation.

A. B. MANNING.

Manufacture of hydroaromatic hydrocarbons. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,445, 3.9.28).-The catalysts which may be used in the removal of sulphur compounds, such as thiophen, from crude benzene by hydrogenation under pressure, are capable, at slightly higher temperatures, of producing hydrogenation of the aromatic hydrocarbons. With these catalysts it is unnecessary to use pure hydrocarbons. The catalysts consist of compounds of elements of groups V and VII. Crude benzene and hydrogen passed over molybdenum trioxide at 460° and 200 atm. is converted quantitatively into cyclohexane. The catalyst is more efficacious when mixed with zinc oxide, manganic oxide, or metal powder. Toluene is hydrogenated at 450° in the presence of cobalt molybdate at 120 atm. A 1:1 mixture of benzene and naphthalene is converted at 200 atm. and 450° in the presence of a molybdenum-chromium catalyst into a mixture containing 50% of cyclohexane, 10% of decahydronaphthalene, and 40% of tetrahydronaphthalene. In some cases temperatures up to 800° may be necessary, and the operation may also be carried out in T. A. SMITH. the liquid phase.

Manufacture of fuel containing alcohol. W. STEIGER (B.P. 309,155, 28.6.28. Ger., 7.4.28).—Alcohol containing up to 20% of water may be used as an engine fuel when added to turpentine which has been

saturated with acetylene and to which benzine, benzene, or toluene have been added. Before the addition of the alcohol, the gum-forming constituents of the turpentine are precipitated by the addition of commercial lysol or cresol containing neutral soap. After decantation, 4—5 vols. of alcohol are added, and no separation takes place. T. A. SMITH.

Catalytic gas generator. F. UMPLEBY (U.S.P. 1,738,620, 10.12.29. Appl., 29.1.27. U.K., 29.1.26).— See B.P. 269,269; B., 1927, 435.

Incorporation of material to be briquetted with a liquid building medium [by spraying nozzles]. E.KLEINSCHMIDT (B.P. 322,220, 31.8.28).

Liquid fuel burners. P. FARROW, and CANNING TOWN GLASS WORKS, LTD. (B.P. 322,257, 10.9.28).

Liquid fuel burners. P. TARAGNO, and Soc. ANON. PER L'IMPIEGO RAZIONALE DEGLI OLII COMBUSTIBILI I.G.N.E.A. (B.P. 322,337, 28.11.28).

[Fuel shut-off device for] furnaces heated by oil burners. R. Théry (B.P. 303,510, 31.12.28. Fr., 6.1.28).

Muffle furnace (U.S.P. 1,730,570).—See I. Unsaturated hydrocarbons (B.P. 322,284).—See III. Bituminous compositions (B.P. 321,948).—See IX. Treatment of metal (U.S.P. 1,736,282).—See X. Insulating materials (B.P. 322,208).—See XI. Salts of sulphonic acid (B.P. 321,980).—See XIII. Higher alcohols, acetone, etc. (B.P. 322,029).—See XVIII.

III.—ORGANIC INTERMEDIATES.

Detection and determination of benzoic and salicylic acids, particularly in foodstuffs. H. C. S. SNETHLAGE (Chem. Weekblad, 1929, 26, 604—605).— Methods are suggested by which clear aqueous filtrates, suitable for extraction with a mixture of ether and light petroleum, may be obtained in different cases. The acids are extracted from the organic solvents by sodium hydroxide, and detected and determined colorimetrically by means of the reactions with ferric chloride.

S. I. LEVY.

2:4-Dichloro-1-aminoanthraquinone. I. GUBEL-MANN, H. J. WEILAND, and O. STALLMANN (Ind. Eng. Chem., 1929, 21, 1231—1232).—This compound cannot be prepared by the methods used for the corresponding dibromo-derivative, for which it may serve as a cheaper substitute in the preparation of dyes not containing the original halogen, but is obtainable as follows : *m*-Dichlorobenzene is treated with phthalic anhydride and aluminium chloride, the resulting 4': 6'-dichloro-o-benzoylbenzoic acid, m.p. 100—101°, being converted into its 3'-nitro-derivative, m.p. 174°, which is reduced to the 3'amino-compound, m.p. 164°. This is then condensed to the final product, m.p. 205—206°, in presence of sulphuric acid. The yields in each step are high, the total yield being about 70%. T. H. POPE.

Extraction of acetic acid and alcohol. MARILLER. Pyrolysis of the paraffins. HAGUE and WHEELER. —See II. Glycerin analysis. PETERSON.—See XII. Enzymes as reagents. BARGELLINI.—See XVIII. Sodium citrate. CATULLO.—See XX.

PATENTS.

Manufacture of unsaturated hydrocarbons of low b.p. J. Y. Johnson. From I. G. FARBENIND. A.-G. (B.P. 322,284, 11.10.28).—The capacity of metals of group VIII to act as catalysts in the hydrogenation of oxides of carbon to liquid products is increased by the addition of small amounts of sulphur to the alkaline catalyst. This lengthens the life of the catalyst, causes the production of liquids of lower b.p., and promotes the formation of unsaturated compounds. The proportion of sulphur (free or combined) should be 0.15-0.4% of the metal, and of alkali metal (free or combined) 0.3-0.6%. Addition of selenium or tellurium produces a similar result. The catalysts are best prepared by the addition of the alkali sulphide or hydrosulphide to the hydroxide of the metal obtained by precipitating a solution of a salt. The solution should be acidified with nitric acid and precipitated by ammonia or alkalis; the precipitated hydroxide should be well washed. 200 c.c. of an iron catalyst, the preparation of which is described, when dried at 170-180° and reduced at 350° produces, from 1 m.³ of a gas containing 25% CO and 70% H₂, at 260°, and by passing once over the catalyst 25 c.c. of liquid hydrocarbons of which only 20% boils above 180°. With no sulphur present a similar catalyst yields a product of which 55% boils above 180°. The bromine values of the respective products are 140 and 95. Gaseous unsaturated hydrocarbons containing 3-5 carbon atoms are also obtained, and their formation may be favoured or hindered by appropriate reaction conditions. A catalyst containing cobalt yields 36 c.c. of liquid products (bromine value 130-135, 10% boils above 180°) from 1 m.3 of gas. The unsaturated hydrocarbons are of value as anti-knocks or, after condensation by means of aluminium chloride etc., for the production of lubricating or insulating oils. They may also be used for the preparation of benzene hydrocarbons, T. A. SMITH. alcohols, etc.

Catalytic reduction of oxides of carbon and organic oxygen compounds. SELDEN Co., Assees. of A. O. JAEGER (B.P. 306,471, 14.4.28. U.S., 21.2.28).— Oxides of carbon, ketones, aldehydes, or carboxylic acids are reduced with hydrogen etc. in the gaseous phase at high temperatures in presence of contact masses comprising base-exchange substances (other than multi-component zeolites) in which a catalyst is present in chemical combination or physical association ; stabilisers and/or stabiliser-promoters may be added. C. HOLLINS.

Manufacture of acetaldehyde from acetylene. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 319,542, 3.12.28).—Ammonium salts, or ammonia and acid, are added to the mercury solutions to prevent precipitation of sludge and prolong the activity of the catalyst. C. HOLLINS.

Production of acetic acid [from acetaldehyde]. S. W. ROWELL, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 319,433, 7.7.28).—A 10—25% solution of acetaldehyde in acetic acid is oxidised by air or oxygen in very finely-divided form, produced, *e.g.*, by forcing the gas through a porous plate at the bottom of a tower into which the solution is fed. Cooling or heating coils may be used, and the exit gases may be scrubbed with acetic acid. C. HOLLINS.

Concentration of acetic acid. DR. A. WACKER GES. F. ELEKTROCHEM. IND. G.M.B.H. (B.P. 298,137, 3.10.28. Ger., 3.10.27).—Dilute acetic acid is distilled with butyl acetate to remove water, and the ester is then removed by adding the calculated quantity of water (liquid or as steam) and distilling off the azeotropic mixture. Other esters of b.p. between 103° and 133° may be used. C. HOLLINS.

Manufacture of aliphatic [acetic] esters and acids. H. DREYFUS (B.P. 319,030, 16.3.28).—Methyl ether and carbon monoxide are passed at 100—150 atm. over a catalyst (sodium formate or methoxide) at 300—400° to give methyl acetate. Other ethers in analogous manner yield esters of higher acids.

C. HOLLINS.

Manufacture of lactic acid esters. A. CARPMAEL. From SCHERING-KAHLBAUM A.-G. (B.P. 319,043, 14.6.28).—Magnesium lactate, dried at 110—120°, is finely powdered, mixed with alcohol, and sulphuric acid is added below 20°. After keeping for 24 hrs. the mixture is warmed for 6 hrs. at 30° and nearly neutralised (using light Congo paper) with magnesia. The whole is then heated at 70° for 6 hrs., carefully neutralised at 30°, and worked up as usual. C. HOLLINS.

Manufacture of vic-trihalogenobenzenes. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 319,149, 4.10.28).—The Sandmeyer reaction is applied to 2:6-dihalogenosulphanilic acids and 2-halogeno-m-phenylene-diamine-5-sulphonic acids, the amino-group or groups being replaced by halogen, and the sulphonic group is then removed by hydrolysis with sulphuric acid. The preparation of 1:2:3-tribromobenzene, m.p. 87°, and 1:2:3-trichlorobenzene, m.p. 54°, is described.

C. HOLLINS.

Manufacture and purification of triaryl phosphates. (A, B) IMPERIAL CHEM. INDUSTRIES, LTD., W. GIBSON, C. R. HENSHAW, and (A) J. B. PAYMAN (B.P. 322,036 and 322,057, [A] 27.9.28, [B] 24.10.28).— (A) Phenols are heated with phosphorus oxychloride at about 200° in the presence of small quantities of organic bases; the products are plasticisers for cellulose ester solutions. (B) The crude products are stirred at about 100° with small quantities of oleum (20% free SO_3), then washed with water until free from acid, and dried. The products may be used direct or distilled *in vacuo*. L. A. Coles.

Separation, isolation, and purification of aromatic hydroxyaldehydes. GRAESSER-MONSANTO CHEM. WORKS, LTD., and D. P. HUDSON (B.P. 318,939, 11.5.28). —Vanillin and *iso*vanillin are separated by fractional acidification of their aqueous sodium salts, *iso*vanillin being precipitated first, or by treatment with just sufficient sodium hydroxide solution to dissolve the vanillin. Similarly, guaiacol may be separated from vanillin, salicylaldehyde from *p*-hydroxybenzaldehyde, pyrocatechol monoethyl ether ("æthacol") from bourbonal, etc. For sharp separation dilute solutions of the alkali salts and dilute mineral acid or very weak acids should be used, and the acid must be added slowly with vigorous agitation. C. HOLLINS. Manufacture of alkoxy-3-[hydr]oxythionaphthens [alkoxythioindoxyIs]. I. G. FARBENIND. A.-G. (B.P. 298,493, 8.10.28. Ger., 8.10.27).—Aluminium chloride may be used for the cyclisation of alkoxyarylthioglycollic acids, preferably in presence of a diluent (chlorobenzene) and at low temperatures $(30-40^{\circ})$. The preparation of 5-chloro-7-methoxy-4-methylthioindoxyl, 6-ethoxy- β -naphthathioindoxyl, m.p. 142— 144°, and 5-ethoxy- α -naphthathioindoxyl, m.p. 157— 158°, is described. C. HOLLINS.

Manufacture of methyl alcohol. H. DREYFUS (U.S.P. 1,738,989, 10.12.29. Appl., 27.5.26. U.K., 13.6.25).—See B.P. 262,494; B., 1927, 124.

Treatment of hydrocarbon gas (B.P. 290,613). Hydroaromatic hydrocarbons (B.P. 322,445).—See II. Salts of sulphonic acids (B.P. 321,980).—See XIII. Higher alcohols, acetone, etc. (B.P. 322,029). Denaturing alcohol (B.P. 298,611).—See XVIII.

IV.—DYESTUFFS.

PATENTS.

Manufacture of a green vat dye from 1:12perylenequinone. F. BENSA (B.P. 300,922, 19.11.28. Austr., 19.11.27).—1:12-Perylenequinone is heated at 165° with aluminium chloride and benzoyl chloride (1.5 pts.), and the product is purified by vatting.

C. HOLLINS.

Manufacture of yellow azo dyes [for wool]. I. G. FARBENIND. A.-G. (B.P. 290,253, 11.5.28. Ger., 11.5.27).—Level wool dyes fast to light are obtained by coupling halogenated 1-o-sulphophenyl-3-methyl-5pyrazolones with diazo- or tetrazo-compounds other than diazotised aminoacylated o-aminophenolsulphonic acids. Examples are : sulphanilic acid \rightarrow 1-(4'- or 5'-chloro-2'sulphophenyl)methylpyrazolone ; o-chloroaniline \rightarrow 1-(p-chloro-o-sulphophenyl)methylpyrazolone.

C. HOLLINS.

Manufacture of disazo dyes [for wool]. A. CARP-MAEL. From I. G. FARBENIND. A.-G. (B.P. 318,882, 11.6.28).—2: 3-Hydroxynaphthoic arylamides are coupled with a diazotised aminoazo-compound containing two sulphonic groups or one sulphonic and one carboxylic group to give blue to blue-black wool dyes fast to washing, hot-pressing, and light. Examples are: naphthionic acid \rightarrow Cleve acid \rightarrow 2: 3-hydroxynaphthoic *p*-anisidide; α -naphthylamine-3: 6-disulphonic acid $\rightarrow \alpha$ -naphthylamine \rightarrow anilide; 5-aminosalicylic acid \rightarrow Cleve acid \rightarrow anilide. C. HOLLINS.

Manufacture of [black tetrakis-]azo dyes [for printing on silk]. A. CARPMAEL. From I. G. FARBEN-IND. A.-G. (B.P. 319,407, 23.6.28).—Benzidine-disulphonic or -dicarboxylic acid or a derivative is tetrazotised and coupled with 2 mols. of a middle component (the same or different), and the product is tetrazotised and coupled with 2 similar or dissimilar mols. of a 2:8aminonapthol (or its N-aryl derivative) carrying either two sulphonic groups in the naphthalene nucleus or one such sulphonic group and a sulphonic or carboxylic group in the N-aryl residue. Examples are : benzidine-2:2'disulphonic acid \rightarrow 2 mols. of Cleve acid \rightarrow 2 mols. of H-acid ; benzidine-3:3'-disulphonic acid \rightarrow 2 mols. of

cresidine $\rightarrow 1$ mol. of H-acid and 1 mol. of *m*-carboxyphenyl- γ -acid; benzidine-2: 2'-disulphonic acid $\rightarrow 1$ mol. of cresidine and 1 mol. of Cleve acid $\rightarrow 2$ mols. of H-acid. C. HOLLINS.

V.-FIBRES; TEXTILES; CELLULOSE; PAPER.

Microbiology of wool. Enhancement of "mildew " by soaps and vegetable oils. R. BURGESS (J. Text. Inst., 1929, 20, T 333-372).-Mildew on cellared or aged and stored wool goods is due to mould fungi rather than to bacteria. Soaps, wool creams, and the majority of conditioning fluids enhance its development on account of the alkali present in them, which, by combining with the wool, renders it more easily attacked. Another factor in the case of hygroscopic soaps is the increase in the range of relative humidity over which mould growth can occur. Vegetable oils such as olive oil enhance mildew growth, but to a smaller extent than soap, and in this connexion the nutritive value of the oil is important. The presence of foots in the oil does not increase liability to mildew. The commercial conditioning liquid "Hygrolit" and two other fluids resembling it retard the mould growth, as also do the lower fatty acids, such as hexoic, octoic, and lauric acid; on the other hand, more complex fatty acids, e.g., oleic acid, favour the growth. Mineral oils have a protective effect and are not used as food by mould fungi. The greenish-yellow stains commonly found on mildewed wool are caused by mould action on the soap present. Washing scoured or unscoured wool in several changes of hot water reduces the liability to mildew. The reaction range over which mould growth can occur on wool is considerable, since both acid and alkaline conditions favour it. It is recommended that, if possible, the use of conditioning liquids should be discontinued, and water used instead. The practice of dispatching goods in air-tight cases is unsound, since the stagnant conditions so produced favour the growth of fungi by setting up localised regions of moisture condensation. B. P. RIDGE.

Physical and chemical characteristics of hemp stalks and of seed flax straw. E. R. SCHAFER and F. A. SIMMONDS (Ind. Eng. Chem., 1929, 21, 1241—1244). —Analyses of hemp fibre (*Cannabis sativa*) grown on peat marshes in Wisconsin show it to be practically identical with flax straw (*Linum usitatissimum*). The growing of hemp for paper-making in these areas is discussed.

A. G. POLLARD.

Chemical characteristics of different celluloses. S. FOTJEW and W. JAKIMANSKIJ (Zellstoff u. Papier, 1929, 9, 834—835).—The percentage of ash, of ether- and alcohol-soluble resin, α -cellulose content, pentosan content, the copper number and permanganate number (as indicative of the lignin content) of different cellulose materials have been determined in order to afford a means of distinguishing between them. Sulphatediffers from sulphite-cellulose in that it has a lower resin content, lower copper number, and a somewhat higher pentosan content. Straw cellulose has a very high ash and pentosan content and a correspondingly lower α -cellulose content. Bleached sulphite-cellulose has a smaller lignin, pentosan, and α -cellulose content than

unbleached. Purified cellulose has a smaller lignin, ash, and resin content, and a much larger α -cellulose content than ordinary bleached material. Methods used in the determination of these properties are given.

B. P. RIDGE.

Preparation of hydrocellulose in the cold and by disintegration. J. P. LEHALLEUR (Ann. Acad. Brasil. Sci., 1929, 1, 79-80).—A process is described for obtaining from cotton a hydrocellulose suitable for the preparation of smokeless powders. The cotton (400 g.) is treated for $\frac{1}{2}$ hr. with hydrochloric acid (5 litres, $d \cdot 1 \cdot 14$). The material is washed with water and finally with dilute sodium carbonate solution; $83 \cdot 5\%$ of the acid is recovered. R. K. CALLOW.

Determination of hydrocellulose and oxycellulose in commercial celluloses. J. P. LEHALLEUR (Ann. Acad. Brasil. Sci., 1929, 1, 76–78).—A preliminary note on the difficulty of obtaining concordant results by various published methods. R. K. CALLOW.

Action of caustic soda on cellulose. I. FUKUSHIMA and Y. TAKAMATSU (J. Cellulose Inst., Tokyo, 1929, 5, 255-262).-The solubility of cellulose in sodium hydroxide solutions increases with decreasing temperature, and maxima are shown for 10, 8, and 7-8 vol.-% solutions at, respectively, 20°, 7°, and -10°. Maximum solubility coincides with maximum swelling at 1° in an 8 vol.-% solution. Maximum contraction of cellulose (as ramie sliver) occurs with 10 and 12% solutions at 20° and 4°, respectively, and contraction also increases with decreasing temperature. Contraction appears to be intimately connected with solubility and swelling, and it is thought that in mercerisation contraction and dissolution occur before swelling. The viscosity of solutions of regenerated cellulose in cuprammonium increases with increasing solubility of the cellulose during mercerisation, i.e., with increasing removal of hemicellulose. The viscosity of viscose prepared from alkali-cellulose depends on the temperature of mercerisation. The hydrolysis value (Schwalbe) of regenerated cellulose increases with increasing concentration of the sodium hydroxide used, and also with decreasing temperature. Temperature has therefore a considerable effect on the properties of cellulose during and after mercerisation. B. P. RIDGE.

Control of viscosity of solutions of cellulose. F. OLSEN and H. A. AARONSON (Ind. Eng. Chem., 1929, 21, 1178—1181).—By carefully controlled action of acids on cellulose it is possible to bring about considerable physical disintegration of cotton fibres with a minimum of chemical degradation. Such conditions result in a very considerable decrease in the viscosity of cuprammonium solutions of the product. Treatment with 5% sulphuric acid at 50° for 16 hrs. is convenient (cf. U.S.P. 1,615,343; B., 1927, 580). A. G. POLLARD.

Desulphurisation of viscose [rayon] silk. Y, KAMI and T. MATSUYAMA (J. Cellulose Inst., Tokyo, 1929, 5, 293-304).—Viscose rayons of 120 and 150 denier were treated with sodium sulphide solutions of various concentrations for 20 min. at 50°, and of the same concentration at different temperatures. The concentration of the bath before and after the immersion was determined iodometrically, whilst the sulphur

content of the desulphurised material was found by the oxidation method. Provided that sufficient sodium sulphide to react with the sulphur in the material is present, and that a sufficiently long time of reaction is given, the desulphurisation process is independent of the concentration of the bath. Temperature and the total quantity of sodium sulphide present are of little importance if the concentration of the solution exceeds 20 g./ litre, and in desulphurisation by the steeping process the use of a solution of this concentration for 15 min. at 25-30° is recommended, whilst for the "passage" process a higher concentration and temperature are necessary. The relation between sulphur content (S%) of the desulphurised rayon and the temperature (θ°) of the bath is given by the empirical formula S = $76 \cdot 970^{-0 \cdot 8073}$, from which it is evident that it is impossible completely to remove the sulphur in the rayon by means of sodium sulphide. Iodometric analysis of the desulphurising liquor does not distinguish between mono- and poly-sulphides, hence the active power of the solutions (*i.e.*, the quantity of monosulphide present) cannot be determined by this method. Treatment of the rayons with solvents for sulphur (e.g., carbon disulphide) and with agents which react with sulphur to form water-soluble compounds (e.g., ammonium sulphide or ammonia) shows that desulphurisation occurs not as the result of direct dissolution of sulphur, but as a result of the action of chemical reagents which convert it into compounds which are readily soluble in water. B. P. RIDGE.

