BRITISH CHEMICAL ABSTRACTS

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levice, or to an anxiliary separator and than which the air with a liftle residual be retained to the affet of the rotar. MAY 23 and 30, 1930.*

I.-GENERAL; PLANT; MACHINERY.

Preheaters with curved tubes. F. HORNUNG (Chem. Fabr., 1930, 133-134).—Several types of preheater or economiser are described in which the tubes are bent on an arc of considerable radius. By curving the ends of the vessel or by similar means each tube end is at right angles to the outer shell. Difficulties caused by the thermal expansion of straight tubes are thus avoided, and the risk of fracture of a tube following on pitting, which may easily occur in the preheating of solutions, is reduced. C. IRWIN.

Prevention of boiler scale. R. ESCOURROU (Chim. et Ind., 1930, 23, 273-293) .-- Colloids available for use as boiler disincrustants may be classified as (i) those having a hydrated or liquid dispersed phase, such as starch, dextrin, tanning extracts, or soaps; (ii) nonhydrated colloids such as graphite. The last-named substance adsorbs the crystal nuclei and, because of its high conductivity, gives a mud which offers no risk of overheating. The action of various disincrustants of the first class was studied in a laboratory boiler of 2-litre capacity. A hard feed-water was used, and photomicrographs of scale formation with and without disincrustants were taken. Various tanning extracts and cellulose extracts are shown to be effective. Cellulose extracts in some cases tend to give acid vapours, and entrained colloidal sulphur may occur in the condensed water. Synthetic tannins are too acid for practical use. Sugars have no effect whatever. Sodium sulphoricinate and resinate destroy scale, but have certain disadvantages. The usual quantity of tanning extract recommended is an initial dose of 1-2 kg./m.³ and then 0.2-0.3 kg./m.3 per day. The optimum dose for a given water can be determined on an experimental boiler. Tests with varying $p_{\rm H}$ values for one disincrustant showed best results at neutrality. A number of miscellaneous commercial disincrustants were similarly tested. Disincrustants should be introduced directly into the boiler, not into the feed-water store. It is pointed out that the action of some disincrustants is greatly modified by increase of pressure and other variables and that, although the experimental boiler gives speedy information regarding scale prevention, such tests offer no security against possible corrosion. C. IRWIN.

Derivation of Dühring's rule. A. McL. WHITE (Ind. Eng. Chem., 1930, 22, 230–232).—Duhring's rule, which states that $(T_a - T'_a)/(T_b - T'_b) = m$, when the temperatures are those of equal vapour pressure, has been hitherto considered to be empirical. The Clausius-Clapeyron equation states that $d \log p$ $dT = \Delta H/RT^2$, where p = vapour pressure, T =

absolute temperature, and $\Delta H =$ heat of vaporisation. It may be integrated if approximations are made and the relation $(1/T_a - 1/T'_a)/(1/T_b - 1/T'_b) = n = \Delta H_b/\Delta H_a$ is derived, a and b being two different substances, the vapour pressures of which at T_a and T_b are equal. Combining this equation with the Dühring one, the slope of the Dühring line m can be calculated if the vapour pressures and heats of vaporisation of the two substances are known. Examples show that so long as the Clausius equation holds good this method of calculation gives results in agreement with experiment. The reverse process of calculation of heats of vaporisation from the slope of the Dühring line is also possible.

C. IRWIN.

Nomograms for technical gas analysis. E SCHWARZ VON BERGKAMPF (Z. anal. Chem., 1930, 80, 103-108).-The construction of nomograms for the calculation of the volume of a gas at N.T.P. and for calculating the pressure in the correction tube of a Jeller apparatus is described. A. R. POWELL.

Fractionating columns. CHILLAS and WEIR .--See II. Insulating board from straw. GIBSON .---See V. Removal of incrustation from evaporator and heater tubes. Springer.-See XVII. Metafiltration and brewing. PICKARD.-See XVIII.

See also A., Apr., 447, Rapid evaporation (NAU-MANN). Vacuum-distillation apparatus (FRIEDRICHS).

PATENTS.

Heat exchanger or condenser. BIRMINGHAM ALUMINIUM CASTING (1903) Co., LTD., and P. PRITCHARD (B.P. 326,278, 31.12.28).-A single baffling and dividing wall is formed as a corrugated cylinder, and is sandwiched between cylindrical walls which make contact with the crests of the corrugations, thus producing helical inner and outer passages for the two fluids.

B. M. VENABLES.

Heat-transferring devices such as air preheaters. W. A. WHITE (B.P. 326,381, 11.4.29. Addn. to B.P. 313,998; B., 1929, 739).-Means are described for securing in groups the unit heaters described in the B. M. VENABLES. prior patent.

Drying and heating apparatus. H. KÜPPERS (B.P. 326,269, 19.12.28).-A flame thrower suitable for drying moulds or foundry ladles is described. B. M. VENABLES.

Apparatus for liquation [of sulphur etc.]. J. THAME and W. E. LANGTON (B.P. 325,948, 16.1.29) .--The material is conveyed on a perforated belt or chain of trays through a heated chamber. The fine solid matter that drops through the perforations with the

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liquid is separated from the latter on a riffled concentrating table underneath the conveyor.

B. M. VENABLES.

Means for the control of temperature. ELECTRO-FLO METERS Co., LTD. From REPUBLIC FLOW METERS Co. (B.P. 326,309, 13.2.29).—A purely mechanical gear for controlling oil burners, electric rheostats, etc. is described. The primary control is of the hit-and-miss type, and is sufficiently gentle to be operated by the pointer of a moving-coil instrument, which is clamped during the actual "hit." B. M. VENABLES.

[Optical pyrometer for] measurement of high temperatures, specially of incandescent bodies. A. DORNFRIED, E. KARCHER, and A. SINGLE (B.P. 325,863, 28.9.28).—A filter of coloured glass or other material is graduated from a minimum density at one end to a maximum at the other, it is placed within a frame provided with a scale, and the incandescent body is observed through the filter by means of a rider provided with a collecting lens, which is moved to a position where the body is just invisible.

B. M. VENABLES.

Fine-grinding of dry material. C. PONTOPPIDAN (B.P. 326,366, 21.3.29).—In the fine-grinding of cement or the materials therefor it is found that in the later stages the material adheres to the grinding bodies, owing to frictional electricity, and prevents further reduction. To prevent this, 0.5—10% of one or more materials such as coal, coke, cinder, ore, or peat is added, or an atmosphere of, *e.g.*, superheated steam or carbon dioxide may be provided. The effect of the added substance is to produce a *P.D.* which reduces that set up by the material. B. M. VENABLES.

Apparatus for treatment of granular or pulverulent materials with gases. S. WRIGHT (B.P. 326,085, 3.5.29).—In an apparatus of the type where the gases rise against a stream of the material which is agitated and the fall is hindered by rotating retarders, the last-mentioned are made Z-shaped in section.

B. M. VENABLES.

Filtering apparatus. E. W. W. KEENE (B.P. 326,221, 8.11.28).—In a rotary drum filter the sections of cloth are supported on frames which form shallow filtrate compartments in conjunction with the impervious drum, and the openings for filtrate leading to the outlet channels come under the channel-shaped rims of the frames. B. M. VENABLES.

Filtration of water or liquid. R. H. L. PENNELL and A. W. WYLIE (B.P. 325,937, 5.1.29).—A filter of the sand or gravel type, preferably operating with upward flow, is washed by a reverse current which is accelerated compared with the rate of filtration. In the case of a closed filter the rush of wash liquid is produced by the pressure of air trapped above the filter bed; in an open filter the wash-water outlet pipe is extended downwards as far as possible to produce a barometric suction. B. M. VENABLES.

Centrifugal separators. G. JUNGBLUTT (B.P. 312,271, 14.5.29. Fr., 23.5.28).—A fluid from which a solid or liquid is to be separated is passed axially through a rotor which is surrounded by a fluid (preferably the

same) substantially in hydrostatic equilibrium. The material to be separated and some of the fluid (e.g., dust) and air) pass through the circumference of the rotor to a settling device, or to an auxiliary separator such as a cyclone, from which the air with a little residual fine dust may be returned to the inlet of the rotor.

B. M. VENABLES.

Centrifugal sludge separator. A. Nyrop (B.P. 312,997, 31.5.29. Denm., 4.6.28).—The separator bowl is in three parts, the upper part being single and rigidly connected to the separating discs or filters and to either the inner or outer part of the lower double bowl. The two lower walls slide on each other in a liquid-tight manner so that a circumferential sludge outlet between the upper and lower halves may be opened and closed. If the inner part is coupled to the upper, the sludge outlet is held closed by springs and hydraulic pressure is used to open it. The pressure is generated between the lower bowls by separated liquid overflowing inwards through passages near the axis, which the liquid reaches only when sludge has accumulated; the effect may be aided by an external supply of liquid through an axial passage. When the sludge discharges, a slight additional sliding movement uncovers discharge ports for the hydraulic liquor so that the bowl rapidly shuts again. If the outer part of the lower bowl is coupled to the upper, the sludge outlet is closed by the hydraulic pressure of an externally supplied liquid and opened by gravity, and when the separated liquid overflows inwards it causes an outlet for the other liquid to open, releases the pressure, and allows the bowl to open. An automatic gear is described for controlling the supply of feed and hydraulic liquor.

B. M. VENABLES.

Heating of liquids, using the sun's rays for the purpose. J. A. THOMSON (B.P. 325,928, 31.12.28).— The heat-absorbing element comprises a pair of thin, corrugated plates which are maintained a short distance apart by wires or metal strips which also serve the purpose of causing the internal liquid to take a sinuous path. The element is placed in a vertical or inclined position to catch the sun's rays, is preferably connected in closed circuit with a storage tank, and may be enclosed in a glass hut to minimise the loss by convection. B. M. VENABLES.

Apparatus for cleaning articles by solvent vapour. CARRIER ENG. Co., LTD., and K. J. R. ROBERTSON (B.P. 326,299, 30.1. and 2.3.29).—The articles are conveyed through a bath of solvent vapour by means which makes a knee-like bend at both entrance and exit, under canopies in which "air cushions" are maintained to isolate the vapour from the ambient air; the escape of vapour is further prevented by refrigerating coils near the air cushions. B. M. VENABLES.

Condensation of vapours. I. G. FARBENIND. A.-G. (B.P. 301,430, 29.11.28. Ger., 29.11.27).—An apparatus which effects silently the condensation of steam or other vapour in a liquid comprises a number of downwardly directed jets of vapour surrounded by annular openings through which the liquid flows in the same direction. The downward flow tends to prevent detachment of vapour bubbles, with consequent noise when they condense, and their formation is entirely prevented by immediately dispersing the mixture among Raschig rings, gravel, or other filling.

B. M. VENABLES.

Utilising the waste gases from furnaces. CAR-BORUNDUM Co., LTD. From CARBORUNDUM Co. (B.P. 326,205, 3.12.28).—The waste gases from a tunnel kiln are taken partly through a dryer and partly through an air preheater for the kiln. The goods in the dryer, *e.g.*, porcelain ware, are not in contact with the gases, but the latter are supplied to a lowermost distribution chamber, and thence, through adjustable openings in the ceiling, to an intermediate chamber with an impervious metal roof, through which the heat is conducted to the goods chamber at the top. B. M. VENABLES.

[Countercurrent] gas washers. C. A. JENSEN. From BARTLETT HAYWARD CO. (B.P. 325,300, 21.11.28). —The gas passes upwards and the liquid downwards through a tower as shown in the figure. The liquid is lifted from the trays and sprayed by the rotating



perforated cones, 15-16b, into the pockets, 18 and 18a, which are provided with perforated division plates about tangential to the rotating inclined blades, 17, by which the gas is projected into the pockets. The blades forming the pockets have, at the bottom, open centres and closed outer parts, and at the top, perforated outer parts and centres closed by the rotating discs, 19 and 19a, which also serve to spray the descending liquid. B. M. VENABLES.

Air washing and the like. PNEUMATIC CONVEYANCE & EXTRACTION, LTD., and W. A. SMITH (B.P. 325,884, 3.12.28).—The air is forced into the lower part of a tank of water, and while rising is caused to travel in a zig-zag manner by horizontal or sloping baffles, all of which are drowned. Inclined louvre-like baffles are provided at the points where the gas passes round the edges of the main baffles. B. M. VENABLES.

Air filters. C. G. VOKES (B.P. 326,047, 28.3.29).— A supporting spider is described for a filter composed of pleated fabric. B. M. VENABLES.

Refrigerating apparatus. LIVERPOOL REFRIGERA-TION Co., LTD., and J. ALLAN (B.P. 326,827-8, 20.11.28).

Absorption refrigerating apparatus. Electro-LUX, LTD. From Platen-Munters Refrigerating System Aktieb. (B.P. 326,965, 22.2.29).

Absorption refrigerating machines. SIEMENS-SCHUCKERTWERKE A.-G. (B.P. 308,793, 11.3.29. Ger., 28.3.28).

Utilisation of waste liquors (B.P. 326,112).— See II. Continuous kilns (B.P. 309,547).—See VIII. Boiler-feed water (Austr.P. 109,459).—See XXIII.

II.—FUEL; GAS; TAR; MINERAL OILS.

Chemical and microscopical investigations of the coals from the Witbank and Ermelo coal fields. P. E. HALL (J. Chem. Met. Soc. S. Africa, 1930, 30, 195-219).-Proximate and ultimate analyses, and the results of additional coking tests, of 22 samples of coal have been recorded; four of the coals were subjected to benzene pressure extractions, and thin sections of six were prepared and examined microscopically. The Witbank coals may be divided into three groups: (a) a non-banded, tough, homogeneous coal, composed of vegetable tissues which have suffered a partial aerobic decay with the formation of a "fusainised" type of material; (b) a finely-banded, striated coal with good caking qualities; and (c) a less strongly caking, banded coal with wider bright bands. The Ermelo coals are of a less mature nature and are non-caking. None of the coals contained any durain. They are all suitable for steam raising, and some for gas manufacture. Their high ash content, of at least 9%, and the unfavourable nature of the ash makes them unsuitable for the production of blast-furnace coke. A. B. MANNING.

Comparative tests of various fuels when burned in a domestic hot-water boiler. E. S. MALLOCH and C. E. BALTZER (Canada Dept. Mines Rept. No. 705, 1929, 92 pp.).-A number of fuels have been tested in the furnace of an experimental heating installation of the hot-water type, and of a size suitable for a house of eight or nine rooms. Three different rates of combustion were used; most of the tests were continued until 1000 lb. of fuel had been consumed, and an endeavour was made to keep all errors within the limit of 2%. The plant and method of making observations are described in detail. The fuels may be divided into three groups: (1) anthracites and cokes of 75-92% fixed carbon content, (2) semi-bituminous coals of 70-74% fixed carbon content, and (3) Alberta subbituminous and domestic coals of 40-51% fixed carbon content. One test was carried out with air-dried peat, and one with Welsh briquettes. The average thermal efficiencies obtained with the fuels of each of these groups were 72.9%, 65.8% and 60.8%, respectively. The quantities of fuel fired per therm delivered to the

water averaged 10.78 and 11.07 lb. for groups (1) and (2), respectively; for group (3) the figures varied from 14.77 to 19.06 lb. The furnace required little attention when burning fuels of group (1), considerably more with those of group (2), and more again with those of group (3). Of the 21 fuels tested Welsh anthracite was the most economical. A. B. MANNING.

Rôle of the catalyst in the processing of coal. H. S. TAYLOR (Proc. II. Int. Conf. Bit. Coal, 1928, 1, 190—199).—" Oxide" catalysts (potassium carbonate, zinc, tungstic, or chromic oxide, etc.) are preferred to metallic hydrogenation catalysts on account of the presence of sulphide poisons. Thorium, aluminium, selenium, titanium, and zirconium oxides are good hydration-dehydration catalysts. The presence of small quantities of alkali is advantageous. Phenols inhibit the polymerisation of hydrocarbons; lead tetraethyl and iron carbonyl inhibit oxidation.

CHEMICAL ABSTRACTS.

Chlorination of coal. S. OCHI (J. Fuel Soc. Japan, 1930, 9, 27-29).-Treatment of coal with saturated chlorine water removes considerable amounts of the sulphur present, inorganic sulphur being the most affected. The reaction is facilitated by fineness of size of the coal, is almost unaffected by pressure, and conforms with an optimum temperature of 25°. The total sulphur content of Miike coal was reduced by chlorination from 3.73% to 1.36%. Treatment with chlorine water also reduces the amount of ash, especially acid-soluble ash. Miike coal which had been extracted with benzene yielded further benzene extracts after chlorination. These extracts can be separated into portions soluble or insoluble in ethyl alcohol. Ibaraki coal (of younger geological age) gave products insoluble in benzene but soluble in ethyl alcohol.

H. E. BLAYDEN.

Determination of phenols in waters from coking plants. A. TRAVERS and AVENET (Compt. rend., 1930, 190, 975—976).—The total phenol content in such waters is determined by distillation with superheated steam (350°), followed by oxidation of the sulphur compounds in the distillate with excess of hydrogen peroxide, removal of the excess of hydrogen peroxide by boiling with cobaltic oxide, and titration with bromidebromate mixture in the presence of excess of 15% sulphuric acid. A. I. VOGEL.

Influence of the reactivity of coke on water-gas formation. K. BUNTE and A. GIESSEN (Gas- u. Wasserfach, 1930, 73, 241-247).-The gasification of coke in steam was determined in an electrically heated quartz tube, packed at the bottom with quartz beads to preheat the gas, and then with a column of graded coke. Nitrogen saturated with water at 70° was passed through the furnace at known rates and the effect of changes in reaction temperature and in time of contact was deter-Undecomposed steam in the exit gas was mined. measured by cooling and drying with calcium chloride and phosphorus pentoxide; permanent gases were collected over brine for analysis. Curves are given showing the results obtained at different temperatures and velocities. The reactivity of seven different cokes

or charcoals towards steam is found to vary in the same order as their reactivity to oxygen or carbon dioxide. An exact relation between ignition point, combustibility, and reactivity to steam is only obscured by secondary reactions, in which steam reacts with carbon monoxide or reverse changes are set up as the gases are cooled.

R. H. GRIFFITH.

Gum formation in cracked gasolines. C. R. WAGNER and J. HYMAN (J. Inst. Petroleum Tech., 1929, 15, 674-680).-The colour of a gasoline is no indication of its gum content, but on evaporation a "gummy" gasoline develops a yellow colour until a final residue is obtained varying in consistency from an oily liquid to a solid mass and from pale amber to deep brown in colour. Usually this is insoluble in light petroleum, partially soluble in benzene, and completely soluble in acetic acid and alcohol. It appears that "gummy" gasolines contain little or no gum in solution, but that gum-forming materials are present which become resinified by heat during evaporation. The common aldehydes are incapable of forming appreciable quantities of gum alone, but by the addition of crotonaldehyde to a straight-run gasoline and exposure to oxygen and light a gum was formed on evaporation which was practically identical with that from a "gummy" gasoline. A sample of gum-free, vapour-phase cracked gasoline containing at least 50% of olefines, after exposure to oxygen and light, gave a reaction for peroxides and left an appreciable residue of gum on evaporation. A sample of highly unsaturated gasoline that had been exposed to an oxidising atmosphere was distilled in vacuo to a 28% bottom, having an acid number of 0.75 and a saponif. value of 13.4. It gave a strong test for peroxides and contained 0.2% O. On distillation it gave a series of violent explosions and vapours of acraldehyde were evolved. The residual 10% remaining undistilled at 172° was a heavy resinous mass which was separated into a lightred oily liquid (d 0.9027, acid value 4.49, saponif. value 32.41), and a black asphaltic resin (acid value 64.86, saponif. value 307.9). The rate of gum formation is slow at first, but after the "period of induction" it is rapid, especially at elevated temperatures. In the dark and at room temperature autoxidation is very much less pronounced. A trace of hydrogen chloride gas causes polymerisation in gum-free, vapour-phase cracked gasoline and promotes oxidation. Glacial acetic acid and a-crotonic acid show only faint catalysing action. Both quinol and ammonia decrease the rate of gum formation. A theory of gum formation is offered involving autoxidation, per-acids, and oxonium compounds.

H. S. GARLICK.

Deterioration of cracked spirits by gumming-E. W. J. MARDLES and H. Moss (J. Inst. Petroleum Tech., 1929, 15, 657—673).—Engine tests carried out on a Delco engine with bouncing-pin equipment in the standard manner by comparison with fuels of known H.U.C.R. showed that for cracked spirits stored at ordinary temperatures a decrease of anti-knock value occurs even after 23 days. The results obtained after incubation of oracked spirits and blends at higher temperatures and under different conditions of storage are given. The addition of a small quantity of phenol reduces the gum

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yield and partly prevents the fall in H.U.C.R. After deterioration there was only a partial return to the original anti-knock quality after reconditioning by alkali wash and redistillation. Results show that the copper or glass dish method with standardised conditions give results comparing favourably with those obtained by more elaborate methods, but that evaporation in steam tends to promote hydrolytic cleavage and steam-distillation. An apparatus is described in which 20 c.c. of fuel are evaporated by a stream of air, steam, or nitrogen, from a copper or glass dish supported in a chamber suspended in an oil bath. Results are lowest when a copper dish is used, and tend to show that the copper does not catalytically induce gum formation. The gumming tendency of a spirit is determined by the gum yields of samples withdrawn at regular intervals from a bulk sample incubated in contact with air or oxygen. The gum yields of various fractions of a vapour-phase cracked spirit vary considerably. The results of the investigation of the influence of a large number of substances on the gumming rates of several cracked spirits are given. Water and anti-oxygens exhibit a considerably inhibiting effect. H. S. GARLICK.

Determination of existent gum in cracked distillates. W. S. NORRIS and F. B. THOLE (J. Inst. Petroleum Tech., 1929, 15, 681-685).-The present dish methods for the determination of existent gum in cracked distillates suffer from the following disadvantages: (1) the period of evaporation is long and differs for samples of varying volatility; (2) the degree of oxidation is not under control and the degree of heat polymerisation varies with the rate of evaporation; (3) the results are affected by the thermal conductivity of the material of the dish; (4) the material of the dish may exert a specific catalytic action; (5) the usual final temperature of the "gum" is about 100°, which differs considerably from the normal temperature of an inlet valve upon which gum deposits usually accumulate; (6) evaporation in an atmosphere of steam involves a considerable and non-standardisable period of heating and may cause chemical interaction. The authors consider that an ideal test would embody the following essentials: (a) instantaneous evaporation of the whole of the sample so that heat effects would be reduced to a minimum; (b) evaporation at a temperature about 200°, approximately equal to that on an inlet valve of an automobile engine; (c) exclusion of air to avoid oxidation effects; and (d) maintenance of an accurately controlled temperature during the test. A method of flash evaporation based on the above and giving concordant results consists in mounting a spiral tube of pyrex glass, 45 cm. long and 6 mm. internal diam., in an oil bath maintained at 200° or, preferably, in an air oven maintained at 220°. The inlet of the spiral is fitted with a cork carrying a tube through which nitrogen is passed at a rate of 120 c.c. per min., and a tap-funnel by means of which a measured sample of spirit (25 c.c.) is introduced at a rate of 3 drops per sec. Vapour from the exit of the spiral, mixed with nitrogen, is led to a convenient condenser. The spiral tube is weighed before and after the evaporation of the sample and is subsequently cleaned in chromic acid mixture. The results are considerably lower than those obtained in a glass dish on the steam bath. H. S. GARLICK.

Estimation of gum in petrol and its significance. S. J. M. AULD (J. Inst. Petroleum Tech., 1929, 15, 645-656).-The methods of determining preformed gum in cracked distillates are discussed in relation to the value of such fuels as motor spirits. No evaporation method is entirely satisfactory, but the steam-bath method, although giving results consistently higher than the steam-oven method, is considered the most suitable for works' control owing to its simplicity of operation and reasonable concordance of results. The results are comparative only, and are higher than the least quantity of preformed gum in a given sample. The copper-dish method gives disproportionately high results due to the catalytic action of the metal and the longer time necessary to evaporate 100 c.c. over that needed for 20 c.c. It is established that only preformed gum has any bearing on engine operation, but the nature of the gums and their solubilities in the various hydrocarbons or other motor fuel constituents has to be considered. As a measure of the stability of a motor fuel the gum content is determined by the steam-bath method on a 20-c.c. sample of motor spirit withdrawn every 24 hrs. from a bottle in which it is stored in contact with oxygen. H. S. GARLICK.

Design of fractionating columns, with particular reference to petroleum distillation. R. B. CHILLAS and H. M. WEIR (Ind. Eng. Chem., 1930, 22, 206-213).-The problem of designing a platecolumn still for separating crude oil into six fractions is not capable of mathematical solution, and the number of plates corresponding to each fraction is determined experimentally. A small quantity of the lower-boiling fraction present in each product is best removed by a "stripper" and returned to the main column. The maximum fractionating effect is believed to be obtained with a free space velocity of 4-6 ft./sec., provided that entrained liquid can be removed. This, however, entails a considerable pressure drop. The heat balance and volumes of vapour and liquid for a typical still are worked out. Large columns with single downpipes and overflows should have low bubble-caps of less height than the overflow weirs or the liquid gradient will be too high. An example of the working out of plate dimensions for a velocity of 2.25 ft./sec. is given. The spacing demanded for the flow of reflux is not sufficient for the removal of fine spray, whilst in the case dealt with the theoretical space is 7 in., at least 18 in. with one set of baffles should be provided. The baffles are a series of blades set at 30° to the vertical. The trend of design is towards smaller diameters and C. IRWIN. higher vapour velocities.

Atmospheric oxidation of sub-Moscow coal at different temperatures. N. M. KARAVAEV and A. K. IVANOV (Chim. et Ind., 1930, 23, 294-300).—See B., 1929, 344.

See also A., Apr., 424, Extinction of methane flames by water vapour (CowARD and GLEADALL). 429, Catalytic oxidation of carbon monoxide in presence of hydrogen (KUENTZEL). 467, Action of aluminium

chloride and metallic aluminium on hydroxycompounds (Postovski and Lugovkin).

PATENTS.

Internal-combustion engines utilising the gaseous mixture obtained from the electrolysis of water. C. FIRPO (B.P. 325,866, 30.10.28).—An engine using electrolytic gas as fuel is directly coupled to a generator supplying current for the electrolysis of caustic soda solution. The mixed gases produced are passed to the cylinder through a carburettor, to which alcohol is supplied as an "auxiliary fuel." The cylinder head is movable, so that the dimensions of the combustion space may be altered. Firing may be by sparking plug or by spontaneous ignition due to compression.

T. A. SMITH.

Apparatus for carbonisation of coal and like material. ILLINGWORTH CARBONIZATION CO., LTD., and S. R. ILLINGWORTH (B.P. 325,810, 23.11.28. Cf. B.P. 244,837; B., 1926, 428).—High-temperature retorts are fitted with a special base-plate which acts as a support for removable, metal, low-temperature retorts. This enables the plant to be used for high- or lowtemperature carbonisation as may be desired.

Т. А. Ѕмітн.

Processes of and ovens for carbonising coal. H. F. MAUREL (B.P. 325,869, 1.11.28).-Preformed coal briquettes are passed through an oven having two heating zones, in the first of which the briquettes are heated gradually to about 315°, and in the second are maintained at that temperature, the total heating period being about 4 hrs. The briquettes are supported on a conveyor which enters the oven at the bottom. Horizontal partitions divide the first heating chamber into a series of superposed passages through which the conveyor, supported by guide sprockets at each end of the chamber, carries the briquettes. The conveyor then delivers them into the second heating chamber, which is in the form of a hopper, and re-collects the finished briquettes from the bottom thereof. The conveyor enters and leaves the oven through a liquid seal. The briquettes are heated directly by the circulation of hot combustion gases through the oven; they may also be heated indirectly by the circulation of hot gases through some of the partitions in the first heating chamber, which are made hollow for that purpose.