Production and treatment of cellulose in the paper industry. J. STRACHAN (Inst. Chem. Eng., Nov. 27, 1929. Advance copy. 4 pp.).-An outline is given of the sources of cellulose for papermaking, and the various pulping processes are described. Of the more recently suggested processes, that in which neutral sodium sulphite is used is the most promising, sodium sulphite having little or no degrading effect on cellulose at moderate cooking temperatures. Efficient recovery of the black liquor is, however, difficult. Electrical conditions have a marked effect on digestion processes in general, and by the application of very small electrical charges from an outside source satisfactory digestion may be accomplished at lower temperatures and with a reduced consumption of chemicals. D. J. NORMAN.

Oak chips from tan-works as raw material for paper. W. NERECHTSKIJ (Zellstoff u. Papier, 1929, 9, 835-836).-Waste chips may be used for the manufacture of cellulose, but the bark, which cannot be removed after the lixiviation process, is detrimental to the properties and quality of the pulp. Oak wood contains 5-6.5% of tannin material, of which the heartwood contains 82%, the sapwood 2%, and the bark 16%. By de-barking the wood and removing the sapwood before extraction an improved tannin extract may be obtained. The sapwood could then be used for the manufacture of cellulose, whilst a second tannin extract could be obtained from the bark and the residue of the latter would serve as fuel. Alternatively the bark could be burned without extraction, thus giving an increased yield of heat. De-barked, lixiviated waste chips give 51.3% of unbleached cellulose or 46.1%

of bleached material; this corresponds to 27.7% on the original wood. The unbleached pulp may be used for the manufacture of packing papers, the price of which is lower than that of similar papers from straw cellulose. The properties of such papers and of pasteboards made from waste chip cellulose are also superior to those of corresponding materials from straw cellulose. For the economical conversion of the waste chips into paper the lixiviation and paper works should have a common steam-power plant. B. P. RIDGE.

Chintschin's sizing process [for paper]. A. MARTJEMIANOV (Zellstoff u. Papier, 1929, 9, 838-839).--Papers of different kinds were sized by the usual process (in which the necessary ingredients, pulp, filling, rosin, alumina, etc. were simultaneously mixed together before beating), and by Chintschin's method, in which softened water was used and the alumina was added 30-40 min. after admixture of the rosin milk with the other ingredients. In the latter case, 41.6-50% saving of rosin and 27-33% of alumina was effected. This behaviour is similar to that found for the Delthirna process. The most satisfactory results were obtained by use of a size containing 50-54% of combined rosin. The superiority of Chintschin's process is demonstrated by a comparison of the rosin and alumina consumptions on a price basis. B. P. RIDGE.

Action of liquids on paper. J. STRACHAN (Proc. Tech. Sect. Papermakers' Assoc., 1929, 9, 220—228).— An outline is given of the effect of beating and different methods of sizing on the penetration of paper by water, oils, varnishes, etc. Since resin sizing confers only increased resistance to wetting by aqueous liquids and has no appreciable influence on the absorption of oils and varnishes, it is suggested that a considerable saving might be effected and a better paper produced if resin sizing were omitted entirely from most printing papers. The resistance of paper to penetration by all liquids, particularly oils and varnishes, increases with the degree of beating and the closeness of the sheet.

D. J. NORMAN.

Testing crude pasteboard by its absorption of anthracene oil. KORN (Papier-Fabr., 1929, 27, 765-766).-In this test samples of material each weighing 1 g. are slowly immersed in the oil, allowed to drain completely, weighed, and the percentage of oil absorbed is found. Conditions affecting the results obtained have been investigated, using an oil of $d \ 1.095$, and samples weighing 1 g. cut square in shape, and also larger ones of 1 sq. m. surface area. The time of draining is shorter for the small than for the large test pieces, and, in general, it is shorter for those of higher weight per sq. m. than for those of lower weight. The longer the time of hanging after complete drainage, the smaller is the oil absorption; the values are 0.5-2% and 4-11.6% lower, respectively, if weighing is done 1 hr. and 18 hrs. after drainage is complete. Better average results are obtained by using large rather than small samples, but the former give lower values than the latter. The length of the test pieces used is important, since if long narrow strips are taken instead of squares lower values are given, hence it is necessary to use samples of definite surface dimensions in carrying out the test. B. P. Ridge.

Extraction of acetic acid etc. MARILLER.—See II. Leather and sulphite-cellulose extract. MERRILL and BOWLUS.—See XV. Fermentation of cellulose. BORUFF.—See XVIII.

PATENTS.

Manufacture of textile fibres. TEXTILES (NEW PROCESS), LTD. (B.P. 321,903, 18.4.29. Fr., 8.10.28).— Waste fibrous vegetable materials such as remnants of jute sacks are wetted with a dilute solution of olein, magnesium sulphate, potassium nitrate and phosphate, heated to about 30°, heaped, and allowed to ferment for 24—48 hrs. After being unravelled, they are boiled with a dilute solution of caustic soda or sodium carbonate and magnesium chloride, which solution may have been used for a previous treatment, washed, bleached, and passed into a bath containing soap, vaseline oil, and a suitable alkali. Finally the material is dried to a water content of 30%, carded, and again dried. F. R. ENNOS.

Improvement of vegetable fibrous material. L. LILIENFELD (B.P. 320,062, 2.7.28).—Textile materials are treated with a solution of a cellulose derivative containing the CS·S group from which cellulose may be regenerated, *e.g.*, viscose, and are then treated before, during, or after regeneration of the cellulose with shrinking agents, *e.g.*, strong caustic alkalis or mineral acids. Gas-forming compounds, *e.g.*, carbonates, may be incorporated with the viscose solution, also fillers, pigments, softening agents, etc. Materials dressed in this way have a soft feel, good extensibility without cracking of the viscose layer, and are substantially unaffected by washing. Thirty-four examples are given.

D. J. NORMAN.

Treatment of wood, fabrics, and other cellulosic materials. (SIR) G. C. MARKS. From CURTIN-HOWE CORP. (B.P. 321,786, 9.10.28).—The material is rendered non-inflammable and resistant to insect and fungus attack by impregnation with a solution containing ammonia and upwards of 5% of arsenious acid, capable of depositing free arsenious oxide on exposure to air. F. R. ENNOS.

Washing of wool and other textile materials and compositions for use therefor. N. E. WILLIS (B.P. 321,729, 21.7.28).—The scouring liquid consists of a dilute aqueous solution containing a buffer salt (trisodium phosphate, borax, or ammonium carbonate), whereby the alkalinity is controlled between $p_{\rm H}$ 7.5 and 11, a water-soluble carbohydrate (glucose), an emulsifying protein, and an antiseptic. F. R. ENNOS.

Production of cellulose from wood. G. GURTNER (Swiss. P. 123,468, 23.3.25. Addn. to Swiss P. 120,266). —Wood is treated with dilute hydrochloric, sulphuric, nitric, or acetic acid, and is subjected to mechanical treatment in the presence of part of the acid until loosening of the fibre structure occurs. B. P. RIDGE.

Cellulose compounds for use in the manufacture of transparent paper and artificial silk. C. RUZICKA (B.P. 321,521, 5.10.28).—Cotton cellulose, wood cellulose, or the like is intimately mixed with phenol, or a soap-forming fatty acid or resin, and is then treated with strong alkali solution, *e.g.*, caustic soda solution $(d \ 1 \cdot 36)$, and left to ripen at the ordinary temperature for a period varying from a few hours to a month or more. The mass is then dissolved by churning in caustic soda solution of d 1.18, optionally with addition of carbon disulphide to facilitate dissolution. The resulting cellulose solution when precipitated with, e.g., 15% sulphuric acid gives products (apparently esters of cellulose with fatty or resin acids) which are particularly suitable for artificial filaments or films which require to show resistance to water. Suitable proportions are 162 pts. of cellulose, 57 pts. of castor oil fatty acids, and 288 pts. by wt. of caustic soda solution $(d \ 1 \cdot 36)$, with a ripening time of one month at 15.5°. Hardening agents, e.g., formaldehyde, may be used at any stage of the D. J. NORMAN. process.

[Production of] artificial silk and like filamentary material. C. H. FIELD and D. HASLETT (B.P. 319,294, 13.6.28).-Artificial filaments consisting of a mixture of cellulose xanthate and cellulose acetate and/or cellulose nitrate are obtained by spinning a solution of cellulose acetate or nitrate and cellulose xanthate in epichlorohydrin, mono- or di-chlorohydrin, an acetin or like ester of glycerol, or glycerin itself into an acid coagulating bath, e.g., a hydrochloric acid-ammonium chloride bath. The xanthate may be prepared and ripened in the usual way, but is preferably allowed to coagulate spontaneously, and should contain a minimum quantity of water. A suitable spinning solution is made by mixing equal parts of a 5-7% solution of cellulose acetate in epichlorohydrin and an 8-12% solution of cellulose xanthate in glycerin and dichlorohydrin (1:1). D. J. NORMAN.

Production of artificial filaments, yarns, or threads. BRIT. CELANESE, LTD., H. DREYFUS, W. A. DICKIE, and W. I. TAYLOR (B.P. 321,762, 13.9. and 18.12.28).—In the production of threads of cellulose acetate silk by the dry-spinning method, the filaments are drawn at varying linear speeds by suitable means, such as passing them round a roller the peripheral speed of which is varied, whereby a more or less frequent, regular, and systematic variation in denier is imparted thereto. F. R. ENNOS.

Manufacture of artificial threads or filaments. BRIT. CELANESE, LTD., and W. I. TAYLOR (B.P. 320,106, 5.7.28).—In the manufacture of artificial filaments by the dry-spinning process, starting-up is facilitated if a vacuum is applied to the outer face of the jet until an uninterrupted flow is obtained through all the orifices. Suitable devices are described. D. J. NORMAN.

Manufacture of artificial silk and the like. H. P. BASSETT and T. F. BANIGAN, ASSTS. to H. P. BASSETT (U.S.P. 1,736,280, 19.11.29. Appl., 19.5.24).— Freshly-spun cuprammonium silk filaments are washed to remove excess alkali, twisted while wet, again washed, partly dried without being under tension, and the moisture content is suitably reduced while under tension. P. E. L. FARINA.

Manufacture of artificial [silk] threads. L. LILIEN-FELD (B.P. 319,293, 11.6.28. Addn. to B.P. 281,352; B., 1928, 228).—The concentration of caustic soda solution specified in the earlier patent is extended to include solutions of 2-5% concentration (calc. as NaOH). D. J. NORMAN.

Manufacture of artificial thread from viscose. L. LILIENFELD (B.P. 321,679, 11.8.28. Addn. to B.P. 274,521 and 274,690; B., 1927, 745).—A stream of viscose is coagulated by passing it into an atmosphere containing a gaseous mineral acid or acid anhydride (hydrochloric acid, sulphur trioxide) with or without an inert diluent such as air or carbon dioxide, whereby threads of high dry tenacity exceeding 2 g. per denier are obtained. F. R. ENNOS.

Viscose artificial silk. C. R. LINKMEYER (F.P. 631,674, 18.3.27).—The precipitation liquid coming from the spinning machine is heated to boiling, whereby the fine particles of viscose which separate out during the precipitation are converted into other substances which dissolve in the precipitation bath. B. P. RIDGE.

Production of regenerated cellulose structures [from viscose]. S. DUNLOP. From E. H. MORSE (B.P. 320,161, 24.7.28).-Viscose films of improved strength and flexibility are made by passing an unsupported film of viscose solution of the usual degree of ripeness first through a coagulating, but not celluloseregenerating, bath and then through a series of regenerating baths of gradually increasing acidity. An 18% solution of ammonium sulphate containing 1% or less of sulphuric acid at 24° may be used as the coagulating bath, and a solution containing 10% of ammonium sulphate, 5% of sodium sulphate, and about 2% of sulphuric acid as the first regenerating bath. The second (and third) regenerating baths may contain 13—17% (5%) of sodium bisulphate and 1.5-2.5% (3.5-4%) of free sulphuric acid, and the final bath sulphuric acid of about 6% concentration. The temperature of these baths is preferably about 24°. D. J. NORMAN.

Manufacture of cellulose ethers. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 321,651, 9.8.28).— Water-insoluble cellulose ethers are purified by extraction with a mixture of water and a water-soluble solvent, *e.g.*, dilute alcohol, acetone, or acetic acid, to which are added a small quantity of alkali and a bleaching agent (hydrogen peroxide), whereby the constituents of low viscosity which swell in water are removed.

F. R. ENNOS.

Treatment of cellulose acetates. G. B. ELLIS. From Soc. DES USINES CHIM. RHÔNE-POULENC (B.P. 321,648, 12.7.28).—To modify their solubility, cellulose acetates dissolved in anhydrous or aqueous phenols or polyphenols are saponified at 30—70° by means of alkaline phenoxides, the amount of the latter used being that which is theoretically necessary for fixing the quantity of acetic acid which it is desired to eliminate from the cellulose acetate. F. R. ENNOS.

Manufacture of plastic masses from cellulose ethers. I. G. FARBENIND. A.-G. (B.P. 295,940, 20.8.28. Ger., 19.18.27).—The cellulose ether, in particular ethyl cellulose, is mixed with an alcohol of the terpene series and, if desired, with a solvent (alcohol, benzene) and/or a softening agent (benzyl alcohol, *iso*butyl phthalate).

F. R. ENNOS.

Manufacture of materials from cellulose ethers and esters. I. G. FARBENIND. A.-G. (B.P. 295,942, 20.8.28. Ger., 19.8.27).—Films and fibres of enhanced tensile strength and extensibility are made from solutions of cellulose ethers and esters (other than nitrocellulose) in a solvent in which carbon disulphide is the main constituent. F. R. ENNOS.

Cellulose foil. L. RADO (B.P. 305,571, 22.10.28. Ger., 7.2.28).—The foils are rendered waterproof and their content of softeners is retained therein by coating them by the use of adhesives on one or both sides with thin metal foils ; in the former case the other side is covered with a celluloid or cellulose nitrate solution.

F. R. ENNOS.

Manufacture of valuable products from carbohydrates. W. TRAUBE (B.P. 294,572, 5.7.28. Ger., 27.6.27).-Cellulosic materials, starch, or other carbohydrates are treated in the dry state with sulphur trioxide vapours either in vacuo or in admixture with an inert gaseous medium, e.g., dry air, until the parent material has absorbed 50% or more of its weight of sulphur trioxide. The brownish, semi-solid reaction product is partly or completely soluble in water, the solubility depending on the amount of sulphur trioxide absorbed, and gives, on neutralisation of its aqueous solution with caustic potash, compounds of the general formulæ C₆H₇O₅(SO₃K)₃, H₂O and C₆H₆O₅(SO₃K)₄, H₂O. These products have low copper numbers, give highly colloidal solutions, and may be used as intermediates in the manufacture of cellulose esters or as protective colloids. D. J. NORMAN.

Manufacture of valuable products from carbohydrates. W. TRAUBE (B.P. 322,003, 30.8.28. Addn. to B.P. 294,572; preceding abstract).—The carbohydrate is esterified as in the prior process except that the sulphur trioxide is dissolved in a liquid medium inert to the reagents under the reaction conditions (carbon disulphide). F. R. ENNOS.

Flexible sheet material. [Glass substitute.] BRIT. CELANESE, LTD. (B.P. 308,587, 13.3.29. U.S., 23.3.28. Addn. to B.P. 307,462).—Iron or steel wire netting etc. is coated with a solution of a wholly or partially polymerised vinyl compound resin with or without an organic derivative of cellulose (cellulose acetate), polymerisation of the former substance being completed, if necessary, after application of the coating material. The quantity of this coating may be either sufficient or insufficient to fill the reticulations, which, in the latter case, are completely closed by application of a further coating consisting of a solution of cellulose acetate with or without a content of the polymerised vinyl compound resin. F. R. ENNOS.

Treatment [varnishing] of fish-bone bristles. GIMMY & DIEPOLD GES.M.B.H. (B.P. 305,484, 4.2.29. Ger., 4.2.28).—To prevent softening by moisture absorption, the bristles are varnished with a methylalcoholic solution of pinic acid resin, sylvic acid, and colophony, to which vesuvin is subsequently added. F. R. ENNOS.

Operation of paper mills. Manufacture of paper. D. K. PATTILLO and J. H. MACMAHON, ASSIS, to

British Chemical Abstracts

MATHIESON ALKALI WORKS, INC. (U.S.P. 1,733,070—1, 22.10.29, Appl., [A] 23.12.27, [B] 12.1.28).—(A) Prior to the papermaking operation, the stock is sterilised by treatment with sufficient chlorine to give it a residual chlorine content of 0.5—1 pt. per million, whilst the white water formed in the operation is treated with a coagulating agent (alum) to yield a stable, sterilised, short-fibred product. (B) The half-stock or fibre-water mixture, after formation in the beaters and when at its maximum dilution, is treated with chlorine to sterilise it and to remove slime therefrom, and is finally made into paper. F. R. ENNOS.

Manufacture of carbon papers and the like. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 321,538, 29.10.28).—Improved results are obtained in the preparation of carbon papers if the oils which are normally used as softeners are partly or wholly replaced by suitable liquid or low-melting aromatic or hydroaromatic substances such as aryl phosphates, methyldiphenylamine, phthalic acid esters of ethylene glycol monoalkyl ethers, etc. D. J. NORMAN.

Manufacture of cigarette paper. J. F. M. CRO-LARD, and BRIT.-AMERICAN TOBACCO Co., LTD. (B.P. 322,149, 3.4.29).—In order to obviate the tendency of the paper to become discoloured, stained, or spotted after contact with tobacco, the pulp is mixed with a solution containing stearin and borax, the former being precipitated on the pulp by means of aluminium sulphate etc. before running off from the beater. F. R. ENNOS.

Preparation of transparent paper. O. BRENNER (F.P. 631,282, 2.3.27).—The paper is steeped for 12 hrs. in a 1% solution of ammonia, partially dried, covered with an oil varnish or polish by an immersion process, and dried. Transparent sheets of such paper, to be used for decorative purposes, should be covered with a rubber-oil varnish. B. P. RIDGE.

Coating of paper. D. B. BRADNER, Assr. to CHAM-PION COATED PAPER CO. (U.S.P. 1,733,524, 29.10.29. Appl., 8.11.26).—Paper in the form of a web or sheet is coated with an aqueous slurry containing raw starch and a pigment (china clay), the whole being subjected, by means of saturated steam, to sufficient heat without substantial drying in order to gelatinise the starch, and is afterwards dried and finished. F. R. ENNOS.

Manufacture of impregnated pasteboard articles. M. P. OTTO (B.P. 315,296, 11.12.28. Fr., 11.7.28).— Pasteboard articles which have been impregnated with drying oils are exposed to an atmosphere of ozonised air at the ordinary temperature to harden the oil. By thus avoiding drying at high temperatures the hygrometric condition of the cellulose is substantially undisturbed and the article is not subject to subsequent curling and distortion. D. J. NORMAN.

Treatment of waste liquors from the making of paper pulp and similar liquors to generate heat and recover chemicals therefrom. C. L. WAGNER (B.P. 321,413, 7.8.28).—The waste liquor is sprayed downward through a refractory-lined vertical retort where it meets an upward current of heated air, which effects combustion of the volatile constituents of the liquor and allows the carbonaceous residue to fall through the bottom of the retort into a second chamber, where the combustion process is completed by the introduction of further quantities of air. The alkali salts in the residue are recovered in the usual way. When once started, *e.g.*, by first burning oil until the retort is sufficiently hot, the process is self-supporting and continuous, and provides sufficient heat to supply the whole of the requirements, other than mechanical power, of a wellequipped soda-pulp mill. The process can be applied to the waste liquor from the soda, sulphate, or monosulphite processes. D. J. NORMAN.

Mineral fibre paper and its manufacture, G. C. MARKS. From Plastic, Inc. (B.P. 321,537, 26.10.28).-Asbestos fibre is formed into sheets with an insoluble metal salt of alginic acid. Thus 1000 pts. of wet kelp (100 pts. of dry kelp) are ground up with 15 pts. of soda ash and to this mixture sufficient 10% sulphuric acid is added to neutralise the alkali; the resulting coagulum is washed to eliminate natural mineral salts and is then pressed to remove water. Of this purified kelp, 15 pts. are beaten with 100 pts. of asbestos and 2.25 pts. of sodium carbonate and the mixture is sheeted on an ordinary papermaking machine. The formed sheet may be supercalendered without cracking and is stronger and more flexible than similar paper made with vegetable D. J. NORMAN. fibre.

Manufacture of artificial threads, filaments, ribbons, etc. E. HAZELEY and E. A. MORTON, Assrs. to COURTAULDS, LTD. (U.S.P. 1,739,458, 10.12.29. Appl., 7.9.28. U.K., 7.11.27).—See B.P. 305,279; B., 1929, 280.

Manufacture of textile materials [staple fibres]. H. DREYFUS (B.P. 322,417, 12.6.28).

Device for sucking air and other gases from centrifugal boxes used for spinning artificial silk threads. H. WADE. From N. V. BOUWONDERNEMING KETABANG IV (B.P. 322,675, 15.1.29).

Hardening of papier maché materials or the like [with hardened linseed oil varnish]. G. OHLHAVER (B.P. 295,259, 7.8.28. Ger., 5.8.27).

Triaryl phosphates (B.P. 322,036 and 322,057).— See III. Plastic materials (B.P. 322,158).—See XIII.

VI.-BLEACHING; DYEING; PRINTING; FINISHING.