A. B. MANNING.

Heating of coke ovens or the like. P. E. VERPEAUX, and UNION CHIM. BELGE Soc. ANON. (B.P. 326,094, 9.5.29).—Horizontal coke ovens having heat regenerators and vertical heating flues are provided with auxiliary flues by means of which air is distributed to various levels in the heating flues to produce supplementary combustion of the gas admitted to the lower portion of the heating flues. The quantity of hot air which can be drawn through the regenerators is increased by fitting injectors constructed of refractory material under the auxiliary flues. Air is supplied to the injectors at 100 mm., and further air is drawn into the auxiliary flues through the regenerators. By regulating the pressure at the nozzles the temperature of the air supplied to the auxiliary flue can be controlled.

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Production of [carbonaceous] artificial materials. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,872, 3.11.28 and 16.1.29).—The solid residues obtained by the complete hydrolysis of the carbohydrates of vegetable materials with acids are mixed with sulphur and/or bituminous materials, and, if desired, with fillers and other binding agents etc., and are compressed while hot into suitable shapes. The products can be used as acid-proof coating agents, insulating materials, roofing materials, etc. A. B. MANNING.

Extraction of products from carbonaceous materials. J. W. H. AINSCOW (B.P. 300,984, 19.11.28. Austral., 22.11.27).-The material in granular form is conveyed through an inclined retort on an endless belt or scraper conveyor, and passes therein through a series of zones of progressively higher temperatures. The zones are separated from each other by closures formed by the material itself, as it is drawn through sections of the retort, which are diminished in height. The gases and vapours in each zone are withdrawn separately through re-fractionating chambers arranged directly above the contractions in the retort, and so constructed as to prevent condensed liquid from falling back on to the material. A hopper with feed delivery means is fitted at one end of the retort. The conveyor enters and leaves the retort through a water-seal. At the outlet end the seal takes the form of a tank into which the residual solid falls, and from which it is removed at convenient intervals. A. B. MANNING.

Treating coal to remove smoke-producing constituents. F. LLOYD, R. V. WHEELER, and A. P. PEHRSON (B.P. 324,386, 23.10.28).—Bituminous coal is heated in a single stage at a temperature not much higher than its active decomposition point and not lower than that at which the smoke-producing constituents (hydrocarbons and resins) are distilled. The required temperature of distillation is dependent on the carbon content of the coal, and varies from about 250° to 365°. A. B. MANNING.

Distillation and utilisation of solid fuels. A. J. A. HÉRENG (B.P. 325,809, 23.11.28. Cf. B.P. 322,332; B., 1930, 176).-The dried and preheated fuel is passed through a distillation chamber in a horizontal layer on an endless conveyor which is permeable to gases, the volatile products of distillation being removed from the under face of the moving layer. The roof of the chamber is formed by a radiating plate heated by a furnace wherein the gas produced by the plant itself may be burnt. A current of gas is circulated continuously through heating coils in the furnace, thence over and countercurrent to the moving layer of fuel, up through the dryer and preheater and through the cooling chamber for the coke, back to the heating coils. If desired, steam may be introduced into the gas-circulating system. The solid residue is cooled and recovered as a compact semi-coke, or may be conveyed directly to a combustion chamber and utilised A. B. MANNING. for steam raising etc.

Production of fuel from brown coal etc. SIEMENS-SCHUCKERTWERKE A.-G., Assees. of R. HEINRICH (G.P. 457,613, 5.3.25).—To utilise the carbon content of flue gases from industrial furnaces, finely-divided brown coal or other low-grade fuel is injected into the flues under conditions which prevent its combustion and the gases are passed through an electrical precipitation plant. The resulting flue dust has a higher calorific power than the original brown coal, and is suitable for direct use in coal dust-fired furnaces. A. R. POWELL.

Conversion of coal, tars, mineral oils, etc. into fuels of low b.p. J. Y. JOHNSON. From I. G. FARB-ENIND. A.-G. (B.P. 325,862, 28.9.28).—The destructive hydrogenation of the starting material is carried out in stages and the carbonaceous substances of high mol. wt., which would otherwise choke the catalysts used in the later stages, are removed, *e.g.*, by conversion into products of lower mol. wt. in the earlier stages of the process, or by condensation or adsorption before the material enters the second or later stages. [Stat. ref.]

A. B. MANNING.

Preparation of active carbon. A.-G. F. STICKSTOFF-DÜNGER (B.P. 301,330, 26.11.28. Ger., 26.11.27).— Ashes carried over into the flue as a result of the combustion of coal etc. are sieved or graded, purified by boiling with hydrochloric acid, washed with water, dried, and ground. H. ROYAL-DAWSON.

Gas producer for the gasification of ligneous fuel. K. SCHMIDT (B.P. 325,616, 5.12.28).—In order to facilitate the removal of the ash from a producer with downward combustion, in which ligneous fuel, *e.g.*, ricehulls, are gasified, the lower part of the producer is provided with a vertical grating in addition to the horizontal bottom grating, and the lower part of the fuel bed is kept in constant motion by means of a stirring device. A. B. MANNING.

Generation of water-gas from powdered fuel. M. HELLER (B.P. 308,972, 27.3.29. Ger., 2.4.28).—The powdered fuel and steam are injected into an externally heated chamber in such a manner that the fuel and steam circulate therein and the particles of fuel are brought repeatedly into contact with the hot walls. The chamber may be circular in vertical cross-section, the fuel and steam being injected tangentially in at the bottom and the water-gas and ash withdrawn through a central discharge conduit. A number of such chambers, alternating with heating chambers, may be arranged in the form of a battery. The gas and air are introduced into the heating chambers so that a circulating flame is produced therein, and the waste gases are withdrawn from the centre. In another form of apparatus the fuel and steam circulate vertically in a shaft containing a vertical dividing wall which leaves passages at the top and bottom. The fuel and steam are injected at the bottom and the water-gas is withdrawn from the top. A. B. MANNING.

Grids for gas purifiers. A. BEUTHNER (G.P. 456,371, 27.1.27).—The grids comprise a number of rotatable, horizontal shafts carrying two series of grid rods, one above the other, fixed to the shafts in such a way that the rods of the lower series are all on the lefthand side and those of the upper series on the right-hand side of the shafts. In this way blocking of the passage ways between the rods may be avoided by occasional gentle rotation of the shafts. A. R. POWELL.

Discharge conduits for moisture-laden gases. E. MEYER and E. FICHTE (B.P. 325,793, 20.11.28).— Waste gases from gas heaters or gases containing a high percentage of steam or other condensible substances are discharged into a conduit made from a non-combustible plastic mass comprising moist wood shavings, Portland cement, sand, and water; the material may be rendered water-repellent by a coating of dilute aluminium acetate solution. H. ROYAL-DAWSON.

Removal of ammonia and sulphuretted hydrogen from gases. C. J. HANSEN, Assee. of H. KOPPERS A.-G. (B.P. 299,765 and Addn. B.P. 301,061, [A] 18.9.28, [B] 19.9.28. Ger., [A] 31.10.27, [B] 24.11.27).—(A) The gases are scrubbed with iron thiosulphate liquors $[FeS_2O_3 + 2NH_3 + H_2S = (NH_4)_2S_2O_3 + FeS]$, and any hydrogen sulphide in excess of the ratio 2NH₃:1H₂S is removed by a separate liquor, preferably either an iron polythionate solution or an iron hydroxide suspension. The order in which the operations are carried out may be varied; e.g., the ammonia may be removed first by condensation, then part of the hydrogen sulphide by means of the iron polythionate solution, and finally the remainder of the hydrogen sulphide, in the presence of all or part of the ammonia previously removed, by the iron thiosulphate liquor. The spent liquor containing iron sulphide is regenerated either by treatment with sulphurous acid to give thiosulphate, or by blowing in air to give iron hydroxide. (B) The process may be further modified by subjecting the gases to a preliminary washing with the spent thiosulphate liquor, and subsequently adding this ammoniacal liquor to the iron thiosulphate liquor in the main scrubbing operation. Other minor modifications of the process are described. A. B. MANNING.

Separation of hydrogen from gaseous mixtures. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,968, 30.1.29).—The gaseous mixtures are washed under pressure and at elevated temperatures with a liquid, e.g., a tar or mineral oil, the solvent power of which for hydrogen increases with a rise in temperature. On cooling the liquid without releasing the pressure, a gas rich in hydrogen is evolved. Suspensions of coal in oil, or tars etc. which are to be hydrogenated, may be used as washing liquids under such conditions of temperature and pressure that they take up the quantity of hydrogen necessary for their subsequent hydrogenation, without any appreciable alteration in their chemical nature. A. B. MANNING.

Separation of unsaturated hydrocarbons from gaseous mixtures. J. Y. JOHNSON. From I. G. FARBEN-IND. A.-G. (B.P. 325,817, 26.11.28. Cf. B.P. 325,309; B., 1930, 406).—Unsaturated hydrocarbons, and in particular acetylene, are recovered from gaseous mixtures by washing the latter, preferably under pressure, with a liquid ketone containing more than three carbon atoms, *e.g.*, diethyl ketone, acetophenone, *cyclohexanone*, etc. A. B. MANNING.

Manufacture of hydrocarbons from tars, mineral oils, and like liquid hydrocarbon materials. I. G. FARBENIND. A.-G. (B.P. 301,059, 3.9.28. Ger., 24.11.27). —The tars, oils, etc. are subjected to destructive hydrogenation at elevated temperatures and pressures by

passing the material, together with hydrogen, or gases supplying hydrogen, through more than two reaction vessels in series, so arranged that no appreciable cooling occurs between the separate reaction vessels. The material and the hydrogen may be preheated before entering the first reaction vessel, and the desired temperatures in the system maintained by suitably lagging the reaction vessels and connecting pipes, the reaction being exothermic. A. B. MANNING.

Refining of low-temperature tar, tar oils of any origin, crude benzene, and products obtained by the destructive hydrogenation of carbonaceous materials. F. HOFMANN and C. WULFF (B.P. 301,420, 1.11.28. Ger., 29.11.27. Cf. B.P. 298,484; B., 1930, 406).—The crude materials are washed with a solution of sulphuric or phosphoric acid in an oxygen-containing organic solvent, *e.g.*, ethyl alcohol. A. B. MANNING.

Preparation of artificial resin, wax, and other complex hydrocarbons from coal-distillation residues. E. RAHMAN (B.P. 325,816, 27.11.28).-Coal tar and pitch are distilled in the presence of mixtures of the chlorides and oxides of iron, aluminium, calcium, or magnesium. Steam at 3-8 atm. is admitted through a pipe carried down to the bottom of the liquid and ending in a distributor having a large number of small apertures. Hydrogen may be admitted with the steam to bring about the formation of softer products, and crude montan wax may be added to the pitch. The waxes and resins produced are useful in the manufacture of varnishes and impregnating materials. The product distilling between 200° and 300°, on treatment with sodium or sodamide at 150°, yields fluorene. Pyrene, fluoranthene, retene, and picene may be obtained by fractionating the product distilling above 360°. T. A. SMITH.

Purification and/or utilisation of waste liquors. F. C. BUNGE and H. MACURA (B.P. 326,112, 18.6.29).-The phenol-containing liquors obtained in the treatment of coal tar or wood tar are purified by treatment with aldehydes (formaldehyde or furfuraldehyde). Resins are formed in a state of fine division. Before or during the treatment coagulating agents such as aluminium sulphate or lead acetate may be added. The recovered resins are useful for paint manufacture, and, when lead acetate has been used for coagulation, have a useful lead content. The bulk of the aldehyde resins may be removed by filtration and the residue by flotation treatment with coal sludge. The purified water is practically free from hardness, and may be used as boiler-feed water. T. A. SMITH.

Conversion of mineral oils into hydrocarbons of low b.p. E. D. KAMM, R. C. ODAMS, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 325,487, 15.11.28).— Heavy mineral oil is hydrogenated to produce chiefly middle oil, heavy residue from this process being returned for further hydrogenation. This middle oil is cracked and any heavy residues produced are also returned to be rehydrogenated. By this method there is no loss of liquid carbonaceous material, and the formation of incondensable gases is low, if suitable catalysts (such as ferric oxide) are used in the hydrogenation step. Thus, by hydrogenating a heavy mineral oil, 86% of which boils above 300°, for 1 hr. at 200 atm. and 450° in the presence of 5% of hydrated ferric oxide, 20% of petrol and 30% of middle oil is obtained. The heavy oil is returned for hydrogenation. The middle oil is cracked for 15 min. at 450° and 100 atm., yielding 37% of petrol, 45% of middle oil, and a pitch residue which is rehydrogenated. Coal pastes may be similarly treated. The preheated heavy oil or paste is pumped to a hydrogenation tower from which it passes to a catch-pot maintained at 350°. Residue from this pot is returned for hydrogenation, while the vapours consisting of benzine and middle oil are passed to a fractionating condenser, where the middle oil portion is condensed and retained in a catch pot maintained at 200°. From this catch pot the middle oil is transferred to a cracking unit all the products from which are passed to the heavy-oil catch pot. The heavy portions are thus returned for hydrogenation and the middle oil recycled for further cracking. The combined benzine vapours from all stages are condensed and the gases decomposed to provide hydrogen T. A. SMITH. for the process.

Cracking of oils. S. SEELIG (B.P. 296,000, 18.8.28. Ger., 22.8.27).-Coke formation is prevented during cracking by passing preheated cracking stock into an asphalt-removing chamber, where it comes in intimate contact with the oil which has been through the cracking unit, whereby all but the asphalt is vaporised. The asphalt is run off and the vapours are conducted to a second separator maintained at such a temperature that cracking stock is condensed and light vapours are removed to a condenser. The refined cracking stock is pumped from the second dephlegmator to the cracking unit, which consists of a metal bath maintained at cracking temperature. The oil is fed in below the surface of the molten metal. A uniform mixture of new refined cracking stock and recycled material is T. A. SMITH. obtained.

Mineral oil distillation. A. E. PEW, JUN., and H. THOMAS, Assrs. to SUN OIL Co. (U.S.P. 1,742,933, 7.1.30. Appl., 17.3.24).-A stream of oil is passed into, through, and out of a series of confined spaces in which the oil is distributed over surfaces heated by mercury vapour. This vapour is generated from a separate supply of mercury and flows through multiple paths in heatexchange relation but out of contact with the oil, thereby effecting by heat exchange and by its condensation the vaporisation in each confined space of the desired oil fraction. Condensed mercury is returned to the main supply, and the oil vapours are removed and led to separate condensers. Cracking is minimised by maintaining in one or more of the confined spaces an absolute pressure on the oil of less than 25 mm. Hg, by maintaining so thin a layer of oil on the heated surfaces as substantially to eliminate hydrostatic pressure, and by regulating the pressure and temperature of the condensation of the mercury vapour at each locus of heat-H. S. GARLICK. exchange independently.

Treatment of mineral oils. A. H. ACKERMAN, ASST. to CATALYTIC CHEM. Co. (U.S.P. 1,742,020, 31.12.29. Appl., 14.12.25. Renewed 15.4.29).—In order to prevent the formation of, or to break up, carbon clusters in petroleum products, the oil is agitated with a composition comprising anthracene (10 pts.), sulphuric acid (2 pts.), oil of myrbane (4 pts.), sodium hydroxide (1 pt.), and naphthalene (200 pts.), with or without the addition of phosphate rock, sodium phosphate, ammonium carbonate, sugar, arsenious acid, arsenic sulphide, and golden antimony sulphide. H. S. GARLICK.

Manufacture of lubricating oils. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 325,832, 28.11.28).— An alkylated naphthalene hydrocarbon substituted by one or more alkyl groups, or a mixture thereof with a customary lubricating oil, is allowed to flow slowly at atmospheric or reduced pressure through an ozoniser and is there subjected to the action of the silent electric discharge produced by an alternating current of 500— 3500 or more periods/sec. H. S. GARLICK.

Separating oily emulsions. G. W. COGGESHALL and A. REILLY, Assrs. to JEFFERSON CONSTRUCTION & OIL TREATING CO. (U.S.P. 1,742,648, 7.1.30. Appl., 1.7.27).—Emulsions to be treated are mixed at ordinary temperatures with dispersions or solutions of the sulphonic acids or their alkaline salts, recovered from the sludge resulting from the treatment of mineral oils with acid, in the proportion of approx. $1 \cdot 4$ lb. per 100 gals. of emulsion. Sufficient mineral acid is then added to cause substantially all of the sulphonic acid salts to be converted into free sulphonic acid within the emulsion, and sufficient time is allowed for settling to take place. H. S. GARLICK.

Demulsifying soap. J. F. TURNER, D. H. MATTHEWS, and M. F. Ross, Assrs. to VACUUM OIL Co. (U.S.P. 1,742,623, 7.1.30. Appl., 30.11.27).-The acid sludge resulting from the treatment of petroleum oils with concentrated or fuming sulphuric acid, after being separated from the reacting oil, is washed with water to remove unspent acid and then treated with open steam. After settling and removing the aqueous portion, the acid sludge is neutralised, preferably with caustic soda solution, and then treated with "white water," obtained by washing with water a mineral oil that has been treated with acid and alkali, after which the layer containing in solution and in suspension the demulsifying soap is removed from the supernatant layer containing colouring matter. H. S. GARLICK.

Manufacture of motor fuels. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,858, 29.8.28).— A non-knocking motor fuel having final b.p. 185° is obtained by mixing a knocking gasoline, b.p. below 150° , with an anti-knocking hydrocarbon fraction, b.p. 150— 180° , which may be obtained by (a) distillation of aromatic tars or aromatic petroleums; (b) condensation of unsaturated compounds; (c) destructive hydrogenation or dehydrogenation of aliphatic or hydroaromatic compounds, aromatic middle oils, such as anthracene oils, coal-tar products, residue obtained by cracking and high-temperature tars; or (d) by the extraction of products of appropriate boiling range with sulphur dioxide. H. S. GARLICK.

Manufacture of highly concentrated paraffin wax. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,941, 7.1.29).—Crude paraffin wax is treated in the solid state with an aqueous solution of a wetting or emulsifying agent, e.g., aqueous solutions of potassium, ammonium, or sodium soaps, and in particular of polynuclear and alkylated sulphonic acids, thereby displacing the oil from the wax. H. S. GARLICK.

Apparatus for manufacture of combustible gas. W. J. MURDOCK, E. E. LUNDGREN, and O. B. EVANS, Assrs. to PIER PROCESS CORP. (U.S.P. 1,743,725, 14.1.30. Appl., 28.8.26. Renewed 21.11.29).—See B.P. 240,440; B., 1927, 246.

Burner for pulverulent or gaseous fuels. ALLGEM. ELEKTRICITÄTS GES. (B.P. 304,142, 14.1.29. Ger., 13.1.28).

Drying and heating apparatus (B.P. 326,269). Control of temperature (B.P. 326,309).—See I. Acetic acid from pyroligneous acid (B.P. 316,284).— See III. Self-combustible mixtures (B.P. 299,396). —See XXII.

III.—ORGANIC INTERMEDIATES.

Drying of organic solutions in volatile solvents. A. LUND (Chem. Umschau, 1930, 37, 29).—Such solutions are easily dried without loss of solvent by shaking with, *e.g.*, anhydrous sodium sulphate in a glass-stoppered separating funnel fitted with a fused-in, porous, glass filter disc just above the tap. The solution is drained off through the filter and tap, and the dehydrating agent is easily washed with fresh, dry solvent.

E. LEWKOWITSCH.

Detection of organic compounds. L. Rosen-THALER (Pharm. Ztg., 1930, 75, 272-273).-Acetone and alcohols, even when completely free from aldehyde, produce a red colour with Schiff's reagent unless the total quantity present is less than 20% of methyl alcohol, 5% of ethyl alcohol, 10% of propyl and isopropyl alcohols, 2.5% of n-butyl alcohol, and 5% of acetone. Previous addition of hydrochloric acid prevents the formation of the red colour in the Schiff reaction, but if the acid be added after the formation of the colour this changes to blue and gradually disappears. Deniges' reagent oxidises methyl, ethyl, n-propyl, n-butyl, and isobutyl alcohols to the corresponding aldehydes and is itself reduced to mercurous sulphate. The aldehydes may be characterised by formation of their p-nitrophenylhydrazones. a-Naphthol may be differentiated from β -naphthol by the character of the precipitates produced by mixing equal amounts of their saturated solutions and a 2% solution of mercuric acetate; β-naphthol gives a white precipitate soluble in glacial acetic acid and a-naphthol gives a yellow viscous liquid from which flocks separate on keeping. With β-naphthol the reaction is sensitive at a dilution of 1:5000, and with α -naphthol 1:250,000. The difference in behaviour is most marked when examined under the E. H. SHARPLES. microscope.

Determination of phenols. TRAVERS and AVENET. Xylene from light oils. BESPOLOV.—See II. Separation of fatty acids. GROSSFELD.—See XII. Absolute alcohol from raw spirit. Schlage. Waste from butyl alcohol manufacture. HATFIELD.—See XVIII.

See also A., Apr., 501, Higher alcohols of fermentation (SWENARTON).

PATENTS.

452

Catalytic hydrogenation and dehydrogenation of organic compounds. HOLZVERKOHLUNGS-IND. A.-G. (B.P. 305,198, 3.12.28. Ger., 2.2.28).—Catalyst masses are prepared by using a suitable granulated carrier, e.g., magnesia or lime, as a precipitant for the oxide or hydroxide of the catalyst metal. A solution of a salt of the metal or metals, e.g., copper formate, copper and manganese nitrates, or nickel nitrate, is poured over the granulated carrier. C. HOLLINS.

Manufacture of ethylene [from acetylene]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,695, 22.2.29).—Aluminium powder, cerium, or ceria is used as catalyst in the hydrogenation of acetylene to ethylene at 280—320° and preferably at ordinary pressure.

C. HOLLINS.

Dehydration of vapour mixtures containing acetic anhydride and water. I. G. FARBENIND. A.-G. (B.P. 300,563, 14.11.28. Ger., 14.11.27. Addn. to B.P. 285,090; B., 1929, 671).—In the process of the prior patent a dephlegmator is placed at the top of the separating column, and the solvent is injected only at the bottom. C. HOLLINS.

Extraction of acetic acid from pyroligneous acid. Soc. ANON. DES DISTILLERIES DES DEUX-SÈVRES (B.P. 316,284, 15.3.29. Belg., 28.7.28).—Tars are removed from pyroligneous acid, prior to the extraction of acetic acid, by treatment with *C*-alkylated cresols, *e.g.*, the *C*-butylcresol obtained by condensing ordinary cresol with butyl alcohol in presence of zinc chloride.

C. HOLLINS.

Manufacture of glacial acetic acid from aqueous acetic acid. I. G. FARBENIND. A.-G. (B.P. 300,923, 19.11.28. Ger., 19.11.27).—A halogenated hydrocarbon (trichloroethylene) is used as entraining liquid to remove water from dilute (85—95%) acetic acid.

C. HOLLINS.

Production of keten. KODAK, LTD., Assees. of H. T. CLARKE and C. E. WARING (B.P. 309,577, 15.3.29. U.S., 13.4.28).—Acetone (etc.) is vaporised into a chamber containing a network or sponge of copper, free from iron and nickel, at 650—700°, the time of contact being less than 5 sec. A yield of 80% is claimed.

C. HOLLINS.

Production of esters of α -hydroxycarboxylic acids. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,531, 20.10.28. Addn. to B.P. 300,040; B., 1929, 11).—In the process of the prior patent alcohol and the necessary amount of water are added before or after the formation of the cyanohydrin, an inert solvent being present and the esterification being performed without isolation of the intermediate products. The process is suitable for alcohols of high mol. wt. and for viscous aldehydes and ketones. The preparation of cyclohexyl lactate, b.p. 95—110°/7 mm., and β -chloroethyl $\alpha\gamma$ -dihydroxyvalerate, b.p. 120—135°/ 10 mm., and cyclohexanol-2-carboxylate, b.p. 134°/6 mm., is described. C. HOLLINS.

Preparation of [polymerisation] products of acrylic acid or its derivatives. Rohm & HAAS A.-G. (B.P. 304,681, 2.11.28. Ger., 24.1.28).—Acrylic acid or

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a derivative (e.g., ethyl acrylate) is polymerised (and in part oxidised) by heating, preferably in acetone solution, in a current of oxygen or air. Solid products or their solutions are obtained which are useful as adhesives and for films, lacquers, etc. C. HOLLINS.

Preparation of diarylthiocarbamides. SILESIA VER. CHEM. FABR. (B.P. 307,906, 4.1.29. Ger., 17.3.28). —Excess of aniline (twice the theoretical amount) is warmed for 4—5 hrs. with carbon disulphide at 45—50° under reflux. A 90% yield of very pure thiocarbanilide, m.p. 153—154°, is claimed. C. HOLLINS.

Manufacture of N-[hydr]oxyethyl derivatives of nuclear substitution products and homologues of 4-amino-1-oxybenzene [p-aminophenol]. I. G. FARBENIND. A.-G. (B.P. 300,503, 7.11.28. Ger., 12.11.27. Addn. to B.P. 280,873 and 290,997; B., 1929, 38, 236).— Nuclear substituted p-aminophenols are condensed with ethylene chlorohydrin or oxide. The preparation of N-mono- and N-di- β -hydroxyethyl derivatives of 2-chloro-p-aminophenol, m.p. 67—68° and 112°, respectively, 5-aminosalicylic acid, m.p. 206° (decomp.) and 183° (decomp.), respectively, and of 6-amino-m-cresol, m.p. 80—82° and 108—109°, respectively, is described. C. HOLLINS.

Manufacture of derivatives of naphthalene [from p-benzoquinones and ay-butadienes]. J. Y. JOHN-SON. From I. G. FARBENIND. A.-G. (B.P. 324,661, 26.9. and 1.10.28) .- A p-benzoquinone substituted in position 2 and/or 3 is condensed with an $\alpha\gamma$ -butadiene; if no 2- or 3-substituent is present, mild conditions are employed. p-Benzoquinone and 0.85 pt. of ay-butadiene at 60-65° under pressure yield a product which is converted by acid or alkali at 50-60° into 1:4dihydroxy-5: 8-dihydronaphthalene, oxidisable by way of a quinhydrone to *a*-naphthaquinone. Other 1:4-dihydroxy-5:8-dihydronaphthalenes described are the 2-methyl, 6:7-dimethyl, 6-methyl, 2-chloro-, 2:3-dichloro-, and 2:3-dichloro-6:7-dimethyl derivatives. C. HOLLINS.

Recovery of β -naphthol and other difficultly filterable organic compounds. R. F. STEWART, R. J. VENN, and DORR CO., LTD. (B.P. 325,772, 1.7.29).— Fine sand is added to the suspension of β -naphthol, which is then filtered, and the filter-cake is levigated to obtain a concentrated aqueous suspension of β -naphthol, from which the naphthol is separated as an oil after raising to the requisite temperature. C. HOLLINS.

Manufacture of oxythionaphthens [thioindoxyls]. I. G. FARBENIND. A.-G. (B.P. 298,955, 17.10.28. Ger., 17.10.27).—4-Alkylthioindoxyls are obtained by heating the corresponding o-cyano- or o-carboxy-arylthioglycollic acids with water at 180°. The preparation of 6-chloro-4-methyl- and 6-chloro-4:7-dimethyl-thioindoxyls is described. C. HOLLINS.

Manufacture of OO-diacetyldiphenolisatin. F. HOFFMANN-LA ROCHE & Co. A.-G. (B.P. 314,518, 17.5.29. Ger., 29.6.28. Addn. to B.P. 221,976; B., 1925, 26).— Diphenolisatin diacetate is obtained in one operation by heating isatin and phenol in acetic acid at 80° in presence of a little sulphuric acid, adding acetic anhydride, and continuing the heating until acetylation is complete.

C. HOLLINS.

Manufacture of 1-halogeno-2-aminonaphthalene [naphthylamine]sulphonic acids. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 325,387, 12.2.29).—A β -naphthylaminemono- or di-sulphonic acid is acetylated, halogenated in the α -position, acidified, and hydrolysed. The preparation of 1-chloro- β -naphthylamine-5-, -6-, and -8-sulphonic and -5:7-disulphonic acids, and of 1bromo- β -naphthylamine-7-sulphonic acid, is described. C. HOLLINS.

Manufacture of diphenyl. FEDERAL PHOSPHORUS Co., Assees. of T. J. SCOTT (B. P. 312,902, 8.2.29. U.S., 2.6.28).—Benzene vapour passes through a metal coil immersed in a lead bath at 600—650° (*i.e.*, below the temperature at which diphenyl is formed) and bubbles up through the molten lead into a similar arrangement of metal coil and lead at 750—800°. The diphenyl produced is passed at high velocity into a water-cooled condenser. C. HOLLINS.

Manufacture of halogen derivatives of the dibenzanthrone and isodibenzanthrone series. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,525, 21.8.28, 23.3, 22.5, and 4.6.29).—Dibenzanthrone or isodibenzanthrone is brominated in an inorganic medium, especially chlorosulphonic acid. The products are usually isomerides of the known bromo-compounds, and when chlorosulphonic acid above 50° is used they contain both chlorine and bromine. Halogen carriers should preferably be present. Dibenzanthrone yields a chlorodibromo-compound which is a marine-blue vat dye of greater fastness than the starting material; 26 other examples, leading to violet or blue vat dyes, are given.

C. HOLLINS.

Manufacture of derivatives of pyranthrone. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,250, 9.10.28).—The nitro-group in mononitropyranthrone (cf. B.P. 23,361 of 1912; B., 1913, 746) is exchanged for halogen by the action of benzoyl chloride, or is reduced and exchanged for halogen or a hydroxyl, thiol, cyano-, or thiocyano-group by the Sandmeyer reaction. Hydroxypyranthrone may be etherified, for example with β -chloroethyl-*p*-toluenesulphonate. The products are either dyes or intermediates. C. HOLLINS.

Separation of unsaturated hydrocarbons (B.P. 325,817). Complex hydrocarbons from coal (B.P. 325,816).—See II.

IV.—DYESTUFFS.

Fastness of dyestuffs in ultra-violet light. G. A. BRAVO (Boll. Uff. Staz. Sperim. Ind. Pelli, 1930, 8, 50-59).—Pieces of filter paper, soaked in filtered aqueous or alcoholic solutions of the dyestuffs and dried in the dark, were exposed at about 50 cm. distance to the light of a 2000-c.p. mercury-vapour lamp without an intervening nickel oxide glass screen. Effects due to the heat or ozone generated were minimised by ventilation. The dyestuffs examined, belonging to the nitroso-, nitro-, and azo groups, were thus divided into four classes, in accordance with their fastness under these conditions. T. H. POPE.

Relation of media $p_{\rm H}$ to the bacteriostatic action of dyes. S. E. OWEN (Amer. J. Pharm., 1930, 102, 154– 158).—The action of 13 dyes on 4 types of bacteria has British Chemical Abstracts---B. 845

been examined. Of the 10 food dyes investigated, 8 of them showed no bacteriostatic action in a $p_{\rm H}$ range of from 5.4 to 10.4. The $p_{\rm H}$ value of the media is an insignificant factor in the selective action of gentianviolet, basic fuchsin, and probably methylene-blue. Erythrosin inhibits the growth of *B. anthracis* within the range studied (4.4—10.4) and guinea-green inhibits the growth of the same organism at $p_{\rm H}$ 7.4 and under.

E. H. SHARPLES.

See also A., Apr., 473, Behaviour of Pechmann dyes with amines (BOGERT and GREENBERG). 477, Acyl-*p*quinones and the "Pechmann dyes" problem (BOGERT and HOWELLS).

PATENTS.

Manufacture of nitrogenous vat dyes. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,550, 15.10.28. Addn. to B.P. 318,180; B., 1929, 51).-The process of the prior patent is extended to condensation of halogenated (etc.) polynuclear heterocyclic compounds with two or more primary or secondary amines of which at least one is vattable and at least one contains a 4-ring residue. Examples are α -aminoanthraquinone and aminodibenzanthrone with chlorobromoanthraquinonacridone (grey), or the dichlorinated vat dye from pyrazolanthrone (by alkaline melt and ethylation) (redviolet) or with dibromo-6: 6'-dichloro-4: 4'-dimethylthioindigo (grey-black) or with hexabromodihydroxydinaphthazine (green-grey); tribromoanthraquinonenaphthacridone with 1-amino-4-methoxyanthraquinone and aminopyranthrone (grey), etc. C. HOLLINS.

Manufacture or vat dyes of the anthraquinone series. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 325,267, 15.11.28. Cf. B.P. 305,082; B., 1929, 277).—The process of the earlier patent is applied to the carbazolisation of 1:1'-dianthraquinonylamines containing two acridone rings in the 4:4'-position and no arylamino-groups. Trichlorinated anthraquinone-2:1-acridone is condensed with the aminodichloroanthraquinonacridone obtain by the action of oleum on the product from 4-bromo-1-aminoanthraquinonesulphonic acid and 2:6-dichloroanthranilic acid (followed by removal of the sulphonic group) and the resulting dianthraquinonylacridone is carbazolised to give a fast green vat dye. C. HOLLINS.

Manufacture of vat dyes [of the isodibenzanthrone series]. I. G. FARBENIND. A.-G. (B.P. 303,123, 28.12.28. Ger., 28.12.27).—1: 4-Dichloro-8-aroylnaphthalenes yield vat dyes when treated with alkaline condensing agents, 4 mols. of hydrogen chloride being removed from 2 mols. of the starting material. 1: 4-Dichloro-8benzoylnaphthalene with alcoholic potassium hydroxide at 100—150° gives isodibenzanthrone; a bluer violet is obtained from the o-chlorobenzoyl compound, a redder-violet from the p-isomeride. Dibenzoisodibenzanthrones obtained from 1: 4-dichloro-8- α - and - β -naphthoylnaphthalenes are, respectively, reddish-blue and pure blue vat dyes. C. HOLLINS.

Manufacture of derivatives of mono-aminodibenzopyrenequinones. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,222, 8.10.28. Cf. B.P. 324,964; B., 1930, 411).—Aminodibenzopyrenequinone

 α -naphthylamine or Cleve acid, then rediazotised and coupled with a salicylic acid to give chrome-printing browns. Examples are: Laurent acid \Rightarrow Cleve acid \Rightarrow salicylic acid; α -naphthylamine - 4:7 - disulphonic acid \Rightarrow Cleve acid; α -naphthylamine \Rightarrow salicylic acid. C. HolLINS.

Manufacture of [green] polyazo dyes. I. G. FARBENIND. A.-G. (B.P. 300,987, 21.11.28. Ger., 22.11.27).-An aromatic amine is diazotised and coupled, through a suitable *a*-naphthylamine middle component, with a cyanuric compound, $X \cdot Cy(A) \cdot R$, in which A is a 1:8-aminonaphthol residue (substituted or not), R is an aminoazo residue, and X is halogen or an amino-, thiol, or ether residue. Examples are : m-4-xylidine-5sulphonic acid \rightarrow 2-ethoxy-Cleve acid \rightarrow condensation product from cyanuric chloride and H-acid, p-aminobenzeneazosalicylic acid, and aniline or H-acid (green on cotton); p-aminoacetanilide-m-sulphonic acid \rightarrow 1-amino-2-naphthol β -sulphatoethyl ether \rightarrow condensation product from cyanuric chloride and ethyl-H-acid, 4-amino-4'-hydroxyazobenzene-2: 3'-dicarboxylic acid, and thio-p-cresol (green); 4-chloroaniline-2-sulphonic acid \rightarrow 2-methoxy-Cleve acid \rightarrow condensation product from cyanuric chloride and H-acid, o-nitro-p-toluidine, and dimethylamine, reduced, \rightarrow 1-o-carboxyphenyl-3methyl-5-pyrazolone (yellowish-green). Many other cyanuric coupling components are mentioned.

C. HOLLINS.

Manufacture of o-hydroxyazo dyes and of metal compounds therefrom. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,208, 7.8.28).—A sulphonated o-aminophenol is diazotised and coupled with p-substituted phenols; the dyes may be converted into metal compounds. Examples are: 4-nitro-o-aminophenol-6-sulphonic acid \rightarrow m-4-xylenol (yellow-brown on wool, deeper brown when chromed); 4-chloro-oaminophenol-6-sulphonic acid $\rightarrow \psi$ -cumenol (brown-red on wool, dark brown when chromed). Carboxylated components are excluded, as are aminophenols and naphthols as coupling components. [Stat. ref.]

C. HOLLINS.

Manufacture of [azo] dyes containing metal. Soc. CHEM. IND. IN BASLE (B.P. 297,003 and 325,204, 10.9.28. Switz., 10.9.27) .- (A) A disazo or polyazo dye is treated with a solution containing several metals, such as chromium, nickel, copper; or an azo dye is converted into a metal compound and then coupled with a diazo component, or the metal compound is diazotised and coupled with a coupling component, in either case further metals being introduced, if desired. Examples are: 4-chloro-o-aminophenol (1 mol.) \rightarrow di-J-acid, precoppered, coupled with diazotised 4-chloro-o-aminophenol, and further treated with copper sulphate; 3:3'-dichlorobenzidine $\rightarrow 2$ mols. of J-acid in acid solution, coupled alkaline with 2 mols. of diazotised 4-chloro-o-aminophenol, and treated with copper sulphate and chromium fluoride solution. (B) Chromable monoazo dyes having J-acid or an N-substituted J-acid as end-component are treated with a number of metal solutions; e.g., 5-nitro-o-aminophenol \rightarrow phenyl-J-acid is boiled with copper sulphate, nickel sulphate, and chromium fluoride to give a pure blue dye for cotton. and Electronic to source i no source of the no. C. Hollins.

is condensed with benzoyl chloride (orange-red), m-methoxybenzoyl chloride (orange-red), 1-chloroanthraquinone-2-carboxylic chloride (orange), α chloroanthraquinone (orange-brown), cyanuric chloride (red-brown), 1-nitro- or 1-amino-anthraquinone-2-carboxylic chloride (brick-red), oxalyl chloride (yellow), bromo- or nitro-dibenzopyrenequinone (brown), bromobenzene (brown), octobromocyclohexane (green-grey), trichlorinated anthraquinone-2 : 1-acridone (brown), benzotrichloride (orange), methyl iodide (green-grey), tetrabromoindigo (brown), dibromoanthanthrone (brown), nitropyranthrone (grey), nitrodibenzanthrone. C. HOLLINS.

Manufacture of azo dyes [ice colours and pigments]. I. G. FARBENIND. A.-G. (B.P. 300,504, and 300,557, [A], 9.11.28, [B] 14.11.28. Ger., [A] 12.11.27, [B] 14.11.27).—(A) A halogenated m-5-xylidine is diazotised and coupled in substance or on the fibre with an arylamide of 2:3-hydroxynaphthoic or acetoacetic acid. Examples are: 2-bromo-m-5-xylidine with 2:3hydroxynaphthoic p-anisidide (bluish-red); 4-chlorom-5-xylidine with the 5-chloro-o-anisidide (scarlet) or bisacetoacetyltolidine (reddish-yellow), etc. Amongst the new bases used are 2-chloro-m-5-xylidine, m.p. 58-59°, 2-bromo-m-5-xylidine, m.p. 66-67°, 4-bromom-5-xylidine, m.p. 27-28°, b.p. 261-263°; 2:4dichloro-m-5-xylidine, m.p. 71-72°; 4:6-dichloro-m-5xylidine, m.p. 88-89°, and 2:4:6-trichloro-m-5xylidine, m.p. 188-189°; (B) 2-Amino-p-cymene or a derivative is diazotised and coupled with a 2:3hydroxynaphthoic arylamide. Examples are : 2-aminop-cymene with 5-chloro-o-anisidide (scarlet); 5-chloro-2-amino-p-cymene with 5-chloro-o-toluidide (bluish-red); 6-nitro-2-amino-p-cymene with p-anisidide. [Stat. ref.] C. HOLLINS.

Manufacture of yellow [pyrazolone] azo dyes [for wool, silk, and lakes]. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 325,229, 13.11.28).— A pyrazolone is coupled with a diazotised aminoarylsulphonarylalkylamide; e.g., m-aminobenzenesulphonmethylanilide, $\mathrm{NH}_2 \cdot \mathrm{C}_6\mathrm{H}_4 \cdot \mathrm{SO}_2 \cdot \mathrm{NPhMe}$, is diazotised and coupled with 1-p-sulphophenyl-3-methyl-5-pyrazolone for a yellow wool dye. C. HOLLINS.

Manufacture of [mordant] azo dyes. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 325,485, 12.11.28).—An aminosulphosalicylic acid (5:4- or 3:4-) is diazotised and coupled with *p*-cresol, quinol monomethyl ether, *m*-4-xylenol, *p*-hydroxydiphenylmethane, *p*-acetamidophenol, 6-chloro-*m*-cresol, or other *p*-substituted, non-carboxylated, monocylic phenols, to give chromable dyes for wool. C. HOLLINS.

Mordant disazo dyes. J. R. GEIGY Soc. ANON. (J. R. GEIGY A.-G.) (B.P. 306,448, 8.1.29. Ger., 20.2.28). —Arylamine-mono- or -di-sulphonic acids containing no chelate groups are diazotised and coupled with

Solutions of azo dyes in drying oils. J. R. GEIGY, A.-G. (B.P. 301,726, 6.11.28. Ger., 3.12.27).— Non-sulphonated dyes derived from tetrazotised diaminodiarylmethanes are easily soluble in linseed oil and produce a quick-drying printing oil. Examples are : diamine from benzaldehyde and p-xylidine $\rightarrow 2$ mols. of β -naphthol; diamine from benzaldehyde and o-toluidine $\rightarrow 2$ mols. of p-cresol; diamine from o-chlorobenzaldehyde and p-xylidine $\rightarrow 2$ mols. of phenylmethylpyrazolone etc. C. HOLLINS.

Manufacture of sulphur dyes. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 325,519, 20.11.28. Addn. to B.P. 315,910; B., 1929, 809).—Halogenated dinaphthylene dioxides are heated with sulphur, with or without sodium sulphide, to give brown dyes; decachlorodinaphthylene dioxide yields a grey.

C. HOLLINS.

Manufacture of acid wool dyes. I. G. FARBENIND. A.-G. (B.P. 299,721, 29.10.28. Ger., 29.10.27).-A sulphamic or a sulphonated amino-derivative of naphthalic anhydride is condensed with ammonia or a primary amine (including o-diamines); or the sulphamic or sulphonic group is introduced into the product from naphthalic anhydride. The sulphamic acid obtained from 4-aminonaphthalic anhydride, chlorosulphonic acid, and pyridine is heated with o-phenylenediamine to give an orange-yellow wool dye. Instead of the diamine there may be used ammonia (yellow) or aniline (greenish-The product obtained by sulphonating yellow). 4-aminonaphthalic anhydride with oleum at 50-60° gives with o-phenylenediamine an orange wool dye. A yellow results from sulphonation of 4-aminonaphthalimide with oleum at 110°. C. HOLLINS.

Manufacture of dyes of the safranine series. I. G. FARBENIND. A.-G. (B.P. 300,178, 6.11.28. Ger., 7.11.27).-A 4-acylamino- or 4-nitro-3'-amino-diphenylamine-2-sulphonic acid and a p-diamine are oxidised together, and, if desired, the acyl group is removed by hydrolysis or the nitro-group is reduced. The preparation is described of safranines from : 3'-amino-4-acetamido-4'-methyldiphenylamine-2-sulphonic acid and p-aminodiethylaniline-3-sulphonic acid (hydrolysed, reddish-violet) or 4-amino-4'-methoxydiphenylamine-2sulphonic acid (hydrolysed, violet); 4-nitro-3'-dimethylaminodiphenylamine-2-sulphonic acid (reddish-blue) or 4-amino - 4' - methoxydiphenylamine - 2 - sulphonic acid (blue). C. HOLLINS.

Derivatives of dibenzanthrone etc. (B.P. 325,525). Derivatives of pyranthrone (B.P. 325,250).—See III. Colouring photographic prints (G.P. 458,989). Pictures from dyes (B.P. 298,979).—See XXI.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Kendyr [seed-hair] down. N. L. KARAVAEV and P. N. ODINZOV (Papier-Fabr., 1930, 28, 133—136).— The properties of the Kendyr (*Apocynum venetum*) seedhairs have been investigated in order to ascertain whether the material is suitable for use in the cellulose industries. The hairs are very soft, of mean thickness 14μ , wall-thickness about 2μ , of round cross-section, very brittle, and have little tensile strength and extensibility. On chemical analysis they were found to

contain (%): moisture 11.9, ash 2, protein 2.4, wax, fat, etc. 2.7, pentosan 20.8, lignin 30.4, pure cellulose 37%. On boiling with sodium hydroxide under pressure for times up to 6 hrs. they give 25-44% of very impure technical cellulose (on the wt. of dry material). Comparison is made between the properties of this and of other cellulose materials such as straw, wood, cotton, etc., and it is found that the down resembles straw in its cellulose content and yield of soda-cellulose. It is useless for the manufacture of cellulose nitro-products, and though it might be of use in some ways, e.g., as heat-insulating material, its prospects are not good. On the other hand, a certain future may be predicted for the true Kendyr fibres from the stem of the plant as raw material for textiles, and perhaps for paper. B. P. RIDGE.

Digestion of maize stalks with neutral sulphites. E. HORVÁTH (Papier-Fabr., 1930, 28, 239—241).—Smallscale digestions of maize stalks with sodium sulphite are described. The product obtained by digestion with a 10-20% solution of the salt differs only slightly from that obtained with water alone, and the use of a 30-40%solution does not yield a much improved product. The addition of caustic soda gives a somewhat brighter product with a lower lignin content. The ash of all products is high, and the pentosan content is not appreciably affected by variation of the concentration and temperature of digestion. The best product obtained is much inferior to that obtained by the usual process of alkaline digestion. T. T. Ports.

Structure of the vegetable cell-membrane. LÜDTKE (Papier-Fabr., 1930, 28, 129-133).-The cellulose lamella of vegetable fibres is divided by membranes into co-axial cylinders, and the latter are subdivided by other radial membranes into strips which are often inclined at a small angle to the axis of the fibre and produce a spiral structure. The strips thus formed are themselves built up of fibrils. At intervals along the fibre these membranes are joined to transverse elements. The membranes and transverse elements consist of non-cellulose material, which is probably a furfuroid. The bead-necklace effect observed on treating vegetable fibres with cuprammonium, shortening of the fibres in mercerisation, absorption and swelling phenomena, increased absorption and attack by chemical reagents at mechanically damaged places, etc. are shown to result from this structure. The effects of different conditions of nourishment during growth on the characteristics of plants are shown by study of the straw from wheat plants grown under various conditions of phosphorus, potash, and nitrogen manuring. Excess of nitrogen or of phosphorus causes an increase in the percentage of *z*-cellulose obtained from the dry material. Variations in conditions of nourishment or environment account for differences in the properties of pulps prepared from the same kind of plant under identical B. P. RIDGE. conditions.

Cooking-heat and its economical use in cellulose works. W. SCHMID (Papier-Fabr., 1930, 28, 138-141). -Further economy lies in making the most of the cooking-heat and in shortening the time of circulation in the cooker by using preheated fresh liquor. The

Waldhof works use the cooking-heat directly for heating the fresh liquor, but the economy thus effected is counterbalanced by increased cost of plant, since large liquor reservoirs are necessary and preheating must be effected under pressure in acid-resistant vessels. Further, the liquor is heated only to about 70°, instead of to 105°, which is necessary if the time required for bringing it to the boil is to be reduced to zero. Heat requirements and costs involved in producing the desired conditions are discussed, and it is shown that by the use of a steam reservoir and two steam ejectors, used instead of the liquor pumps, the liquor may be heated to the required temperature (105°) in two stages, without any great increase in cost of plant. A fuel economy of 18% and shortening of the time of circulation for the cooker of 25%, i.e., twice the corresponding values obtained by the Waldhof method, are claimed.

B. P. RIDGE.

[Heat-]insulating board from straw. A. G. GIBSON (Ind. Eng. Chem., 1930, 22, 223-226).-Only a very small proportion of the straw produced in the U.S.A. is put to any useful purpose, the main problem being collection cost. A plant manufacturing insulating board from straw came into production in 1928. Straw is cut to short lengths, sprayed with water, and digested with water under 60-75 lb. steam pressure for 8 hrs. The cooked straw is drained, seasoned, and disintegrated. Water is added and the mixture passed to pulp grinders consisting of rotating discs of highsilicon iron. These last 3-4 weeks; other steels are worn out in a few hours by the abrasive action of the The pulp, with water, alum, and resin size straw. added, is beaten and passed to the forming machines and mixed with 5-10% of old newspapers to give the necessary fine aggregate. The board is formed on a cylinder machine, pressed to remove some of the water, and dried. The dried board as it leaves the dryer is sprayed with concentrated liquor from the digesters; this contains furfuraldehyde and resin, and acts as a preservative and binder. Straw board has a heat conductivity only slightly greater than that of cork. C. IRWIN.

Sugar-factory filter-cloth. HONIG.—See XVII.

See also A., Apr., 417, Behaviour of cotton cellulose and regenerated cellulose in sodium hydroxide solution (NEALE). 418, Elastic properties of wool in organic liquids (SPEAKMAN).

PATENTS.

Manufacture of hydrophilic cotton wool. A. CHAR-BONNEAU (F.P. 633,719, 11.9.26).—The raw cotton is boiled with caustic soda and lime, washed, treated with sodium hyposulphite solution at 80°, washed, and bleached with chlorine in very dilute sulphuric acid solution. The product is then again treated with sodium hyposulphite solution and finally immersed in sulphuric and nitric acids. A. R. POWELL.

Improvement of cellulose raw material. ZELL-STOFFFABR. WALDHOF, V. HOTTENROTH, and O. FAUST (B.P. 301,088, 23.11.28. Ger., 24.11.27).—Cellulose raw material is treated with 9—18% caustic alkali solution, and, after removal of the excess of the latter by pressure, is allowed to ripen for a period and at a temperature in accordance with the desired reactivity and is afterwards washed. [Stat. ref.] F. R. ENNOS.

Treatment of cellulose material. EUROMERICAN CELLULOSE PRODUCTS CORP., Assees. of B. DORNER (B.P. 312,634, 23.4.29. U.S., 29.5.28).—Maize stalks, after being leached, disintegrated, and washed, are treated with dilute alkali to remove silica (e.g., with 0.1%caustic alkali at 120° and 1 atm.) and are then subjected to a second alkali treatment (e.g., with 0.6% caustic alkali at 138° and 2.5 atm.), conditions in both treatments being such that the organic non-cellulosic material is not caramelised. F. R. ENNOS.

Manufacture of viscose. I. G. FARBENIND. A.-G. (B.P. 306,971, 28.2.29. Ger., 28.2.28).—The deleterious effect of small quantities of heavy metals in the constituents used is more or less avoided by addition of 1—10 g. of oxalic acid or alkali oxalate to each litre of viscose produced, at any stage in its manufacture or when in the finished condition. F. R. ENNOS.

Production of artificial filaments or threads. BRIT. CELANESE, LTD., H. DREYFUS, E. KINSELLA, J. BOWER, and W. I. TAYLOR (B.P. 326,232, 7.12.28. Addn. to B.P. 300,998; B., 1929, 203. Cf. also B.P. 304,674; B., 1929, 353).—A solution of cellulose acetate or other cellulose derivative is spun from a nozzle comprising a line of extrusion orifices, while a collector device, having a shape appropriate to that of the spinning nozzle, constrains substantially the whole of the evaporative medium to pass through the immediate vicinity of the orifices. F. R. ENNOS.

Production of artificial filaments, yarns, or threads. BRIT. CELANESE, LTD., H. DREYFUS, W. A. DICKIE, and W. I. TAYLOR (B.P. 326,777-8, 13.9.28).— Regular or systematic variations in denier are imparted to the extruded filaments by (A) varying the speed of the pumps feeding the spinning solution to the nozzles, or (B) producing pulsations in the delivery of the spinning solution to the nozzles by the vibration or reciprocating action of a diaphragm or piston in contact with it. (Cf. B.P. 321,762; B., 1930, 98.) F. R. ENNOS.

Production of artificial silk threads. G. S. WALLIS (B.P. 326,963, 21.2.29).—Spun threads of wool, cotton, etc. are subjected to a spray of cellulose solution while traversing a perforated tube which passes through a vessel containing the cellulose solution under pressure. F. R. ENNOS.

Drawing or stretching process in the manufacture of cuprammonium artificial threads, filaments, and yarns. LONZA-WERKE ELEKTROCHEM. FABR. G.M.B.H. (B.P. 299,022, 19.10.28. Ger., 19.10.27). —Threads spun from cuprammonium cellulose solution, which have been coagulated in a strongly alkaline liquid, are treated with warm water or dilute aqueous solutions containing no free acid (e.g., magnesium sulphate solution) until they become soft and rubber-like without losing their copper content; while in this condition they are stretched by suitable means to as much as twice their original length, and are finally fixed in an acid bath. F. R. ENNOS.

Manufacture of artificial silk [from synthetic

resin]. INTERNAT. GEN. ELECTRIC Co., INC., Assees. of ALLGEM. ELEKTRICITÄTS-GES. (B.P. 303,867, 11.1.29. Ger., 11.1.28).—The raw material, consisting of a condensation product of a polyhydric alcohol (glycerin) and a polybasic acid (phthalic acid) or its anhydride together with a plasticiser if desired, is extruded under heat into the air at a temperature of 150—200° or from a solution in acetone into a coagulating bath, the filaments being subsequently baked. F. R. ENNOS.

Cellulose films. FILM OZAPHANE (SOC. INDUSTRIELLE D'APPLICATIONS PHOTOGRAPHIQUES) (B.P. 301,878, 6.12.28. Fr., 7.12.27).—Cellulose films regenerated from viscose are rendered uninflammable by impregnation after manufacture with a solution of commercial ammonium phosphate (about 10% of phosphate) or one containing not less than 8% of ammonium sulphate or chloride. The films may be sensitised before, during, or after the impregnation with a mixture of diazo compounds and phenol, which can be developed by the action of ammonia etc. F. R. ENNOS.

Manufacture of cellulose derivatives. H. DREY-FUS (B.P. 326,861, 23.11.28).—Cellulosic materials are treated at 140—200° with esters of organic acids in the presence of tertiary organic bases (e.g., dialkylanilines); the product is afterwards esterified by any suitable method. F. R. ENNOS.

Manufacture of plastic masses from cellulose derivatives. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 326,952, 12.2.29).—A cellulose ester of a saturated fatty acid containing at least eight carbon atoms (e.g., cellulose laurate), a solvent for the ester, and a resin are mixed with suitable fillers.

F. R. ENNOS.

Improvement of acylcellulose. I. G. FARBENIND. A.-G. (B.P. 299,326, 22.10.28. Ger., 22.10.27).—After precipitating the acylcellulose from its crude solution and washing, it is stabilised by heating up to 100° with dilute aqueous or alcoholic sulphuric acid, under such conditions that the solubility in a specific solvent is not altered. F. R. ENNOS.

Manufacture of mixed ethers of carbohydrates. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 326,865, 19.12.28).—Cellulose is heated at about 120° with a mixture of methyl or ethyl chloride and an alkyl chloride containing three or more carbon atoms (e.g., butyl chloride), in the presence of caustic alkali; the films produced therefrom are very little affected by water. F. R. ENNOS.

[Apparatus for] manufacture of imitation fur or the like. G. ROMANE (B.P. 314,517, 14.5.29. Fr., 30.6.28).

Production of [compound] yarns or threads of fibrous substances. A. GREEN (B.P. 326,786, 19.9.28).

Cellulose ester compositions (B.P. 297,679).—See XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Fastness of dyestuffs. BRAVO.-See IV.

PATENTS.

Bleaching of cellulose derivatives. K. Roos (B.P. 326,471, 11.12.28).—Coloured threads and films

of nitrocellulose or cellulose acetate are rapidly bleached at 50° by means of active chlorine (chlorine gas or sodium hypochlorite) after a preliminary swelling in 1-20%acetic acid. A. J. HALL.