Defects [in dyed fabrics] caused by skin particles. L. L. LLOYD (J. Soc. Dyers and Col., 1929, 45, 343-344).-Serious defects in the appearance of dyed and finished woollen and particularly worsted fabrics may be caused by the presence of particles of sheep skin. In fabrics bleached by means of hydrogen peroxide the skin particles appear pale reddish-brown, which is deepened in tone by hot pressing or decatising; the particles readily harden in such a way that they fracture adjacent wool fibres. In dyeing, skin particles absorb dyes more readily than the wool fibres, but in subsequent steaming and brushing the absorbed dye readily bleeds into the adjacent wool. Skin particles may be detected by first steeping in cold dilute caustic soda so that the substance assumes its normal structure sufficiently to be recognised under the microscope; the particles may also be recognised by boiling with water and testing for glue, e.g., by the tannin test. A. J. HALL.

Application of the locust bean in the textile industry, and especially in calico printing. G. TAG-LIANI (J. Soc. Dyers and Col., 1929, 45, 344-349).-The locust bean contains no starch but about 50% of nitrogenous substances (hemicelluloses), and from it, after grinding, may be obtained a viscous gel suitable for use in textile printing. The adhesive properties of this gel are not high; it is readily susceptible to fermentation, and becomes more viscous in the presence of an organic acid but less so with mineral acids. All alkalis gelatinise the endosperm gel to a transparent mass, but this may be inhibited by pre-fermentation, by pre-acetylation, or by adding suitable protective colloids such as glycerin and glucose. The gel is precipitated by tannins in the cold, but the precipitate dissolves on warming or on the addition of excess of the precipitant. It forms a film on textile fibres which is not sticky but withstands friction and has a marked elasticity. A. J. HALL.

Improving the appearance of buntal fibre or of articles made therefrom. S. DEL MUNDO (Philippine J. Sci., 1929, 40, 515-517).—Hats made of buntal fibre from the leaves of buri palm (*Corypha elata*) are satisfactorily bleached by immersion in a dilute solution of potassium permanganate and sodium carbonate followed by treatment with water and acidified sodium thiosulphate solution. E. H. SHARPLES.

Dyeing of cherries. JEFFREY and CRUESS.-See XIX.

PATENTS.

Bleaching of textiles by means of solutions yielding nascent oxygen. H. WADE. From DEUTS. GOLD- U. SILBER-SCHEIDEANSTALT, VORM. ROESSLER (B.P. 320,072, 3.7.28).—In bleaching textile materials by subjecting them to the action of rapidly circulating solutions of oxygen-liberating substances, undesirable decomposition of such substances as are produced by the catalytic effect of the materials of the apparatus is avoided by using cement or similar vessels or vessels of other materials coated with cement, and preferably painted with a solution of sodium silicate. Suitable apparatus is described. [Stat. ref.] A. J. HALL.

Dyeing [with oxidation dyes]. E. SCHUELLER (B.P. 307,732, 23.8.28. Fr., 12.3.28).—The elimination of toxic or unstable intermediate products formed during the dyeing of textiles and furs with aromatic phenolic or amino-compounds in the presence of oxidising agents is effected by washing the dyed material with a solution of an alkali or alkaline-earth salt (particularly an alkaline-earth chloride); this treatment fixes the fully oxidised products but not those incompletely oxidised. A. J. HALL.

Production of coloured materials made with or containing cellulose esters. BRIT. CELANESE, LTD. (B.P. 295,579, 10.8.28. U.S., 13.8.27).—Instead of applying vat and sulphur dyes to cellulose ester fabric from a dye bath necessarily containing a caustic alkali so that the silk is deleteriously affected, the fabric is printed all over with a paste containing the dye and

caustic alkali and then steamed; the fabric is not adversely affected under these conditions, although partial hydrolysis of the ester occurs. White or coloured discharge effects may be obtained by the usual methods.

A. J. HALL.

101

Laundering textile fabric. R. A. PHAIR and B. BUCARIA, Assrs. to H. KOHNSTAMM & Co., INC. (U.S.P. 1,732,729, 22.10.29. Appl., 6.3.25).—During the bleaching operation a porous silica compound (kieselguhr) is added to absorb oily matters and assist in removing stains. F. R. ENNOS.

Manufacture of dyed artificial silk. H. J. J. JANSSEN, ASST. to N. V. NEDERL. KUNSTZIJDEFABR. (U.S.P. 1,739,475, 10.12.29. Appl., 15.12.25. Ger., 15.12.24).—See B.P. 244,496; B., 1927, 406.

Dyeing of organic derivatives of cellulose. W. WHITEHEAD, Assr. to CELANESE CORP. OF AMERICA (U.S.P. 1,738,978, 10.12.29. Appl., 11.12.26).—See B.P. 282,036; B., 1929, 169.

Apparatus for washing woven fabrics. M. FREIBERGER, and GES. F. TEXTILVEREDELUNG M.B.H. "GETEVAU" (B.P. 322,219, 30.8.28).

Drying system etc. (U.S.P. 1,731,290).—See I. Varnish-coated fabrics (B.P. 301,024).—See XIII.

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

Recovery of iodine in manufacture of nitric acid. J. P. LEHALLEUR (Ann. Acad. Brasil. Sci., 1929, 1, 89—90).—The sodium hydrogen sulphate obtained in the manufacture of nitric acid from Chili nitrate contains iodate, and iodine is liberated when it is heated with water and scrap iron. By absorption of the iodine vapour in soda solution 15—50 g. of iodine may be recovered per ton of nitrate. R. K. CALLOW.

Properties of nickel in caustic [soda] evaporation. R. J. McKAY (Ind. Eng. Chem., 1929, 21, 1283-1287).-Corrosion in caustic soda evaporators may be by the solution or by the steam. Tests over a long period with welded nickel tubes inserted in an evaporator showed a thinning of 0.06 mm. per year mainly from the steam side. Data of a similar nature from laboratory tests on nickel and other metals are given. Variations are due to variations of the conditions, but the corrosion rate is low enough for many years' service. Other experiments show that the corrosion of nickel by steam is negligible unless an unusual concentration of carbon dioxide is present. Galvanic corrosion of steel may occur at a point of contact with nickel. The production of caustic soda free from iron and copper is a desirable result of the use of nickel. The physical properties of nickel tubing and nickel tube sheets are discussed. Steel or cast iron evaporators may be lined with lightgauge nickel sheets electrically welded. C. IRWIN.

Reactions involved in the Hargreaves [saltcake] process. B. NEUMANN and H. KUNZ (Z. angew. Chem., 1929, 42, 1085—1087).—In this process sodium chloride is treated with sulphur dioxide (burner gases), air, and moisture at 500°. The principal reaction is probably $SO_2 + H_2O + 2NaCl = Na_2SO_3 + 2HCl$, the sodium sulphite being afterwards oxidised. The equilibrium

constant for this reaction was determined experimentally at temperatures from 350° to 600° and compared with values calculated from Nernst's formula. The experimental results were about 100 times the calculated values, the discrepancy increasing with the temperature. A turbidity was noticed in the oleum used to absorb moisture from the exit gases in the apparatus, and it was concluded that the variation was caused by decomposition of the sulphite formed : $3Na_2SO_3 + SO_2 +$ $H_2O = 3Na_2SO_4 + H_2S$. This view was confirmed by determining the weight of sulphur formed. The residue in the reaction tube contained no sulphite, though air had been entirely excluded. The reaction $3SO_2 =$ $2SO_3 + S$, which might be supposed to occur and supply another explanation of the origin of the sulphur, is very unlikely under the conditions of working.

C. IRWIN.

Ratio of fluorine to phosphoric acid in phosphate rock. D. S. REYNOLDS, K. D. JACOB, and W. L. HILL (Ind. Eng. Chem., 1929, 21, 1253—1256).—Most American phosphate rocks contain 3-4% F. Florida pebble phosphate has an almost constant content of $3\cdot9\%$ irrespective of the phosphoric acid content. In other types (Florida hardrock, phosphates from Tennessee and Idaho) the fluorine content varies directly with the phosphoric acid, the ratio being constant for each type. The fluorine is present in the form of complex fluophosphates, perhaps formed by reaction between phosphates and fluorides in solution. It tends to be higher in the older rocks. C. IRWIN.

Manufacture of high-analysis phosphates. E. L. 6% of moisture. After crushing and drying it contains 32% P2O5, together with 7% of organic matter, which is removed by calcining. It is then ground and agitated by compressed air with sulphuric acid in a continuous plant consisting of three large tanks. It then passes through Dorr thickeners and Oliver filters. Wood, hard lead, and alloys resistant to phosphoric acid are amongst the constructional materials used. The phosphoric acid is concentrated up to 44% P2O5 in vacuum evaporators using steam raised by the gases from reverberatory furnaces. The phosphoric acid is mixed with rock phosphate to form "treble superphosphate," the acid concentration used being the highest with which it is possible to obtain a uniform product. The product is aged for 30 days and then dried at below 200°. A certain amount of ammonium dihydrogen phosphate is also made by mixing phosphoric acid and ammoniacal liquor. C. IRWIN.

Fertilisers. MATIGNON.—See XVI. Sodium citrate. CATULLO.—See XX.

PATENTS.

Process for the manufacture of alkali iodates and its application to the manufacture of oxygen. I. G. FARBENIND. A.-G. (B.P. 299,445, 16.8.28. Ger., 28.10.27. Addn. to B.P. 290,749; B., 1928, 523).— The reaction described in the prior patent is accelerated, even at ordinary pressure, by adding to the melt heavy-metal or earth oxides, *e.g.*, 1% of bismuth oxide or 4% of aluminium hydroxide. By raising the temperature of the melt to 575—600° oxygen is evolved, whilst the regenerated iodide can be used again. Gases containing oxygen may be used instead of oxygen.

P. E. L. FARINA.

Manufacture of [dehydrogenating] catalysts [hydrated copper oxide]. J. P. P. MAYOR, Assee. of Soc. ALSACIENNE DE PROD. CHIM. (B.P. 303,347, 13.8.28. Fr., 31.12.27).—Precipitated copper hydroxide or carbonate is heated at about 90° in the presence of the mother-liquor until the desired hydrate (e.g., nCuO,H₂O; n = 4 or 6) is obtained, when the precipitate is stabilised, removed, washed, and dried *in vacuo*. The stabilising agents comprise alkaline-earth hydroxides which may be used in excess as the precipitants or may be added after precipitation, and soluble compounds, *e.g.*, sugar or alkali salts, applied by washing the precipitate with solutions containing them and drying the impregnated hydrate. L. A. COLES.

Production of anhydrous stannic chloride from metals [alloys] containing tin. G. A. FAVRE (B.P. 304,282, 7.1.29. Switz., 18.1.28).—The alloys are treated with chlorine at about 900° in a melting pot provided with inlets for the alloy and chlorine, with heating and cooling means, with a perforated annular device above the level of the molten metal for collecting the least volatile (lead and copper) chlorides as a liquid, and with a baffle plate below a vapour outlet above the pot. The escaping vapours pass through one or more coolers in which iron, aluminium, and antimony chloride etc. condense, and which may contain material to combine with excess chlorine, and thence into a condenser for the residual stannic chloride vapour.

L. A. Coles.

Manufacture of white titanic acid. I. G. FARBENIND. A.-G. (B.P. 296,730, 5.9.28. Ger., 6.9.27).— The ore, worked up by treatment with sulphuric acid, is hydrolysed in the presence of hydrofluoric acid or a soluble fluoride, water being added to prevent concentration of the free sulphuric acid formed; 89% of the titanic acid separates, after 6 hrs.' boiling, in a granular condition, which is easy to filter and remains pure white even after ignition at 900°.

P. E. L. FARINA.

Making base-exchange materials. A. S. BEHR-MAN, ASST. to PERMUTIT Co. (U.S.P. 1,736,281, 19.11.29. Appl., 29.12.24).—Solutions containing about 31 mols. of sodium silicate and 8—10 mols. of basic aluminium sulphate are mixed, the concentrations being such that a gel is formed; the reaction mass is then dried and leached. P. E. L. FARINA.

Manufacture of nitrous oxide. W. FRIEDERICH (B.P. 310,507, 15.2.29. Ger., 27.4.28).—A purer product with a yield 96—98% of the theoretical is obtained by adding to the ammonium nitrate to be decomposed 0.7—1.4% of ammonia, either in gaseous form or to a solution of the nitrate. In a continuous process an aqueous solution of ammonium nitrate is used, this being run into a reaction vessel made of suitable acid-resisting materials, which is heated to 200—240° and preferably contains a mixture of sodium and potassium nitrates. P. E. L. FARINA. Stabilising and improving the base-exchanging a properties of silicates. A. ROSENHEIM (B.P. 302,690, co 19.12.28. Ger., 20.12.27).—Glauconite or material containing or resembling it is treated successively at the ordinary temperature or above with solutions of acidreacting salts of metals which are at least bivalent 2. (preferably tervalent, amphoteric metals, *e.g.*, ferric a chloride), with solutions of alkali salts having an alkaline reaction (sodium silicate), and with a neutral alkali salt (sodium chloride) solution. The first two treatments may be repeated alternately until the water to be softened no longer becomes turbid when passed through the treated material, and the material may be washed with water between the different treatments.

L. A. COLES.

Recovery of sulphur from gaseous mixtures containing sulphur vapours. H. D. ELKINGTON. From COMSTOCK & WESCOTT INC. (B.P. 321,919, 17.5.28). —Mixtures of sulphur vapour with non-reacting gases, other than the mixtures claimed in B.P. 306,107 and 321,911 (B., 1930, 106), are brought in contact with solid condensing elements maintained at a temperature such that the condensed sulphur flows off in a freely liquid condition ; e.g., the gases are passed through the tubes of a tubular boiler at a temperature corresponding to a steam pressure of 2 to just under 6 atm., the tubes being provided with baffles to ensure good contact between the vapour and the condensing surface. L. A. COLES.

Concentration and distillation of solutions of hydrogen peroxide. R. WIETZEL, L. SCHLECHT, and O. KÖHLER, ASSTS. to I. G. FARBENIND. A.-G. (U.S.P. 1,738,625, 10.12.29. Appl., 18.1.27. Ger., 18.1.26).—See B.P. 264,535; B., 1928, 604.

By-products from gases (B.P. 321,982).—See II. Sulphur and iron oxide from ores (B.P. 321,911 and 321,920).—See X. Electrolytic lead peroxide (B.P. 299,306).—See XI. Vermilion (G.P. 453,523).—See XIII.

VIII.—GLASS; CERAMICS.

Continuous process for plate glass at the Ford River Rouge plant. E. P. PARTRIDGE (Ind. Eng. Chem., 1929, 21, 1168—1171).—The continuous plant described was started by the Ford Motor Co. in 1923. Tank furnaces are used from which the glass flows to rolls. The furnaces are gas-fired and pyrometrically controlled, and have a capacity of 32 tons per 24 hrs. and a life of 11—12 months. The rolls, which are of cast iron and water-cooled, gradually become eroded. The annealing lehrs are also gas-operated. The processes of grinding and polishing are also described. C. IRWIN.

Ultra-violet solar radiation and the solarisation of window materials. W. W. COBLENTZ and R. STAIR (Bur. Stand. J. Res., 1929, 3, 629-689).-Data are given on the variation of ultra-violet solar radiation with the time of day, season of the year, altitude, and geographical position, and pollution of the atmosphere. The amount of therapeutically useful ultra-violet radiation obstructed by common window glass, and by a number of the new glasses for transmitting shortwave radiation, is measured. These glasses are classified according to their transmissive properties at $302 \text{ m}\mu$, and vary from 25% to 90% as compared with 1% for common window glass. C. J. SMITHELLS.

PATENTS.

Strengthened glass. P. H. HEAD (B.P. 321,977, 23.8.28).—Ethyl lactate is employed, alone or in combination with other solvents, to seal glass to celluloid or cellulose acetate. Edges are sealed by bevelling in V-shape and either cauterising or filling with oleaginous material. Alternatively, addition of small proportions of methylcyclohexanone or triacetin to the ethyl lactate renders it unnecessary to seal the edges of the sheets. A. COUSEN.

Sterilisation of glass tubes and glass vessels. J. DICHTER (B.P. 305,185, 1.2.29. Ger., 1.2.28).— Glass tubing is maintained clean and sterile by closing the ends by fusion during the process of manufacture. A. COUSEN.

Baking a highly refractory lining in metallurgical furnaces, especially induction furnaces, crucibles, and the like. S. WESTBERG (B.P. 310,458, 20.8.28. Ger., 26.4.28).—The refractory lining or crucible is placed in an induction furnace and a plug of conducting material is suspended within it. The plug is heated by induction and serves to heat by radiation the crucible to be baked. The refractory can thus be fired out of contact with corrosive slags etc. to a temperature above that at which it will be used. If the plug be made of a material having a sufficiently high m.p., the inner surface of the lining or crucible may be fused and will give, on solidification, a surface layer very resistant to gas, metal, or slag. J. A. SUGDEN.

Manufacture of abrasive materials having an alumina base. Soc. ANON. DES MANUF. DES GLACES ET PROD. CHIM. DE ST.-GOBAIN, CHAUNY & CIREY (B.P. 292,611, 22.6.28. Fr., 23.6.27).—The admixture of 2% of fluorides or fluosilicates (preferably of the alkalis or alkaline earths) to ground bauxite enables the sintering and recrystallisation of the alumina to take place at 1300—1350°. J. A. SUGDEN.

Method and apparatus for producing sheet glass. A. E. WHITE. From MISSISSIPPI GLASS Co. (B.P. 322,620, 13.11.28).

Manufacture of [multi-]coloured patterned glass and other transparencies or translucencies. B. R. BAYNE (B.P. 322,075, 9.11.28).

Glass substitute (B.P. 308,587).-See V.

IX.-BUILDING MATERIALS.

Setting and hardening of Portland cement in the presence of water-soluble compounds. H. W. GONELL (Z. angew. Chem., 1929, 42, 1087—1091).— The effect of the addition of various water-soluble compounds on the setting of Portland cement was studied by the microscopical examination of thin sections and of preparations of the finest grains of the cement (diam. = 10-40 μ) mounted in the solution on a slide. The former were much more difficult to study than natural rock slices, and clearer results were obtained with the powder. With sugar solution crystal formation was retarded and gel formation predominated. Crystallisation may be evident only after months. Calcium saccharate has a similar effect, so that the result is not due to the solubility of calcium oxide in sugar solution alone. It is known that sugar acts as a stabiliser to many emulsions. Copper chloride and lead nitrate were found to lengthen to 7 days the time required for crystals to develop. Sodium carbonate was found to promote crystallisation, but the inferior final strength with its use is probably due to the suppression of the gel phase. Both gel and (later) crystal formation are essential to good setting. C. IRWIN.

Action of sulphates on Portland cement. I. Use of the expansion method in studying their action on Portland cement mortar and concrete. T. THORVALDSON, D. WOLOCHOW, and V. A. VIGFUSSON (Canad. J. Res., 1929, 1, 273-284) .- To investigate the reproducibility of expansion tests, mortar bars 0.625 in. thick and 7.5 in. or 10 cm. long were made in different batches from Portland cement and standard sand (1:7.5 mix) with smooth ends of neat cement and cured for 7 days in moulds, followed by curing periods of 14 days, 1 month, or 3 months in distilled water or a damp closet. The times taken by the bars to give a certain percentage expansion when immersed in 0.15Msodium sulphate showed definite fluctuations amongst batches of the same age, but the variations were slight compared with those shown by cements of different origin. Tensile tests on briquettes (1:5 mix) during immersion in 0.5M-sodium sulphate and -magnesium sulphate showed that a rapid rise in strength occurs during the first 2 days, followed by a period of no change and then by a rapid decrease. The expansion-strength curve is not linear, the tensile strength diminishing at a decreasing rate with respect to expansion. By determining the time required to attain a given expansion with 1:10, 1:5, 1:3, and 1:2 mixes of cement of different grades and standard sand it was shown that resistance to sulphate action increases rapidly with richness of mix and the superiority of good-quality cement is the more evident the richer is the mix. This increase in resistance with richness of mortar is more pronounced when graded sand is used.

H. J. DOWDEN.

Substitute for the compression test of concrete. G. J. GRIESENAUER (Eng. News-Rec., 1929, 103, 846— 847).—The cement, sand, and gravel separated from a weighed quantity of freshly made concrete by washing and sieving are dried and weighed, so that a check is obtained on the proportions used without waiting for the aggregate to set. S. I. LEVY.

Utilisation of low-grade timber and waste wood. C. G. SCHWALBE (Z. angew. Chem., 1929, 42, 1118—1121). —A résumé of recent developments in the technology of wood and timber. S. I. LEVY.

Primary tars. MENEGHINI. Road tar. MALLISON. —See II.

PATENTS.

Coloured bituminous compositions. C. H. GRIM-SHAW (B.P. 321,948, 22.6.28).—A bituminous emulsion is mixed with clay and a colouring matter which may be a synthetic dye. The admixture is made while the constituents are cold. C. A. KING.

Treatment of wood and fibres. G. E. RICE, Assr. to CONSERVATION CORP. OF AMERICA (U.S.P. 1,732,379, 22.10.29. Appl., 3.3.26).—Wood is cleansed and stabilised by immersion in a solution containing a compound which exerts osmotic pressure in solution, *e.g.*, sugar, and a boron compound, *e.g.*, boric acid, which acts as a catalyst. The bath is slowly heated and boiled until no further scum is produced. F. G. CLARKE.

Manufacture of [fused] cements. A. BAUCHÈRE and G. ARNOU (U.S.P. 1,739,383, 10.12.29. Appl., 10.11.24. Fr., 4.12.23).—See B.P. 225,858; B., 1926, 159.

[Bitumen-coated] concrete. M. L. GLOVER (B.P. 321,976, 23.8.28).

Mixing machine (321,899).—See I. Dispersions of pitch, bitumen, etc. (B.P. 321,721)—See II. Treatment of wood etc. (B.P. 321,786).—See V.