Manufacture of materials for use in dyeing or printing. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 325,563, 23.10.28).—Preparations needing no alkali for dissolution are made by mixing an alkali-starch compound with a phenolic coupling component (or its alkali salt), with or without diluents. *E.g.*, the sodium salt of 2 : 3-hydroxynaphthoic o-toluidide or 5-chloro-otoluidide is ground with 3-8% of alkali-starch; or the p-anisidide (30 pts.) is mixed with the diazoaminocompound from diazotised 4-chloro-o-anisidine and 4-sulphoanthranilic acid (70 pts.) and alkali-starch (5 pts.). C. HOLLINS.

Dyeing of viscose silk. I. G. FARBENIND. A.-G. (B.P. 301,754, 3.12.28. Ger., 2.12.27).-Uniform shades are obtained by dyeing viscose silk with secondary disazo dyes, $A \rightarrow M \rightarrow E$, in which A is an aromatic monoamine not containing a nitro-group or the salicylic acid grouping, M is a middle component, and E is an ortho-coupling naphthol or naphthylamine other than an N-substituted 2:8-aminonaphtholsulphonic acid. Examples are : p-toluidine-3-sulphonic acid \rightarrow 2-ethoxy Cleve acid \rightarrow N.W. acid (blue); aniline-o-sulphonic acid \rightarrow Cleve acid \rightarrow Schäffer acid (violet); *m*-aminoacid \rightarrow o-anisidine \rightarrow methyl- β -naphthylbenzoic amine-7-sulphonic acid (violet); aniline-2: 5-disulphonic acid \rightarrow 1-m-aminophenyl-3-methyl-5-pyrazolone C. HOLLINS. 1:3:6-naphtholdisulphonic acid.

Dyeing of artificial silk of regenerated cellulose. Soc. CHEM. IND. IN BASLE (B.P. 300,916, 19.11.28. Switz., 19.11.27).—Azo dye compounds containing two or more metal complexes give level shades on viscose silk. Amongst the examples are: 4-nitro-o-aminophenol (2 mols.) \rightarrow di-J-acid, with chromium and copper (grey); 4-chloro-o-aminophenol (2 mols.) \rightarrow phosgenated J-acid, with copper and chromium (ruby); 5-nitro-o-aminophenol \rightarrow o-tolyl-J-acid with 25% of copper and 75% of chromium (blue). C. HOLLINS.

Dyeing or colouring higher fatty acids. I. G. FARBENIND. A.-G. (B.P. 299,790, 31.10.28. Ger., 31.10.27).-The fatty acids are converted partly or completely into their hydroxyalkylamine salts, especially β-aminoethyl alcohol and "triethanolamine" salts, before, during, or after application of the dye, or the dye may be pretreated with the hydroxyalkylamine; metal salts may be added to modify the colour. In the examples the following colouring matters are used with stearic acid and ceresin : benzeneazodimethylaniline (yellow); 1 - di-(β - hydroxyethyl)amino - 4 - hydroxyanthraquinone (bluish-red); cupric chloride (green); ferric chloride (yellow); o-toluidine \rightarrow phenylmethylpyrazolone and cobalt nitrate (brown); Victoria-blue B; methyl-violet B; p-nitroaniline $(2 \text{ mols.}) \rightarrow \text{H-acid}$, reduced, $\rightarrow 2:4$ tolylenediamine (2 mols.) (black); patent-blue A; alizarin-blue B; 5-chloro-o-aminophenol \rightarrow S-acid (violet); alizarin and aluminium chloride (bluish-red); 4: 6-dichloro-o-aminophenol \rightarrow phenylmethylpyrazolone and cupric chloride (clear brown); thioindigo-red. C. HOLLINS.

Preparation of dyed effect threads. CHEM. WORKS, FORMERLY SANDOZ (B.P. 324,680, 31.7.28. Addn. to B.P. 280,493; B., 1928, 812).—Cellulose dyed with direct dyes suitably resistant to acetylation is mono- or di-acetylated by the process of the prior patent, and may then be used for effect threads since the dyeing has become nearly as fast as vat dyeings to washing and crossdyeing. C. HOLLINS.

Production of pattern effects upon textile fabrics or other materials. BRIT. CELANESE, LTD., G. H. ELLIS, and W. B. MILLER (B.P. 324,650, 29.9., 3.11., and 3.11.28, and 29.4.29).-In the colouring of textiles, especially of acetate silk, by impregnation with amines followed by diazotisation on the fibre and development with a coupling component, resist or discharge effects are obtained by local application of chlorates, chromates (or other oxidising discharges), sulphoxylates, hyposulphites (or other reducing discharges), which prevent diazotisation of the amine. For coloured discharge effects a colour which resists the particular discharge applied is added; e.g., for acetate silk, acetylated aminoanthraquinones. Amongst the examples are: acetate silk is padded with 5-nitro-o-anisidine, printed with sodium chlorate, diazotised and coupled with 2:3-hydroxynaphthoic acid for a white pattern on a pink ground ; acetate silk is padded with dianisidine, printed with Durindone-red Y, alkali, anthraquinone, hyposulphite, and Formosul, steamed, diazotised, and developed with 2:3-hydroxynaphthoic acid for a red pattern on a navy-blue ground. C. HOLLINS.

Colouring of textile materials [resist effects with oxidation dyes]. BRIT. CELANESE, LTD., G. H. ELLIS, and W. B. MILLER (B.P. 324,683, 24.8.28).—A reducing agent, *e.g.*, formaldehydesulphoxylate, hyposulphite, or an oxalate, is applied locally before or after the amine to be oxidised on the fibre. A coloured resist is obtained by adding a vat dye to the printing paste. The process is particularly suitable for acetate silk.

C. HOLLINS.

Manufacture of discharge basic dyeings [with synthetic mordants]. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 325,562, 23.10.28).—Basic dyeings on a synthetic mordant are discharged by means of oxidants, e.g., sodium chlorate. C. Hollins.

Manufacture of non-dyeing mordants, and dyeing of basic dyes on cotton. G. B. ELLIS. From CHEM. WORKS, FORMERLY SANDOZ (B.P. 325,388, 13.2.29).—A phenol containing no nitrogenous groups is boiled under reflux with an aqueous suspension of sulphur and lime for 30—50 hrs. The precipitated calcium salt is converted into the sodium salt and applied as mordant for basic colours. C. HOLLINS.

Printing fabrics in [ice] colours on aniline-black. I. G. FARBENIND. A.-G. (B.P. 305,476, 4.2.29. Ger., 2.2.28).—Fabric padded as usual for aniline-black, e.g., with aniline, aniline hydrochloride, ferrocyanide, and chlorate, is dried and printed with a coupling component (an arylamide of 2:3-hydroxynaphthoic or acetoacetic acid), the printing paste containing zinc oxide and sufficient caustic alkali to neutralise the acid of the aniline padding. The fabric is then steamed

in a Mather-Platt and the resist is developed by passing the cloth through a diazo solution. Examples are: β -naphthol and 2:5-dichloroaniline (yellow - orange); bisacetoacetyltolidine and 2:5-dichloroaniline (yellow); 2:3-hydroxynaphthoic anilide and 6-chloro-o-toluidine (orange); the o-toluidide and 4-chloro-o-toluidine (red), phenyl 4-hydroxy- α -naphthyl ketone and m-chloroaniline (orange). C. HOLLINS.

Manufacture of vegetable [immunised] effect threads. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 322,556, 15.9.28).—Sodium cellulose is treated with an aromatic or heterocyclic sulphonyl chloride of basic character, *e.g.*, dimethylaniline-*p*-sulphonyl chloride, *m*-nitrobenzenesulphonyl chloride (followed by reduction with stannous chloride), etc. Resistance to ironing and fastness to alkali are claimed for the products. C. HOLLINS.

Preparations for stiffening and sizing textile yarns and fabrics. A. F. GALVIN (B.P. 302,358, 12.12.28. Fr., 15.12.27).—A sizing preparation which dries very rapidly and allows the production of a matt or semi-lustrous finish which does not break, yellow, or harden with age comprises a solution in benzine of a wax, stearine, an animal fat, a benzine-soluble soap, and a resin soluble in benzine, or gum dammar, or carnauba wax. A. J. HALL.

Mothproofing composition. R. M. RITTER (B.P. 327,009, 25.3.29. U.S., 31.10.28).—Animal fibres are impregnated with a solution containing alkaloids extracted from the seeds of *Strychnos Nux Vomica* or *Strychnos Ignatii*, together with saponins of quillaia, metal mordants, and phenyl salicylate. A. J. HALL.

[Apparatus for] cleaning of garments and the like. CARRIER ENG. Co., LTD., and K. J. R. ROBERTSON (B.P. 325,646, 31.12.28. Addn. to B.P. 322,797; B., 1930, 197).—The apparatus described in the prior patent is provided with an additional vacuum plant in which textile materials, after treatment with the solvent and while being carried on a brattice, are brushed by rotary brushes and the loosened dirt is removed by suction. A. J. HALL.

Dyeing machines. A. J. HALL (B.P. 327,168, 30.11.28).

Machines for treating fabrics by drying, drycleaning, dyeing, or washing. H. PIERCE (B.P. 311,222, 15.12.28. U.S., 7.5.28).

Apparatus for printing on fabrics. T. BROWN (MANCHESTER), LTD., and T. BROWN (B.P. 327,088, 9.7.29).

Products from fatty acids (B.P. 295,024).—See XII. Decoration of fabrics (G.P. 460,309).—See XXI.

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

Action of sulphur dioxide on natural phosphates. G. CALCAGNI (Annali Chim. Appl., 1930, 20, 74–79).— The action of sulphur dioxide on finely-divided tricalcium phosphate, apatite, and pebble and Kosseir phosphates, moistened with water, gives products in which up to 99.12, 32.32, 35.75, and 55.37% of the

total phosphoric acid is in the soluble form; if the phosphates are heated during the treatment, the degree of solubilisation is lowered considerably. This treatment may serve to replace the more expensive treatment with sulphuric acid for the manufacture of phosphatic fertilisers. T. H. POPE.

Volatilisation of phosphorus from phosphate rock. R. O. PIKE (Ind. Eng. Chem., 1930, 22, 242-245).—Experiments on the volatilisation of phosphorus (as P2O5) from a mixture of Idaho phosphate rock, sand, and carbon at temperatures below the fusion point showed that addition of carbon raised the fusion point from 1300-1400° to above 1650°. Both carbon and silica are necessary for a satisfactory reaction, though not in any very definite proportion. Effects of time, temperature, and grain size were investigated. These experiments were made in crucibles. An attempt to repeat the results in a rotary kiln failed at 1300-1400° and the phosphorus was only driven off by the use of an oxygen-enriched blast giving a temperature of about 1700°. A viscous slag was then formed, but the temperature is too high for any lining to withstand. The failure of the kiln at the lower temperature is ascribed to the action of the carbon dioxide from the combustion of the oil fuel used penetrating the porous charge and producing the endothermic reaction $C + CO_2 = 2CO.$ C. IRWIN.

Method of analysis of calcium citrate to replace the official method. G. ROMEO and N. SCIACCA (Annali Chim. Appl., 1930, 20, 80-90).-In view of the divergent and erroneous results yielded by the official method of analysis used for trading purposes, the author suggests the use of the following procedure for the analysis of calcium citrate. The sample is decomposed by sulphuric acid, the pectic substances and calcium sulphate being then precipitated by alcohol. In the aqueous alcoholic solution determinations are made of (1) the total acidity; (2) acidity due to the excess of sulphuric acid by the benzidine process; and (3) acidity due to hydrochloric and phosphoric acids from the chlorides and phosphates present-colorimetrically. The content of citric acid 18 obtained by difference. T. H. POPE.

Separation of iodine by the thiosulphate method. J. J. DE UGARTE (Caliche, 1929, 11, 49-51; Chem. Zentr., 1929, ii, 2484-2485).—The reduction of sodium iodate to iodine by means of sodium thiosulphate and sulphuric acid (*ibid.*, 1927, 8, 515) is best effected at 22° and is technically advantageous in that it avoids nitrous fumes and surface losses of iodine.

A. A. ELDRIDGE.

[Helium] inflation of the metal-clad airship ZMC-2. A. R. CARR and A. C. GOOD (Ind. Eng. Chem., 1930, 22, 227-230).—This airship is constructed of "Alclad" alloy sheets, 0.0095 in. thick, the seams of which are sealed with bituminous material and riveted to a supporting frame. Owing to the difficulty of separating helium from air, the air was first displaced upwards by carbon dioxide and then the latter downwards by helium. The carbon dioxide-helium mixture was passed through a caustic soda scrubber and the helium returned. As no dryer was used the final gas was saturated with water vapour. This was removed by recirculating the gas through the scrubber converted into a dryer and charged with solid caustic soda. Blankets prevented the entrainment of the latter. The final gas contained over 92% He and 0.67% CO₂. 100 Cub. ft. of helium per 24 hrs. are required to compensate for outward leakage through the hull. There is no inward leakage of air.

Decomposition of sodium sulphate by silica. BOGITCH. See VIII. Conductivity of chromic acid solutions. CHERRY.—See XI. Solution of arsenious and mercuric iodide. ACTON.—See XX.

See also A., Apr., 423, Electrolytic production of hydrogen (BAARS). 430, Sulphuric acid catalysis (NEUMANN and JÜTTNER). 435, Crystalline sodium sulphide (PECKER). Extraction of rubidium and cæsium from carnallite (JANDER and BUSCH). 438, Preparation of pure hafnium salts (DE BOER and BROOS). Preparation of pure nitric acid (MISH-SCHENKO). New phosphonium salt (EVRARD). 498, Toxicity of lead compounds (BUCK and KUMRO).

PATENTS.

Preparation of chemicals in a granular form. RHENANIA-KUNHEIM VER. CHEM. FABR. A.-G., Assees. of E. GEISEL (G.P. 453,366, 6.3.25. Addn. to G.P. 424,193).—The material is fused and agitated with a proportion of an unfused substance. In examples, sodium sulphide is melted in its water of crystallisation and the liquid is agitated with a quantity of the anhydrous salt while cooling, fused potassium nitrate is stirred with calcium phosphate to obtain a granular mixed fertiliser, or fused borax is mixed with about 1% of wood charcoal to obtain a flux for soldering.

A. R. POWELL.

Manufacture of ammonia salts. "MONTECATINI" Soc. GEN. PER L'IND. MINERARIA ED AGRICOLA, Assees. of G. FAUSER (B.P. 313,446, 10.6.29. It., 11.6.28. Addn. to B.P. 292,129; B., 1929, 978).—The vapour formed by the reaction of the atomised acid in an atmosphere of ammonia is removed by passing it through the acid in the tank from which the atomiser is supplied, thus retaining the ammonia contained therein and avoiding the use of a fan and rectifying column.

H. ROYAL-DAWSON.

Recovery of alkali phosphate and nitrate separately from solutions containing both. [Decomposition of phosphate rock.] I. G. FARBENIND. A.-G., Assees. of R. GRIESSBACH, K. RÖHRE, R. GOLDBERG, and K. O. SCHMITT (G.P. 459,187, 20.11.25).—The rock is treated with nitric acid and an alkali sulphate simultaneously or successively and the filtered solution is neutralised to the monoalkali phosphate stage, whereby the greater part of the alkali phosphate separates on cooling. The mother-liquor is either acidified with nitric acid or treated with an excess of alkali carbonate, evaporated, and cooled to recover alkali nitrate.

A. R. POWELL.

Preparation of hydrogen or hydrogen-nitrogen mixtures. H. BOMKE (G.P. 460,422, 14.12.26).—Coal gas and steam are passed over a catalyst to obtain a mixture of hydrogen and carbon monoxide and, after addition of sufficient oxygen or air to convert the latter into dioxide, the gases are passed first over heated dolomite, then through an absorbent for carbon dioxide. The resulting mixture of hydrogen and nitrogen is suitable for the manufacture of synthetic ammonia.

A. R. POWELL.

Liquation of sulphur etc. (B.P. 325,948).—See I. Internal-combustion engines (B.P. 325,866). Ammonia and hydrogen sulphide from gases (B.P. 299,765). Hydrogen from gaseous mixtures (B.P. 325,968).—See II. Metallurgical furnace (U.S.P. 1,742,441).—See X. White lithopone (B.P. 325,641). —See XIII. Material containing calcium nitrate (B.P. 308,717). Fertilisers (B.P. 326,814 and 326,529). —See XVI. Self-combustible mixtures (B.P. 299,396).—See XXII.

VIII.-GLASS; CERAMICS.

Effect of continued remelting of cullet in sillimanite and fireclay vessels. A. A. CHILDS, V. DIM-BLEBY, H. W. HOWES, and W. E. S. TURNER (J. Soc. Glass Tech., 1929, 13, 296-303 T) .- The repeated remelting at 1400° in open pots in a gas-fired furnace of a glass of initial approximate composition SiO₂ 74%, CaO 8.5%, $Na_2O = 16.5\%$, (Fe₂O₃ + Al₂O₃) as impurity, caused a lowering of the alkali content in one series of nearly 1.5% after 9 meltings. This represented an actual loss by volatilisation as contrasted with the "loss" due to the fall in percentage values as more and more iron and aluminium oxides were taken up from the pot. Fireclay pots behaved similarly, but the pot attack was much more pronounced than in the case of the sillimanite pots. These facts relative to the corrosion of pots are considered noteworthy as this was usually ascribed to melting batch rather than to the attack of the molten glass itself, and in these meltings batch was used to prepare only the first lot of glass, which was then melted and remelted for subsequent trials. M. PARKIN.

Effect on properties of soda-lime-silica glass of continued remelting in platinum. V. DIMBLEBY, H. W. HOWES, W. E. S. TURNER, and F. WINKS (J. Soc. Glass Tech., 1929, 13, 304-321 T).-The effect of pot corrosion was cut out by making 9 remelting tests, similar to those dealt with in the preceding abstract, in platinum vessels heated in an electric furnace. Careful analysis showed that, save for a very slight tendency for the alkali content to fall, there was no certain evidence that any change in chemical composition was thus caused. The densities, determined by the powder method in a sp. gr. bottle and also by a flotation method, using bromoform and pentachloroethane, and the expansions and annealing temperatures, all showed a similar constancy within the (narrow) limits of experimental error. It is pointed out that with such small samples no test of brittleness or " working range" could be made. M. PARKIN.

Devitrification of glass. I. Relative stabilities of different glasses. II. Time-temperature curves of visible devitrification. III. Proposed classification of glasses. C. W. PARMELEE and A. J. MONACK (J. Soc. Glass Tech., 1929, 13, 322-336 T).-I. A number of glasses representative of various types were slowly cooled after heating in crucibles of 15 c.c. capacity

to approx. 1100°, the process taking 12-15 hrs. They were then examined for crystal formation. If necessary the heating and cooling were repeated till devitrification set in. In lead optical glasses a silica content greater than 50-55% appeared to be dangerous (contrast Peddle's 65%). A crown glass containing SiO, 20.2, CaO 13.4, MgO 1.1, alkalis 14.9%, was unexpectedly stable, as 5 thermal treatments did not cause devitrification. A high-zinc oxide glass and a good bottle glass were also of good stability, whilst Fourcault window glass, plate and wire glass, and a light barium crown optical glass devitrified with only one treatment. A borosilicate crown optical glass, although devitrified on the surface, was quite clear inside, even after several treatments, and pyrex glass was practically completely devitrified as a result of a single treatment.

II. Time-temperature curves of visible devitrification were taken, the glass being wrapped in platinum foil suspended by the thermocouple 2—3 mm. below the junction. The quenched samples were viewed under a magnification of 380 diam. to find crystals; if none was found a fresh sample was heated at the same temperature for a longer time and so on till devitrification did set in. These time-temperature curves taken for a light flint optical glass, plate glass, and wire glass showed the value of the method.

III. It is suggested that the area of the rectangle lying between the 0 and 2 hrs. ordinates and 600° and 1200° abscissæ, and outside the curve be taken as a measure of the tendency to devitrify. The greater this area the less is the tendency, provided the curves are plotted to a standard time and temperature scale. A devitrification constant $V = A/(a \times b)$, where A is the area referred to, a the linear measure in cm. of 100° on the temperature axis, and b that in cm. of 1 hr. on the time axis, is suggested as a means of classification. On this basis glasses of class (i) would have V = 12 or less, of class (ii) V = 12—30, and of class (iii) V = above 30. M. PARKIN.

Velocity of crystallisation of soda-lime-silica glasses. A. DIETZEL (Sprechsaal, 1929, 62, 506-509, 524-525, 543-544, 562-568, 584-585, 603-604, 619-621, 638-639, 657-660; Chem. Zentr., 1929, ii, 2487-2488).—The speed of crystallisation is not affected by the thermal history. The curve of the speed is acute for the "short" glasses rich in lime, and flatter for "long" glasses rich in silica. In glasses containing 18% Na₂O, calcium oxide up to 8% has a favourable effect on the vitreous property; for 12%Na₂O the favourable effect of lime is observed up to 12%. In a spatial conception of the maximum crystallisation speed isotherms there is a "valley" extending from 18% Na₂O, 9% CaO to 12% Na₂O, 13.7% CaO; the equation of this line is y = 23.3 - 0.79x, where x is the content of soda and y that of lime. A corresponding line on the devitrification time isochronal diagram is $y = 27 \cdot 7 - (62x - x^2 - 422)^{\frac{1}{2}}$ A. A. ELDRIDGE.

Velocity of crystallisation of soda-lime-silica glasses. K. TABATA (J. Soc. Glass Tech., 1929, 13, 350 T). E. ZSCHIMMER (*Ibid.*, 350-351).—Zschimmer's results (B., 1929, 472) claiming that alteration of the conditions, *e.g.*, time of heating, alters the nature of

the results obtained are criticised. Tabata suggests that longer heating periods at the lower temperatures should be employed.

In reply ZSCHIMMER refers Tabata to the more detailed work (Zschimmer and Dietzel, Sprechsaal, 1927, 58, 110), with which Tabata's results were not in disagreement. A more important point was that recently much higher equilibrium temperatures than those given by Morey and Bowen or by Dietzel had been obtained. Zschimmer considers it important to decide whether devitrification should be induced under falling or rising temperature conditions. M. PARKIN.

X-Ray investigation of felspar glasses. G. L. CLARK and C. R. AMBERG (J. Soc. Glass Tech., 1929, 13, 290—296 т).—Samples of clear silica glass and fused soda felspar were subjected to X-ray analysis using a lead button to exclude the main beam and so cut out the halation which obscured the rings close to the centre. In every case, no matter at what temperature between 1165° and 1700° the felspar was fused, two diffuse rings were obtained, the inner being the more intense. The values found denoted a silica molecule 7.15 Å. long, as against 6.42 Å. from the values of Pauling and Goldschmidt, and 2.52 Å. wide as against 2.80 Å. The molecules were arranged in chains with gaps 0.222 Å. between each. The addition of other oxides as in felspar glass caused a modification of this arrangement resulting in decreased spacings. M. PARKIN.

Diffraction of X-rays by ordinary glass subjected to various treatments. C. W. PARMELEE, G. L. CLARK, and A. E. BADGER (J. Soc. Glass Tech., 1929, 13, 285-290 T).-The X-ray patterns of various commercial glasses were photographed to see whether sharp line patterns were produced. Selenium and copper rubies showed only diffuse rings, as did also a cryolite opal glass. Devitrified pyrex glass gave well defined cristobalite lines, whilst glasses coloured by materials in true solution, viz., amber (Fe₂O₃), blue (CoO), green $(CuO + Cr_2O_3)$, gave only diffuse ring patterns. When a piece of soda-lime glass (from a bottle-glass tank), which exhibited the blue opalescence of incipient devitrification, was tested it gave the diffuse ring, but when heattreated to produce definite crystals and again tested, the same ring was present plus two annuli bounding this, which with the sharp lines formed the pattern of the devitrification product. In consequence, diffuse rings were taken as a sign of incipient crystal formation. Next, a bead of soda-lime glass in a furnace was tested as the temperature was progressively raised in 100° steps to 1300°, with 12-hr. exposures, but no material change in pattern and no devitrification took place. Compressing the specimens did not produce patterns. The X-ray method was thus not suitable for detecting strain in opal glasses. M. PARKIN.

Coloration of glass by X-rays. C. W. PARMELEE, G. L. CLARK, and A. E. BADGER (J. Soc. Glass Tech., 1929, 13, 279—285 т).—Published work dealing with the coloration of glasses by X-rays and those from radium is reviewed, and the results of experiments in which borax beads containing a series of 45 substances to be tested were subjected to the radiation from a tungsten target X-ray tube (70,000 volts, 4 ma.) for $33\frac{1}{2}$ hrs. are

tabulated. Of the compounds tested only those of chromium, lead, thallium, bismuth, and manganese gave pronounced changes of colour, these yielding brownish-yellow, brown, dark brown, orange-yellow, and violet hues respectively. M. PARKIN.

Manufacture of blue glass and the decomposition of sodium sulphate by silica. B. BOGITCH (Compt. rend., 1930, 190, 794-796) .- The fusion of sodium sulphate and silica results in the formation of two superposed liquid layers of the molten salts containing small quantities of silica and sulphuric acid, respectively. The sodium sulphate (upper) layer is destroyed above 1250°, especially if air, nitrogen, or carbon dioxide is bubbled through the melt, whilst carbon dioxide containing more than 10% CO produces coloured (yellow to orange) glasses owing to the progressive transformation of sulphate into sulphur. Addition of sufficient iron silicate to produce a glass containing 0.75% Fe gives a blue glass with 9.5% CO, and a green glass with more than 12.5% CO. The fact that blue glasses are not always obtained in practice under these conditions is due to the slow rate of reaction (cf. A., 1929, 1409). J. GRANT.

Influence of chemical composition on the physical properties of glazes. F. P. HALL (J. Amer. Ceram. Soc., 1930, 13, 182-199).-A study was made of the factors affecting that type of crazing which is caused by unequal expansion or contraction of body and glaze. The physical properties of a large number of glazes in the form of homogeneous glass rods were determined, and a method is indicated for calculating from the chemical composition the approximate values for tensile strength, modulus of elasticity, and the mean coefficient of linear expansion of the glaze. F. SALT.

Possible use of certain California clays in vitreous china sanitary-ware bodies. W. F. DIET-RICH and W. W. MEYER (J. Amer. Ceram. Soc., 1930, 13, 202-217).—The possibility of substituting Californian clays for English china clay and ball clay in a standard sanitary-ware body composed of 32.5% of English china clay, 7.5% of English ball clay, 10% of Tennessee ball clay, 25% of Californian felspar, and 25% of silica was studied. Chemical and physical data on the various clays used are given. Five reasonably good bodies were developed. F. SALT.

Determining the water content of clays. C. L. DEEDS (J. Amer. Ceram. Soc., 1930, 13, 200-201).-Four kg. of water are added to 2 kg. of a representative sample of the clay being tested, and the mixture is blunged. A 250-c.c. flask is filled with this slip and weighed. The amount of dry clay is found from the equation : D = (P - 250)[G/(G - 1)], in which D = wt. of dry clay, P = wt. of slip, and G = sp. gr. of dry clay.From this the percentage of water in the clay is readily F. SALT. obtained.

Rapid method for determination of moisture in grog, semi-porcelain pastes, and granulated blast-furnace slag. P. P. BUDNIKOV (Chem.-Ztg., 1930, 54, 202-203).-The material (20 g.) is heated at 110° in a container through which a current of dry air can be aspirated by means of a filter pump.

H. F. HARWOOD.

Refractory cements. MoMULLEN.—See IX. Spalling furnace. BAUMANN.—See XI. Clay formation and the weathering of felspars. TAMM.—See XVI.

See also A., Apr., 443, Determination of alkalis in silicates (MALJAROV).

PATENTS.

Stratified bodies such as strengthened glass. TRIPLEX SAFETY GLASS Co., LTD., W. R. LYTTLETON, J. WILSON, and H. W. DICK (B.P. 326,229, 5.12.28, 18. and 27.3.29).—A sheet of glass is coated on its unexposed side first with gelatin and then with a celluloid enamel, and, after softening this surface and also that of a sheet of transparent cellulose ester by spraying with a liquid solvent or plasticiser, the two sheets are firmly united by pressure and heat.