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

Testing of sheet metal for deep drawing. M. SCHMIDT (Arch. Eisenhüttenw., 1929-1930, 3, 213-222; Stahl u. Eisen, 1929, 49, 1695-1696).-If a sheet of metal is placed on the stage of a 10-ton Amsler machine and a small plunger forced into it, then the curve showing the load against the depth of impression is found to rise to a maximum, then fall again. This maximum is a logarithmic function of the diameter of the plunger and also varies with the thickness of the sheet, but it never exceeds the breaking strength of the metal. The limiting case in which the drawing power is equal to the breaking strength is called the "drawing limit." By determining the maximum drawing power with two different plungers and the breaking strength on a sheet of known thickness, the drawing limit for any size of plunger may be calculated. The results obtained approximate closely to those obtained in actual commercial work, and give a far better indication of the behaviour of a metal in deep drawing than does the Erichsen test. Tests on cold-rolled iron sheets before and after annealing at various temperatures showed that a minimum drawing limit is obtained with annealed sheet having a coarse-grained structure. The effect of repeated drawing with plungers of decreasing diameter is not identical with that produced by a single drawing up to the limit, and hence it is concluded that cold plasticity and capacity for deep drawing are not interchangeable terms for the same property of a metal, but are closely related properties. A. R. POWELL.

Recent developments in corrosion-resistant and heat-resistant steels. J. A. MATHEWS (Ind. Eng. Chem., 1929, 21, 1158—1164).—It is recommended that all corrosion data should be expressed in depth of penetration in unit time. The properties of stainless steel (12% Cr), the stainless irons (low-carbon ironchromium alloys), and the austenitic nickel-chromium steels also containing up to 5% Si are described. In considering the application of these it must be remembered that their resistances to corrosives may be either increased or decreased by impurities in the latter. Steels containing 10—12% Cr, 25% or 34% Ni, and 5% Si show good resistance to sulphuric acid, and are far

superior in this respect to those of older types. The scale of iron oxide formed by long exposure to high temperatures is in the case of these alloys formed in layers of which only the innermost contains more than traces of nickel or chromium. Tests of the time required to develop visible scale on various alloy steels are described. The high-chromium steels are very suitable in this respect, but when good physical properties at a high temperature are necessary the nickel-chromiumsilicon steels are preferable. These can be satisfactorily welded, and have many applications in furnace work in the steel industry, in oil-cracking, etc. C. IRWIN.

Eutectoid transformation in relation to the mechanism of quenching and tempering aluminium bronze. I. OBINATA (Mem. Ryojun Coll. Eng., 1929, 2, 205-225).—The eutectoid transformation in copperaluminium alloys containing 9.5-16% Al is investigated, and found to be a stepped transformation of the type $\alpha + \delta \rightleftharpoons \beta' \rightleftharpoons \beta$. With rapid cooling the change $\beta' \rightarrow \alpha + \delta$ is suppressed, and the mechanism of tempering is explained by the tendency for this change to occur. A homogeneous structure, β' , corresponding to austenite, can be obtained by quenching the alloy in toluene at -90° . C. J. SMITHELLS.

Alteration in mechanical properties of duralumin plates after corrosion by sea-water. E. HERZOG and G. CHAUDRON (Compt. rend., 1929, **189**, 1087–1089). —Corrosion of duralumin plates 2 mm. thick by aerated sea-water for one month or by sea-water containing 0.3% of hydrogen peroxide or oxygen under 25 kg. pressure for 48 hrs. produces equal losses in weight (1-2%). The extensibility is decreased, but the breaking load is unaltered unless thinner plates are used, when this also is decreased. These results may be reproduced if small, shallow holes are bored in the original plates. The mechanical properties may be restored by polishing. J. GRANT.

Thermal and elastic properties of elinvar. F. J. SCRASE (J. Sci. Instr., 1929, 6, 385–392).—The temperature coefficient of the elastic constant of an elinvar spring has been found to be about one tenth that of a steel spring. C. W. GIBBY.

Wet method of treating mixed minerals [leadzinc ores]. A. GLAZUNOV (Chim. et Ind., 1929, 22, 890-892).-The ore in question contained 4.0% Zn, 3.5% Pb, 0.3% Cu, with traces of silver and gold. It is proposed to heat it with 8% of sodium chloride at 500° and extract with dilute acid, bringing copper, zinc, and iron into solution. Precipitation of the copper is by means of scrap iron and of the iron and zinc by lime. The latter precipitate is to be treated in a Wetherill furnace to give zinc white. Gold and silver are extracted with cyanide from the residue from the acid treatment, after neutralisation, and the lead sulphate in the remainder is concentrated by flotation methods and smelted. A laboratory trial has given good yields (70% and upwards) by this procedure. C. IRWIN.

Effect of atmospheres on the heat treatment of metals. E. G. DE CORIOLIS and R. J. COWAN (Ind. Eng. Chem., 1929, 21, 1164-1168).—The definition of atmospheres as oxidising, neutral, or reducing is unsatisfactory inasmuch as carbon dioxide or water vapour is capable of oxidising steel at high temperatures. The loss from this cause in the forging of steel and the subsequent pickling is a very serious one. It is shown that scale formation in forging is reduced with increase of carbon monoxide content in the atmosphere, and a gas-fired furnace which would maintain this condition together with the requisite temperature would offer a solution. Scaling during carbonising and reheating may be avoided by working in a stream of unburnt town's gas within a muffle. The difficulty of bright annealing, especially of brass, in an atmosphere of nitrogen is possibly due to the occlusion of gases such as oxygen at the metal surface. Hydrogen can be used for the annealing of nickel but not of copper, the latter being embrittled by the reduction of copper oxide. A successful bright-annealing process should also provide for the preliminary oxidation of any lubricant present. C. IRWIN.

Metallographic polishing. I. Automatic metallographic polishing machine. S. EFSTEIN and J. P. BUCKLEY (Bur. Stand. J. Res., 1929, 3, 783—794).— A description is given of such a machine designed to give reproducible results in a projected study of polishing methods. C. J. SMITHELLS.

Nickel in caustic soda evaporation. McKay.—See VII. Resistance furnace for iron etc. PASCHKIS.— See XI. Enzymes as reagents. BARGELLINI.—See XVIII.

PATENTS.

Production of steel in hearth furnaces. J. GRYCZ (G.P. 455,063, 12.7.23).—The charge is melted in a hearth furnace and the molten iron tapped into a second hearth furnace for conversion into finished steel. To keep the first furnace continually charged the materials are fed into it through a chamber heated by the waste gases, the scrap iron being packed in a wooden frame, which acts as a source of carbon. A. R. POWELL.

Case-hardening agent for iron and steel. J. REICH (Swiss P. 122,402, 2.7.26).—The damp articles are sprinkled with a mixture of powdered sodium chloride, potassium ferrocyanide, wheat flour, and crushed hooves of cattle, heated slowly to cherry redness, and quenched. A. R. Powell,

Ferro-aluminium alloys. S. G. S. DICKER. From AUBERT & DUVAL FRÈRES (B.P. 321,936, 14.8.28).— Aluminium steels are produced by adding to molten steel an alloy of iron and aluminium containing about 60% Al. The alloy is made by first deoxidising iron with aluminium and then adding the required quantity to produce the alloy. C. A. KING.

Manufacture of alloys of iron and aluminium. C. P., O. F. A., and N. P. P. SANDBERG, and J. W. BAMPFYLDE (B.P. 322,446, 3.9.28).—The alloys contain 11-16% Al and 89-84% Fe with or without the addition of 0.5% Si. They are cast at 1600°, and are said to be workable and highly resistant to corrosion. A. R. POWELL.

Manufacture of iron-chromium alloys. H. G. FLODIN (B.P. 322,189, 28.8.28).—A shaft furnace is charged with iron ore briquettes of such a composition

as to produce an iron of low carbon content ; as the obtain ferric oxide and a mixt

charge melts down it is covered with alternate layers of lime and with briquettes composed of chromite and ferrosilicon to give an alloy of the desired composition. The lime and chromite remain suspended in the slag first formed until the last-named is reduced to ferrochromium, which then flows through the slag into the bath of molten iron. The iron ore briquettes are preferably reduced in a separate shaft by means of the gases evolved from the main shaft. A. R. POWELL.

[Iron-copper] alloys [containing chromium and/ or nickel]. W. P. DIGBY (B.P. 322,216-7, 30.8.28).-(A) The alloy contains 20.5-34.5% Fe, 21-50% Ni, and the remainder copper; up to 20% of the iron may be replaced by an equal quantity of chromium and small quantities of manganese may be added as a deoxidiser. (B) The alloy is melted in a gas-fired crucible, which is then transferred to an induction furnace to ensure thorough mixing of the constituents.

A. R. POWELL. Mixing apparatus [for alloys]. G. A. SEELEY, Assr. to WESTERN ELECTRIC CO., INC. (U.S.P. 1,734,747, 5.11.29. Appl., 24.7.28).—A bath of molten metal is caused to circulate through a vertical, submerged casing and back through the main bath. A hood, partly submerged, surrounds the casing and encloses a minor part of the surface of the bath. The alloying metal is admitted within the hood, which serves to prevent access of dross from the large part of the bath.

B. M. VENABLES.

Separation and refining of metal mixtures. R. LORENZ and W. FRAENKEL (G.P. 453,592, 9.8.24).— The alloy is melted under a salt layer containing the oxide or sulphide of one of the constituents, and the equilibrium is disturbed by passing chlorine into the salt layer to volatilise the chloride of one of the metals ; a corresponding quantity of this metal is then dissolved out of the alloy by the slag. The chlorine may be generated by adding a chloride to the salt layer and electrolysing, using the molten alloy as cathode. The process is suitable for the separation of tin from lead-tin alloys.

A. R. POWELL. **Concentration of copper ores.** S. TUCKER (B.P. 322,527, 7.9.28).—The ore is heat-treated to reduce its copper content to metal as described in B.P. 250,991 (B., 1926, 590), and the treated ore is subjected to froth flotation in a pulp containing an alkali cyanide, sodium silicate, and a derivative of xanthic acid, together with the usual oils. A. R. POWELL.

Binding of fine ores, burnt pyrites, and the like. M. PASCHKE and E. SCHIEGRIES (G.P. 454,866, 17.8.26. Addn. to G.P. 453,469; B., 1929, 249).—Preheated air or oxygen is blown through the chamber in which the ore is mixed with slag as described in the prior patent. A. R. POWELL.

Treatment of iron [sulphide] ores. COMSTOCK & WESCOTT, INC., Assees. of E. W. WESCOTT (B.P. 306,107, 17.5.28. U.S., 16.2.28).—Iron sulphide concentrates are heated with dilute chlorine to form ferrous chloride and sulphur, which is collected in a suitable receiver. The ferrous chloride is then further chlorinated to form ferric chloride, which is vaporised and burned to obtain ferric oxide and a mixture of chlorine and nitrogen. Two thirds of this gas mixture is used in the first stage of the process and one third in the second, whereby the process is made cyclic without the accumulation of nitrogen in the circulating gases. A. R. POWELL.

Recovering sulphur and iron oxide from iron sulphide ores or the like. H. D. ELKINGTON. From COMSTOCK & WESCOTT, INC. (B.P. 321,911 and 321,920, 17.5.28).—(A) Iron sulphide ores or mattes are heated at 325-400° in an atmosphere containing chlorine, whereby ferrous chloride is formed and sulphur volatilised. The issuing gases are passed into a condensing vessel containing steam pipes through which steam is passed at 2-6 atm. pressure so as to condense the sulphur to a mobile liquid. The ferrous chloride is then chlorinated further to produce ferric chloride, which is volatilised and burnt with the aid of producer gas to regenerate chlorine and form a coarse-grained ferric oxide. (B) In the process described above, the regenerated chlorine is used to chlorinate fresh quantities of ore, the air used to burn the ferric chloride is preheated by the waste gases, and the residue from the final chlorinating vessel is treated for the recovery of copper, zinc, and/or nickel chlorides. (Cf. B.P. 306,107, preceding.) A. R. POWELL.

Treatment of ores. S. G. S. DICKER. From BRADLEY-FITCH Co. (B.P. 321,943, 19.6.28. Cf. B.P. 319,392; B., 1929, 985).—Before leaching mixed manganese and iron ores with a solution of ammonium sulphate, the ore is heated in a reducing atmosphere and in the presence of water vapour within the range 450—850°, the lower temperature yielding an insoluble and magnetic iron oxide. The heating of the ore, reducing atmosphere, and water vapour required for the process are derived from the partial combustion of a combustible gas. C. A. KING.

Treatment of complex ores. GELSENKIRCHENER BERGWERKS A.-G., G. VERVUERT, and G. RIEBER (N.P. 42,997, 14.1.25).—The ore is mixed with a reducing agent and the mixture blown on a water- or air-cooled grate with a blast of hot air from tuyères situated above the grate. Volatile metals are thus expelled and can subsequently be collected as oxides, whilst copper, iron, and manganese collect as an alloy below the grate. A. R. POWELL.

Reduction of metal oxides. H. G. FLODIN (N.P. 42,996, 22.4.24).—Metal oxides which are reduced by carbon only above 1200° are mixed with the oxide of a volatile metal, *e.g.*, zinc, and carbon and the mixture is heated to effect reduction of the added oxide, the resulting metal then acting as a reducing agent for the refractory oxide. A. R. POWELL.

Electrothermal production of zinc. FASTIGKETS-AKTIEBOLAGET ØRESUND (N.P. 43,049, 16.9.21).—The mixture of oxide and carbon is passed through a vertical cylindrical preheater provided with an axial screw or spiral conveyer and having its cross-section alternately constricted and opened out. A current of hot carbon monoxide from the later stages of the process is passed upwards through the ore to preheat and partially reduce it. A. R. POWELL.

Condensation of zinc vapours. A./S. MALMIN-DUSTRI (N.P. 43,232, 29.11.24).—The cooling medium used is the vapour of a substance which condenses at temperature below the b.p. of zinc. A. R. POWELL.

Recovery of silver or silver and lead together from pure oxides. Soc. METAL. CHILENA "CUPRUM" (G.P. 447,686, 12.5.23).—The material, *e.g.*, litharge, red lead, or lead peroxide, is digested with a solution of sodium chloride to convert the lead and silver into soluble chlorine compounds which can be further treated in any suitable manner. A. R. POWELL.

Protection of metallic surfaces from corrosion. S. O. COWPER-COLES, L. TAYLOR, A. A. GOULD, and P. G. LUCAS (B.P. 322,296, 26.10.28. Addn. to B.P. 308,180; B., 1929, 523).—The sherardising operation claimed in the prior patent is carried out in a revolving, perforated drum surrounded by an external casing through which carbon dioxide is passed. A. R. POWELL.

Treatment of metal to remove scale. C. FISCHER, JUN., and L. A. STEGEMEYER, ASSTS. to TWITCHELL PROCESS CO. (U.S.P. 1,736,282, 19.11.29. Appl., 25.5.28). —The sulphonated mineral oil product, recovered from the refining of such oils, is introduced into the mineral acid bath to inhibit the action of the acid on the metal. P. E. L. FARINA.

Electrolytic removal of metal from metallic bodies. S. O. COWPER-COLES (B.P. 322,118, 5.6.28).— The fin or splay may be removed from the eyes of needles after stamping by passing them through abrasive material, such as sand or pumice powder, at the bottom of an electrolytic bath in such a manner that the unwanted projections are dissolved away by anodic action and the scouring effect of the abrasive material.

A. R. POWELL.

Rapidly producing uniform metal [e.g., copper] deposits electrolytically. K. BREUSING and U. GOTTESMANN (B.P. 322,371, 28.12.28).—Electrolysis is effected in heated baths containing colloids and the bath is kept stirred by forcing air into the bottom through a porous clay diaphragm so that it ascends through the bath in fine streams. Good deposits of copper are thus obtained from acid sulphate baths with current densities up to 40 amp./dm.² A. R. POWELL.

Production of smooth and dense electrolytic metallic deposits. METALLGES. A.-G. (B.P. 299,725, 29.10.28. Ger., 27.10.27).—A colloid, e.g., silicic acid, is either produced in the electrolytic bath by reaction between suitable substances introduced for that purpose, or is added directly to the bath. Thus an alkali silicate and sulphuric acid may be added to the bath employed for the electrolytic refining of copper, or zinc silicate for the electrolysis of zinc sulphate solutions. In all cases the added substances must be such that no appreciable quantities of foreign ions having a disturbing influence on the electrolysis are produced.

J. S. G. THOMAS.

Enrichment of iron ore, blast-furnace flue dust, burnt pyrite, purple ore, and the like. H. A. MUELLER, ASST. to AKTIEB. FERRICONCENTRAT (U.S.P. 1,738,603, 10.12.29. Appl., 22.8.27. Swed., 28.10.26). —See B.P. 279,797; B., 1928, 715.

Manufacture of metal filaments. R. JACOBY and F. KOREF, ASSIS. to GEN. ELECTRIC CO. (U.S.P. 1,739,234, 10.12.29. Appl., 1.6.22. Ger., 18.6.21).— See G.P. 371,623 ; B., 1923, 706 A.

Washing of ores etc. (B.P. 294,210).—See I. Treatment of tin alloys (B.P. 304,282).—See VII. Furnace linings (B.P. 310,458).—See VIII. Magnetic alloys (B.P. 321,957).—See XI. Caoutchouc-coated metal (B.P. 302,250).—See XIV.

XI.-ELECTROTECHNICS.

Electric resistance furnaces for the iron industry. V. PASCHKIS (Stahl u. Eisen, 1929, 49, 1685—1691).— An illustrated article describing modern types of electric furnace for the bright annealing of iron and steel.

A. R. POWELL.

Construction of electric resistance furnaces. E. SCHWARZ-BERGKAMPF (Chem. Fabr., 1929, 519—520). —Data are given for furnace construction using chromium-nickel (chronin) wire. S. I. LEVY.

Electrolysis of water at high pressure. G. FAUSER (Giorn. Chim. Ind. Appl., 1929, 11, 479-487).--Theoretical considerations show that increase in the pressure is accompanied by increase in the amount by which the increment of the potential necessary to decompose water exceeds the ideal value of such increment. As regards the overvoltage, it is difficult to see how this can be diminished by effecting the electrolysis at a high pressure, since the gaseous layers surrounding the electrodes have then a higher density than at atmospheric pressure, and should thus offer increased resistance to the flow of the current. Further, any considerable influence of the pressure on the ohmic resistance of the electrolyte is excluded. Hence, of the various factors which intervene to modify the P.D. necessary for the electrolysis of water at high pressure, those increasing this P.D. prevail, so that there should be a global increment of the P.D. and of the energy required. It seems, therefore, that the saving in energy noted by various authors must be only apparent, and that the observed lowering of the E.M.F. must be counterbalanced by a smaller production of gas. Although the amounts of hydrogen and oxygen developed at the electrodes by the flow of a definite quantity of current are usually regarded as invariable, it is pointed out that the application of this law is limited in practice by secondary reactions between the elements separated. That nascent hydrogen and oxygen are able to react at the ordinary temperature is shown by the non-production of gas when water is electrolysed by a symmetrical alternating current. These conclusions are supported by the experimental results obtained on electrolysing water at pressures up to 1500 atm., these showing diminution in the current gas-yield with increase of pressure; hence the accompanying depression of the P.D. is to be ascribed to depolarisation phenomena. The author considers the practical and economic difficulties involved in the electrolysis of water at high pressures to be virtually insurmountable. T. H. POPE.

Treatment of cellulose. STRACHAN.-See V.

PATENTS.

Ironless induction furnace. HIRSCH, KUPFER- U. MESSING-WERKE A.-G. (B.P. 307,044, 6.9.28. Ger.,

2.3.28).—The inductor windings are divided into two separate coils energised from different phases of a lowfrequency, polyphase current, and surrounding, respectively, the upper and lower parts of the furnace. Rings of insulated sheet iron separated by an air space or non-magnetic material are arranged between the coils. J. S. G. THOMAS.

Electric [muffle] furnace. F. B. WOOLFORD (B.P. 322,367, 24.12.28).—Resistors are wound on or supported by silica pins or rods in a fireclay muffle furnace.

J. S. G. THOMAS.

[Electrodes for] electric furnaces. A. E. WHITE. From J. J. NAUGLE (B.P. 322,160, 25.7.28).—Fluid is discharged through apertures in a rotating disc-like electrode member, so that material being treated in the furnace is stirred. J. S. G. THOMAS.

Soluble metallic electrode for galvanic cells. J. MOHR (G.P. 453,763, 6.10.26).—The soluble metal, *e.g.*, zinc, is deposited upon a more electronegative metal, *e.g.*, aluminium, so that on bringing this electrode in contact with electrolyte and passing a current an insoluble, transition resistance layer is formed on the electrode. J. S. G. THOMAS.

Photo-electric cells. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of K. T. BAINBRIDGE (B.P. 303,476, 13.12.28. U.S., 4.1.28).—The inner wall of an evacuated vessel is coated with silver which is oxidised or provided with an adsorbed gas layer. Cæsium or other alkali metal is applied to the coating, and excess alkali removed by heating *in vacuo* at a high temperature.

J. S. G. THOMAS.

Treatment of gases and vapours with electric arc discharge. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,471, 29.8.28).—Gas or vapour to be treated is admitted through jets surrounding the electrodes or through the electrodes themselves, and is submitted to the action of parallel arc discharge in gaps in which the pressure of the gas or vapour is at least 100 mm. Hg, being higher in some parts, preferably at the electrode points, than at others.