F. R. ENNOS.

Manufacture of strengthened glass. TRIPLEX SAFETY GLASS Co., LTD., and J. WILSON (B.P. 326,259, 13.12.28).—Two or more sheets of glass are treated on their unexposed surfaces with a water-soluble coating, *e.g.*, gelatin, with or without a further coating of celluloid enamel, and are firmly united to an interposed transparent layer of celluloid by removing the coating from the marginal portions, applying a plastic luting material such as a solution of rubber and/or an ester gum in a solvent which is also a solvent for the central layer, and subjecting the whole to pressure.

F. R. ENNOS.

Continuous kilns of the Hoffman type. F. NOVELLI (B.P. 309,547, 11.4.29. It., 12.4.28).—The heat is provided by solid fuel burnt among the material, *e.g.*, bricks, being fired. The bricks are stacked so as to form a series of gratings of which the apertures decrease in size downwards, and the fuel is charged through an opening in the top of the chamber, small pieces first, largest lumps last, so that the distribution of heat will remain uniform as the fuel burns away. The bricks actually supporting the fuel usually have to be previously fired, and are arranged as pillars or retorts below the charging openings, but they are surrounded by new bricks. B. M. VENABLES.

Waste gases from furnaces (B.P. 326,205).-See I.

IX.-BUILDING MATERIALS.

Portland cements of high iron oxide content. I. S. NAGAI and K. AKIYAMA (J. Soc. Chem. Ind., Japan, 1930, 33, 47–49 B).—Extensive experiments on the preparation and physical properties of Portland cements containing 6–8% of iron oxide are described.

S. K. TWEEDY.

Testing refractory cements. C. McMULLEN (J. Amer. Ceram. Soc., 1930, 13, 171—173).—An electricallyheated furnace is described which attains a maximum temperature of 1500°, with the aid of which the transverse strength of bars of cement can be tested at high temperatures. The results of modulus of rupture tests on cements carried out at temperatures between 20° and 1400° and also cold after having been heated to various temperatures are presented. The effects of ignition of the temporary bond, the expulsion of the water of hydration in the clay, and of incipient fusion of the clay are noted. F. SALT.

Small-piece testing on strength of cement mortars. III. S. NAGAI (J. Soc. Chem. Ind., Japan, 1930, 33, 46 B).—The relation between C and c (cf. B., 1930, 241) for 1 : 3-cement-sand mortars is $(C-C') = B \times$ (log $c - \log c'$), where B is a constant, which is large in the case of mixed Portland cements, blast-furnace slag cements, "solidit," "neo-solidit," etc. The influence of increase in the water-cement ratios on the decrease of c was also studied. The difference between various kinds of cements is reflected in the different values of the "constants of strength" for these cements.

S. K. TWEEDY.

Paints and wood surfaces. GARDNER.-See XIII.

See also A., Apr., 428, Velocity of dehydration and subsequent hydration of gypsum (BUDNIKOV).

PATENTS.

Manufacture of artificial masses [for covering floors and walls]. Soc. DES PROD. BELTON, and M. FAVRESSE (F.P. 633,754, 29.3.27).—Vegetable residues, e.g., leaves, seaweed, are treated with hypochlorite solution, then with 10% sulphuric acid, and, after neutralisation with soda, the mass is dried, pulverised, and mixed with regenerated rubber, resins, gelatin, drying oils, etc. The material containing rubber is formed into shape after plasticising with sulphur chloride and carbon tetrachloride. A. R. POWELL.

Fine-grinding of material (B.P. 326,366).—See I. Artificial materials (B.P. 325,872). Conduits for gases (B.P. 325,793).—See II.

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

Passivity of metals. IV. Influence of acids in passivity and corrosion. U. R. EVANS (J.C.S., 1930, 478-492; cf. A., 1930, 29).-Owing to the strong oxidising and weak base-dissolving properties of chromic acid it causes iron to become passive when alone, but increases the rate of dissolution of iron when sulphuric acid is also present. The rapid destruction of the oxide film usually present on iron by immersion of the metal in sulphuric acid is due to cathodic reduction of the film to ferrous oxide owing to formation of the cell iron acid ferric oxide. Addition of chromic acid prevents this reduction, so that the film remains intact for many hours in 0.1M-sulphuric acid. A preliminary anodic oxidation of the metal has the same effect as addition of chromic acid, hence the passivity of iron in acid solution during anodic treatment is due to the presence of an oxide film, contrary to the contention of Müller (A., 1928, 1319). The action of carbon dioxide during the rusting of iron has been further investigated, and it is concluded that many of the phenomena hitherto attributed to its agency are in reality caused by the presence of sulphur dioxide or hydrogen chloride. Thus droplets of condensed water on iron develop rust only in places where the iron is non-homogeneous, irrespective of the presence or absence of carbon dioxide; in fact, droplets on a non-rusty surface may be dried up in a current of carbon dioxide without the development of rust; a trace of hydrogen chloride, however, immediately causes general rusting. A solution of carbon

dioxide first causes slight corrosion of iron of the hydrogen-evolution type, but the acidity of the solution rapidly decreases, the evolution of hydrogen ceases, and the ferrous hydrogen carbonate formed is oxidised at the water-line to ferric hydroxide, which then tends to prevent diffusion of oxygen and consequent corrosion of the oxygen-absorption type. Waters saturated with carbon dioxide are therefore accelerators of the corrosion of iron, chiefly on account of the fact that they have a high solvent action on calcium compounds, and therefore prevent or hinder the formation of a protective scale on the surface of the metal. A. R. POWELL.

Properties of corrosion-resisting alloys. P. S. MENOUGH (Blast Furnace Steel Plant, 1929, 17, 1648— 1651, 1810—1815).—A discussion, with tables of comparative properties, of chromium and nickel-chromium steels. CHEMICAL ABSTRACTS.

Reproducibility in corrosion work. U. R. EVANS (Amer. Electrochem. Soc., May, 1930. Advance copy. 11 pp.).-Even when the conditions are as uniform as possible, incomplete reproducibility is to be expected in corrosion work owing to the fact that corrosion begins at a number of isolated points on the surface of the metal. When the number of these points is small a wide variation in the behaviour of individual specimens can be predicted on a purely probability basis, but when the number of points of attack per unit area is large, complications arise because corrosion at one point may hinder that at neighbouring points or even prevent it from starting. The area protected in this way decreases with decreasing conductivity of the solution, indicating that the action is one of cathodic protection. Under such conditions the reproducibility will evidently be greater than that predicted from the probability theory on the assumption that the points of attack can be regarded as independent of one another.

H. J. T. ELLINGHAM.

Relation between the liquidus lines of cast iron and its chemical composition. F. YAMADA (J. Iron Steel Inst., Japan, 1929, 15, 184—186).—It is assumed that in the determination of the liquidus the influence of elements other than carbon can be reduced to that of carbon; the carbon equivalents are $0.387 \times (P \%)$, $0.215 \times (Si \%)$, and $0.077 \times (Cr \%)$.

CHEMICAL ABSTRACTS.

Arc-welding of cast iron with metallic electrodes. S. SATOH (Rev. Mét., 1930, 27, 37-48).— Excellent welds in cast iron have been obtained by the use of soft iron welding rods covered with a paste of 40-60% of graphite and 60-40% of carborundum with 1% of barium carbonate, bonded with sodium silicate solution ($d1\cdot3$). The welding rod should be connected to the negative terminal of the dynamo and used with 150 amp. at 20-22 volts; no preheating of the work is necessary. Analyses, hardness figures, and micrographs are given of welds produced with these rods, and the effect of additions of 48 other compounds instead of barium carbonate is discussed. A. R. POWELL.

Determination of carbon in open-hearth practice. K. HONDA and T. KASÉ (J. Study Met., Japan, 1929, 6, 49-52).—Since the hardness-carbon content curve is steep, the carbon content can be determined Indirectly by measurement of the (Rockwell) hardness. The results accord with those obtained by chemical analysis. CHEMICAL ABSTRACTS.

Determination of molybdenum in steels and in ferromolybdenum. W. WERZ (Z. anal. Chem., 1930, 80, 109-112).—The steel (3-5 g.) is dissolved in 40 c.c. of hydrochloric acid, the solution evaporated to dryness, and the residue heated at 130°, cooled, and dissolved in 30 c.c. of hydrochloric acid and 10 c.c. of 1:1 nitric acid. After filtering to remove silica, the solution is evaporated to expel most of the acid, diluted with hot water, and poured into a boiling solution of 70 g. of sodium hydroxide in 300 c.c. of water. The mixture is cooled, diluted to 750 c.c., and 600 c.c. of this solution are filtered through a dry paper, rendered just acid to methyl-orange by addition of nitric acid, heated to boiling, and treated with 10-15 c.c. of 10% lead nitrate solution. The precipitate of lead molybdate is collected in a glass filter-crucible, washed with hot water, dried at 200-300°, and weighed. If the steel contains tungsten, 3-5 g. are dissolved in hydrochloric acid, the solution is oxidised with nitric acid, evaporated, diluted, and poured into an excess of hot sodium hydroxide solution. An aliquot part of the alkaline liquor is filtered, made just acid with sulphuric acid, and boiled with an excess of ammonia. The precipitate is removed and the solution boiled with 20 c.c. of 30% tartaric acid, ammonia to alkalinity, and 50 c.c. of freshly prepared ammonium sulphide solution; acidification with 50 c.c. of 1:1 sulphuric acid effects precipitation of molybdenum sulphide free from tungsten. The sulphide is collected, washed, and converted into trioxide for weighing. Ferromolybdenum is analysed by the first of the above methods after decomposition by fusion with peroxide. A. R. POWELL.

Determination of beryllium in aluminium-free steel. F. SPINDECK (Chem.-Ztg., 1930, 54, 221).-Steel filings (1 g.) are dissolved in hydrochloric acid (d 1.12), oxidised with nitric acid, evaporated, and again evaporated with hydrochloric acid. The residue is dissolved in a little hydrochloric acid and silica removed by filtration. The diluted filtrate is heated and sodium acetate added to precipitate iron and chromium. The mixture is made up to 1 litre and 500 c.c. of the clear solution are evaporated to 30-40 c.c., filtered, and the slight iron precipitate washed on the filter with sodium acetate solution. The filtrate is treated with hydrochloric acid, boiled for 2 min., and precipitated with ammonia at 20-30°. The precipitate is collected, washed, ignited, and weighed as beryllia. With highchromium steels it is advisable to dissolve in sulphuric acid and oxidise the chromium with silver nitrate and ammonium persulphate solution. Silver is removed by hydrochloric acid; iron and beryllium are precipitated with ammonia, dissolved in hydrochloric acid, and J. H. BIRKINSHAW. separated as before.

Effect of heat-treatment on certain silver-zinc and silver-cadmium alloys. L. GUILLET and J. COURNOT (Rev. Mét., 1930, 27, 1–7).—On annealing at 600° zinc-silver alloys with $69 \cdot 77\%$ and $62 \cdot 28\%$ Ag and quenching, a homogeneous solid solution is obtained which decomposes on tempering at 210° with the

British Chemica	Abstracts-B
464	CL. X METALS ; METALLURGY, INCLUDING ELECTRO-METALLURGY.

separation of Zn₃Ag₂ in a highly dispersed form in the first case and in relatively coarse crystals in the second ; in both cases appreciable hardening takes place. The cadmium-silver alloy with 60% Ag has a homogeneous structure when quenched from 600°; on subsequent annealing at 150-320° a new constituent appears along the grain boundaries and as needles in the grains themselves, but practically no change occurs in the hardness. On the other hand, an alloy containing 49.25% Ag has a hardness of 119 after annealing at 500°, 86 after quenching from 500°, 107 when subsequently annealed at 150°, and 80 when annealed at 320°. The microstructure shows corresponding complex changes during these heat treatments, and it appears that the accepted equilibria in this section of the diagram do not represent A. R. POWELL. the facts.

Roasting and sintering of galena in a rotating furnace. N. C. KYRIACOU (Rev. Mét., 1930, 27, 49-53). —The theory of the roasting and sintering of galena for blast-smelting is explained and the advantages of a rotating furnace over the usual Huntington-Heberlein and Dwight-Lloyd roasting furnaces are discussed. Finally the operation of various types of rotating furnaces in operation at several lead smelting works (mostly American) is described briefly. A. R. POWELL.

Purity of lead at the time of the Nativity. A. EBELING and H. ADAM (Wiss. Veröff. Siemens-Konz., 1929, 8, [3], 203—209).—A specimen of Roman lead pipe found at Pompeii was encrusted with lead carbonate containing 0.5% Sn and consisted of coarse crystals of lead cemented together with lead oxide. After removing the corrosion products with 30% acetic acid the lead crystals contained 0.451% Sn, 0.066% Cu, 0.075% Sb, 0.006% As, 0.004% Ag, 0.005% Fe, 0.003% Zn, and 0.004% Sb. A specimen of Roman lead from Spalato-Salona, Dalmatia, contained 0.119% Sn, 0.036% Cu, 0.007% Sb, 0.001% As, 0.004% Zn, 0.001% Ni, and 0.004% Si. The complete absence of bismuth in both samples is noteworthy. A. R. POWELL.

Physics and metallography. W. ROSENHAIN (Z. Metallk., 1930, 22, 73—78).—A lecture to the Deutsche Gesellschaft für Metallkunde, in which the value of a knowledge of the lattice structure in the study of metals and alloys is discussed. A. R. POWELL.

Crystallographic analysis by X-rays. A. Roux and J. COURNOT (Rev. Mét., 1929, 26, 655-661; 1930, 27, 8-18).-Simultaneous electrodeposition on iron or aluminium of cadmium and silver, tin, or nickel, or of copper and zinc yields deposits which are shown by X-rays to consist of complex mixtures of solid solutions and compounds and not of mixtures of the pure metals. The heat-treatment of silver-zinc alloys with 69.77% and 62.28% Ag has been followed röntgenographically. After quenching from 500-600°, the alloys consist of a homogeneous solid solution with a face-centred cubic lattice, a = 4.054 and 4.367 Å., respectively. Annealing at 210° results in hardening due to deformation of the lattice into the tetragonal system, owing to the precipitation of a second constituent in a finely-divided form, undetectable by X-rays. The tetragonal lattice of the alloy with the higher silver content has a = 4.054 Å, and b/a = 1.02, and that of the other alloy has a = 4.175 Å.

and b/a = 1.06. Hardening of the aluminium-copper alloy (10% Al) after quenching and tempering takes place in a similar manner. The mechanism of deformation and recrystallisation during cold-working and annealing of aluminium and duralumin and the effect of impurities in restraining the grain growth of copper and aluminium during recrystallisation are illustrated by numerous röntgenographs taken at various stages of the treatment. A. R. POWELL.

Moisture in blast-furnace slag. BUDNIKOV.—See VIII. Active oxygen as anti-rust agent. HEBBER-LING. Rust-preventive paints. HOEPKE. Pigments and rust prevention. WAGNER.—See XIII. Corrosion of canned-food containers. BOGATSKY and others.— See XIX.

See also A., Apr., 402, Tellurium-platinum thermoelements (TEICHMANN). 419, Iron-nitrogen system (EPSTEIN and others). System nickel-chromium (NISHIGORI and HAMASUMI). 445, Spectroscopic determination of bismuth in copper (LOMAKIN).

PATENTS.

Metallurgical furnace. F. A. J. FITZGERALD and J. KELLEHER, ASSTS. to TITANIA CORP. (U.S.P. 1,742,441, 7.1.30. Appl., 24.7.28).—An electric furnace for the production of titanium nitride consists of a chamber of refractory material provided with an inclined grate to support the charge and a resistance heating element above the charge. Nitrogen is caused to circulate through the charge. Gas-tight charging and discharging hoppers are provided. C. A. KING.

Ignition furnace. METALLGES. A.-G. (B.P. 318,197, 19.6.29. Ger., 30.8.28).—The width of the exit slit of an ignition furnace may be varied by a lateral movement of the side walls of the furnace.

C. A. KING.

Heating or melting of metals or alloys by induced currents of electricity. C. TAMA, and ELECTRIC FURNACE CO., LTD. (B.P. 325,940, 7.1.29).—A charge to be melted in an induction furnace is rendered conductive by chemical or electrochemical treatment so that currents of comparatively low frequency may be used throughout the heating operation; *e.g.*, finely-divided material is pressed into coherent masses and the surface of materials coated with oxide is cleaned electrolytically. C. A. KING.

Manufacture of steel. J. K. SMITH, Assr. to GRANULAR IRON CO. (U.S.P. 1,742,487, 7.1.30. Appl., 11.2.28).—Iron is charged into an open-hearth furnace, covered with a mixture of basic slag, ground limestone, and carbonaceous material, and melted. C. A. KING.

Heat-treatment of steel and iron. GES. F. INDUSTRIEGASVERTUNG M.B.H. (B.P. 297,796, 23.8.28. Ger., 28.9.27).—Iron or steel heated to within the usual limits of annealing temperatures is cooled continuously to normal temperature by immersing it in a liquefied gas of low b.p., e.g., liquid air. It is claimed that thereby the hardening proceeds much more slowly than by a single immersion in water, but a similar effect may be obtained by interrupting the cooling in water or oil so that the successive immersions approximate to the conditions of a single immersion in liquid air.

C. A. KING.

Steel. W. C. HAMILTON and C. E. SIMS, Assrs. to AMER. STEEL FOUNDRIES (U.S.P. 1,742,857, 7.1.30. Appl., 3.12.27).—Steel suitable for car wheels consists of a high-manganese, pearlitic steel containing 1-2.5%Mn and 0.5-2% Cu. C. A. KING.

Surface-hardened material and its production. Case-hardening. A. B. KINZEL, Assr. to ELECTRO METALLURGICAL CO. (U.S.P. 1,736,919 and 1,736,920, 26.11.29. Appl., [A] 28.7.27, [B] 20.8.27).—(A) The surface layer of iron or steel is "aluminised" by heating the article in contact with powdered aluminium. It is claimed that the presence of aluminium in iron greatly accelerates the action of case-hardening by nitrogenous substances, *e.g.*, ammonia. (B) The presence of more than 0.3% V in solid solution in iron accelerates nitrogenisation of steel by ammonia and similar case-hardening reagents. Aluminium may also be present with advantage as in (A). C. A. KING.

Hard [iron] alloy. R. PAQUET (Dutch P. 17,526, 13.10.25).—An alloy of 67% Fe, 0.3% Ni, 20% Cr, 9.5% Mo, 0.3% W, 1% V, 2% Mn, and 1.7% C is claimed. A. R. POWELL.

Hard [tungsten] alloy and its manufacture. P. M. McKENNA, Assr. to VANADIUM ALLOYS STEEL CO. (U.S.P. 1,737,255, 26.11.29. Appl., 22.1.29).—A hard alloy suitable for machine tools consists of tungsten, up to $5 \cdot 5\%$ Be, and not more than 7% (preferably less than 3%) C. The alloy is prepared by heating a mixture of tungsten and carbon black in a neutral atmosphere and grinding the product with powdered beryllium in a ball mill for 8 hrs.; the powder is then pressed hydraulically, heated, cut to shape, and sintered.

C. A. KING. Age-hardening aluminium alloys. ALUMINIUM-IND. A.-G. (Swiss P. 124,793-4, 5. and 19.11.26. Ger., [B] 21.8.26).—(A) The alloy comprises a nearly saturated solid solution of zinc or copper in aluminium to which is added not more than 4% of a constituent which will produce age-hardening, e.g., tin, cadmium, silicon, or magnesium silicide. (B) The alloy comprises aluminium with 10-15% Zn, 1.5-3% Cu, 0.05-0.2% Mg, 1-2% Fe, and small quantities of manganese, nickel, chromium, or titanium. Part or all of the iron may be replaced by silicon. A. R. POWELL.

Manufacture of vanadium-aluminium-silicon alloys. VANADIUM CORP. OF AMERICA, Assees. of B. D. SAKLATWALLA (B.P. 305,202, 20.12.28. U.S., 2.2.28).— See U.S.P. 1,727,180; B., 1929, 945.

Moulds for casting metals. A. E. WHITE. From ALUMINIUM, LTD. (B.P. 325,553-4, 21.8.28).

Drying and heating apparatus (B.P. 326,269).— See I. Metallising bands (U.S.P. 1,731,261).—See XI. Uniting rubber to metal (B.P. 307,056 and 310,461).— See XIV.

XI.—ELECTROTECHNICS.

[Electric] furnace for high temperatures. S. REINER (Chem. Fabr., 1930, 101-102).—The furnace comprises a highly refractory tube embedded in a mass of "kryptol" packed inside a rectangular prismatic brick structure. The kryptol acts as the heating resistance, and for heating a tube 10 cm. in diam. and about 40 cm. long a current of 100 amp. is required. Temperatures of 2000° can be maintained for some time and an oxidising atmosphere is obtained by passing a current of air through the tube. A. R. POWELL.

Electric spalling furnace. H. N. BAUMANN, JUN. (J. Amer. Ceram. Soc., 1930, 13, 167—170).— A description is given of an electric furnace which is heated by a graphite (or silicon carbide) resistor. Twelve standard refractory bricks can be heated simultaneously to $1350^{\circ} \pm 20^{\circ}$. In the spalling test one brick from each side of the furnace is removed at a time and subjected to an air-blast for 10 min. F. SALT.

Safety devices for electric light and power plant in chemical works. G. A. SCHMIDT (Chem. Fabr., 1930, 115—116).—An automatic cut-out for use in place of the usual fuses for electric motors in chemical works is described and illustrated in various modifications. A. R. POWELL.

Some conductivity characteristics of chromic acid and chromic acid chromium-plating solutions. R. H. CHERRY (Amer. Electrochem. Soc., May, 1930. Advance copy. 9 pp.).—Approximate data have been obtained for the specific conductivity of chromic acid solutions of various concentrations at various temperatures. At 25° the conductivity reaches a maximum at about 3.75M, and at 45° at about 4.5M. The conductivity of a $2 \cdot 5M$ -solution is a linear function of temperature. The presence of chromic sulphate has only a small effect on the conductivity, but with $2 \cdot 5M$ chromic acid solution a maximum conductivity is reached when the ratio of the chromic acid molarity to the sulphate normality is $55 \cdot 5$. From the conductivity data for chromic acid solutions, values of the degree of dissociation and the hydrogen-ion concentration are calculated on the basis of the classical theory of H. J. T. ELLINGHAM. electrolytic dissociation.

Testing refractory cements. McMullen.—See IX. Arc-welding of cast iron. SATOH.—See X. Determination of crystal in massecuites. ŠANDERA. Electrodialysis of molasses. KAMEYAMA and KATO. —See XVII. Electrodialysis of wort and beer. WINDISCH and others.—See XVIII.

See also A., Apr., 391, Photo-cell (LANGE). 402, Measurement of weak alternating currents (TEICH-MANN). 422, Standardisation of antimony electrodes (ITANO). Biilmann's quinhydrone electrode (ITANO and ARAKAWA). 423, Overvoltage in the electrolytic production of hydrogen (BAARS). 433, Action of silent discharge on oils, fats, and fatty acids (IWAMOTO). 446, Apparatus to measure colour temperature of lamp filaments (SHARP). 451, Action of silent discharge on saturated fatty acids (IWAMOTO).

PATENTS.

Electrolytes for electric cells. L. A. LEVY, and ALMEIDA ACCUMULATORS, LTD. (B.P. 324,918, 5.11.28).— An electrolyte for secondary cells of the type described in B.P. 320,916 (B., 1930, 153) consists of zinc chloride and potassium bromide, or chlorides and bromides of potassium and zinc, a small amount of hydrochloric acid,

and an organic acid or salt, *e.g.*, zinc or potassium acetate, or acetic acid. J. S. G. THOMAS.

Production of an electrical connexion of high conductivity between a layer formed of a metal compound and a conductor. SIEMENS-SCHUCKERT-WERKE A.-G. (B.P. 305,171, 29.1.29. Ger., 1.2.28).—A layer of finely-divided graphite, *e.g.*, Aquadag, is sprayed upon the metal compound, *e.g.*, a metallic oxide rectifier, before the application of a metal coating.

J. S. G. THOMAS.

Metallising the surfaces of insulating bands particularly for use in electrical condensers. E. PFIFFNER, Assr. to RADIO PATENTS CORP. (U.S.P. 1,731,261, 15.10.29. Appl., 16.12.25. Ger., 24.11.24).— A flexible band of insulating material is passed by means of rollers through a series of baths consisting alternately of a solution of a metal compound, *e.g.*, ammoniacal silver oxide solution, and of a solution of a reducing agent, *e.g.*, formaldehyde, whereby first one side of the band and then the other is coated with a conducting film of metal. A. R. POWELL.

Apparatus for generating actinic rays. V. H. M. A. DANGERFIELD (B.P. 327,122, 24.12.28. Addn. to B.P. 275,596).

Solid electric conductor, especially for high and maximum voltages. METALLGES. A.-G. (B.P. 314,340, 21.6.29. Ger., 25.6.28).

Control of temperature (B.P. 326,309).—See I. Internal-combustion engines (B.P. 325,866). Lubricating oils (B.P. 325,832).—See II. Metallurgical furnace (U.S.P. 1,742,441). Heating of metals or alloys (B.P. 325,940).—See X. Separation of rubber from latex (B.P. 307,747 and 325,401). Plastic composition (B.P. 325,312).—See XIV. Treatment of milk (B.P. 325,470).—See XIX.

XII.—FATS; OILS; WAXES.

Preservation of fats. G. W. FIERO (Amer. J. Pharm., 1930, 102, 146-154).-The preserving action on lard of a large number of substances has been examined. Complete preservation was effected by resorcinol (1%), clove oil (0.38%), guaiacol (0.06%), thymol (2.5%), and creosote (0.25%). Using the following substances, the lard remained free from rancidity (Kreis test) for four weeks in a warm, light room, or for 10 weeks in a cool, dark room, but rancidity developed after 8 and 25 weeks, respectively : safrole (0.5%), sodium benzoate (1%), sodium benzoate dissolved in water and emulsified with the fat by means of neutral soap (0.1%). "Methenamine" completely prevented rancidity, but the fat became yellow on keeping. Mixtures of lard with the following substances did not develop rancidity : hydrogenated oil (25%), white wax and petrolatum (25% of each), white wax and liquid paraffin (25% of each), paraffin and liquid paraffin (25% of each).

E. H. SHARPLES. Fractional saponification of fatty substances. I. E. DE'CONNO and L. FINELLI (Annali Chim. Appl., 1930, 20, 67-73).—The results of experiments on drying, semi-drying, and non-drying vegetable oils, fish oils, animal and vegetable solid fats show that partial saponification, by modifying considerably the constants of the unsaponified part (especially the Tortelli heat number) and of the saponified part (mean mol. wt. of the non-volatile insoluble acids), may furnish useful indications concerning adulteration of edible fats.

Colorimetry of oils and fats. F. PALLAUF (Chem. Umschau, 1930, 37, 21—22).—Observations of Greitemann (B., 1929, 564) are criticised. In view of the current English standard practice (Brit. Stand. Spec., No. 258), the standardisation of the iodine colour value in terms of mg. of iodine per 100 c.c. of solution and the use of a layer 10 mm. thick (except in the case of very pale edible oils) is advocated ; further, these conditions lead to more convenient numerical values for the colour index. E. LEWKOWITSCH.

Free [fatty] acid important in cotton-seed value index. G. S. MELOY (Oil & Fat. Ind., 1930, 7, 135–138). —Calculations and formulæ are described for determining the value index of an actual cotton-seed in relation to quotations for a "basis cotton-seed": the latter is taken as a seed which on analysis gives oil 19%, ammonia 3.5%, tare 11%, and free fatty acids not more than 2% at the time of purchase. A table is given for the corrections to be applied to the index of seed containing excess of free fatty acids.