J. S. G. THOMAS.

Apparatus for electro-osmotic separation from solutions of anodic or cathodic travelling particles. SIEMENS-ELEKTRO-OSMOSE GES.M.B.H. (B.P. 307,879, 2.3.29. Ger., 15.3.28).—Solution to be treated and one electrode are placed in a space which is separated, by a porous diaphragm impenetrable to the particles to be removed, from a second space containing the other electrode and a liquid which is a poor conductor of electricity. J. S. G. THOMAS.

Separation of visible rays from ultra-violet rays by filtration. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,200, 20.7.28).—Radiation is passed through transparent sheets of cellulose or its derivatives or of condensation products of urea and formaldehyde stained with organic or inorganic colouring matters, *e.g.*, fuchsin, crystal-violet. J. S. G. THOMAS.

Apparatus for influencing substances by means of high-frequency electric energy. A. ESAU, and C. LORENZ A.-G. (B.P. 301,929 and 301,930, 7.12.28. Ger., 8.12.27).—(A) Substances are subjected to the action of ultra-short electromagnetic waves of wavelength 10 m. and less. As a practical possibility the removal of dust from gases is cited. (B) Material is subjected to the process claimed in (A) between, but out of contact with, the plates of a condenser supplied with electrical energy of frequency of at least 3×10^7 periods/sec. J. S. G. THOMAS.

Electrolytic production of protective coatings of lead peroxide on electrical conductors. SIEMENS & HALSKE A.-G. (B.P. 299,306, 10.10.28. Ger., 22.10.27). —Lead peroxide is deposited electrolytically upon anodes in an alkaline solution of a lead salt to which is added an organic compound of one of the following classes: (a) hydrocarbon compounds containing hydroxyl groups, (b) organic acids without hydroxyl groups, (c) carbon-nitrogen compounds, e.g., cyanides, thiocyanates, oximes. J. S. G. THOMAS.

Electrical insulating materials. W. S. SMITH, H. J. GARNETT, J. N. DEAN, H. C. CHANNON, W. GARD-NER, and H. F. WILSON (B.P. 322,208, 25.8., 11.10., and 14.11.28. Cf. B.P. 307,390; B., 1929, 400).— Thermoplastic cable insulation is composed of 30-60%of rubber, freed from resins and/or water-soluble or -insoluble compounds, mixed with bitumen (having neither free carbon nor ash content above 2%, and m.p. 100° or over). If desired, 10% of a flux, e.g., ceresin or other wax, may be substituted for bitumen to reduce the temperature at which the latter becomes sufficiently fluid for working. The rubber after being partially vulcanised at below the m.p. of the bituminous filler is then completely vulcanised at above 185° after addition of the powdered bitumen. J. S. G. THOMAS.

Production of magnetic materials [brittle magnetic alloys]. STANDARD TELEPHONES & CABLES, LTD. From WESTERN ELECTRIC CO., INC. (B.P. 321,957, 22.8.28).—A mixture of nickel and iron, preferably containing more than 25% of nickel, melted in the presence of oxygen and an oxidising agent, *e.g.*, iron oxide, is boiled until oxidised, poured into a mould, and allowed to solidify. The material is then rolled at a temperature above the recrystallisation temperature but not lower than the temperature at which it ceases to be malleable, and finally powdered.

J. S. G. THOMAS.

Rod for use in arc-welding or cutting. J. B. GREEN (U.S.P. 1,733,795, 29.10.29. Appl., 10.2.27).— By coating the rod with sufficient alumina, or compound thereof, alumina is introduced into the arc, and the voltage drop, with a normal welding length, is thereby raised. F. G. CLARKE.

[Multi-layer] insulated [and fireproof electrical] conductors. Rockbestos Products Corp., Assees. of H. O. Anderson (B.P. 313,909, 18.10.28. U.S., 19.6.28).

[Block-type] galvanic batteries. L. and G. J. A. FULLER (B.P. 322,251, 6.9.28).

["Sac "-type] electric batteries. E. P. GRIFFIN and W. A. BUCKLEY (B.P. 322,285, 11.10.28).

Incandescence electric tubes [for illumination in long lines]. H. HARTMAN (B.P. 296,315, 27.8.28. Ger., 26.8.27). [Cathode-glow] electric discharge tubes. S. G. S. DICKER. From N.V. PHILIPS' GLOEILAMPENFABR. (B.P. 321,915, 13.7.28).

Röntgen tubes [with round focal spot]. RADIO-LOGIE A.-G., and F. BENNEMANN (B.P. 322,680, 19.1.29).

[Projection] means for [electrolyte in] electroplating [baths]. W. J. PITT (B.P. 322,611, 6.11.28).

Furnace linings (B.P. 310,458).—See VIII. Removal of metal (B.P. 322,118). Metallic deposits (B.P. 299,725). Electrodeposition of copper (B.P. 322,371).—See X. Caoutchouc-coated metal (B.P. 302,250).—See XIV. Photochemical products (B.P. 321,992).—See XX.

XII.—FATS; OILS; WAXES.

Comparison of cacao butter and its substitutes. W. VAUBEL (Chem. Umschau, 1929, 36, 377-380).— Determinations made in an endeavour to discriminate between expressed and extracted cacao butter, fat from husks, etc., and substitutes are described. The author observes that the determination of the various bromine-iodine values (cf. B., 1927, 883) may be of assistance, but the corresponding values for the fats under comparison must be obtained under similar conditions; the bromine absorption of mixed fats is a new characteristic and not calculable directly from the known absorptions and proportions of the components.

E. LEWKOWITSCH.

Solidification curves of cacao butter. J. STRAUB and R. N. M. A. MALOTAUX (Chem. Weekblad, 1929, 26, 596—599).—The temperature-time diagrams of solidifying fats may be determined satisfactorily with the aid of a Dewar vessel cooled in water maintained at 10°. The two types of curves observed for cacao butter by Pichard (B., 1923, 1185 A) have been reproduced with this simple apparatus, and the differences between them traced to the presence of a non-fatty constituent which retards crystal formation; this substance may be removed by treatment with hydrochloric acid, after which the curve of the first type changes over to that of the second type. S. I. LEVX.

Quality of fat from pigs. P. I. MEDVEDTSCHUK (Biochem. Z., 1929, 214, 282—309).—A method of taking samples of fat from living pigs and a filter-press in which the samples are pressed while hot are described. The most useful property of the fat from which to estimate the quality of the meat to be obtained from the animals is the iodine value, although the thiocyanogen value (cf. Kaufmann, B., 1926, 447) and the refractive index should also be determined. The Margosches method for the determination of iodine value is recommended. W. MCCARTNEY.

Testing of pure lard. H. P. TREVITHICK and M. F. LAURO (Oil and Fat Ind., 1929, 6, [12], 21—23).—Hydrogenated vegetable fats have the same effect as tallow on the Bömer value of a lard, and this test offers a more convenient and certain method for the detection of such adulteration than the phytosteryl acetate test. The glyceride crystals obtained by two or three recrystallisations of 50 g. of fat from 50-c.c. portions of ether at 15° (5°, or anhydrous acetone, or a 3:1 ether-alcohol mixture may be used for the first crystallisation) must not be melted before the determination of the m.p.; the fatty acids may be melted into the capillary tubes, but should be kept in a desiccator before making the m.p. determination to avoid absorption of ammonia. The Bömer value for a pure lard is not less than 71.

E. LEWKOWITSCH.

Fluorescence of lard. A. VAN RAALTE and A. VAN DRUTEN (Chem. Weekblad, 1929, 26, 602-603).—The discrepancies between the results obtained by the authors separately (B., 1928, 792; 1929, 607) are found to have been due to different conditions of working. Under the conditions employed by van Raalte unrefined fat does not fluoresce, whilst refined fats generally do. S. I. LEVY.

Drying oils. XII. Changes in linseed oil, lipase, and other constituents of the flaxseed as it matures. E. R. THEIS, J. S. LONG, and C. E. BROWN (Ind. Eng. Chem., 1929, 21, 1244—1248).—A series of flaxseeds of varying degree of maturity were examined, and characteristics of the oils obtained are given. The seeds contained a lipin- and ester-hydrolysing enzyme, the lipolytic activity (greatest in the presence of water, preferably at 25°) decreasing as the seed matures. Certain inorganic salts (e.g., alkali chlorides) retard the action of the enzyme, which, however, is not entirely destroyed during commercial hot-pressing, and may be responsible for the increase of acid value of such oils on storage if moisture be present. E. LEWKOWITSCH.

Analysis of glycerin and standardisation of reagent acid. W. A. PETERSON (Oil and Fat Ind., 1929, 6, [12], 15—18).—Details of provisional official methods for the standardisation of the acid (sulphuric or hydrochloric) to be used in the International acetin method for the analysis of crude glycerin are submitted for consideration by the American Oil Chemists' Society.

E. LEWKOWITSCH.

Seeds of Hydnocarpus alcalæ. DE SANTOS and WEST.—See XIII. Esters of Hydnocarpus Wightiana oil. Cole.—See XX.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Plasticity of paint. F. H. RHODES and J. H. WELLS (Ind. Eng. Chem., 1929, 21, 1273-1277).-The plastic characteristics of a paint depend on many factors, of which the following are the most important : concentration by vol. of pigment, fineness, size-distribution, and shape of pigment particles, wetting and flocculation of the pigment, nature and viscosity of vehicle, and the presence in the paint of substances causing "false body," e.g., water, soap. A series of plasticity determinations were carried out in a modified Bingham-Green plastometer in order to study these variables, and the results are tabulated and discussed. The effect of the acid value of the oil is considered at some length. Whilst increase in acid value of oil is found in most cases to increase the mobility of the paint, this is not true for zinc oxide paints, probably owing to soap formation. Pigments adsorb free fatty acids from linseed oil to markedly different extents, affecting both oil absorption and character of pastes formed. Nature of thinner is also of importance; e.g., turpentine lowers

yield point and increases mobility to a smaller extent than does a petroleum thinner or xylene. This is probably bound up with the tendency of turpentine to agglomerate the pigment. S. S. WOOLF.

Wetting of pigments and its relation to various paint characteristics. E. L. MCMILLEN (Ind. Eng. Chem., 1929, 21, 1237—1239).—The wetting of lithopone by a number of liquids was studied according to Bartell's method (B., 1928, 1). Contact angles and adhesion tensions are compared with yield values for the mixtures concerned. It is shown that good wetting (high adhesion and small angle of contact) results in flocculation, high yield value, and low mobility, whilst very poor wetting causes practically no yield value and high mobility. Settling is greatest in those liquids which are the poorest wetters. These results confirm the ideas of such earlier workers as De Waele, Lewis, and Haller. S. S. WOOLF.

Pigment and oil. E. KLUMPP and H. MEIER (Farben-Ztg., 1929, **35**, 599—601).—The authors' previous work (B., 1929, 989) is extended to mixtures of primary and secondary pigments, oil absorptioncomposition curves for which are given. From theoretical considerations the amount of oil absorbed by secondary particles is divided into "agglomerate" oil and "interstitial" oil. Curves based on the latter figures closely resemble those for mixtures of primary particles, and it is possible to calculate the size of the secondary aggregates from the position of the minimum in the curve. S. S. WOOLF.

Mechanism of baking process of oil varnishes. R. H. KIENLE and L. V. ADAMS (Ind. Eng. Chem., 1929, 21, 1279-1282).-Baking tests on a typical stoving varnish were carried out in a specially designed glass apparatus that permits the use of different atmospheres. The degree of baking was judged by observing the change in colour corresponding to the following states of the film: (a) dry to touch (V_s) ; (b) useful, *i.e.*, nontacky either warm or cold (V_u) ; (c) corresponding to one third the time taken to reach the "useless" state, when the film cracks or checks on the slightest abuse (V_t) . The baking process involves oxidation and polymerisation. When oxygen is present the rate of baking at any temperature increases with the oxygen concentration. If oxygen be absent and vapours formed be removed as they are produced, baking proceeds independently of the gas atmosphere in which it is carried out. The baking process is expressed in the form of a general chemical equation. S. S. WOOLF.

Abietic anhydride. E. FONROBERT (Chem. Umschau, 1929, 36, 373—377).—The existence of abietic anhydride (cf. Fonrobert and Pallauf, B., 1926, 594; also Nagel, B., 1929, 219) is confirmed. It crystallises in shining scales (m.p. 151°, $[\alpha]$ —18° in benzene) and is clearly distinct from abietic acid (prismatic crystals, $[\alpha]$ 0° to —4° in benzene) and shows f.p. depressions (in benzene, nitrobenzene, camphor) equivalent to a bimolecular abietic acid derivative. It does not distil at 275°/3 mm. In contradistinction to Dupont's dehydrated abietic acid (Chim. et. Ind., 1927, 20, 1691), which gives normal unimolecular values, no ethane is evolved by the anhydride on treatment with magnesium ethyl bromide. On boiling Fonrobert's derivative with anhydrous ethyl alcohol equivalent amounts of abietic acid and ethyl abietate are produced, affording conclusive proof of the acid-anhydride nature of the compound. A corresponding anhydride may be obtained from pyroabietic acid (cf. Fonrobert and Greth, B., 1929, 403). The m.p. 151—153° as given by Dupont for the dehydrated abietic acid is queried: by recrystallisation from anhydrous butyl ether the m.p. was raised to 165°.

E. LEWKOWITSCH.

Physical properties of shellac solutions. II. M. RANGASWAMI and M. VENUGOPALAN (Indian Lac Res. Assoc., 1929, Bull. No. 2, 17 pp.).-The experiments already described (cf. B., 1929, 64) are extended to the use of binary solvent mixtures of alcohols, alcohols and esters, and alcohols and ketones. As an efficient solvent mixture gives high "solvent power" with low viscosity of solution, the ratio of solvent-power number to relative time of flow of solution with reference to water has been taken, for purposes of comparison, as a measure of efficiency. From such considerations it is shown that a mixture of equal volumes of methyl and ethyl alcohols is the most efficient mixture of these two solvents. Corresponding advantages are not conspicuous in alcohol-ester mixtures (with the exception of ethyl alcohol-ethyl acetate), but alcohol-acetone mixtures show a marked peak in the efficiency-composition curve, and the desirability of employing nonsolvents for admixture with alcohols on economic S. S. WOOLF. grounds is clearly indicated.

Resins in the seed coats of Philippine chaulmoogra seeds (*Hydnocarpus alcalæ*). I. DE SANTOS and A. P. WEST (Philippine J. Sci., 1929, 40, 485—489). —The oils obtained by extraction of the kernels, from which the seed coats (tegmen) had been removed, and from the seed coats themselves, of *Hydnocarpus alcalæ* had, respectively, d_4^{30} 0.9438, —; $[\alpha]_{20}^{30} + 46\cdot1^{\circ}, -$; iodine value $84\cdot1$, $89\cdot9$; free fatty acid 0.25, 0.57; saponif. value $197\cdot6$, $197\cdot9$; n_{20}^{30} 1.4765, —; unsaponifiable matter 0.45, 0.76; resin acids nil, 3.73%; appearance white solid, dark brown oil.

E. H. SHARPLES.

Viscosity and plasticity. BLOM. Adhesion tension and liquid absorption. BARTELL and GREAGER. —See I. Carbon black. JOHNSON.—See II. Rosin size. Doliwo-Dobrowolskij and KAHAN.—See V.

PATENTS.

Titanium pigment and paint forming durable outside coating. Soc. DE PROD. CHIM. DES TERRES RARES (B.P. 302,659, 14.12.28. Czechoslov., 19.12.27). —Barium carbonate obtained by precipitation and preferably ground is added to titanium oxide obtained by hydrolysis from sulphate solutions and subsequently dehydrated, in sufficient quantity to provide 10—30% of barium carbonate in the resulting composite pigment. S. S. WOOLF.

Manufacture of heavy-metal salts of oil-soluble sulphonic acid and of drying oil compositions, paints, varnishes, etc. containing such salts. C. ARNOLD. From STANDARD OIL DEVELOPMENT CO. (B.P. 321,980, 23.8.28).—The residue of sodium sulphonate and petroleum oil which is derived from the crude sulphonic acid formed in the sulphonation of petroleum oils is dissolved in aqueous alcohol, oil is removed by successive extractions with light petroleum, and the oil-free sodium sulphonate is recovered by evaporation of the solvent and dissolved in water. A water-soluble salt of a heavy metal, *e.g.*, lead, manganese, or cobalt, is added to the solution, and the precipitate of oil-soluble sulphonate is dried and purified by dissolving in organic solvents, thus separating insoluble inorganic matter. The sulphonate is used as a drier for paints, varnishes, etc. (cf. U.S.P. 1,735,493; B., 1930, 69). S. S. WOOLF.

Wet process of production of vermilion, fast to light, from its elements. A. EIBNER (G.P. 453,523, 7.4.25).—The mass of black mercury sulphide or of cinnabar produced by shaking mercury and sulphur with a solution of liver of sulphur is dissolved in potassium sulphide and vermilion is recovered from the solution. J. S. G. THOMAS.

Treatment of casein varnish-finished coated fabrics or articles and products thereof. E. I. DU PONT DE NEMOURS & Co. (B.P. 301,024, 10.11.28. U.S., 23.11.27).—A casein varnish is applied to the surface of rubberised fabrics etc. and is then halogenised, *e.g.*, with a 4% solution of bromine in carbon tetrachloride; free halogen and halogen acid are then neutralised, *e.g.*, with ammonia. Improvements in the quality of the surface and increase of waterproof characteristics of the film are claimed. S. S. WOOLF.

Manufacture of plastic masses. R. Bünz (B.P. 322,133, 11.2.29).—Artificial stones, hard rubber-like materials, and grinding discs etc. are obtained from linseed oil by treatment with more than 35% of sulphur chloride and addition, with stirring, of mineral substances, e.g., ground quartz sand, slate powder, emery. S. S. WOOLF.

Manufacture of plastic and mouldable materials. H. P. BAYON. From MAGNASCO ROGGERO & Co. (B.P. 322,158, 21.7.28).—Cellulosic material, e.g., wood pulp, cotton linters, is modified by treatment with a solution of an oxidising acid, e.g., nitric acid alone or mixed with sulphuric acid, and preferably alkaline treatment. It is then incorporated under heat with an initial phenolaldehyde condensation product which may be added as such or formed *in situ*. Halogenated aromatic hydrocarbons may be added at any stage of the reaction. The product may be stored indefinitely in an amorphous condition before being moulded under heat and pressure. S. S. WOOLF.

Preparation of thermoplastic sheets. H. WADE. From BAKELITE CORP. (B.P. 314,937, 28.8.28).—A pulp composed of fibre and a reactive and plastic resin is prepared in the subdivided state and suspended in water or other liquid medium, a sheet is formed by laying this pulp and draining away excess suspension medium, and the residual suspension medium is dried out from the drained sheets under conditions which preclude the reaction of the resin to an infusible state and lessening of its plasticity. Drying may be effected by means of a current of heated and preferably predehydrated air or other gas, the treatment being carried out under reduced pressure. S. S. Woolf.

Manufacture of artificial [polyvinyl] materials.

O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 322,157, 22.5.29).—Polyvinyl esters, alcohols, or ethers are heated at about 100° in the presence of catalysts, *e.g.*, hydrochloric acid, lactic acid, zinc chloride, time and temperature varying with the nature and amount of catalyst. If catalysts be absent, temperatures of about 200° must be employed. The resultant materials are elastic, more or less infusible, and insoluble or only very slightly soluble in the usual organic solvents.

S. S. WOOLF. Nitrobenzene-sulphur resin. W. C. WILSON, Assr. to CUTLER-HAMMER, INC. (U.S.P. 1,732,453, 22.10.29. Appl., 22.6.25).—Nitrobenzene is refluxed with sulphur until resinified, a filler (asbestos) is added, and the mixture is cooled, ground, and screened. The product may be moulded cold and cured by heat treatment. Free nitrobenzene and other volatile substances are removed if the article be moulded hot, or if furfuraldehyde be added to the mix to increase its strength.

F. G. CLARKE.

Manufacture of acid- and water-proof black ink. J. INOUYE (U.S.P. 1,738,998, 10.12.29. Appl., 9.6.25).— See B.P. 253,368 ; B., 1926, 638.

Production of plastics and elastic substances. KEMIKAL, INC., Assees. of I. S. MELLANOFF (B.P. 306,522, 28.8.28. U.S., 23.2.28).—See U.S.P. 1,681,155; B., 1928, 866.

Aqueous dispersions of resins (B.P. 321,721). Products from asphalt etc. (B.P. 313,433).—See II. Glass substitute (B.P. 308,587). Varnish for fishbone bristles (B.P. 305,484).—See V. Face paint (B.P. 322,376).—See XXIII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

"Dry rubber" content of latex from deep and shallow tapping. B. J. EATON and R. G. FULLERTON (J. Rubber Res. Inst. Malaya, 1929, 1, 132—134).—Tests on a series of samples over a year from two plantations in the coastal area of Malaya show that the "dry rubber" content of latex is generally greater from shallow than from deep tapping. D. F. TWISS.

Effect of damp storage on raw rubber. B. J. EATON and R. G. FULLERTON (Rubber Res. Inst. Malaya, 1929, Bull. No. 2, 26 pp.).-Smoked sheet rubber and air-dried sheet rubber when kept in an atmosphere almost saturated with water at about 28° absorb moisture, reaching a maximum after several days. Almost invariably moulds develop from spores already present and a loss in weight occurs concurrently amounting after 20 months to as much as 28%; it is evident, therefore, that the rubber hydrocarbon itself is attacked to a considerable extent. "Spot disease" in crêpe rubber also causes a loss in weight, which is less, however, than that observed for sheet rubber. The growth of moulds does not reduce the nitrogen content of the rubber, although the character of the nitrogenous constituents may undergo alteration. Under the above conditions p-nitrophenol is not an absolutely effective preventive, but its introduction into the latex or application to the sheet considerably delays the development of mould; sodium trichlorophenoxide is less effective than p-nitrophenol, probably on account

of its conversion by acids into volatile trichlorophenol. The defect known as "white streak" in smoked sheet rubber is caused by absorption of water from a damp atmosphere and not to incomplete drying during the smoking operation. The pale amber colour frequently favoured in smoked sheet rubber is undesirable and indicative of too complete combustion of the fuel for the smoking chambers, so that little, if any, fungicidal creosote is absorbed by the rubber. D. F. Twiss.

Identification and determination of the yellow pigment of raw rubber. B. J. EATON and R. G. FULLERTON (J. Rubber Res. Inst. Malaya, 1929, 1, 135—148).—The unsaponifiable portion of the resins of raw *Hevea* rubber contains the yellow hydrocarbon pigment carotene. It is possible to determine the carotene in the acetone extract colorimetrically, using a standard solution of potassium dichromate for comparison.

D. F. Twiss.

Berginisation of raw rubber. H. I. WATERMAN, R. H. DEWALD, and A. J. TULLENERS (Kautschuk, 1929, 5, 200-202).—Samples of crêpe rubber were heated in an autoclave for 15 min. at 450° with and without the presence of hydrogen at 110 kg./cm.² pressure. The berginised sample yielded a volatile product in greater quantity and of lower refractive index, higher aniline point, and greater stability than the merely cracked sample. D. F. Twiss.

Accelerators of vulcanisation [of rubber] and their use. F. EMDEN (Kautschuk, 1929, 5, 241-244, 269-276).—A list is given of 99 commercial accelerators of vulcanisation including their trade names and, in most cases, their chemical description. Such accelerators are grouped into "ultra-accelerators," e.g., salts of dithio-acids and the thiuram sulphides; "semi-ultraaccelerators," e.g., mercaptobenzthiazole and some aldehyde-amine products; "moderately strong," e.g., diarylguanidines, aldehyde-ammonia, and most aldehydeamines; and "weak," e.g., trisubstituted guanidines, formaldehyde-amines, and thiocarbamides. The members of these classes are considered individually as to such characteristics as method of formation, sp. gr., colour and general appearance, m.p., solubility, accelerative activity, and best conditions for use.

D. F. Twiss.

Ageing of vulcanised rubber under varying elongation. A. A. SOMERVILLE, J. M. BALL, and W. H. COPE (Ind. Eng. Chem., 1929, 21, 1183-1187).-Using a basic mixture of rubber 100, zinc oxide 5, whiting 60, stearic acid 1, sulphur 4, and diphenylguanidine 11, the effect of various factors on the relative rate of ageing under different degrees of extension has been examined ; vulcanised rings of "pure" rubber containing an antioxidant were also tested. In "bomb" ageing, the extent of deterioration was almost independent of the degree of extension; in a Geer oven, deterioration at 100% elongation was about 30% greater than for the unstretched material; whilst in ozone or sunlight, deterioration was greatest near an elongation of 5% or 10%. Cracking of stretched material did not occur in the bomb or in the Geer oven, but did so in ozone or sunlight, ozone possibly being responsible also in the last case. A modified mixture in which the whiting was replaced by 40 pts. of carbon black gave similar cracking behaviour. A high proportion of sulphur favoured deterioration in sunlight or ozone, as also did under-vulcanisation. The presence of a filler such as whiting did not change the shape of the ozone- or sunlight-ageing curves, and whilst "pure" rubber bands with increase of stretch up to 700% showed progressively poorer ageing in the bomb, in ozone they exhibited the usual maximum deterioration at about 10% extension and a minimum at about 400%. The incorporation of tetramethylthiuram disulphide as a vulcanising agent and also mineral rubber led to some improvement in ageing in ozone or sunlight, but paraffin wax, although providing some protection in sunlight, permitted bad deterioration in ozone. The introduction of an antioxidant did not affect the degree of extension for maximum deterioration in sunlight or ozone, although it reduced the rate of ageing; also antioxidants giving comparable results in the oven and bomb tests gave unlike results in ozone or sunlight. Synthetic rubber behaved similarly to natural rubber. D. F. Twiss.

Vulcanisation and structure of rubber. E. LIND-MAYER (Kautschuk, 1929, 5, 202-204).—Polemical in reply to Loewen (B., 1929, 444). D. F. TWISS.

Permeability of rubber to air. I. Effect of temperature, pressure, and humidity. V. N. MORRIS and J. N. STREET (Ind. Eng. Chem., 1929, 21, 1215— 1219).—Membranes 0.07 cm. thick, prepared from a mixture of rubber with sulphur 2.89%, zinc oxide 2.89%, and di-o-tolylguanidine 0.63% by vulcanisation at 149° for 30 min., were tested as to permeability by a manometric method. The permeability was approximately proportional to the pressure, but increased slightly more rapidly at higher pressures. Permeability increased rapidly with temperature, e.g., by about 100% for a change from 26° to 37°. Brief immersion in water reduced the permeability, but prolonged immersion increased it considerably, probably by a loosening of the structure of the rubber; the effect of atmospheric moisture, however, was small.

D. F. Twiss.

Behaviour of progressively racked rubber with respect to ageing, hysteresis, m.p., and energy effects. H. FEUCHTER and E. A. HAUSER (Kautschuk, 1929, 5, 194—200, 218—227, 245—250, 276—283; cf. Feuchter, B., 1928, 377, 457).—An account of experimental results on the progressive racking of rubber and the nature of the spontaneous changes undergone by such rubber with time as indicated by its thermo-elastic behaviour, alteration in density, X-ray spectrum, resilient energy, etc. The experimental work is followed by a theoretical discussion.

D. F. Twiss.

Carbon black. JOHNSON.-See II.

PATENTS.

Manufacture of synthetic rubber. I. G. FARBENIND. A.-G. (B.P. 294,661, 27.7.28. Ger., 28.7.27. Addn. to B.P. 283,840; B., 1929, 485).—The polymerisation of butadiene, isoprene, etc. in aqueous emulsion in the presence of oxygen or of a substance yielding oxygen is accelerated by the additional presence of a waterinsoluble or colloid-soluble salt of a heavy metal, *e.g.*, cobalt, lead, manganese, chromium, or silver, especially of such metals as yield salts of value as siccatives.

D. F. Twiss.

Manufacture of synthetic rubber. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 322,114, 17.12.28).— In the polymerisation of butadiene, isoprene, or similar hydrocarbons in an emulsified state, the process is expedited by the addition of polymerised or blown oils or of products derived from these, *e.g.*, by treatment with ammonia. Polymerised castor oil is mentioned.

D. F. Twiss.

Manufacture of articles of rubber or similar material. DUNLOP RUBBER Co., LTD., and G. W. TROBRIDGE (B.P. 321,913, 19.5.28).—An article of rubber of moderate thickness can be produced by a single immersion of a heated, non-porous former, *e.g.*, at 75°, into concentrated or into concentrated and compounded latex. After a very short time the former is withdrawn and the adherent substantially fluid deposit is allowed to set and dry. D. F. Twiss.

Manufacture of treads for tyres. I. G. FARBENIND. A.-G. (B.P. 321,882, 30.8.28. Addn. to B.P. 299,037; B., 1930, 71).—The plastic products obtained by polymerisation of butadiene are employed as initial materials in the manufacture of treads for resilient tyres, whether solid or pneumatic. The processes of manufacture are similar to those used in the case of rubber. The treads so obtained maintain their elasticity to a great extent even at low temperatures. D. F. Twiss.

Repair of pneumatic tyres. V. SONNINO and P. SAMA (F.P. 631,167, 19.3.27).—Sulphur and metallic oxides are added to rubber dissolved in benzene or carbon disulphide and the mixing is completed on warm rolls. Sulphur chloride is then added and the mixture is sheeted thinly. The sheet is then applied to the spot to be repaired, previously cleaned and painted with a rubber solution. A piece of fabric coated on one side with vulcanised rubber, and a translucent fabric, e.g., tracing cloth, are finally applied in succession.

D. F. Twiss.

Treatment [increasing the age-resisting properties] of rubber and like material. GOODYEAR TIRE & RUBBER CO., Assees. of (A) A. M. CLIFFORD, (B) J. TEP-PEMA (B.P. 305,647 and 308,249, [A] 8.11.28, [B] 27.11.28. U.S., [A] 9.2.28, [B] 20.3.28).—(A) Compounds comprising two hydroxyaromatic molecules attached as in the formula $OH \cdot R \cdot R' \cdot OH$, where R and R' are aromatic groups, e.g., β -dinaphthol, are effective antioxidants for rubber. (B) Aminoazo-substituted hydrocarbons, e.g., p-aminoazobenzene or 4-aminoazo- $\alpha\alpha$ -naphthalene, are applied as antioxidants for rubber; they are substantially without accelerative influence on vulcanisation, and their inodorous and crystalline character is additionally advantageous. D. F. Twiss.

Prevention of mould in rubber. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 321,850, 3.12.28).— Mould fungi on rubber can be destroyed, and their growth prevented, by treating the rubber with a watersoluble inorganic acid containing one or more organic radicals, *e.g.*, alkyl, aralkyl, aryl, or *cycloa*lkyl groups, derived from organic compounds which are soluble in oils or fats, or with a water-soluble derivative of such an acid. Typical substances are sodium butylnaphthalenesulphonate, potassium methyl sulphate, and sodium ditolyl phosphate. D. F. Twiss.

Accelerator of vulcanisation [of rubber]. GOOD-YEAR TIRE & RUBBER CO., Assees. of J. TEPPEMA (B.P. 302,142, 27.8.28. U.S., 10.12.27).—Rubber is vulcanised in the presence of the reaction product of a 2halogen-substituted benzthiazole and a dithiocarbamate, e.g., 2-chlorobenzthiazole and sodium diethyldithiocarbamate. D. F. TWISS.

Manufacture of caoutchouc-coated metal body. A. JENNY (B.P. 302,250, 12.12.28. Ger., 12.12.27).— The rubber layer formed on a metal such as aluminium by electrodeposition from an emulsion, *e.g.*, latex, is only feebly adherent and easily loosens on bending. This drawback is obviated by the addition of an alkaline solution of stick-lac or shellac to the rubber emulsion before electrodeposition. D. F. TWISS.

Antioxidant or age-resister [for rubber]. A. M. CLIFFORD, Assr. to GOODYEAR TIRE & RUBBER CO. (U.S.P. 1,739,480, 10.12.29. Appl., 10.12.27).—See B.P. 302,142; preceding.

Curing [vulcanisation] of [rubber] inner tubes. FIRESTONE TYRE & RUBBER Co. (1922), LTD. From FIRESTONE TIRE & RUBBER Co. (B.P. 321,937, 17.8.28).

Insulating materials (B.P. 322,208).—See XI. Varnish-coated fabrics (B.P. 301,024).—See XIII.

XV.-LEATHER; GLUE.

Control of vegetable tan liquors for tanning light leathers. Report of Committee, 1928-29 [of the American Leather Chemists' Association]. H. B. MERRILL (J. Amer. Leather Chem. Assoc., 1929, 24, 663-669).-Samples of hide powders tanned with quebracho, sulphite-cellulose, oak bark, quebracho-sulphitecellulose extracts, and a blended liquor, respectively, were washed in Wilson-Kern extractors with distilled water for periods of from 1 hr. to 4 days, and each sample was dried and weighed to determine the increase in weight due to combined tannin. It was shown that the tannin-collagen compound was still being hydrolysed at the end of 4 days, contrary to Wilson and Kern's results (cf. B., 1920, 522 A). With the exception of quebracho-tanned powder, the curves for removal of soluble matter from the tanned powders became practically linear after 24 hrs. and the slope of the linear portion was very small. The correct percentage of tannin in the extract was obtainable by extrapolation, but it was practically identical with that found by washing the powder for 16 hrs. only. D. WOODROFFE.

[Determination of acetic acid in calcium acetate in tan liquors.] Report of Committee [of the American Leather Chemists' Association] on control of vegetable tanning for heavy leather. D. H. CAMERON (J. Amer. Leather Chem. Assoc., 1929, 24, 669-677).—The acetic acid in the tail liquors is determined by distilling 10 c.c. of the liquor in steam and titrating the distillate with 0.1N-sodium hydroxide, using phenolphthalein as indicator. The calcium acetate is determined by acidifying a second 10 c.c. of the tan liquor with phosphoric acid, distilling in steam, and deducting the acetic acid titration from the titration figure of this second distillate. Curves have been derived to show the amounts of acetic acid and calcium acetate in a series of "rocker vats," which show their distribution in the various tan liquors. Calcium acetate is detrimental to tan liquors, inhibiting acid-swelling, which is essential for favourable tannage.

D. WOODROFFE. Calcium chloride in fellmongering practice. A. M. WRIGHT and H. O. ASKEW (New Zealand J. Sci. Tech., 1929, 11, 157-165).-By mixing a solution of suitable concentration of calcium chloride with solutions of sodium hydroxide and/or sodium sulphide the alkalinity of the liquor was found to be diminished owing to the reaction of the calcium chloride with the sodium hydroxide, calcium hydroxide being precipitated. The alkalinity of 100 gals. of commercial sodium sulphide solution $(d \ 1 \cdot 12)$ was reduced 4% by adding $12 \cdot 25$ gals. of saturated calcium chloride solution. This mixture did not loosen the hair readily, and the best results were obtained with 1.75 gals. of saturated calcium chloride solution per 100 gals. of sodium sulphide solution. Less damage is done to sheepskins on which this modified "paint" is used in warm weather owing to the diminished alkalinity. Figures are given showing the alkalinity and sodium sulphide content of the treated pelts. Typical " paints " $(d \ 1 \cdot 236 - 1 \cdot 260)$ of this type contain sodium hydroxide 4.15-4.35%, sodium sulphide 8.19-8.33%. D. WOODROFFE.

Effect of temperature on chrome tanning. H. B. MERRILL and H. SCHROEDER (Ind. Eng. Chem., 1929, 21, 1225-1227).-Pieces of pickled calf pelt were treated with a large excess of chrome-tanning liquor at temperatures varying from 10° to 50° and the rate of fixation was observed after periods of from 4 hrs. to 5 days. The fixation of chromic oxide increased with rise in temperature. The increase was greatest between 20° and 30°, and was 60% greater at 30° than at 20°. Leather tanned at 40° withstood the action of boiling water after 8 hrs.' tanning; that tanned at 20° after 48 hrs. The apparent acidity of the chromium salt fixed by the pelt was much higher at 20° than at 30°. Analysis of the liquors before and after use showed that the acidity, $p_{\rm H}$ value, and precipitation figure remained practically constant. D. WOODROFFE.

Absorption by leather of sulphur compounds from spruce [and sulphite-cellulose] extract. H. B. MERRILL and J. L. BOWLUS (Ind. Eng. Chem., 1929, 21, 1291—1292).—Analyses of seven calf leathers tanned with mixtures of vegetable tanning materials and sulphite-cellulose extracts showed 0.27-0.96% SO₃ (Procter-Searle), 4.98-9.34% total SO₃ (Wuensch), 0.50-0.85% SO₃ in ash, and 0.50-0.82% SO₃ extractable by sodium carbonate. Tests on hide powder tanned with mixed quebracho and sulphite-cellulose extracts and with sulphite-cellulose extract alone showed that the sulphur compounds absorbed by the powder from sulphite-cellulose extract were very resistant to hydrolysis, particularly with the sulphite-cellulose tanned powder. The ratio of the total material absorbed to the sulphur compounds absorbed from the mixed tannage

was independent of the time of tanning and of the $p_{\rm H}$ value, and was the same as the ratio of total tannin to sulphur compounds in the tan liquor. The sulphurcontaining radical in the sulphite-cellulose is not removable by prolonged washing, and is an integral part of the tanning molecule. The Procter–Searle value based on leathers tanned with sulphite-cellulose extract is only a measure of the sulphur compounds which have been oxidised to sulphate during the ignition with sodium carbonate, which amount depends on the conditions of ignition. D. WOODROFFE.

Cause of vein-like protuberances on finished leather. A. C. ORTHMANN and W. M. HIGBY (J. Amer. Leather Chem. Assoc., 1929, 24, 654—656).—It is concluded that such protuberances are due to coagulated blood left in the blood vessels owing to improper bleeding of the animal after death. D. WOODROFFE.

Mould growth on leather and its prevention. A. C. ORTHMANN and W. M. HIGBY (J. Amer. Leather Chem. Assoc., 1929, 24, 657-663).-Light-coloured spots, $0 \cdot 1$ —10 mm. in diam., were observed on the grain side of coloured chrome-tanned calfskins, and could only be covered up by the application of heavy coats of pigment finishes, which detracted from the value of the leather. The spots are shown to be due to various mould growths on the leather in the "blue," arising from contamination with spores of the Aspergillus and Penicillium groups present in the materials and solutions used, particularly the chrome-tanning liquors and the cornflour used in the shaving operation. Growth of most of the moulds was prevented by adding an alcoholic solution of 5 oz. of β -naphthol to every 100 gals. of liquor in the tanning drums and "dip" vats, and of a 1:1 mixture of β -naphthol and phenol in the case of Penicillium divaricatum. D. WOODROFFE.

Permeability of membranes. BERGMANN.—See I. Oak chips from tan-works for paper. NERECHTSKIJ. —See V.

PATENT.

Waterproofing of leather for packing etc. J. J. DOUGHTEN (U.S.P. 1,735,564, 12.11.29. Appl., 11.12.28). —An untanned dressed hide is boiled in a lubricating oil for 60 min., immersed in glycerin, and cut into strips, braided, and used for packing shafts. D. WOODROFFE.

XVI.—AGRICULTURE.

Production of rational fertilisers based on phosphoric acid. C. MATIGNON (Chim. et Ind., 1929, 22, 860—867).—The preparation of phosphoric acid in the electric furnace is necessarily costly in energy. Its production by means of sulphuric acid introduces problems in purification. Urbain reduces phosphates in a shaft furnace to phosphorus, which is reoxidised in the upper and cooler part of the furnace. If a potash felspar such as leucite is used to supply the necessary silica, the process can be arranged so that the product KPO₃ is precipitated as dust from the gas. This process is being operated on the scale of 10 tons of materials per day. The furnace, which is not lined internally, is fed with briquettes of calcium phosphate, felspar, and coke breeze, mixed with lime, and a slag cement is produced as by-product. An air blast is used preheated to 600°, and the potassium metaphosphate is recovered in a spray washer. It is considered that in a large furnace 5 pts. of coke would produce 1 pt. of metaphosphoric acid. This process could also be operated with an electric furnace, but with lower thermal efficiency. The acid metaphosphate solution may be used to bring a further quantity of tricalcium phosphate into solution, the calcium content being precipitated by addition of ammonium sulphate and neutralised with ammonia. A product is then obtained in the form of a neutral powder containing 30-32% P_2O_5 , 8-9% K_2O , and 9-10% N. The process might advantageously be attached to a coke-oven plant.

C. IRWIN.

Factors affecting the drillability of fertilisers. A. L. MEHRING (Ind. Eng. Chem., 1929, 21, 1219-1223). -The effect of atmospheric conditions and fineness of grinding on the ease of distribution of fertilisers is examined. Temperature changes produced but little effect. All materials could be drilled at humidities below 50%, but above the hygroscopic point none could be handled satisfactorily. Fertilisers containing considerable amounts of material passing 200-mesh were too dusty when dry, but undrillable at greater humidities at which particles between 5- and 80-mesh worked easily. Ease of drilling varies inversely with the angle of repose of the fertiliser. Mixtures of particles of varying size, shape, and density tend to segregate in the distributor, producing notable differences in the proportions of plant nutrients applied to the soil. Best distribution was obtained with materials containing 20-30-mesh rounded particles having an angle of repose of 40°. Numerous records of typical fertilisers are included.

A. G. POLLARD. Four-year field trials with six different nitrogen fertilisers. L. MAYER (Forts. Landw., 1929, 4, No. 6; Bied. Zentr., 1929, 58, 541—544).—Comparative field trials with a number of crops, using ammonium sulphate and chloride, sodium nitrate, calcium nitrate, cyanamide, and urea are recorded. Generally speaking, ammonium sulphate proved the most efficient, its value being emphasised during wet seasons. The crop increase per unit of fertiliser used was in most cases greatest with the smallest dressings applied, except in the case of cabbage treated with urea and with ammonium sulphate, where the second largest dressing was relatively the most efficient. A. G. POLLARD.

Influence of increasing amounts of calcium sulphite and calcium sulphate on the germination and development of seedlings of cereals. K. SCHARRER and W. SCHROPP (Landw. Versuchsstat., 1929, 108, 217—251; Bied. Zentr., 1929, 58, 558—560).— Germination and growth of wheat, rye, and barley in a loamy soil were not affected by small amounts of calcium sulphite, and only slightly depressed by larger quantities. Calcium sulphate, however, tended to decrease yields, the effect on wheat being less than on rye, barley, or oats. On low-moor and sandy soils both sulphite and sulphate tended to decrease yields without affecting germination. The effects were not traceable to changes in the $p_{\rm H}$ value of the soil.

A. G. POLLARD.

Fertiliser experiments with tobacco on the southern coast of Crimea in 1911—1919. W. E. Evko (U.S.S.R. State Inst. Tobacco Invest., Bull. 55, 1929, 41 pp.).—Experiments carried out at Yalta, on a marl-slate soil, indicated that when 82 kg. N, 52 kg. P_2O_5 , and 75 kg. K_2O were applied (? per hectare) in the form of sodium nitrate, superphosphate, and potassium sulphate, respectively, the increase in yield of tobacco was 86%, 75% of which was due to the nitrogen and 10.5% to the phosphoric acid and potash. Farmyard manure in amounts of 18—100 tons gave increases of 16—35% in yield, and was chiefly useful in providing nitrogen and in improving soil texture. There are advantages in autumn application of artificial fertilisers.