E. LEWKOWITSCH.

Separation of solid and liquid fatty acids and detection of hardened fats in cacao butter. J. GROSSFELD (Chem. Umschau, 1930, 37, 3-13, 23-28). -Appreciable losses of solid unsaturated acids may occur by the recrystallisation of the insoluble lead salts from 95% alcohol, such loss being favoured by the presence of potassium acetate and reduced by the presence of excess of lead acetate; it is, however, notable that the losses of isooleic acid become relatively much greater as the total amount of the acid present increases, so that even small quantities of hardened oils can be detected in admixture with cacao fat. By dilution of the alcoholic solution with water it is possible to recover far greater quantities of isooleic acid : at first no appreciable amount of lead oleate is precipitated with it, but after a certain degree of dilution the precipitation of the oleate increases rapidly, but may be modified by the presence of acetic acid or lead acetate, or by temperature conditions. A new procedure is detailed for the fractional crystallisation of the lead salts from aqueous alcohol, by which oleic and other liquid acids are quantitatively removed. E.g., 2.5 g. of fat are saponified with 1 c.c. of 50% potash and 25 c.c. of 95% alcohol and decomposed with 100 c.c. of lead acetate solution (50 g. of crystals and 5 c.c. of 96% acetic acid made up to 1 litre with 80 vol.-% alcohol). The salts are completely dissolved by warming, 20 c.c. of boiling water are added, and the mixture is kept overnight; the precipitate thus formed is collected on a glass Gooch crucible and washed with 50 c.c. of 70% alcohol and the crucible is fitted in an inverted position in an extractor, 3 c.c. of 96% acetic acid are poured over the plate, and the salts are dissolved, by extraction, in 100 c.c. of the lead acetate solution, then 15 c.c. of hot water are added with shaking and the solution is cooled overnight. The lead

T. H. POPE.

salts are collected and washed as before, and are then dissolved in 5 c.c. of acetic acid and 10 c.c. of 96% alcohol and decomposed when warm with 5 c.c. of nitric acid $(d \ 1 \cdot 2)$, the flask being filled to the neck with water and warmed until a clear fatty acid layer is formed. After cooling, the acid cake is removed, washed with cold water, dried in the steam oven, and returned to the dried-out flask and dissolved in chloroform preparatory to the determination of iodine value. It is preferable not to weigh the solid fatty acids, but to express the iodine value found in terms of the percentage of isooleic acid in the original oil (1 c.c. of 0.1Nthiosulphate = 0.565% of *iso*oleic acid). A certain amount of isooleic acid lead salt passes into solution (23-34% of isooleic acid was recovered from hardened oils containing actually 36-43%), but the presence of as little as 0.3% of hardened arachis oil in cacao butter may be detected with certainty by this method. Traces of water in the fatty acids had no deleterious effect in the Hanus determination, nor was any oxidation of isooleic acid observed on drying the acids in the steam oven. Increase of weight due to esterification did not amount to more than 0.1-0.3%. It is probable that the fatty acids of hardened arachis oil contain two isooleic acids, differentiable by solubilities of their lead salts, one of which is so insoluble as to be precipitated practically quantitatively. E. LEWKOWITSCH.

Determination of tung oil. J. MARCUSSON (Farben-Ztg., 1930, 35, 1203).—The author replies to criticism of his method by Wolff and his co-workers (B., 1930, 292). Coagulation of tung oil by iodine-chloroform is hindered by the presence of turpentine and lead driers. If these be removed (by shaking out with alcohol and acetic acid, respectively), the method gives satisfactory results. S. S. WOOLF.

[Determination of tung oil.] H. WOLFF and J. RABINOWITZ (Farben-Ztg., 1930, 35, 1203; cf. preceding abstract).—Polemical against Marcusson. The authors reiterate that the method is unreliable.

S. S. WOOLF.

Hydnocarpus anthelmintica seed from Ceylon. ANON. (Bull. Imp. Inst., 1930, 28, 6—8).—The seeds (wt. 2 g., 70% of shell) of *H. anthelmintica*, from an experimental plantation in Ceylon, contain 30% of kernel (wt. 0.6 g., 7.3% of moisture) which on extraction yields 60.1% of oil having α (in chloroform) + 47.2° , α of fatty acids (in chloroform) + 48.8° , and solidifying point of fatty acids 37.2° . Hydnocarpic acid [m.p. 60° , $\alpha_{\rm D} + 67.9^{\circ}$, iodine value (Wijs, 3 hrs.) 100.0%, 29.9% Ag in silver salt] and chaulmoogric acid (m.p. $67-68^{\circ}$, $\alpha_{\rm D} + 60.7^{\circ}$, iodine value 89.3%, 27.5% Ag in silver salt) have been isolated from the oil.

E. H. SHARPLES.

Determination of the oil content of palm kernels. A. GEHRKE (Chem. Umschau, 1930, 37, 1—3).—Possible reasons for the discrepancies observed between English and German determinations of the fat content of palm kernels on sampling shipments are discussed: it is recommended that the jute bags now used should be replaced by containers impervious to water and dust.

E. LEWKOWITSCH.

[Analysis of] sulphonated oils. Report of a Committee of the American Leather Chemists' Association. G. W. PRIEST (J. Amer. Leather Chem. Assoc., 1929, 24, 570—576).—Two methods of determining the neutral fat in a sulphonated oil by extraction with light petroleum and methylated ether, respectively, have been compared in the case of 4 samples of sulphonated castor oils. The results obtained with light petroleum were too low, and by the ether-extraction method are much lower than those given by the official method of the American Leather Chemists' Association. D. WOODROFFE.

Determination of neutral fat in sulphonated oils. R. HART (J. Amer. Leather Chem. Assoc., 1929, 24, 576-582; cf. B., 1929, 403).-The saponification value of the total fatty matter of the sulphonated oil is determined as follows. The oil (2-2.5 g.) is boiled for 30 min. under reflux with 25 c.c. of 0.5N-alcoholic potash, 50 c.c. of neutralised alcohol are added, the mixture is boiled gently to expel all ammonia, the excess of alkali titrated with 0.5N-acid, and the mg. of alkali, F_o , absorbed by 1 g. of the fat is calculated therefrom. The percentage of neutral fat is determined from the formula $100F_n/V_n$, and particulars are given for the calculation of F_n and V_n from F_o and the other figures obtained in the official method of analysis. The method has been tested on mixtures of known composition and on sulphonated oils, and the accuracy of the method is proved. The results obtained by this saponification method on the oils used by the Committee of the American Leather Chemists' Association (cf. preceding abstract) are about twice those obtained by extraction with methylated ether and much greater than those given with light petroleum. The extraction of the original undecomposed oil by solvents does not yield all the neutral fat, since some of it must be sulphonated, and therefore partly soluble in water.

D. WOODROFFE.

Drying of organic solutions. LUND.—See III. Fats and carbonation. STANEK and VONDRAK.—See XVII.

See also A., Apr., 407, Adsorption of Japanese acid clay (UENO). 433, Action of silent discharge on oils, fats, and fatty acids (IWAMOTO). 434, Oxidation of oils in presence of irradiated sterols (COUTURE). 451, Action of silent discharge on saturated fatty acids (IWAMOTO). Fatty acids of wheat starch (LEHRMAN). Soaps of fatty acids of the oleic acid series (HIROSE and SHIMUMURA). 477, Colour reaction for ergosterol (MEESEMAECKER). 489, Microchemical saponification process (ROSENTHALER). 500, Decomposition of oils by fat-decomposing enzymes (EZOL). 507, Fruit of Gleditschia triacanthos (HARRIS).

PATENTS.

Products derived from soap-forming fatty acids, their glycerides or sulphonic acids. E. I. DU PONT DE NEMOURS & Co. (B.P. 295,024, 27.7.28. U.S., 4.8.27).—The hydroxylated alkylamine (especially "triethanolamine") salts of soap-forming fatty acids (e.g., oleic and stearic acids) or sulphonated oils (e.g., Turkeyred oil), obtained by mixing the base and the acid or

by heating the base with a fatty oil, are organic soaps useful as dyeing assistants and dispersing agents.

C. HOLLINS.

Drying and conditioning of household soap [for stamping]. TOMLINSONS (ROCHDALE), LTD., and J. N. TOMLINSON (B.P. 324,459, 21.11.28).—The soap is transferred on movable supports into a chamber where it is heated by circulating hot air, and then cooled by cold air, circulated first in one direction and then in the reverse, the total process occupying about 50 min. E. LEWKOWITSCH.

Manufacture of cod-liver oil and like oils. C. FOWLER (B.P. 325,529, 15.10, 1.11, and 17.12.28).— The cooking or settling tanks are fitted with draw-off devices providing orifices at adjustable levels or (especially for floating factories) with flexible draw-off tubes, to be lowered either mechanically or automatically by the provision of floats, so that the orifice is maintained just below the surface of the liquid.

E. LEWKOWITSCH.

Recovery of oil from fish livers and other similar materials. A. W. OWE (U.S.P. 1,742,666, 7.1.30. Appl., 25.2.26. Norw., 5.3.25).—Fish liver in a finelydivided condition is heated to 60° or over and maintained at this temperature for such time only as is necessary to cause the liver to give off oil, after which it is cooled suddenly to 50° or below in contact with non-gaseous cooling means. S. S. WOOLF.

Manufacture of linoleum. LINOLEUM MANUF. Co., LTD., and A. A. GODFREY (B.P. 326,763, 12.12.28).

Wax from coal (B.P. 325,816). Demulsifying soap (U.S.P. 1,742,623).—See II. Dyeing of fatty acids (B.P. 299,790).—See VI. Sealing wax (B.P. 325,014). —See X1II.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Ovens and furnaces for the paint and varnish industry. H. SPEICHER (Farben-Ztg., 1930, 35, 1259— 1261).—A general dissertation on the use of electricity, or gas in place of coal, coke, etc. in varnish cooking, pigment manufacture, etc., the advantages of each type of heating agent being considered. S. S. WOOLF.

Viscosity of paints containing water. H. WOLFF (Farben-Ztg., 1930, 35, 1100-1101).-If water be introduced into white lead paints, the exponent n in the equation $kp^n = V - v$ (which expresses the viscosity V of oil paints of various pigment concentrations, p being the percentage concentration of the pigment by vol., v the viscosity of the oil, and k and n constants characteristic of the pigment; cf. B., 1929, 825) increases with the quantity of water added. In the case of lithopone paints the exponent is hardly altered and, if anything, is lowered. The white lead curves for different water contents intersect at an oil content of approx. 34.5% by wt., whilst the lithopone curves do not intersect over the range for which the equation holds. As a working hypothesis, these differences are attributed to the fact that in the case of white lead the water is emulsified in the oil, whilst lithopone particles are surrounded by a water sheath. It is considered that these experiments indicate the value of the "turboviscometer" in

fundamental investigations (thus exceeding the original functions of the apparatus). S. S. Woolf.

Durability of exterior paints on wood surfaces. H. A. GARDNER (Amer. Paint and Varnish Manufrs.' Assoc., Feb., 1930, Circ. 361, 180–234).—The causes of failure of exterior paints are discussed and illustrated, and methods for their prevention are indicated. Subjects treated include chalking, alligatoring, or checking, gas discoloration, copper stains, spotting effects, brown staining, soot collection, washing effects, types of priming, flaking, cracking, blistering, and miscellaneous construction defects. S. S. WOOLF.

"Active oxygen " as anti-rust agent. H. HEB-BERLING (Farben-Ztg., 1930, 35, 1256—1257).—The ascendency of red lead as a rust-preventive pigment is due to its liberation of nascent oxygen in films. This is not bound up with lead peroxide content only, grade of dispersion being of great significance in this connexion. The suitability of other pigments, *e.g.*, zinc chromate, is discussed from this aspect. S. S. WOOLF.

Testing of rust-preventive paints. F. HOEPKE (Farben-Ztg., 1930, 35, 1153-1154).-A dissertation, the subjects dealt with comprising opacity, viscosity, drying, permeability, elasticity, tensile strength, hardness, gloss, swelling and shrinkage, micrography, durability, including artificial weathering, etc. Numerous results obtained by these methods are tabulated and discussed, among the conclusions drawn being the following : films of highly-dispersed red lead in linoleateboiled oils are stronger than similar films containing resinate-boiled oils; iron oxides of high ferric oxide content are inferior to red lead in boiled oils, but superior in resinate-stand oils; boiled linseed oil absorbs more water and has poorer durability than linseed oil-tung oil blends; ratings of paints by normal and by accelerated weathering tests show concordance. S. S. WOOLF.

Iron oxide pigments and rust prevention. H. WAGNER (Farben-Ztg., 1930, 35, 1151-1152, 1204-1206).—The influence of the physical and chemical properties of iron oxide pigments on water absorption by paint films derived therefrom and on rusting of painted iron plates was studied by the immersion in water and subsequent exposure of plates coated with paints based on 27 such pigments representing types differing considerably in composition, particle shape and size, electrolyte content, variation from neutrality, etc. It was shown by X-ray photographs that the hæmatite spacelattice persists in all iron oxide pigments, even highly dispersed artificial oxides showing it, and it is considered that amorphous iron oxide pigments are non-existent. Swelling of the paint films is influenced mainly by the oil content and by the soluble non-ferrous constituents, soap-formation being entirely absent, contrary to many previous statements. Rust formation is classified into 3 types according as it takes place (a) under, (b) through, or (c) over the surface. Type c is the "abnormal" type described by Wolff (cf. B., 1929, 988). Type b may be measured by electrical methods recording permeability, e.g., by means of Jäger's penetrator, but this does not show concordance with visual inspection of type a, nor can ultra-violet fluorescence methods be successfully applied in this case. Rust formation cannot be correlated with oil content and swelling of films. The results are discussed at length, and although it was not possible to define rust-preventing characteristics, the presence of calcium sulphate etc. is considered harmful, whilst high iron oxide content appears at least not unfavourable to rust prevention, especially when vehicles affording better adhesion than linseed oil are used. S. S. WOOLF.

Evaporation balance [for paint, varnish, and lacquer solvents]. L. P. HART (Amer. Paint and Varnish Manufrs.' Assoc., Feb., 1930, Circ. 360, 173— 179).—A counterpoised-beam balance for determination of evaporation rates of such solvents is described, and a description also given of three further types of apparatus under development in this connexion.

S. S. WOOLF.

Composition of turpentine and of turpentine and rosin oils from the Vakhtan factory. B. ARBUZOV (J. Appl. Chem., Russia, 1929, 2, 585–594).—The composition of the fractions is recorded. The turpentine contains a substance $(7 \cdot 4\%)$ which is not present in turpentine from *Pinus sylvestris*.

CHEMICAL ABSTRACTS. Menthenol from turpentine from the Vakhtan factory. B. ARBUZOV (J. Appl. Chem., Russia, 1929, 2, 595–598).—The menthenol, $C_{10}H_{18}O$, had $d^{16}O \cdot 9378$, $\alpha_D + 16^{\circ}$ to $+50^{\circ}$, b.p. 213–214°. The component, $C_{10}H_{18}O$, of high optical activity had b.p. 98–99°/10 mm., $\alpha_D + 43 \cdot 20^{\circ}$. CHEMICAL ABSTRACTS.

Sp. gr. and Baumé gravity tables for turpentine. W. C. SMITH and F. P. VEITCH (U.S. Dept. Agric., Feb., 1930, Circ. 110, 9 pp.).—Tables are given from which specific gravities and degrees Baumé of turpentine at 60° F. compared with water at 60° F. may be read off from observed hydrometer readings at known temperatures. S. I. LEVY.

Refining of pine pitch with soda. F. SOLODKI (J. Appl. Chem., Russia, 1929, 2, 599—619).—Increase in concentration of the soda solution from $2 \cdot 5$ to 5% increases the yield by only 3%, but poor separation of the soaps results from the use of the more dilute solutions. CHEMICAL ABSTRACTS.

Tests for resins of jalap, podophyllum, and scammony. Dorr.—See XX.

PATENTS.

Preparation of white lithopone from incompletely purified zincic solutions. M. BIDAINE (B.P. 325,641, 27.12.28).—Substances that are blue or greenish-blue or that acquire such colour by calcination, *e.g.*, chromium sulphate, zinc or cobalt aluminate, are precipitated on or at the same time as lithopone, so that the yellow or reddish-yellow tint imparted to the latter by the impurities, *e.g.*, nickel and cobalt, left in the solutions containing zinc is complemented. S. S. WOOLF.

Preparation of lacquers and lacquering. BAKE-LITE GES.M.B.H. (B.P. 295,335, 9.8.28. Ger., 9.8.27).— Condensation products of phenol and aliphatic aldehydes in the intermediate or "B" stage are dissolved under specified conditions of temperature and pressure in cyclic ketones or alcohols, hydrogenated naphthalenes (except tetrahydronaphthalene) or phenols, etc., or suitable mixtures of these, with or without addition of oils, *e.g.*, linseed, poppyseed, and tung oil, and non-solvent liquids, *e.g.*, bromobenzene, benzene hydrocarbons, tetrahydronaphthalene, etc. Greater quantities of solvent than are required for dissolution are used and the excess is subsequently removed by distillation. Catalysts, *e.g.*, nitrophenols, and plasticisers may be added.

S. S. WOOLF.

Lacquers, coating compositions, etc. BRIT. CELANESE, LTD. (B.P. 307,289, 4.3.29. U.S., 3.3.28).—A cellulose acetate lacquer containing a furfuraldehydeacetone resin (produced by alkaline condensation) gives adherent, clear films. Other resins, plasticisers, pigments, etc. may be added; the usual solvents (acetone, alone or with benzene, toluene, alcohol, etc.) are employed. C. HOLLINS.

Lacquers, coating compositions, etc., and articles coated therewith. BRT. CELANESE, LTD. (B.P. 307,290 -1, 4.3.29. U.S., 3.3.28).—Coating compositions containing (i) a derivative (preferably organic) of cellulose, e.g., cellulose acetate, (ii) a synthetic resin obtained by the condensation of furfuraldehyde with (A) an aromatic amine, e.g., aniline, or (B) a phenol (in the presence of an alkaline catalyst), and (iii) a volatile solvent are claimed. In addition, one or more artificial resins (e.g., a phenol-formaldehyde resin, with an acid catalyst), natural gums or resins, semi-synthetic resins, plasticisers or softeners, solvents of medium or high b.p., pigments, and dyes may be incorporated.

S. S. WOOLF.

Coating material for the handles of utensils. C. SCHMIDT (G.P. 461,009, 20.7.26, and B.P. 326,255, 12.12.28).—The product obtained by oxidising with permanganate the hardened condensation product of formaldehyde with phenol in the presence of excess ammonia is mixed with the product obtained by digesting ivory-nut turnings with concentrated sulphuric acid and the mixture is heated until it hardens. The material so obtained adheres firmly to metal, is resistant to acids and alkalis, and is a non-conductor of heat and electricity. A. R. POWELL.

Increasing the durability of coatings of paints, varnishes, and the like. CHEM. FABR. DR. J. WIERNIK & Co. A.-G., and BAKELITE GES.M.B.H., Assees. of J. SCHEIBER (B.P. 299,024, 19,10.28. Ger., 19,10.27).— The durability of paint coatings etc. that have completed their normal drying is improved by treatment with solutions of deoxidants, *e.g.*, multivalent phenolic substances, α -naphthol, aromatic amines, in volatile solvent adapted to soften but not to dissolve the coating. Diminution in gloss is overcome by adding up to 10% of raw or treated tung oil to the deoxidant solution.

S. S. WOOLF.

Removal of varnish and enamel coatings. E. C. FRIES, ASST. to STUDEBAKER CORP. (U.S.P. 1,742,347, 7.1.30. Appl., 23.2.26).—Varnish and enamel removers containing a chlorinated acetic acid, dichlorobenzene, and, if desired, alcohol are claimed. S. S. WOOLF.

Manufacture of cellulose ester compositions. E. C. DE STUBNER (B.P. 297,679, 22.9.28. U.S., 24.9.27). —A resinous ingredient for incorporation with cellulose

ester compositions (such as lacquers etc.) is prepared by esterifying the hydroxyl group or groups of a natural fossil or semi-fossil resin, the other ester ingredient (e.g., butyl acetate) being simultaneously prepared by the esterification process. F. R. ENNOS.

Manufacture of crayons and sealing wax. O. Y. IMRAY. From I. G. FARBENIND. A.-G. (B.P. 325,014, 8.9.28).—A cellulose ether or a cellulose ester of an acid of high mol. wt., *e.g.*, lauric acid, is dissolved at a raised temperature in a fatty acid, a fat, a hydrocarbon which is solid at ordinary temperatures, or in a mixture of any of these, dyes or pigments are incorporated, and the solution is cast in moulds. S. S. WOOLF.

Manufacture of artificial resins and products containing them. BRIT. CELANESE, LTD. (B.P. 299,067, 20.10.28. U.S., 21.10.27. Addn. to B.P. 299,066; B., 1930, 338).—The ketone-phenol resins of the prior patent are condensed with formaldehyde or other aldehyde to give a soluble, non-reactive resin, m.p. about 100°, suitable for cellulose acetate lacquers.

C. HOLLINS.

Manufacture of synthetic resins. BRIT. CELANESE, LTD. (B.P. 296,674, 3.9.28. U.S., 3.9.27).—A phenol is condensed with an aldehyde in molecular proportions not greatly exceeding 1:1, in the presence, at least in the final stages of the reaction, of soluble dihydrogen phosphates, *e.g.*, of ammonium, alkali or alkaline-earth metals. The reaction may be begun in the presence of phosphoric acid and sufficient alkaline material added later, thus modifying the rate of reaction. Pale fusible resins, soluble in acetone etc. and free from appreciable darkening on exposure, are obtained. S. S. WOOLF.

Manufacture of condensation products from phenols and formaldehyde. R. HESSEN (B.P. 324,913, 5.11.28).—Molecular proportions of a phenol and formaldehyde are condensed together in the presence of a basic catalyst, the aqueous layer is removed, subsequent additions (2—4) of formaldehyde and, if desired, catalyst are made, the condensation is continued, and the aqueous layer removed, the process continuing until no free phenol remains in the resinous layer.

S. S. WOOLF.

Manufacture of condensation products of cresol and formaldehyde. P. CHESTAKOFF [SHESTAKOV] (B.P. 303,022, 24.12.28. Fr., 22.12.27).—Cresol is condensed with formaldehyde at 80—100° in the presence of a catalyst of low activity, e.g., oxalic acid, succinic acid, zinc or lead acetate. The dehydrated intermediate product ("resol") is treated with 0.5-3% of an organic sulphonic acid of high mol. wt. and dispersive power, readily soluble in the resol, e.g., the product of sulphonation of petroleum oils etc. The treated resol is cast in moulds and the temperature is gradually raised for 5—10 hrs. to 110—130°, until a hard, insoluble, infusible resin is obtained. S. S. WOOLF.

Artificial resins and their manufacture. INTER-NAT. GEN. ELECTRIC CO., INC., Assees. of ALLGEM. ELEKTRICITÄTS-GES. (B.P. 296,787, 7.9.28. Ger., 8.9.27). —Polyhydric alcohols, *e.g.*, glycerin, are condensed with polybasic acids, *e.g.*, phthalic acid, in an atmosphere practically free from oxygen, *e.g.*, *in vacuo*, or under a

stream of inert gas, *e.g.*, carbon dioxide, hydrogen. The artificial resins so obtained are practically colourless. S. S. WOOLF.

[Grinding apparatus for] manufacture of paints. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of R. C. B. WEBSTER (B.P. 303,380, 31.12.28. U.S., 30.12.27).

Artificial resin from coal (B.P. 325,816). Utilisation of waste liquors (B.P. 326,112).—See II. Products of acrylic acid (B.P. 304,681).—See III. Ice colours and pigments (B.P. 300,504 and 300,557). Azo dyes for lakes (B.P. 325,229). Azo dyes in drying oils (B.P. 301,726).—See IV. Artificial silk (B.P. 303,867).—See V.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Coagulation of *Hevea* [rubber] latex. N. BEUMÉE-NIEUWLAND (Arch. Rubbercultuur, 1929, 13, [10]; Med. Proefstat. Rubber, 1929, [44], 555-567).-Latex may be regarded as a system of lyophilic colloidal proteins protecting the lyophobic rubber globules; it shows certain phenomena characteristic of lyophobic colloids and others typical of the lyophilic group. The phenomenon of the "second liquid zone" in its coagulation behaviour may arise from a change of molecular proteins into acid proteins, and this is confirmed by the fact that protein-free latex exhibits no "irregular series." The $p_{\rm H}$ at which coagulation of latex occurs also coincides with the $p_{\rm H}$ of protein precipitation. It is possible that lipins play an important rôle in latex, and that the rubber globules with a covering layer of lipins and a viscous interior are suspended in an emulsion of protein. D. F. Twiss.

Plasticity determinations in crude rubber. VII. Relation between structure and plasticity of rubber prepared in different ways. O. DE VRIES and N. BEUMÉE-NIEUWLAND (Arch. Rubbercultuur, 1929, 13, [6]; Med. Proefstat. Rubber, 1929, [43], 283-370).—The soluble serum substances mechanically retained in rubber have a marked influence on the plasticity, a high proportion leading to hardening of the rubber on keeping. On the other hand, the substances, e.g., proteins, precipitated with the rubber during coagulation, which may amount to 2% or more, have little influence on the plasticity. Coagulation of latex with papain, which decomposes part of the protein substances, also gives rubber of fairly normal plasticity. Centrifuging, or especially re-centrifuging of re-diluted cream, is the only method discovered so far to yield a plastic rubber without tendency to deterioration and tackiness on keeping. Treatment of latex with rubber solvents, such as benzene or toluene, which cause fusion of the globules to aggregates has little influence on plasticity of the dried rubber. D. F. Twiss.

Tensile strength of Java plantation rubber. O. DE VRIES and R. RIEBL (India-Rubber J., 1930, **79**, 419-420). —The average figures for tensile strength obtained in the routine testing of crêpe and sheet rubber at the Buitenzorg testing station from 1923 to 1929 inclusive give no indication whatever of any deterioration. Examination of 983 additional samples drawn from as wide a range of estates as possible, using a $92\frac{1}{2}:7\frac{1}{2}$ rubber-sulphur mixture, confirms that there is no

47I

decrease in tensile strength. Complaints may have arisen from faulty technique or equipment in testing or from failure of European manufacturers to discriminate between first-grade plantation rubber and rubber from small native or Chinese estates. D. F. Twiss.

Difference between ultramarine and Thénard's blue in rubber mixtures. R. DITMAR and K. H. PREUSSE (Gummi-Ztg., 1930, 44, 1355—1356).—Although ultramarine imparts a more attractive colour than the more expensive Thénard's blue in rubber, unlike the latter it is not resistant to rigorous vulcanisation with sulphur chloride and is also less stable in hot vulcanisation in the presence of certain organic accelerators.

PATENTS.

D. F. Twiss.

Centrifugal treatment of rubber latex and the like. AKTIEB. SEPARATOR (B.P. 304,686, 10.1.29. Swed., 24.1.28).—Latex, especially ammonia-preserved latex, intended for centrifugal treatment is stored in a vertical ank of uniform cross-section, the surface being protected from contact with the air by a float. Sedimented impurities are prevented from reaching the centrifuge by drawing the liquid from immediately under the float through a flexible tube attached thereto.

D. F. Twiss.

Producing a pure rubber from rubber latex. AKTTEB. SEPARATOR (B.P. 301,085, 23.11.28. Holl., 24.11.27).—Latex, treated with a preservative such as ammonia, is subjected to centrifugal force so that impurities and precipitates are removed before coagulation; the purified latex has substantially the same sp. gr. and rubber content as the original latex.