E. HOLMES.

Comparison of the Mitscherlich and Neubauer methods for determining the nutrient content of soils. J. PÁZLER (Z. Zuckerind. Czechoslov., 1929, 54, 153-170).—The nutrient values of soils as determined by the two methods show good general agreement, but in the detailed figures some divergence is apparent. In soils of small phosphate content the Mitscherlich values are relatively lower than those of Neubauer, and the reverse is the case in rich soils. In soils containing much chalk Neubauer's method indicates lower phosphate contents than that of Mitscherlich. Potash contents determined by the two methods show poorer agreement than in the case of phosphates. By grouping the soils examined a certain parallelism between the two sets of results is obtained. In very rich soils both methods yield similar results, but in all others Mitscherlich's values are about 75% lower than Neubauer's. With clay soils Neubauer values are the higher, and approach double the Mitscherlich figures where, in addition, much chalk is present. On sandy soils containing much chalk Neubauer valves are lower than those of Mitscherlich. The limiting values of the Neubauer determination on which manurial requirements are based must be selected with reference to the mechanical analysis and chalk contents of the soil examined.

A. G. POLLARD.

Process of nicotine formation during germination of tobacco seeds. G. S. ILIIN (U.S.S.R. State Inst. Tobacco Invest., Bull. 57, 1929, 26 pp.).-Studies of the germination of tobacco seeds during 15 days, both in the light and in the dark, show that although nicotine is absent at first, after 5 days it is present in considerable and increasing quantities. The formation of nicotine varies with the decomposition of storage proteins and with the increase of soluble nitrogen compounds; production of the latter compounds reaches 25% of the initial proteins, both in the light and in the dark. The amount of amines produced is rather greater in seeds germinated in darkness. The relation formerly established between nicotine content and storage of proteins in ripening seeds is reversed during E. HOLMES. germination.

Periodic harvesting of tuba root (*Derris elliptica*, Benth.). C. D. V. GEORGI and E. A. CURTLER (Malayan Agric. J., 1929, 17, 326—334).—The variation in the amount of ether extract from tuba roots of various ages was investigated; the optimum age for harvesting is at 25 months (about 1130 lb. of roots/acre as sole crop),

115

CL. XVII.-SUGARS; STARCHES; GUMS. CL. XVIII.-FERMENTATION INDUSTRIES.

at which period both the ratio of "fine" to total roots and the ether extracts from "fine" and total roots are maximal. E. LEWKOWITSCH.

Variations in the amount of ether extract of tuba root (*Derris malaccensis*, Prain). C. D. V. GEORGI (Malayan Agric. J., 1929, 17, 361—363).—The amount of the ether extracts from "fine" and "coarse" roots of *D. malaccensis* (Erect Sarawak) are four and eight times, respectively, as great as those from *D. elliptica* (cf. preceding abstract); the optimum age of the plants for harvesting in order to obtain maximal yield of ether extract is about 23 months. Assuming that the toxicity of the root is related to the amount of extract, it seems advisable for insecticidal purposes to establish standards of valuation based on the latter.

E. LEWKOWITSCH.

New solvents for the active principles of pyrethrum (Chrysanthemum cinerariæfolium, Trev.). W. A. GERSDORFF and W. M. DAVIDSON (Ind. Eng. Chem., 1929, 21, 1251—1253).—A large number of solvents (alcohols, hydrocarbons, chlorinated hydrocarbons, etc.) completely extract the active principles (against the aphid Myzus persicæ, Sulz.) from pyrethrum; most of these vehicles (except kerosene, xylene, and amylene dichloride), and especially ethyl alcohol, are suitable for application to plants as resistant as cabbage without injury to the foliage.

E. LEWKOWITSCH.

Toxicity of common arsenicals. L. FULMEK (Forts. Landw., 1929, 4, 209; Bied. Zentr., 1929, 58, 555—558). —The toxicity of a number of arsenites and arsenates was examined, using caterpillars of the cabbage white and vapourer moth and the leaf weevil. The order of toxicity of the arsenites was: Mg > Pb = Ca = Cu > Fe > Zn; and of the arsentates: Pb > Cu > Ca > Mg > Zn > Fe. The order of toxicity of these materials is not parallelled by their contents of water-soluble arsenic, but agrees closely with their solubilities in buffer solutions of $p_{\rm H}$ 9.0, which is approximately that of the digestive juices of the insects.

A. G. POLLARD.

Decomposition and action of the nitrogen and carbon compounds in stall manure. K. SCHEIBE (Landw. Versuchsstat., 1929, 108, 61—114; Bied. Zentr., 1929, 58, 537—541).—In the fermentation of stall manure the loss of dry weight and of nitrogen was greater from a compressed than from a loosely-stacked heap. Losses of nitrogen from the upper portions of the stack were considerably reduced by banking with earth. In a comparison of hot-fermented manure (Krantz) with that from a closely compacted stack and from an ordinary yard stack, the rate and extent of nitrification, rate of carbon dioxide production in soil, and crop yields were in the (descending) order named. A. G. POLLARD.

Analytical-chemical determination of the noxious influence of sulphur dioxide on vegetation. M. KRAJČINOVIČ (Arh. Hemiju, 1929, 3, 187—192).— The volatile and fixed sulphur contents as well as the ash content of leaves in the vicinity of a galena roasting furnace are higher than the corresponding values of leaves in other localities. R. TRUSZKOWSKI.

Phosphate rock. REVNOLDS and others. Phosphates. LARISON.—See VII. Artificial milk for cattle-rearing. TERROINE.—See XIX.

XVII.—SUGARS; STARCHES; GUMS.

Losses in weight and sugar content of beet slices during brief steaming. F. KRVŽ (Z. Zuckerind. Czechoslov., 1929, 54, 170–171).—The steaming of fresh beet slices for 5 min. under conditions such that actual extraction with condensed water is avoided leads to a loss in weight of 12—14% and in sugar content of 4-5%. The bearing of this on certain commercial processes is indicated. A. G. POLLARD.

Influence of some non-sugars on the crystallisation of sugar. E. SOMMER (Z. Zuckerind. Czechoslov., 1929, 54, 133—140).—It is especially the nitrogenous non-sugars, betaine in particular, that exert an effect on the crystallisation of sugar, though amino-acids and colouring matters must also be included. The ratio of the molar concentration of sugar to the equivalent concentration of potassium and sodium ions is no measure of molasses formation, since even at a ratio of 1:1 sugar will crystallise out. J. P. OGILVIE.

Enzymes as reagents. BARGELLINI. Gluconic acid. MAY and others.—See XVIII.

PATENTS.

Carbohydrate products (B.P. 294,572 and 322,003). —See V. Concentration of fruit juice (F.P. 31,589, 32,286, and 32,298). Higher alcohols, acetone, etc. (B.P. 322,029).—See XVIII.

XVIII.—FERMENTATION INDUSTRIES.

Influence of the construction of the malt kiln on the colour of the malt. B. GRÖTZBACH (Woch. Brau., 1929, 46, 515—516).—Using a two-floor malt kiln with a relatively short outlet chimney, pale malt could only be obtained if the temperature were retained under 69°. When the kiln was converted into a threefloor type having a specially high outlet chimney with a revolving cowl, the kilning temperature could be raised to 87—93° without the malt becoming too deep in colour, even if made from highly nitrogenous barley. The new outlet chimneys have proved themselves constructionally sound and resistant to high wind velocities.

C. RANKEN.

Respiration of barley during malting. R. KÜHLES (Woch. Brau., 1929, 46, 489—491, 501—503).—The usual method of following the progress of respiration by the measurement of the carbon dioxide evolved by the grain during germination was replaced by one in which the amount of oxygen consumed was determined. The samples were taken at all stages of the malting operations, and after drying as rapidly as possible at 30—35° were ground and sieved. For the tests the finest flour was suspended in water which was saturated with oxygen. Respiration was activated by the addition of sodium zymophosphate and of phosphate buffers, a maximum being reached with the latter at about $p_{\rm H}$ 7·6. The further addition of boiled yeast juice containing co-

British Chemical Abstracts-B.

enzyme did not influence the result. The small amount of oxygen taken up by the ungerminated barley rapidly increased during steeping and during the first days of germination. After the third day the values became almost constant, but increased later to a maximum on the upper floor of the kiln. A rapid decrease followed owing to the partial destruction of the respiration enzyme at the higher temperatures and to the proportionally great loss of water. The respiration was sensitive within wide limits of temperature, and barley germinated at high temperatures showed a greatly increased respiration. C. RANKEN.

Nitrogenous constituents of wort and their assimilation by yeast. S. B. SCHRYVER and E. M. Тномая (J. Inst. Brew., 1929, 35, 571-576).-А description is given of the modifications of known processes which were necessary for the determination of the total, ammonia-, amino-, amide-, and peptide-nitrogen in wort. The values of the peptide-nitrogen, which were obtained by determining the amino-nitrogen after hydrolysis of the wort, were inconsistent. The variations were least when the hydrolysis of the wort was effected by heating with 16% hydrochloric acid for 20 hrs., and no advantage was obtained by carrying out the hydrolysis in an autoclave with 5% sulphuric acid at 140° or 120°. Attempts to replace the Van Slyke method for the determination of amino-nitrogen by Sörensen's and colorimetric methods failed owing to the inability of obtaining indicators which would function with the dark-coloured hydrolysed wort. Apart from some increases in the amount of amino-nitrogen when the wort is treated with macerated yeast, the attempts to avoid the dark colour of hydrolysed wort by using enzymes in place of acids as agents of hydrolysis have so far given unfavourable results. C. RANKEN.

Calculation of the original gravity of beer. L. HEINTZ (Woch. Brau., 1929, 46, 513-515).—The divergence of the true original gravity of a wort from the values calculated by the several known formulæ is due to calculating the extract and alcohol contents in terms of percentage by wt. (*i.e.*, as g. in 100 g.). The errors grow greater as the gravity of the wort increases, and the slightly greater accuracy of the results given by the Schönfeld-Balling formula is due to fortuitous increases in the divisor. The greatest concordance between the calculated and observed results is obtained if the calculation is based on terms of weightvol.-% (*i.e.*, g. per 100 c.c.). Thus the simplest type of formula O.G. $= 2A + E_w$, where A and E_w are the alcohol and residual extract contents respectively, gives results which require no correction provided A and E_w are calculated in terms of weight-vol.-%.

C. RANKEN.

Determination of volatile acid in wine. K. WOIDICH (Oesterr. Chem.-Ztg., 1929, **32**, 190—191).— In the determination of acetic acid in wine by the official methods, high values due to the inclusion of sulphur dioxide in the total volatile acids may be obviated by oxidation with hydrogen peroxide. The apparatus recommended consists of a steam generator which encloses the bulb containing the sample of wine. The bulb is fitted with a trap and connects to a water-cooled receiver. After conducting a blank experiment to free the apparatus from acid, 10 c.c. of wine and, if sulphur dioxide be present, 3 drops of 3% hydrogen peroxide are introduced into the apparatus and steam-distillation is allowed to proceed at such a rate that 100 c.c. of distillate are collected in $\frac{1}{4}$ hr. It is necessary to arrange that the volume of liquid in the bulb shall be the same at the beginning as at the end of the distillation. Titration of the distillate is performed just below the boiling temperature with 0.1N-caustic soda.

H. J. DOWDEN.

Distillery problems. I. Technical fermentation of raisins. I. B. BLEYER, W. DIEMAIR, and S. TAHSIN (Landw. Jahrb., 1929, 69, 361—389; Bied. Zentr., 1929, 58, 568—570).—The effect of substrate nutrients on the fermentation of raisin mash by various yeasts is examined. The addition of potato press-juice increases the soluble nitrogen content of the mash to a considerable extent, and to this fact, in conjunction with the simultaneous addition of vitamins and mineral matter, the accelerated fermentation and increased vitality of the yeast are attributed. The alternative addition of various ammonium salts as a yeast nutrient is examined and the alcohol yields are recorded. A. G. POLLARD.

Distillery residue [with higher feed value]. E. LÜHDER (Z. Spiritusind., 1929, 52, 371-372).-The residues from distillation will yield a cattle feed with a higher nutrient content if the proportion of malt to potatoes in the mash be decreased. The dextrin content of the wort will be raised at the expense of that of the fermentable sugars, and fermentation will cease sooner, leaving a residue with a higher fodder value after distillation. The diminished yield of alcohol is partly compensated by the saving in malt and by the increased yield of fodder. In addition, to attain the standard production of alcohol, the distillery will require to remain longer active during the winter, and thus permit the cattle being supplied longer with fresh fodder at a period when no pasturage is available. C. RANKEN.

Enzymes as reagents. G. BARGELLINI (Giorn. Chim. Ind. Appl., 1929, 11, 493—499).—The subjects dealt with include : specificity of enzyme action ; identification of monoses by means of *Monilia balcanica*, *Krusei*, and *metalondinensis* ; differentiation of glucosides ; hydrolysis of polyoses and its analytical applications ; action of proteases ; oxidases of *B. xylinum* and the use of *B. xylinum* to prepare ketoses difficult to obtain otherwise, to differentiate aldoses from ketoses, to differentiate and separate various stereoisomeric polyhydric alcohols, and to transform various ketoses into stereoisomeric polyhydric alcohols and vice versa ; reductases of *B. manniticus* ; action of *B. pyocyaneus* ; enzyme of *B. aliphaticum* ; detection of arsenic, selenium, and tellurium by means of moulds etc.

T. H. POPE.

Fermentation products of cellulose. C. S. BORUFF [with A. M. BUSWELL] (Ind. Eng. Chem., 1929, 21, 1181—1182).—The production of carbon dioxide, methane, and hydrogen during the fermentation of cellulosic material by inoculation with sewage sludge is examined. Results indicate an approximation to the equation $C_6H_{10}O_5+H_2O \rightarrow 3CO_2+3CH_4$. Maize stems

produced most gas when pretreated by soaking for 4 days in limewater. Suitable plant for the production of gas for domestic purposes on these lines is indicated. In plant residues generally, pithy matter is digested much more quickly than fibrous material. The value of this in connexion with paper-making is discussed.

A. G. POLLARD.

Hydrolysis of pectin by various micro-organisms. G. A. PITMAN and W. V. CRUESS (Ind. Eng. Chem., 1929, 21, 1292-1295).-The pectinase activity of various micro-organisms occurring on fruits has been investigated under aerobic conditions at room temperature in or on apple juice containing added apple pectin. Penicillium glaucum (P. expansum) and a Pythium species exerted the greatest hydrolytic action, the latter destroying practically all the pectin in 12 weeks at about 20°. Bacterium aceli and B. amylovorus showed little, and Saccharomyces cerevisiae, several strains of Mycoderma, and Saccharomyces ellipsoideus from grapes no noticeable, effect on pectin. The appearance and texture of the pectin precipitate varied greatly, and one organism (Colletrotrichum), although not greatly reducing the quantity of pectin as determined by Wichmann's method, changed its character so much that it refused to set; in this case the enzyme involved was apparently pectase. The viscosities of the liquids from most of the cultures followed in only a general way the apparent pectin content. The latter was not greatly reduced by the natural enzymes of apple juice during the period required for complete fermentation of the sugars by S. cerevisiæ at 35°. Hydrolysis of pectin by Penicillium glaucum is more rapid in media of $p_{\rm H}$ 6 and 5 than in one of $p_{\rm H}$ 3. When present in a pectin stock solution, dextrose is not altogether objectionable as it protects the pectin against hydrolysis by P. glaucum.

T. H. POPE.

Semi-plant-scale production of gluconic acid by mould fermentation. O. E. MAY, H. T. HERRICK, A. J. MOYER, and R. HELLBACH (Ind. Eng. Chem., 1929, 21, 1198-1203).-The yield of gluconic acid obtained by fermentation of commercial dextrose solutions by Penicillium luteum purpurogenum depends on the ratio of the surface area (sq. cm.) of the mycelium to the volume (c.c.) of the solution and varies from 82% of the theoretical yield when this ratio approaches 1 to 30% when the ratio is 0.16. The most convenient practical value of the ratio is 0.25-0.3, 20-25% dextrose solutions then giving yields of 55-60% and actual maximum weights of the acid. Each m.² of the mycelium is capable of producing 4-4.5 kg. of gluconic acid in 14 days from the time of inoculation of the spores. Sub-surface agitation of the solution enhances the production of acid with all but highly concentrated (25%) glucose solutions. Variation in the hydrogen-ion concentration of the liquid exerts no marked effect on the oxidation. Shallow pans, $43 \times 43 \times 2$ in., of aluminium (at least 99.45% Al with less than 0.1% Cu + Mn) give good results as fermentation vessels, yields of 52-61% being obtained after the first few fermentations. A number of such pans may be arranged in a rack, enclosed by removable wooden frames covered with four thicknesses of cheese cloth as a protection against foreign fungal spores and provided with peep-holes :

sterile air may be supplied by means of a fan-blower. Bacteria and yeasts do not thrive under the conditions of the fermentation, for which the optimum temperature is 25°. Stock cultures of the organism keep active far longer at 4° than at room temperature. To prepare agar cultures for immediate use, transfers are made from a tested stock culture on wort agar to slopes of a medium containing, per litre, 15 g. of bacto-peptone "Difco," 30 g. of commercial dextrose, and 30 g. of agar-agar, which favours a good vegetative growth and a uniform and heavy sporulation over the entire slope in 8-10 days at 25-30°. A suitable sugar solution contains 63 kg. of commercial (about $91 \cdot 5\%$) dextrose, $0 \cdot 315$ kg. of sodium nitrate, 0.079 kg. of crystallised magnesium sulphate, 0.016 kg. of potassium chloride, and 0.009 kg. of phosphoric acid (100%) per 315 litres, this being sterilised in steam at 100°. The fermented solution is neutralised with calcium carbonate or thoroughly slaked lime (the $p_{\rm H}$ being kept below 4.5) and the calcium gluconate, after crystallisation, decomposed in hot 15—20% solution by the calculated amount of dilute sulphuric acid. The raw material costs \$4—5 per 100 lb., giving, for a 50% yield, \$8-10 as the cost of the acid, but at least one half of the dextrose lost should be recoverable by a secondary fermentation to either T. H. POPE. gluconic acid or alcohol.

Unusual alcoholic fermentations. J. R. EOFF, JUN., 2 H. BUTTLER, and W. MELCHIOR (Ind. Eng. Chem., 1929, 21, 1277-1279).-Fermentation of solutions of sucrose in pineapple juice yields pineapple wines showing no sweetness (1.8% of sugar), no marked flavour, and a high alcohol content (up to 19.2% by vol.). Among the various yeasts tested, the two wine yeasts, Tokay and Steinberg, stand out as alcohol producers, the maximum alcohol yield being obtained at about 15°. The must should consist, partly at least, of fresh juice, sterilised or old juices giving lower proportions of alcohol. Unlike what occurs with grape must, sugared pineapple must without much added water undergoes less attenuation than a mixture of 1 pt. of pineapple juice with 2 pts. of 35% sugar solution. Yeast revived from agar cultures is more active than yeast kept in liquid media for long periods. T. H. POPE.

PATENTS.

Concentration of fruit juices and extraction of by-products therefrom. Soc. DES ETABL. BARBET (Addn. F.P. 31,589, 31.10.25; 32,286, 3.3.26; and 32,298, 17.3.26, to F.P. 615,942; B., 1927, 856).-A boiler of high capacity, which works without pressure, is used to heat simultaneously the preheater, concentrator, and pasteurising apparatus by circulating steam. Fruit refuse, such as grape skins, is dried in the evolved hot gases, and used as fuel for the boiler. The juice is concentrated to $d \cdot 1.415$ and the crystallisation of sugar and tartar initiated by stirring and by seeded dextrose. In the case of grape juice, the filtered syrup, which contains 4-6 times as much lævulose as dextrose, is slightly further concentrated, and by repeated crystallisation eventually yields lævulose free from dextrose. C. RANKEN.

Manufacture of higher alcohols, acetone, and the like. J. Y. JOHNSON. From I. G. FARBENIND, A.-G.

(B.P. 322,029, 19.9.28).—A solution of sugars obtained by the action of acid on peat is fermented with bacteria of the *Amylobacter* group. Prior to inoculation, humic substances, tannin, etc. are preferably adsorbed and removed from the sugar solution by calcium phosphate precipitated in the solution by added water-soluble phosphates (cf. B.P. 318,649; B., 1929, 994).

C. RANKEN.

Denaturing of alcohol. I. G. FARBENIND A.-G. (B.P. 298,611, 11.10.28. Ger., 12.10.27).—The alcohol is mixed with the sparingly water-soluble higher fractions (boiling above 120°) of the natural pyridines, or with homologues of synthetic pyridines which are sparingly soluble in water. These denaturing agents may be mixed with each other or with the natural water-soluble pyridines of commerce. C. RANKEN.

XIX.-FOODS.

Preparation of artificial milks for the rearing of cattle. E. F. TERROINE (Compt. rend., 1929, 189, 866-868).-The most satisfactory artificial milk is found to consist of water 1 litre, tapioca flour 112 g., leguminous flour 75 g. (pea flour 4.04% N, soya bean 7.38% N), malt extract 13 g., calcium citrate 2 g., sodium chloride 1.10 g., sodium bicarbonate 0.25 g. All fat in the diet is avoided. In the feeding of young pigs with this milk a greater increase in weight is observed over the same period than with cow's milk alone. With calves diarrhœa is apt to supervene and not more than 50% of the cow's milk can be replaced by artificial milk. Digestibility is ensured by previous slow cooking by the action of the amylase of the malt extract. The necessary vitamins are obtained by periodic feeding of portions of cow's milk. P. G. MARSHALL.