D. F. Twiss. Electrical separation of rubber from rubber latex. SIEMENS & HALSKE A.-G. (B.P. 307,747 and 325,401, 4.3.29. Ger., [A] 12.3.28, [B] 10.11.28).---(A) Electrically charged particles (e.g., of rubber with or without sulphur, pigments, etc.) are separated from fluid suspension by means of a "balanced" alternating current, i.e., a current representable by a sine curve for which the arithmetic mean is zero. The most suitable frequency is up to 150, and aluminium or an aluminium alloy is the best material for the electrodes, although tantalum and its alloys are also applicable. The electrodes may be covered with porous conducting or semi-conducting material, or with their metallic oxides, or may be separated from the suspension by porous diaphragms with water, an aqueous solution, or a dielectric fluid, e.g., oil, alcohol, or glycerin, in the electrode space. (B) The yield of rubber obtained per watt by the preceding process is the greater the further the curve for the alternating current departs from a sinusoidal form. The desired type of current may be obtained by inserting choke coils and condensers in the circuit of an alternating current of unsatisfactory characteristics, by superposing two or more alternating currents which are out of phase with one another, or by generating from continuous current by means of a rotating commutator. D. F. Twiss.

Manufacture of rubber compounds. RUBBER LATEX RES. CORP. (B.P. 302,151, 13.11.28. U.S., 10.12.27).—Rubber compositions, in granular or other state of sub-division suitable for moulding purposes, are produced by treating granular fillers or fibrous materials, *e.g.*, asbestos, with a small proportion of appropriately diluted latex containing some proteid protective colloid, such as hæmoglobin, preferably together with zinc oxide. The treated material is then dried and reduced to a suitable form for moulding. The rubber content of such material may be as little as 6—8% and is satisfactorily resistant to oxidation. D. F. Twiss.

Manufacture of artificial rubber and rubber-like masses. I. G. FARBENIND. A.-G. (B.P. 294,963, 1.8.28. Ger., 2.8.27).—The polymerisation of a butadiene or mixture of butadienes is expedited and the yield of product rendered almost quantitative by forming an emulsion of the hydrocarbon in the presence of water (or an aqueous solution of an emulsoid colloid, *e.g.*, albumin, dextrin, or glue) and of a hydrotropic emulsifying substance (*e.g.*, sodium tetrahydronaphthalenesulphonate or sodium protalbinate) and polymerising the emulsion thus obtained. D. F. TWISS.

Manufacture of latex-like emulsions and rubberlike masses. I. G. FARBENIND. A.-G. (B.P. 301,515, 1.12.28. Ger., 2.12.27).—The polymerisation of butadiene, homologues thereof, or analogues containing the chain $\cdot C: C \cdot C: C \cdot$ is greatly accelerated by the presence of a water-soluble salt of a bile acid, *e.g.*, sodium deoxycholate, or a derivative. D. F. Twiss.

Manufacture of rubber articles. DUNLOP RUBBER Co., LTD., E. A. MURPHY, R. G. JAMES, and D. F. TWISS (B.P. 324,988, 6.10.28).-In the manufacture of articles from aqueous dispersions of rubber by dipping, spreading, electrophoresis, etc., a wrinkled or corrugated surface is imparted by bringing the uncoagulated layers of the dispersion into contact with single liquids, e.g., carbon tetrachloride, or mixtures of liquids, e.g., acetic acid and benzene, which effect coagulation and swelling concurrently, or alternatively into successive contact with two liquids, one of which, e.g., acetic acid, produces coagulation and the other, e.g., a mixture of benzene and alcohol, causes swelling. The subsequent " setting " of the wrinkled layer may be effected by merely drying by the action of heat, or by immersion in a dehydrating and setting bath; alternatively, wrinkling and setting can be effected concurrently by means of a fluid mixture of dehydrating and swelling agent such as a mixture of aqueous ammonium acetate, alcohol, and benzene.

D. F. Twiss.

Manufacture of colouring materials for colouring materials of the nature of rubber. I. G. FARBENIND. A.-G. (B.P. 325,967, 30.1.29. Addn. to B.P. 242,274; B., 1927, 186).—Materials for colouring rubber are produced by introducing into factice or a mixture thereof with glycerin, rubber-softening agents, anti-agers, vulcanisation accelerators, etc., large quantities of insoluble, dry pigment powders, *e.g.*, cadmium-yellow, and working the mixture until the pigment is in a state of colloidal or almost colloidal dispersion. The resulting coloured mixtures can be added to rubber without appreciable detriment to its properties. D. F. Twiss.

Preservation of rubber and the like. B. F. GOOD-RICH Co., Assees. of W. L. SEMON (B.P. 312,630, 2.11.28.

British Chemical Abstracts-B.

U.S., 29.5.28).—For preservation purposes rubber is treated, before or after vulcanisation, with a compound of the class represented by the formula NHR \cdot R'' \cdot NHR', where R and R' represent phenyl groups and R'' is a *p*-phenylene group. At least one of the groups R, R', and R'' contains neutral or basic substituents. Acidic substituent groups impair the age-resisting qualities. Phenyl-*p*-diphenylamino-*p*-phenylenediamine, di- β -naphthyl-*p*-phenylenediamine compounds of the structure NHR $\cdot C_6H_4 \cdot NH$ — $\cdot \cdot \cdot - NH \cdot C_6H_4 \cdot NHR'$ containing up to 6 amino-groups connected by phenylene groups, and their alkyl, aryl, amino-, hydroxy-, nitro-, and other substitution products are included. D. F. Twiss.

Manufacture of agents for use in vulcanising rubber. I. G. FARBENIND. A.-G. (B.P. 311,372, 20.4.29. Ger., 10.5.28).—Selenium or a selenium compound is incorporated in the colloidal state into natural or synthetic rubber or rubber latex. *E.g.*, dissolved selenium compounds may be added to rubber latex and the selenium precipitated therein in a highly dispersed condition by the addition of an acid such as acetic, formic, or sulphurous acid, or formaldehyde; coagulation of the rubber generally occurs concurrently. The resulting mixture can be used, directly or after washing and drying, as a vulcanising agent. D. F. Twiss.

Accelerator of vulcanisation. GOODYEAR TIRE & RUBBER Co., Assees. of J. TEPPEMA (B.P. 302,143, 27.8.28. U.S., 10.12.27).—Vulcanisation accelerators are made by condensing sodium salts of thiols, such as 2-thiolbenzthiazole or dithiocarbamic esters, with phenyl 3-nitro-6bromothiolphenyl ketone, PhCO·C₆H₃(NO₂)·SBr ["4nitro-2-benzoylphenyl sulphur bromide"].

C. HOLLINS.

Vulcanisation of rubber. I. G. FARBENIND. A.-G. (B.P. 300,208, 7.11.28. Ger., 8.11.27).—The bases themselves or the dithiocarbamates, thiuram mono- and disulphides, carbamides, guanidines, thiocarbamides, and aldehyde-ammonias, etc. derived from secondary, hydrogenated, cyclic bases or from secondary amines carrying a hydrogenated aromatic radical, are used as vulcanisation accelerators. Examples are: decahydroquinaldine, zinc cyclohexylethyldithiocarbamate, and thiuram disulphide from decahydroquinoline. C. HOLLINS.

Plastic composition and its manufacture. F. WECKERLE (B.P. 325,312, 27.11.28).—Latex or rubber is mixed with a vulcanising agent (e.g., up to 30% of sulphur), quinol, and a glucoside, e.g., æsculin, or a phenol-formaldehyde condensation product (to impart age-resistance), and fillers selected according to the purpose for which the composition is intended. The mixture is kneaded, with the addition of benzine if desired, and subsequently worked hot or cold, e.g., on a calender, and pressed or turned into the desired shape. The mixture may also be dissolved, e.g., in cyclohexanol, and applied to the desired surface by spraying with hot air. The composition is resistant to acid, heat, and swelling, and possesses high dielectric capacity. D. F. Twiss.

Plastics. RUBBER LATEX RES. CORP. (B.P. 301,077, 13.11.28. U.S., 25.11.27).—Aqueous liquids, particularly latex, are thickened by the addition of hæmoglobin solution, with a small amount of zinc oxide. The pro-

ducts, which have batter-like consistency, form good binding material for composite articles containing, e.g., fibres, rubber scrap, granular abrasives, etc. which may be added to the latex either before or after the thickening process. The additional introduction of formaldehyde gives increased tensile strength to the final products. D. F. Twiss.

Uniting rubber to metal. GOODYEAR TIRE & RUBBER Co., Assees. of S. S. KURTZ (B.P. 307,056, 12.2.29. U.S., 2.3.28).—Rubber is attached to metal, such as iron, by first applying to the latter a copper or cobalt salt, *e.g.*, an oleate, stearate, acetate, or chloride. The salt may be applied in solution in benzene or in a mixture of benzene and alcohol. The rubber layer is then pressed against the surface and vulcanised by heat.

D. F. Twiss.

Uniting rubber and other substances. GOODYEAR TIRE & RUBBER Co., Assees. of L. B. SEBRELL (B.P. 310,461, 29.1.29. U.S., 26.4.28).—A suitable polymerising agent such as stannic chloride is allowed to act on a solution of rubber, containing, if desired, also a rubber softener, and the resulting solution is applied to the surfaces to be secured together, *e.g.*, cardboard, wood, textile material, iron, or steel. The treated surfaces are brought into contact and heated, *e.g.*, at 80—120° for 10—30 min., when strong union is effected.

D. F. Twiss.

XV.—LEATHER; GLUE.

Sheep skin defects. I. H. BLANK and G. D. MCLAUGHLIN (J. Amer. Leather Chem. Assoc., 1929, 24, 544-567).-Low tensile strength of sheep skins as compared with that of calf skin is due to the small amount of corium and the short and almost parallel fibre bundles. Wilson's conclusion that there are numerous sweat glands and fat cells in the thermostat layer which leave empty spaces in the finished leather is confirmed. Pinholes are due to the grouped wool fibres in fine-woolled skins. The depilitant removes the partitions between the individual wool follicles, leaving a large hole. "Blind rib" is a ribbed appearance evident only when the skin is viewed by transmitted light. " Lap rib " consists of raised ridges on the surface of the skin, usually running in parallel ridges from the backbone towards the flanks. They are characterised either by an abnormal fatty deposit or an excessive fibrous structure at the upper edge of the corium. A similar deposition of fat, which, however, is not present in ridges, appears in skins showing loose grain. It weakens the skin at the junction of the corium and thermostat layer, and the mechanical working of the skin brings up the loose grain. Cockle is a cellular and vascular congestion. No abnormal amount of fat was observed in the cockled area, which appears as dark raised spots, chiefly on the shoulders and flanks. They become hard and brittle after tanning and will not take the dye. From 2 to 200 million bacteria per g. of pelt were observed on fresh sheepskins, of which 95% were on the wool, and up to 260 million on salted skins. Bacterial growth during soaking is reduced by a low temperature, the use of sea-water, and changing the soak water at frequent intervals during soaking. Drumming the skins in water prior to changing the soak water reduced the number of organisms per c.c. Fresh skins should be put into soak water immediately after flaying, to minimise bacterial growth.

D. WOODROFFE.

Tannin content of Acacia arabica pods. ANON. (Bull. Imp. Inst., 1930, 28, 1-6).—The composition of 11 samples of pod-cases from A. arabica is described. The tannin content varied from 30.4 to 41.7% except in one Northern Nigerian sample, which contained 19%. "Goniake" pods from French West Africa (2 samples) contained 30.6 and 41.7% of tannin; Sant pods from the Sudan (3 samples) 30.4% (desert pods), 35.5%, and 39.2%; Northern Nigeria pods 19.0%, 33.0%, 34.7%, and 38.3%; Neb-neb pods from French West Africa 31.8%; A. nilotica pods from the Sudan 38.9%. With the exception of the 19% sample, all were superior in tannin content to those of the same variety grown in India (18.8—27.6% of tannin). E. H. SHARPLES.

Detection and determination of chestnut-wood extract in a mixture of other tanning extracts. Report of a Committee of the American Leather Chemists' Association. F. F. MARSHALL (J. Amer. Leather Chem. Assoc., 1929, 24, 567-570).-The following test was made on several tannin extracts: 50 c.c. of tannin solution of analytical strength were mixed with 5 c.c. of 50% iodic acid, and after 5 min. the mixture was shaken with carbon tetrachloride to extract the lodine, the iodine solution washed free from iodic acid, mixed with 20 c.c. of 50% potassium iodide solution, and titrated with 0.02N-sodium thiosulphate. The result was calculated in terms of the percentage of iodine liberated. The following values were obtained : pyrocatechol tans <1%, chestnut 21.79%, valonia 21.5%, myrobalans 21.06%, European chestnut 18.77%. The D. WOODROFFE. test can be completed in 30 min.

PATENTS.

Treatment of hides. C. J. M. M. LE PETIT (B.P. 300,615, 15.11.28. Fr., 16.11.27).—A plasmolysing salt (e.g., sodium sulphate or bicarbonate, magnesium sulphate), which may be anhydrous, or a mixture of anhydrous sodium sulphate, sodium bicarbonate, and boric acid, with or without a dehydrating agent, is added to the mould culture obtained as described in B.P. 250,907 (B., 1926, 1022). D. WOODROFFE.

Leather manufacture. C. A. VENINO and A. AZZONI (B.P. 320,053, 26.6.28).—Dry leather is drummed with tannin for some time and then a solution of skin scraps or other gelatin-forming material is added. After this has been absorbed, the leather is finished as usual.

D. WOODROFFE.

Leather colour. W. RITZENTHALER (Swiss P. 123,512, 8.2.27).—The colour comprises a mixture of a pigment, a dissolved leather dye, castor oil, varnish, and a diluent (acetone and amyl acetate). A. R. POWELL.

Manufacture of a casein adhesive. E. STERN (G.P. 460,141, 16.10.24. Addn. to G.P. 451,308; B., 1930, 71). —A dry mixture of casein and starch prepared as described in the prior patent is treated with sodium carbonate, sodium hydrogen phosphate, or ammonium chloride. A. R. POWELL.

Manufacture [casting] of [glue-gelatin] impression transfer material. H. WADE. From OXFORD VARNISH CORP. (B.P. 325,615, 5.12.28).

XVI.—AGRICULTURE.

Clay formation and the weathering of felspars. O. TAMM (Medd. Stat. Skogsförsöksanst., 1929, 25, 1-28; Proc. Internat. Soc. Soil Sci., 1929, 4, 347-348).-Felspars were pulverised in the presence of water in a mill producing ultimate particles of 2-0.2 μ in. diam. In the case of microcline and oligoclase sufficient decomposition occurs to produce an alkaline reaction reaching $p_{\rm H}$ 10.7 and 11.1, respectively, for the two minerals. The decomposition products absorb water in amounts which increase with the fineness of grinding. This water is not removed by drying at 105-110° nor in vacuo over sulphuric acid at ordinary temperatures. The decomposed particles of microcline exhibit base-exchanging properties within the range $p_{\rm H}$ 6—10. Under acid conditions $(p_{\rm H} 6-3)$ there is a steady decomposition of the particles, and soluble alkalis and aluminium appear. Felspar particles of less than $0.5 \ \mu$ in diam. react with hydrogen-ions to an extent which increases with decreasing diameter of the particles. Particles of $>2 \mu$ in diam. are not appreciably reactive. The weathering of minerals in soil involves processes and materials similar to the A. G. POLLARD. above.

Annual variations in the reaction of forest soils. T. WLOCZEWSKI (Lwów Nakl. Polskiego towarz. Leśn. Tloczono pierwszej zwiazkomej drukarni we Lwowie, 1928, Pt. 4; Proc. Internat. Soc. Soil Sci., 1929, 4, 351— 352).—The humus layers showed greater variation in $p_{\rm H}$ value than the mineral strata, and, in general, were more acid. Humus and mineral soils showed maximum values in autumn and minimum in spring, although divergences from this rule were more common in mineral soils. Considerable differences in the $p_{\rm H}$ values of fresh and air-dried samples were observed. In humus soils seasonal variations were less definitely marked in the air-dried condition. A. G. POLLARD.

Decomposition of forest litter. M. HELBIG and E. JUNG (Allgem. Forst.- u. Jagdztg., 1929, 105, 336– 344, 382–392; Bied. Zentr., 1930, 59, 109–110).—The micro-organic decomposition of forest litter is examined by means of the carbon dioxide produced. The rate of decomposition varies with the species of tree concerned. Temperature largely affects the rate of decomposition in the early stages, but its influence decreases later. Rates of decomposition of leaves of different species largely depend on the physical properties of the leaves and their mode of accumulation on the forest floor.

A. G. POLLARD.

Phosphate content of forest humus soils. A. NĚMEČ (Forstwiss. Zentr., 1929, 51, 721—732; Bied. Zentr., 1930, 59, 102—103).—In the forest area examined the soluble phosphate content was greatest in the surface covering (litter) of the soil, less in the humus layer, and least in the underlying mineral soil. Hydrochloric and hydrofluoric acid extracts give no indication of the assimilability of soil phosphates. The humus layer is the immediate source of phosphate for plants. Removal of the forest litter has led to serious reduction of the soil phosphate contents. A. G. POLLARD.

Influence of the lime condition of soils on the solubility of phosphates. A. H. ERDENBRECHER (Superphosphat, 1929, 5, 213-214; Bied. Zentr., 1930, 59,

106—107).—The mobilisation of citric-soluble phosphates in soil results from favourable lime conditions. Liming favours the leaching of potash from soil.

A. G. POLLARD.

Neubauer tests for phosphoric acid [in soils] in the Brunswick area and confirmatory tests of the method. A. GEHRING (Superphosphat, 1929, 5, 207— 209; Bied. Zentr., 1930, 59, 99—100).—Records of the root-soluble phosphate content (Neubauer) of numerous soils are given. The limiting value (4 mg./100 g.) is considered too low for practical purposes. A. G. POLLARD.

Determination of effective phosphoric acid [in soils] by Neubauer's method. K. KONISHI and G. MATSUKI (Soils and Fertilisers, Japan, 1929, 3, 10–29). —With rice, the addition of nitrogen, potash, and lime is necessary. Little absorption of phosphate occurs in alluvial soil. CHEMICAL ABSTRACTS.

Determination of absorbable phosphate in soils by Neubauer's method. S. KASUGA (Soils and Fertilisers, Japan, 1929, 3, 31-50).—Young rice plants are used; the phosphate absorbed is increased by a suitable quantity of magnesium and sodium sulphates; hindrance of growth due to excess of one component salt is mitigated by use of calcium phosphate.

CHEMICAL ABSTRACTS.

Soil moisture determinations by the alcohol method. A. SMITH and F. W. FLINT (Soil Sci., 1930, 29, 101-107).—The alcohol method of Bouyoucos (B., 1927, 454, 887) is compared with the ordinary oven-drying method for determining soil moisture contents. The former is unreliable on fine-textured and alkali soils.

A. G. POLLARD.

Index of friability of soils. O. CHRISTENSEN (Soil Sci., 1930, 29, 119—135).—A compression apparatus is described for determining stress-strain curves for small cylindrical soil samples. Reproducible results can be obtained. Results are expressed mathematically in terms of a "friability index" and characteristic constants for individual soils. Relationships between the friability index and the soil composition and moisture content are discussed. A. G. POLLARD.

Hydrogen-ion concentration of Egyptian soils. R. R. LE G. WORSLEY (Tech. Sci. Service Bull. No. 83, Govt. Press, Cairo, 1929, 33 pp.; Proc. Internat. Soc. Soil Sci., 1929, 4, 353).—Colorimetric measurements of the $p_{\rm H}$ values of alkali soils are unsatisfactory owing to the turbidity of the extracts. A suitable electrical method is described. Among the ameliorants examined, sulphuric acid was the most effective. Addition of neutral salts to alkali soils decreases their $p_{\rm H}$ as a result of base exchange. Leaching with water removes much calcium and increases the $p_{\rm H}$ values and impermeability, probably by the formation of sodium carbonate. A method for calculating the potential fertility of soils after the removal of soluble alkali is described.

A. G. POLLARD.

Basicity of Texas soils. G. S. FRAPS and E. C. CARLYLE (Texas Agric. Exp. Sta. Bull., 1929, No. 400, 20 pp.).—A discussion of the basicity and sulphur requirements of the soils. CHEMICAL ABSTRACTS.

Nitrogen balance in cultivated semi-arid Western Kansas soils. P. L. GAINEY, M. C. SEWELL, and W. L.

LATSHAW (J. Amer. Soc. Agron., 1929, 21, 1130–1153). —Cropping in relation to nitrogen losses is considered. CHEMICAL ABSTRACTS.

Significance of nitrogen in soil organic matter relationships. F. J. SIEVERS (J. Amer. Soc. Agron., 1930, 22, 10—13).—From analyses of New England soils it is deduced that the N : C ratio of soils is fairly constant, that variations in soil treatment have no consistent influence on the soil organic matter or the nitrogen or carbon content, that liming scarcely affects the soil organic matter content, and that there can be no apparent increase in soil organic matter without a proportionate increase in nitrogen.

CHEMICAL ABSTRACTS.

Neutralising values and rates of reaction with acid soils of different grades and kinds of liming materials. W. H. PIERRE (Soil Sci., 1930, 29, 137— 158).—The interaction of ground limestone, oyster shell, and basic slag with acid soils is examined. The rate of reaction increases with the degree of soil acidity and with the fineness of grinding of the liming material. Coarser materials (20-mesh) do not react completely even after 2 years. A. G. POLLARD.

Exchangeable calcium and potassium in soils as affected by cropping and fertilisation. B. D. WILSON (Soil Sci., 1930, 29, 91-100).—Limed and fertilised soils were examined after 15 years' cropping. No relationship existed between the amount of exchangeable calcium (by electrodialysis) in the soils and the quantity of lime applied. The $p_{\rm H}$ values of untreated soils and their exchangeable calcium contents were related, but the relationship failed on limed soil. Application of fertilisers had little or no effect on the exchangeable calcium or potassium content of soils. After continuous cropping, the proportion of exchangeable ions other than calcium was very small. No relationship exists between the proportion of colloidal matter in soil and its exchangeable calcium content. Cropping reduced the exchangeable calcium and potassium of untreated soils. It is suggested that the exchangeable calcium content of limed soil depends on the specific adsorptive power of the soil and not on the amount of lime applied, and that therefore the hydrogen-ion concentration of a soil is no criterion of its exchangeable calcium content.

A. G. POLLARD.

Fixation of the potash of a green manure by liming materials. W. H. MACINTYRE and K. B. SANDERS (Soil Sci., 1930, 29, 109—117).—Lysimeter experiments show that the addition of lime, limestone, or dolomite decreased the amount of potash leached from soils with which ground red clover hay had been incorporated. The proportion of potash leached in different seasons was not proportional to the rainfall.

A. G. POLLARD.

Biological effects of certain nitrogen fertilisers. P. E. BROWN and F. H. MENDELL (Proc. Iowa Acad. Sci., 1928, 35, 87-95).—The results of nitrification studies depend on the methods used. Sodium nitrate, but not other nitrogen fertilisers, stimulated nitrification in the Carrington loam employed when applied at the rate of 200 lb. per acre. Smaller quantities caused no increases.

CHEMICAL ABSTRACTS.

Reaction of the soil and agricultural crops. A. LØDDESØL (Meld. Norges Landsbruks., 1928, 8, No. 6; Proc. Internat. Soc. Soil Sci., 1929, 4, 348–351).—The sampling of soils is discussed and the probable error involved in surveying large areas for $p_{\rm H}$ values and lime requirements is examined. A. G. POLLARD.

Hydrogen-ion concentration of the sap as a factor in plant metabolism. W. F. LOEHWING (Proc. Iowa Acad. Sci., 1928, 35, 135—139).—Increased absorption of certain mineral nutrients by plants on unproductive muck soils involves diminished intake of others. Shifts in the internal nutrient balance are correlated with marked changes in the hydrogen-ion concentration of the sap. Profound alteration in the soil solution is believed to follow the use of lime or potash; ionic replacement in the colloidal fraction of the soils and preferential absorption of certain ions by plants following addition of mineral fertilisers may render the soil solution toxic. Differences in response to lime and potash applications on muck and mineral soils are differences chiefly in degree.

CHEMICAL ABSTRACTS. Differences and relationships between varieties of wheat and barley in their resistance to the toxic action of potassium chlorate. M. YAMASAKI (J. Imp. Agric. Exp. Sta., Tokyo, 1929, 1, [2]; Bied. Zentr., 1930, 59, 121-122).-Seedlings of many varieties of wheat and barley were treated with potassium chlorate solutions of varying concentration. Resistance to potassium chlorate and cold-resistance were generally parallel. Early varieties were more resistant than late ones. High growth temperature and a deficiency of nutrients tended to weaken resistance to potassium chlorate. Resistance decreased with the age of the plants. High cell-sap concentration is associated with low resistance, and vice versa. Although the amount of water absorbed from chlorate solutions by resistant varieties was greater than that of less resistant varieties, their total intake of chlorate was less. Differences in resistance are not due to different concentrations o' the cell sap, but depend on the semipermeability of the root-cell membranes. A. G. POLLARD.

Consumption of nutrients and the process of their absorption by various vegetables. H. LIESE-GANG (Gartenbauwiss., 1929, 2, 418—455; Bied. Zentr., 1930, 59, 118—119).—Economic applications of fertilisers for a number of vegetables may be calculated from the known mineral contents of the plants, using the factors 0.67 for nitrogen, 1.25 for potash, and 1.50 for phosphate. Curves showing the course of the intake of nutrients are given and discussed. A. G. POLLARD.

Changes in the carbohydrate constituents and feeding value of mangolds from October to March. S. D. F. HARWOOD and H. MARTIN (J. South Eastern Agric. Coll. Wye, 1928, No. 25, 200-202).—The content of dry matter and of sucrose was highest in December and lowest in March; reducing sugars increased from December (0.173%) to March (1.665%).

CHEMICAL ABSTRACTS. Neubauer values of some [Czechoslovakian] soils. J. SUK (Z. Zuckerind. Czechoslov., 1930, 54, 349– 351). Action of sulphur dioxide on natural phosphates. CALCAGNI.—See VII. Agricultural value of sugarfactory mud. BROADBENT. Disposal of sugarfactory waste waters. MONTGOMERY.—See XVII. Sardine waste products. YOSHIMURA and others.— See XIX.

See also A., Apr., 502, Counting soil Actinomyces (Rao and SUBRAHMANYAN). 507, Assimilation of nitrate by asparagus in absence of light (NIGHTIN-GALE and SCHERMERHORN). 508, Relation of potassium to properties and functions of the leaf (JAMES).

PATENTS.

Production of material containing a high percentage of calcium nitrate and capable of being readily strewn. F. UHDE (B.P. 308,717, 5.3.29. Ger., 27.3.28).—Potassium, sodium, or magnesium nitrate is added to a solution of calcium nitrate, in such quantity that the product contains 5-20% thereof. The added nitrate may be formed *in situ* from the corresponding sulphate, and is preferably introduced into the hot calcium nitrate solution seeded with the final product. F. G. CLARKE.

Manufacture of manures [phosphatic fertilisers]. E. F. EHRHARDT. From H. WIGGLESWORTH, U. ORLANDI, and G. LEVI (B.P. 326,814, 14.11.28) .- Phosphatic material is treated in three stages with a countercurrent of a mineral acid, the mother-liquors from a previous operation being added during the intermediate stage, in the presence of ammonium or an alkali sulphate in quantity sufficient to yield an easily filterable, complex ammonium or alkali calcium sulphate, and the phosphoric acid solution obtained is treated with sufficient ammonia in the presence of a sodium salt to yield ammonium sodium hydrogen phosphate, which is recovered from the solution. Mixed fertilisers containing potassium and nitrogenous salts in addition to the main product may be obtained, e.g., by adding sodium nitrate or excess potassium or ammonium sulphate to the mineral acid used for treating the phosphatic material. The precipitated complex sulphates are treated with ammonia and carbon dioxide to recover the alkali sulphates L. A. COLES. together with ammonium sulphate.

Manufacture of mixed fertilisers. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 326,529, 16.11.28).— To a hot liquid mixture containing ammonium nitrate, a second fertiliser, and 10% or less of water is added 6% or less of one or more substances which, in dissolving in the liquid, increases its surface tension; the mixture is then dispersed into solid globules. The added substance is preferably also a fertiliser, *e.g.*, urea or calcium nitrate. F. G. CLARKE.