Bacteriological control of bottled milk pasteurised by the holding method. K. J. DEMETER (Milch. Zentr., 1929, 58, 367—372).—A bibliographical review is given of investigations on the thermophilic, heatresistant, spore-forming, and non-spore-forming bacteria which are to be found in milk after pasteurisation. The best method of determining the efficiency of pasteurisation is the *B. coli* test, in which 0·1-c.c. samples are taken from five different parts of the milk and examined by the gentian-violet–lactose–peptone–bile method or the indole reaction. Not more than one sample should give a positive reaction. Pasteurised milk of good quality should contain not more than 30,000 living germs per c.c., and no milk should be offered to consumers if it contains more than 100,000 germs per c.c.

H. J. DOWDEN.

Potassium nitrate in Canadian cheese. F. C. HARRISON (Canad. J. Res., 1929, 1, 256—260).— Coloured cheeses containing potassium nitrate are frequently discoloured by flesh-pink patches. Sterile milk containing annatto and 0.05-0.1% KNO₃ when inoculated with bacteria from defective cheese produced identical discoloration. The organisms causing the pink coloration are nitrate-reducing, so that young cheeses give positive reactions for nitrite, but at a later stage-the nitrate is converted into ammonia or free nitrogen. A schedule of nitrate-reducing organisms is given, not all of which produce the pink colour in nitrated annatto milk. Similar bacteria have been isolated from potassium nitrate itself. Since annatto remains unchanged in presence of sodium nitrite, but turns red when acid also is added, it is probable that conditions other than the presence of nitrate-reducing bacteria are necessary to produce the discoloration of nitrated cheese.

H. J. DOWDEN.

Seguidillas bean. F. AGCAOILI (Philippine J. Sci., 1929, 40, 513—514).—The edible seed of *Psophocarpus* tetragonolobus ("seguidillas") contains water 9.74%, fat 17.04%, protein 32.81%, starch 12.50%, carbohydrates other than starch 18.7%, ash 4.01%, crude fibre 5.20%, and on extraction yields an oil having $d^{30} 0.9284$, $n^{30} 1.4666$, n^{30} (Zeiss) 62.8, saponif. value 175.6, and iodine value 82.1. These characteristics are compared with those of the soya bean, to which it is very similar. E. H. SHARPLES.

Effect of hydrogen-ion concentration in the dyeing of cherries. R. N. JEFFREY and W. V. CRUESS (Ind. Eng. Chem., 1929, 21, 1268—1269).—The $p_{\rm H}$ values of the cherries and of the solutions used in dyeing the cherries with Erythrosin greatly affect the evenness and rapidity of dyeing and the fixation or the bleeding of the colour in dyed cherries. The dye is best applied in a dilute solution $(0\cdot 3 - 0\cdot 4\%)$ of sodium bicarbonate (approx. $p_{\rm H}$ 7.5), and should be fixed by dilute (about $0\cdot 5\%$) citric acid (or other permissible fruit acid) at approx. $p_{\rm H}$ 3.5 or less. Ponceau 3R and Amaranth bleed rapidly at all the $p_{\rm H}$ values used in the experiments reported. E. LEWKOWITSCH.

Detection and determination of benzoic and salicylic acids. SNETHLAGE.—See III. Cacao butter. STRAUB and MALOTAUX. Testing lard. TREVITHICK and LAURO.—See XII. Distillery residue as feed. LÜHDER. Hydrolysis of pectin. PITMAN and CRUESS. —See XVIII. Creamery wastes. LEVINE.—See XXIII.

PATENTS.

Preservation of food [e.g., meat]. D. JASTRZEBSKI (B.P. 321,986, 24.8.29).—Meat is placed in a vessel which is then evacuated and "brine" (sodium chloride and potassium nitrate) is drawn in. The meat may finally be sealed by dipping in a solution of salt and agaragar or melted paraffin wax. E. B. HUGHES.

Animal foods [biscuits of special shapes]. A. E. WHITE. From ELLIS-FOSTER Co. (B.P. 321,965, 23.5.28).

Food preparations. [Custard tablets.] H. THOMPSON & CO.'S IDOLICE SPECIALITIES, LTD., and E. J. THOMPSON (B.P. 322,261, 15.9.28).

XX.--MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Preparation and determination of sodium citrate. M. CATULLO (Boll. Chim. farm., 1929, **68**, 1003).—The method described, which is expeditious though not highly economical, consists in dissolving 840 g. of citric acid in 840 g. of water, gradually neutralising the heated and stirred solution with sodium carbonate (to slight alkalinity), filtering, concentrating from d^{40} 1.20 to d^{80} 1.32, and allowing to crystallise. The total yield

from three crystallisations is 1075 g. of pure crystals. For the determination, 2 g. of the salt are gradually carbonised in a platinum or porcelain crucible, the flame being kept out of contact with the material and the final temperature not exceeding that of redness. The charred mass is boiled for 3 min. in a covered beaker with 50 c.c. of water and 50 c.c. of 0.5N-sulphuric acid, the solution being filtered and the residue washed with water until neutral to litmus paper. The total solution is titrated in presence of methyl-orange with 0.5N-potassium hydroxide, multiplication of the difference in volume (c.c.) between the acid and alkali by 0.04901 giving the weight (g.) of salt. T. H. POPE.

Chemical characterisation of drugs. L. ROSEN-THALER (Amer. J. Pharm., 1929, 101, 784-787).-Two microchemical tests for mucus in mucous drugs are described. The sliced drug is placed in ferric chloride solution, washed, and then placed in potassium ferrocvanide solution. The mucus becomes dark blue. This test may be used for Malvaceæ drugs and Semen The following test may be used for Malvaceae, lini. Tubera salep, and Bulbus scilla: the material is placed in clear lead acetate solution for 5 min., then washed with water free from carbon dioxide, and placed in potassium dichromate solution. The mucus assumes a yellow colour. To test the mucus in slices and powder of *Tubera* salep, alkaline copper solution, which colours the mucus blue, is suitable. The examination of a number of drugs for sodium (using uranyl acetate), potassium (using copper lead nitrite), magnesium (with Pfahl's mixture of phosphates), calcium, and ammonium is described. A specific test for Herba lobelia : 5 g. of lobelia are distilled with 50 c.c. of water and 5 g. of sodium hydroxide so that 10 c.c. of distillate are collected. The distillate gives, with sodium nitroprusside and sodium hydroxide a deep orange to dark purple colour which on addition of acetic acid turns dirty violet; with phenylhydrazine hydrochloride or with p-nitrophenylhydrazine (in dilute acetic acid) immediately a strong turbidity is formed.

E. H. SHARPLES. Manipulation of tobacco. V. P. IZVOSCHIKOV (U.S.S.R. State Inst. Tobacco Invest., Bull. 56, 1929, 27 pp.).—Studies of the curing, storage, and fermentation of tobacco show that the destruction of proteins may reach 26—31% during curing, but only 3—4% during fermentation. Amines and amino-acids increase during curing but usually decrease during fermentation. Despite considerable chemical changes there is little rise in temperature during fermentation of the Tyk-kulak type of tobacco. Chemical changes during storage and fermentation are the same. E. HOLMES.

Content of methyl alcohol in tobacco and its manufactured products. A. SCHMUK and S. KAS-CHIRIN (U.S.S.R. State Inst. Tobacco Invest., Bull. 60, 1929, 14 pp.).—The amount of methyl alcohol in yellow cigarette tobacco varies from 0.4 to 0.9%, and in manufactured tobacco products from 0.2 to 0.75%. There is a relation between quality of tobacco and its methyl alcohol content : the better tobacco contains the more alcohol, but the "extra" quality contains less than the "first" quality. Different types of tobacco

such as Trebizond, Samsun, and Crimean types of American and Dubek contain nearly the same percentage. E. Holmes.

Content of reducing substances and their dynamics during the air-conditioned fermentation of an industrial tobacco. G. I. JURAVSKI (U.S.S.R. State Inst. Tobacco Invest., Bull. 58, 1929, 28 pp.).-There in a decrease in individual and total carbohydrates in Cuban tobaccos during air-conditioned fermentation, the amount of decomposition varying directly with the amounts originally present, but not with the heat developed. The amount of decomposition during afterfermentation or ageing is probably proportional to the original amount of decomposition and to the diminished activity of the ferment. Poly- and di-saccharides are hydrolysed to simple sugars and undergo further decomposition. Maltose and monoses in some samples, on the other hand, increased at the expense of the more complex carbohydrates. Starch and dextrins decompose more slowly during ageing than during fermentation. Anaerobic conditions during the period of intensive fermentation of bales of tobacco are unfavourable to decomposition of sucrose, but its decomposition varies with the activity of the invertase present. The dynamics of ca bohydrate change are the same in air-conditioned as in ordinary fermentation. During the former there is a decrease in phenols due to oxidation accompanied by a change in the colour of the leaf blade to yellow-E. HOLMES. orange.

Determination of nicotine as $C_{10}H_{14}N_2$, HgI₂. V. V. ZAPOLSKI (U.S.S.R. State Inst. Tobacco Invest., Bull. 52, 1929, 23 pp.).—Nicotine is precipitated from alkali carbonate solution (15 or 10% solution of potassium or sodium carbonate, respectively) by means of mercuric iodide dissolved in sodium hyposulphite, the washed precipitate reduced in alkaline solution by zinc amalgam, and the iodine determined by Volhard's method. The method is accurate in the presence of large amounts of ammonia, and of pyridine up to 0.05%.

E. HOLMES.

Rumanian coriander oil. E. KOPP (Pharm. Zentr., 1929, 70, 789–791).—Rumanian coriander seeds yield 0.4-0.9% of an almost colourless to dark greenishbrown essential oil. Five representative samples had characteristics within the following limits : d 0.873-0.888, $\alpha_{\rm D} + 8.7^{\circ}$ to $+10.0^{\circ}$, n_{20}° 1.4642–1.4696, acid value 2.2-4.3, ester value 19.9-30.7, saponif. value 23.7-35.0, acetyl value 163.3-182.1, solubility in 70% alcohol 1 in $2-2\frac{1}{2}$ vols., linalool content (from acetyl value) 51.2-58.0%, (Boulez method) 67.9-74.0%. From the green coriander plants in full bloom was obtained 0.23-0.30% of a green oil with an unpleasant odour and having d^{15} $0.872, \alpha_{\rm D} + 0.9^{\circ}$, n_{20}° 1.4574, acid value 17.0, ester value 35.5, acetyl value 249.9, linalool content (from acetyl value) 81.7%. A specification for coriander oil is suggested.

E. H. SHARPLES.

Hydnocarpus Wightiana oil. H. I. COLE (Philippine J. Sci., 1929, 40, 499–502).—The oil from Hydnocarpus Wightiana contains about 1.2% of lauric acid, and also apparently a new, optically-active, liquid fatty acid, probably a lower homologue of hydnocarpic acid (cf. Power and Barrowcliff. B., 1905, 741).

E. H. SHARPLES.

Reduction of irritation by iodised ethyl esters of Hydnocarpus Wightiana oil. H. I. COLE (Philippine J. Sci., 1929, 40, 503-509).-The factors governing the reduction of irritant effects of the ethyl esters of chaulmoogra oil by the addition of 0.5-2% of iodine and the variations in these effects in the iodised esters are discussed. Too long as well as too short a time of heating of the esters with iodine leads to increase in irritant properties, and a method for the manufacture of iodised ethyl esters having minimum irritant properties is described. E. H. SHARPLES.

Fertilisation of tobacco. EVKO. Nicotine in tobacco seeds. ILIIN.—See XVI.

PATENTS.

Anæsthetics. [Stabilisation of tribromoethyl I. G. FARBENIND A.-G. (B.P. 302,337, alcohol.] 4.9.28. Ger., 16.12.27).-A mixture of, e.g., 2 pts. of tribromoethyl alcohol with 1 pt. of amylene hydrate is claimed to be water-soluble and stable on heating.

L. A. COLES.

Manufacture of valuable photochemical [antirachitic] products. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 321,992, 25.8.28).-Sterols dissolved in pure ethers or in solutions of ethylene or alkali hydroxides in alcohols are subjected to irradiation with ultra-violet rays. The antirachitic properties of the products are greater than when alcohol alone is used as solvent. L. A. COLES.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES

PATENTS.

Sensitisation of colloid layers (gelatin, glue, etc.) by treatment with aqueous sensitising solutions, particularly dichromate solutions. N. LEBEDENKO (G.P. 455,046, 31.12.26).-After treatment with the sensitising solution, the layers, while still moist, are given a short treatment in pure water or dilute sensitising solution and dried after removal of excess water. Crystallisation at the colloid surface, which interferes with the penetration of the light, is thereby prevented. J. W. GLASSETT.

Treatment of exposed chromate-colloidal photographic layers. C. ROEHRICH (B.P. 306,027, 18.1.29. Ger., 14.2.28) .- After the copying exposure, the dichromated gelatin or glue film is moistened and given a second short, uniform exposure. [Stat. ref.]

J. W. GLASSETT.

Cleaning gelatinous surfaces [of photographic films]. TECHNICOLOUR MOTION PICTURE CORP., and B. S. TUTTLE (B.P. 322,173, 23.8.28).-Film matrices impregnated with dye are cleansed by agitation in one or a succession of baths containing an aqueous solution of diethylamine or an aqueous alcoholic ammonia solution containing about 2% of each component.

J. W. GLASSETT.

Printing with dyestuffs photographic gelatin layers. I. G. FARBENIND. A.-G. (B.P. 304,767, 11.1.29. Ger., 27.1.28).-The dye imprint is protected from the action of water or organic solvents used in subsequent treatments by incorporating a gelatin-hardening agent, alternatively with a small quantity of a colloid such as gelatin, in the dye solution, such that the gelatin at the imprinted area is, after a short period of storage, rendered impermeable to these solvents. The following solutions are suitable: (a) para-alkali-blue 2 g., formalin 18 g.; (b) 5% aqueous para-alkali-blue containing 0.7% of gelatin 100 c.c., 10% potassium dichromate solution 32 c.c. J. W. GLASSETT.

Photographic process printing. H. and T. WECK, and G. VAN BUGGENHOUDT (B.P. 322,007, 3.9.28) .---A glass, celluloid, or zinc plate is coated first with a hardened gelatin solution containing gelatin 4 g., 10% chrome alum solution 10 g., potassium silicate 10 g., water 100 c.c., and then, after drying, with a gelatincasein solution containing casein 300 g., hard gelatin 50 g., water 200 c.c. The dried plate is sensitised by bathing in a 2.7% solution of ammonium dichromate, and when dry exposed under a suitable screen negative, washed in running water for 30 min., and finally immersed in glycerin. Before printing, the surface is moistened. with a solution containing glycerin 2 pts., water 1 pt. The surface so obtained possesses much finer depressions than the normal copying plate, and the dot formation is not detectable in the print. J. W. GLASSETT.

Colour photography. T. T. BAKER (B.P. 322,231, 8.8.28).-Improved colour rendering and reproduction of intermediate tints are obtained in the printing of transparencies in natural colours from master multicolour screen pictures if the characteristics of the positive film are so chosen that its average grain size is considerably smaller than that of the master film (preferably about one quarter), and its contrast only slightly greater, e.g., a gamma of 1 for the positive film and 0.8 for the master film. It is advantageous to reverse the master film to a positive image and then to project it, using parallel light at right angles to the film, upon the positive film, which in turn is developed and reversed.

J. W. GLASSETT.

Three-colour photography. T. T. BAKER (B.P. 321,998, 28.8.28). A "tri-pack" comprises (a) a front layer of a red-sensitised, contrasty silver halide emulsion of low green-sensitivity and depressed blue-sensitivity (by addition of yellow screening dye) in front of which is placed a filter containing aesculin, filter-yellow, and mandarin-orange, which serves to absorb the ultraviolet and blue, short wave-length radiations, but transmits the violet; (b) an intermediate layer of a greensensitised, contrasty emulsion with depressed blue sensitivity; and (c) a rear layer of a rapid, soft, unsensitised silver halide emulsion with depressed greensensitivity. The ratio of the sensitivities of the front, intermediate, and rear layers to daylight is about 10:6:17. Both the red- and green-sensitised layers are coated very thinly (about one quarter of the normal silver per unit area), but the emulsion characteristics are so chosen that a normal degree of contrast, *i.e.*, similar to that obtainable in the same time with the rear layer, may be readily obtained. The amount of screening dye used on layers (a) and (b) must not lower excessively the transmission of the violet light to the rear layer. J. W. GLASSETT.

Preparation of photosensitive photographic emulsions. W. FRANKENBURGER and G. ROESSLER, Assrs. to AGFA ANSCO CORP. (U.S.P. 1,738,530, 10.12.29. Appl., 11.8.28. Ger., 19.8.27).—See B.P. 307,716; B., 1929, 417.

Production of negative colour-record kinematograph films. A. PILNY (B.P. 300,210, 8.11.28. Ger., 8.11.27).

Apparatus for making mosaic-screens for colour photography. H. Wade. From Comp. d'Exploit. des Proc. de Photographie en Couleurs L. Dufay (Versicolor Dufay) (B.P. 322,454, 4.8.28).

XXII.—EXPLOSIVES; MATCHES.

Hydrocellulose. LEHALLEUR.-See V.

PATENTS.

Compositions for match heads and striking surfaces. I. G. FARBENIND. A.-G. (B.P. 314,852, 3.4.29. Ger., 3.7.28).—The binding agent in compositions for water-resistant match heads and striking surfaces contains a water-soluble albumin, which is rendered insoluble in water during the drying of the composition. S. BINNING.

Damp-proof matches. W. J. SMITH and A. T. H. PERRY (B.P. 322,545, 5.10.28).—A solution of celluloid in amyl acetate is used instead of gum etc. as binder in the manufacture of matches, and the stems and heads may be dipped in a similar solution. L. A. COLES.

Wrapping up cartridges of plastic explosives and other similar material with paper or the like material. FINSKA FORCIT-DYNAMIT AKTIEB. (B.P. 303,481, 2.1.29. Swed., 4.1.28).

XXIII.—SANITATION; WATER PURIFICATION.

Fumigation with formaldehyde. D. W. HORN and A. OSOL (Amer. J. Pharm., 1929, 101, 744-778).— The yield of gaseous formaldehyde given by fifteen methods of fumigation has been examined. The methods are critically discussed as also is the problem of terminal fumigation. Horn's bleach-formalin method is the most satisfactory for routine disinfection because it combines germicidal efficiency with economy and ease of manipulation. E. H. SHARPLES.

Biological purification of creamery wastes. M. LEVINE (Ind. Eng. Chem., 1929, 21, 1223—1225).—Under anaerobic conditions the lactose present in creamery wastes produces acidities which interfere with the digestion of the protein matter. Under aerobic conditions the lactose is rapidly oxidised, producing effluents which remain neutral after 2 days' storage at 20°. Over 90% of the lactose present was removed in the upper 2 ft. of an experimental trickling filter receiving skim-milk solution containing 1700—3250 p.p.m. of lactose, an extra 0.5—1.0 ft. in depth being required to produce

similar results from cheese wastes containing a lower proportion of nitrogen. Filters from 3 to 5 ft. deep, according to the character of the waste treated, will render this suitable for admission into the public sewer. C. JEPSON.

Cleaning of filter sand. E. K. VENTRE (J. Amer. Water Works' Assoc., 1929, 21, 1519—1520).—Sand, filters may be cleaned *in situ* by treatment with caustic soda or hydrochloric acid according to the composition of the incrustant on the sand. C. JEPSON.

Washing of rapid [sand] filters [for water]. R. HULBERT and F. W. HERRING (J. Amer. Water Works' Assoc., 1929, 21, 1445-1513).-The formation of shrinkage cracks in the sand bed and other attendant filter troubles at an experimental plant at Detroit were overcome by removing a coating of alumina and clay from the sand grains and mud accumulations from the bed. The normal rate of application of wash water (24-30 in./min.) was increased to obtain 50% or more expansion of the sand layer, and this proved effective in preventing coating and shrinkage without impairing the efficiency of the filter. Old filters may be cleaned in situ by successive applications of caustic soda and a strong jet of water, at a cost of about 5% of that of the renewal of the sand layer, and may then be kept clean by applying the wash water at a higher rate. A sandexpansion index is suggested instead of the usual rate of vertical rise as the basis on which filter washes should be compared. The extent to which sand expands under these conditions is shown to increase as the rate of wash increases, and to decrease with increase in the temperature of the water and in the size of sand grain employed.

C. JEPSON.

Electrolysis of water. FAUSER.—See XI. Fermentation of cellulose. BORUFF.—See XVIII.

PATENTS.

Manufacture of face paint or cosmetic. M. FUKUI and T. MIYAGUCHI (B.P. 322,376, 4.1.29).—A fine white powder free from lead is coated with transparent or translucent matter (nitrocellulose, rubber) added in the form of a solution from which the solvent is subsequently evaporated. Gelatinous zinc hydroxide is then incorporated, and water added to give the desired consistency. S. S. WOOLF.

Manufacture of toilet material. T. HASHIMOTO (B.P. 322,607, 2.11.28).—A mixture of india-rubber, gum tragacanth, and a volatile solvent is heated under pressure to remove the adhesive property of the gum; the usual skin toilet substances are then added.

L. A. Coles.

Composition for and method of treatment of garbage. E. H. BRUNE (B.P. 322,368, 27.12.28).—See U.S.P. 1,700,608; B., 1929, 266.

Apparatus [automatic base-exchange softener] for treatment of liquids [water]. ELECTROLUX, LTD. From AKTIEBOLAGET FILTRUM (B.P. 321,757, 4.9.28 and 1.7.29).

Base-exchange materials (B.P. 302,690 and U.S.P. 1,736,281).—See VII.