Instruments for testing or comparing the physical properties [penetrability] of soil. (SIR) E. O. WILLIAMS (B.P. 326,954, 14.2.29).—A tube is provided with a cylindrical foot for applying to the soil and with a collar for holding weights or for receiving impulses by sliding the weights down the upper section of the tube. The tube is made in two sections which can be connected at the collar, and the foot is preferably of $2\frac{1}{8}$ in. diam., so that the application of a 28 lb. weight corresponds to a load of $\frac{1}{2}$ ton/ft.² L. A. COLES.

Granular chemicals (G.P. 453,366).—See VII. Fungicides (B.P. 326,460).—See XXIII.

XVII.—SUGARS; STARCHES; GUMS.

Pan boiling [control of cane sugar]. S. J. SAINT (Trop. Agric., 1930, 7, 3-8).-A continuation of earlier work on the subject (cf. B., 1929, 655). Suggestions are made for the more efficient boiling of final low-purity strikes, using the Zeiss industrial refractometer. By raising the true coefficient of supersaturation of the mother-liquor of the low-purity strike to 1.35 before striking into the crystalliser, a considerably greater extraction of sucrose from the final molasses could be obtained. This can be done with safety with the aid of the refractometer, whereas ordinarily a pan-boiler without such a means of control is cautious of raising the concentration in case false grain may form. It was also shown that the so-called vacuum method of graining, which yields a uniform grain, can be as readily controlled with the aid of the refractometer as the " waiting " method. J. P. OGILVIE.

Pressure evaporation in cane-sugar factories. P. HONIG and J. F. BOGTSTRA (Archief, III Meded., 1929, No. 14, 689-834) .- Working in two cane-sugar factories in Java with a standard triple-effect evaporator without vacuum, the juice temperatures being, respectively, 114°, 108°, and 102°, continuous tests showed that, provided the tubes are kept clean, no fall in the purity nor of the glucose ratio can be detected during concentration to 50° Brix. In the case of juice clarified by the sulphitation process, however, the scale forming on the tubes was found greatly to lower the efficiency of the apparatus, much more so than in ordinary vacuum evaporation. In fact, pressure evaporation cannot be recommended for juice thus clarified, nor for defecation juice, though it appears to be practicable with carbonatation juice. J. P. OGILVIE.

Removal of incrustation from [sugar-factory] evaporator and heater tubes. H. B. Springer (Trop. Agric., 1929, 6, 235) .- Incrustation in evaporator and heater tubes (consisting largely of calcium silicate and sulphate with some phosphate) was softened by boiling with a 2% solution of ammonium hydrogen fluoride during 3 hrs. under 1 in. vacuum. the used solution being made up to its original concentration and used the following week. In this way scraping of the scale was greatly facilitated, and comparatively large quantities were removed from each of the last calandrias. Though the cost of cleaning was increased by £4 per week by the use of this reagent, this extra cost was more than counterbalanced by an increased evaporative capacity of about 25%, making possible an increase in maceration. Less steam had to be used in single effect, and the various power units operated against a lower back pressure.

J. P. OGILVIE. Sucrose losses in crystallisers during cooling. F. H. KING and E. B. JAMORA (Sugar News, 1930, 11, 19-27).—Observations made of the dextrose content per 100° Brix during the cooling of massecuites from about 74° to about 50° show that sucrose was lost to the extent of 2.93% as the average of tests carried out in 12 crystallisers during varying periods of time from 24 to 192 hrs. This for a factory grinding 1000 tons per day would mean a loss of about 0.833ton per day. The sugar decomposition was greatest when the temperature was initially highest, and it is also controlled to some extent by the purity of the product. Acids were rapidly formed during the period when the massecuites was maintained at its highest temperature. The number of micro-organisms remained practically constant during the cooling.

J. P. OGILVIE.

Use of high-power machines for centrifuging raw [beet] sugars. V. STANĚK and K. ŠANDERA (Z. Zuckerind. Czechoslov., 1930, 54, 305—310).—Bergé's process (Austr.P. 115,646; cf. B.P. 290,265; B., 1929, 618) relating to the use of high-power centrifugal machines for affining raw sugars was examined. Using a machine having diam. 32 cm. and speed 2500 r.p.m., it was found possible to free raw beet sugar from the greater part of its adhering syrup, thus opening up the possibility of eliminating an important proportion of its molasses from refining operations, and of thus shortening after-product working without the addition of syrups in affining, and consequently without loss of sugar by dissolution of the crystals in the wash-liquors. J. P. OGILVIE.

Maceration of filter-cake in defecation factories. C. J. E. STOK (Archief, 1929, 37, 1102—1107; Internat. Sugar J., 1930, 32, 139).—In factories grinding the new cane POJ 2878, which contains a relatively high proportion of wax, the filtration of the mud was found to be difficult, the percentage of sucrose in the cake obtained being unreasonably high. Therefore, after steaming out, the cake was dropped into a mixer, where it was diluted to a thin paste with condensed water from the 3rd and 4th bodies of the evaporator, being then filtered through two Kroog presses. In this way it was possible to reduce the sucrose content of the cake from about 7% to 1.19%. J. P. OGILVIE.

Changes in the composition of [sugar-factory] filter-cloth with use. P. HONIG (Vers. Vereen. van Adviseurs [Java], 1929, No. 4, 158—162; Internat. Sugar J., 1930, **32**, 138).—Analysis of a filter-cloth which had been in use in a defecation sugar factory gave wax $4 \cdot 91\%$ and ash $38 \cdot 37\%$. This ash contained $37 \cdot 60\%$ (Fe₂O₃ + Al₂O₃), 26 · 06\% CaO, and 19 · 58% P₂O₅. Washing with hydrochloric acid up to 8% failed to remove the accumulated impurities sufficiently and deteriorated the fabric. J. P. OGILVIE.

Use of fats for subduing froth in carbonatation. V. STANĚK and J. VONDRÁK (Z. Zuckerind. Czechoslov., 1930, 54, 353—360).—Emulsified rape oil gave less satisfactory results than the straight oil in combating the froth arising during carbonatation in the beet-sugar factory. Experiments showed tallow, coconut oil, and lanoline also to be advantageous. J. P. OGILVIE.

Classification of sugars. P. HONIG (Archief, 1929, 37, 949–957).—A comparison of the figures for the polarisation, reducing sugars, ash (by incineration), conductivity, $p_{\rm H}$, and colour for beet white granulated made in Holland with Java plantation white sugars leads

to the conclusion that the purity is almost the same, excepting that in the latter the reducing sugar and colour values are greater. Especially is the quantity of colour around the crystal a little greater in the plantation white than in the Dutch beet white, from which it follows that the Java product must be better washed in the centrifugals to be equivalent to European white sugars. If the technique of washing plantation white sugars were improved by using a better quality of covering liquor, by boiling a more uniform grain, and by more careful washing in the centrifugals with water and steam, a sugar could be made corresponding in composition and in appearance to the best European semirefined grades. J. P. OGILVIE.

Maple syrup colour standards. R. T. BALCH (Ind. Eng. Chem., 1930, 22, 255—257).—Bryan's colour standards, prepared from sugar caramelised under prescribed conditions and diluted with glycerin (B., 1911, 299), are liable to differ considerably. The absorption spectrum of maple syrup is very similar to that of caramel solutions. By use of a spectrophotometer or a Pfund colour grader accurate standards can be prepared from any caramel solution, once the percentage transmissions for any given wave-length (e.g., 560 m μ in a 1-cm. cell) or the Pfund grader readings have been established for the Bryan standards. This has been done by the author, who also suggests slight modifications in the relative dilutions of the Bryan standards.

J. H. LANE.

Measurement of colour in the sugar industry. P. HONIG and J. F. BOGTSTRA (Archief, III Meded., 1928, No. 1, 1-35).-Factors affecting the colour of sugar solutions are the $p_{\rm H}$, the concentration (a liquid may be yellow when dilute, but reddish when in the state of syrup), and the degree of dispersion of particles that may be present in it. Lundén's amethyst shade (cf. B., 1927, 395) is the colour showing a strong absorption in the yellow part of the spectrum, and juices showing it must be regarded as inferior. It is very difficult to eliminate, and it crystallises out with the sugars. Attempts were made to obtain measurements of the colours of Java white sugars (using inferior samples), but the Hess-Ives photometer failed to do so, only the extinction in the left part of the spectrum being measured. So-called "colour curves," obtained by plotting the extinction coefficient against the wavelength at $p_{\rm H}$ 2, 7, 10, and 12 for raw, clarified, and evaporated juices at different periods through the season, demonstrated the varying colour quality, especially in respect of the amethyst shade. J. P. OGILVIE.

Determination of sugar in the beet. G. R. CLARKE, L. F. NEWMAN, and A. W. LING (J. Min. Agric., 1930, 36, 1061—1068).—In preparing the beet pulp for analysis, the use of the "Sans Pareille" press is too tedious, whilst a circular saw removes only a flat section of definite thickness. On the other hand, the conical rasp gives an excellent pulp and the proportion removed is a true fraction of the entire root. A comparative examination of methods of determining sucrose showed that, compared with the Krüger process, the Sachs-le Docte method appears to be the more reliable. It is also more convenient to the routine analyst, owing to its simple manipulative details and the rapidity with which a large number of samples can be examined.

J. P. OGILVIE.

Constant-weight and constant-volume methods [of determining sucrose in the beet]. E. SAILLARD (Sucr. Belge, 1930, 49, 184—188).—When the constantweight method was established, the typical beet was assumed to have an average mark content of $4.75^{\circ}_{0,7}$, and to contain juice of sp. gr. 1.075, but now the average beet contains more marc, and a correction is here necessary. In the last campaign, in fact, roots having 6.2°_{0} of marc and 22.5°_{0} of sugar were largely encountered. The Kaiser-Lewenberg method is not to be recommended. J. P. OGILVIE.

Determination of the amount of crystal in massecuites, using the electrical conductivity method. K. ŠANDERA (Z. Zuckerind. Czechoslov., 1930, 54, 361—364).—In place of calculations based on formulæ employing the dry substance or polarisation of the massecuite, electrical conductivity measurements afford a more reliable method for the calculation of the amount of crystal to be expected, and are besides considerably more expeditious. J. P. OGILVIE.

Defecation control by the hydrogen-ion method. J. H. PARDO (Facts about Sugar, 1930, 25, 220) .--Prior to the introduction of $p_{\mathbf{H}}$ control in a cane-sugar factory in Peru, the juice was limed to a "slight alkalinity" using test-paper, which point was found to be about $p_{\rm H}$ 7.2. On putting the colorimetric method of hydrogen-ion control into use, it was found that the juice clarified best when limed to $p_{\rm H}$ 8.0-8.2, but, as this high alkalinity considerably delayed the time of settling, the liming was reduced to $p_{\rm H}$ 7.8. Whereas with the old method of control there had been a fall in the purity between clarified juice and syrup, after instituting hydrogen-ion control this was changed into an increase, there being also a reduction of inversion losses and an increase in the rate of filtration. Generally, J. P. OGILVIE. phenol-red was used.

Determination of sugar in molasses from Uba cane. E. HADDON (S. Afr. Sugar J., 1929, 13, 833).— In molasses from Uba cane juice, optically active substances are present, probably dextrins hydrolysed from the starch. Previous to polarising, treatment for their elimination is necessary, and the author advises boiling with baryta, addition of basic lead acetate, filtration, addition of ammonia, and refiltration.

J. P. OGILVIE.

Determination of the true sugar content of carbonatation cakes [in beet-sugar factories]. O. SPENGLER (Z. Ver. deut. Zucker-Ind., 1930, 80, 69-80).— In 3 out of 20 German beet-sugar factories visited by the author last campaign the carbonatation cakes contained considerably more sugar (30-100% more) than was indicated by the usual ammonium nitrate and acetic acid methods. As a provisional method for determining the true sugar content in such cases it is proposed to heat 53 g. of the cake in a stoppered nickel beaker or wide-necked glass flask, in a water-bath at $85-90^{\circ}$ for 1 hr., the stopper being tightened after the first minute's heating, and then to add 177 c.c. of

British Chemical Abstracts-B.

ammonium nitrate solution, stir until the cake is completely disintegrated, cool, and polarise as usual.

J. H. LANE.

Crystallisation of "uncrystallisable" syrups. K. SANDERA (Z. Zuckerind. Czechoslov., 1930, 54, 333—338).—Experiments are described in which it was found that if "exhausted" beet-factory molasses is placed between two glass plates in a layer 0.05— 2.0 mm. thick it undergoes at ordinary temperatures further crystallisation around the edges. Beet-factory molasses, therefore, is not a stable system, as has been stated. By the improvement of after-product work it should be possible to raise the yield of sugar in the factory. J. P. OGILVIE.

Electrodialysis of exhausted molasses. N. KAMEYAMA and J. KATO (J. Soc. Chem. Ind., Japan, 1928, **31**, 201—202 в).—Diluted molasses was dialysed in the centre chamber of a three-chambered dialyser having platinum electrodes immersed in water in the outer chambers. The diaphragms were of parchment paper on which copper ferrocyanide had been precipitated. The voltage employed was 70-100 volts, and the current was 1 amp. per 100 g. of molasses. In 4 hrs. the ash content of the molasses was reduced from 10.06% to 1.61-1.86%, the alkali salts being removed more completely than those of the alkaline earths; the sucrose content fell from $34 \cdot 33\%$ to $29 \cdot 3\%$, and the invert sugar content increased from 16.57% to 17.16-17.6%. The molasses became acid, but inversion was restricted by maintaining temperatures below 40°. The chief loss of sugar seems to have been by transformation into acids, the amount of sugar passing into the outer chambers being small. J. H. LANE.

Sugar losses in beet-sugar factories and the recovery of sugar contained in factory waste products. I. Sugar losses. H. CLAASSEN (Z. Ver. deut. Zucker-Ind., 1930, 80, 55-68).-The calculation of sugar losses should be based on the weight of washed roots as weighed before slicing. In many factories a deduction is made from this weight for adhering moisture and residual dirt on the roots and, in consequence, the sugar loss calculated on beets is 0.3-0.9% too low. The moisture and dirt adhering to the weighing machine, however, should be treated as part of the tare and deducted from the apparent weight of roots. Properly calculated, the total sugar losses in the factory usually amount to 1.25-1.5% of the beets. Of this total 0.5-0.6% represents sugar lost in waste products, mainly in exhausted slices, waste waters, and filterpress cake. The balance, 0.75-0.9%, represents the so-called undetermined loss. Part of it is due to causes which can be specified but not accurately assessed. Thus incorrect tare of the weighing machine, drying out of the fresh slices between sampling and analysis, and low results in the usual methods of determining sugar in filter-press cake may each account for 0.05-0.1%. Lowering of polarisation of the juice due to the action of lime may account for 0.1%, and destruction of sugar during heating and evaporation of the juice may add a further 0.02%. There still remains, however, a loss of about 0.4-0.5% of sugar (calc. on beets) for which no explanation is forthcoming. J. H. LANE.

Composition and agricultural value of [sugar] factory mud (press cake). F. W. BROADBENT (Internat. Sugar J., 1930, 32, 216).—Calculated on the solid matter, factory mud contains: CaO 11.33, N 1.85, $P_2O_5 8.89$, and $K_2O 0.37\%$. In Hawaii the mud mixed with water added to give about 14% of solids is being distributed over the fields, where it is used at the rate of 0.0403 ton of wet mud per ton of cane. J. P. OGILVIE.

Waste waters from beet-sugar factories and suggestions for their disposal. W. MONTGOMERY (Internat. Sugar J., 1929, **31**, 545—549, 602—608).— Analyses are given of fluming water, pulp waste water, silo drainage waste water, lime-cake drainage waste water, and final waste water. A method of treatment comprises the separation of the waste waters at the mill, the fluming water being submitted to fine screening and its grit removed, cooled by means of spray towers, and stored in reservoirs for re-use. Finally it is proposed to dispose of these wastes for the irrigation of land, utilising the check method of application with subsurface pipe or surface ditch. J. P. OGILVIE.

Determination of the solubility of dextrin. PARLOW (Z. Spiritusind., 1930, 53, 52).—10 G. of dextrin are stirred for $\frac{1}{2}$ hr. in a beaker with 500 c.c. of water at 20°, and 25 c.c. of the clear filtrate are carefully evaporated to dryness in a weighing glass. The bottom of the weighing glass is covered with a layer of sea sand which has been previously washed and dried at the temperature of evaporation after extraction with acid. The sand ensures more rapid and more regular evaporation, and by lessening the tension when the dextrin solution becomes solid prevents the cracking of the thin-walled weighing glass during cooling.

C. RANKEN

Influence of the dry summer of 1929 on the tenacity of potato flour. SCHULZ and PARLOW (Z. Spiritusind., 1930, 53, 85).—Not only is the tenacity of starch flour influenced by the soil, method of drying the starch, and the size of the starch grains, but the climatic conditions also have their effect. The dry summer of 1929 has yielded potato flours with very low tenacity values. Using Wolff's standard starch for comparison, the average values for the tenacity of the potato starches of 1929 approximated to 120%, compared with 150% for the previous year. C. RANKEN.

Alcohol and yeast manufacture. Stich.—See XVIII.

See also A., Apr., 499, Refractometric measurement of invertase action (GORBACH).

PATENTS.

Manufacture of concentrated grape juice [to obtain dextrose]. Soc. DES ETABL. BARBET (Addn. F.P. 32,711, 8.7.26, to F.P. 615,942; B., 1927, 856).— The solution is concentrated in a high vacuum produced by a two-stage pump until d 1.4 is exceeded; on cooling, dextrose separates in crystals. A. R. POWELL.

Wheat [malt] syrup and its manufacture. F. H. ROGERS. From INTERNAT. WHEAT MALT SYRUP CO. (B.P. 326,264, 17.12.28).—Ground wheat malt is mashed with water at approx. $42 \cdot 5^{\circ}$, and 1 hr. later is heated by successive increments alternated with rest intervals to between 68° and 80°, the final temperature depending on whether a high or low content of sugars is required. The liquid is then separated from the solid portion and evaporated to the desired consistency. C. RANKEN.

XVIII.—FERMENTATION INDUSTRIES.

Metafiltration and the brewing industry. J. A. PICKARD (J. Inst. Brew., 1930, 36, 179-188).-The filter is built up of strips of metal piled one upon the other. On one side the strips carry bevelled edges and a central flat part down the middle of which is a slightly raised rib. When the strips are held in frames, the bevelled edges constitute V-shaped grooves through which the liquid flows from the outside of the strips, whilst regularly spaced perforations in the strips come into register and provide the outlet channel for the drainage of the filtered liquid. Filtration is improved by a filter-bed of kieselguhr deposited in the V-shaped grooves, and when beer is being filtered it is an advantage to add to the stream of beer a further small quantity of kieselguhr to counteract the impervious nature of the deposit and prevent the rapid giving out of the filter. The filter can be used at any pressure and at any temperature, and can be cleaned and sterilised in a few minutes. C. RANKEN.

Action of high pressure of carbon dioxide on yeast fermentation. F. WINDISCH (Woch. Brau., 1930, 47, 82-83).-It has been shown by Lieske and Hofmann (A., 1929, 1199) that whereas above 100 atm. pressure of an inert gas is required to check fermentation, about 40 atm. pressure of carbon dioxide brings the process to a standstill. The author gives a comparison of parallel fermentations under 1.0, 1.4, and 2.0 atm. pressure of carbon dioxide, which show a very slight falling off in the rate of fermentation with increasing pressure. Since he finds that the biological condition of the yeast is improved by pressure, he considers that the inhibiting effect is due to the effect of the dissolved carbon dioxide on the reaction of the medium rather than to any poisonous effect it exerts on the yeast. It is suggested that as no means are available for determining the $p_{\rm H}$ in pressure vessels, the question might be answered by comparing the behaviour of buffered and unbuffered fermentations under pressure.

F. E. DAY.

Electrodialysis of wort and beer. W. WINDISCH, P. KOLBACH, and E. BORGES (Woch. Brau., 1930, 47, 67—71, 77—81).—Wort and beer were submitted to electrodialysis under a P.D. of 100—120 volts for about 6 hrs. The current passing increased from about 0.5 amp. to about 1 amp. during the first 15 min., then decreased to about 0.1 amp. Cooling had to be employed. The nature of the membrane has a strong influence on the rate of dialysis, and the most rapid results were obtained by using leather as anode diaphragm and certain Zsigmondy ultrafilters, especially "cellafilter," as cathode diaphragm. With this combination only 2% of the ash of wort remained after 2 hrs. The effect of using various membranes on the electrodialysis of different classes of constituents was studied. A wort and the beer from it were electrodialysed for 6 hrs., and the buffer titrations compared with those of the same materials before and after treatment with baryta, and with those of the latter after electrodialysis. Determinations of inorganic and phytin phosphorus and of total and formol nitrogen were also made. By using suitable membrane combinations phosphates could be almost completely removed, without great alteration of the nitrogenous constituents, and from the buffering of the resulting liquids the isoelectric zone of the proteins and their decomposition products could be determined. F. E. DAY.

Clarification [of wine] with potassium ferrocyanide. O. REICHARD (Z. Unters. Lebensm., 1929, 58, 488-505).-Clarification resolves itself into three operations : firstly, a test to determine whether iron compounds are the cause of the turbidity; secondly, measurement of the amount of potassium ferrocyanide needed ; and thirdly, a test for the completeness of the process. (i) To determine the nature of the iron compounds, 20 c.c. of wine are centrifuged, whereon a yellow deposit indicates phosphate and a black one tannate ; a mixture of the two may also be present. The sediment is taken up with water slightly acidified with sulphuric acid and tested for iron with potassium ferrocyanide. Microscopical examination of the deposit gives confirmatory evidence. The iron content may be insufficient to cause a deposit in young wine, but will do so after storage; in such cases determination of total iron by colorimetric methods is necessary. The iron content capable of causing turbidity differs from one wine to another, and may vary between 5 and 15 mg./litre, according to the relative amounts of malic and tartaric acids present. Oxidation by keeping and stirring in open vessels or the addition of 3 drops of hydrogen peroxide to 100 c.c. of wine, stored in the dark, will determine whether turbidity is likely to develop. (ii) Exact determination of the amount of potassium ferrocyanide to be added is most essential, but since an excess is to be guarded against it is customary to add sufficient to remove all but 2 mg./litre of iron. The requisite amount is determined by titration in which to 5 samples of wine (each 10 c.c.) are added 0.1, 0.3, 0.5, 0.7, 0.9 c.c. of potassium ferrocyanide solution (0.50 g. in 100 c.c.), respectively, 1 c.c. of gelatin solution (0.2 g. in 100 c.c. of aqueous alcoholcontaining 1.0 g. of tartaric acid), and 1 c.c. of tannin solution (0.2 g. in 100 c.c. of aqueous alcohol). The liquids, after filtration, are divided and tested for iron and potassium ferrocyanide. The test is then repeated, using smaller volumes of ferrocyanide. The number of g. per litre required is called the " clarification number " ("Schönungszahl "), but actually 0.04-0.05 g./litre less than this figure is used in the clarification. Owing to the variations in iron content even amongst different batches of the same wine, every barrel must be tested separately, the samples being taken with every precaution. All wines which have been treated must subsequently be filtered, whether a deposit be visible or not. (iii) The final proving consists of a test for excess potassium ferrocyanide.

H. J. DOWDEN.

Description of gin. W. LANGE (Chem.-Ztg., 1930, 54, 230-231).—Gin prepared exclusively from juniper berries comes under the protection of the brandy monopoly law. Hence the name "Wacholder" (juniper) applied to a mixture of juniper essence and diluted spirit is a false description and should be changed.

J. H. BIRKINSHAW.

Description of gin. A. JUCKENACK (Chem.-Ztg., 1930, 54, 231—232; cf. preceding abstract).—It is not by any means clear whether the brandy monopoly law is intended to apply to gin. J. H. BIRKINSHAW.

Alcoholometry. F. BORDAS and F. TOUPLAIN (Ann. Falsif., 1930, 23, 84—102).—The International Conference (June, 1929) having fixed 20° as the temperature for alcoholometric measurement, the authors have established formulæ for inter-conversion of results at this temperature and at 15°, the legal tables in France being based on d_{15}^{15} of absolute alcohol *in* vacuo. Attention is incidentally drawn to the fact, not generally recognised in commercial transactions, that the alcoholometric calculations are based on weights *in vacuo*. E. B. HUGHES.

Rectification of raw spirit and the manufacture of absolute alcohol. W. SCHLAGE (Z. Spiritusind., 1930, 53, 49-51).-Raw spirit is rectified by periodic and continuous distillation methods and yields a spirit containing $94 \cdot 4 - 94 \cdot 8\%$ by wt. of alcohol. The yield of "fine" or "prima" spirit is higher with the continuous process. A purer alcohol is obtained by filtering the raw spirit through charcoal prior to the distillation. For the manufacture of absolute alcohol dehydration of the rectified alcohol by lime is still in use, but is steadily being replaced by methods in which pure benzene, fine benzine (b.p. 80-110°), or, better, a benzenebenzine mixture (b.p. 94-104°) is used as the dehydrating agent. Most of the absolute alcohol is manufactured by the continuous distillation process either at ordinary or under 10 atm. pressure. The manufacture of 1 hectolitre of absolute alcohol by the periodic system requires 475-500 kg. of steam, whereas 155-185 kg. are sufficient in the continuous system. C. RANKEN.

Economics of alcohol and yeast factories. E. G. STICH (Chem.-Ztg., 1930, 54, 217—220, 238).—In the manufacture of alcohol and yeast from molasses the chief factors for economic working are extremely fine division of the air supplied and strict regulation of the air and mineral nutrients in accordance with the rate of multiplication of the yeast. Fermentation in stages, employing a series of small vats, leads to a considerable saving in total vat capacity, and therefore in installation costs. Comparative cost figures for the old and new processes are given. J. H. BIRKINSHAW.

Observations on the Stich fine-aeration process. P. LINDNER (Chem.-Ztg., 1930, 54, 238—240).—The easy assimilation of alcohol by yeast in presence of air leads to a comparison of the human respiratory system with the Stich fine-aeration process. Attention is drawn to the glycogen and fat formation in yeast. When all the oxygen of the cell is used up, no further growth is possible and synthesis of glycogen may occur. Aeration in a dilute alcohol solution leads to formation of fat: the fatty cells are incapable of further reproduction. The best temperature for fermentation (about 37°) differs from the optimum for growth, which is about 25°. J. H. BIRKINSHAW.

Importance of hydrogen-ion concentration in potato-spirit distilleries. B. DREWS (Z. Spiritusind., 1930, 53, 91-93).-The p_H value of the liquid expressed from raw or steamed potatoes is approx. 5.9, whilst that of the sweet wort prepared from potatoes and malt varies between 5.1 and 5.3 and falls within the zone of optimum action of the diastase. Lactic acid is preferable to sulphuric acid for the acidification of the mash, as the former acid is less dissociated and during its bacterial formation is accompanied by a simultaneous increase in the content of buffer substances. A high buffer content prevents too great a decrease of the $p_{\rm H}$ value of the mash below 4.5, which is the optimum value for alcoholic fermentation and for the after-saccharification necessary for the attainment of a completely fermented mash. To retain the mash at approximately this value when sulphuric acid acidification is used, a greater proportion of green malt must be added and a more concentrated C. RANKEN. mash used.

Beer-slop waste from corn-mash distillation [in butyl alcohol manufacture]. W. D. HATFIELD (Ind. Eng. Chem., 1930, 22, 276-277).-In a butyl alcohol factory working 20,000 bushels of maize per day, over 1.25 million gals. of distillation residue (beer slop) are obtained daily. This slop, which has $p_{\rm H} 4.6-5.0$, contains 11,000 pts. per million of total solids, of Its total which about 4000 pts. are in suspension. nitrogen content is 500 p.p.m., and its oxygen absorption about 5700 p.p.m. On settling in cylinders, the suspended matter occupies 40, 30, and 22% of the original liquid volume after 1, 2, and 11 hrs., respectively; it is so light that it would cause trouble in settling tanks. After dilution of the slop with sewage the solids are easily separated. The sludge is readily digested with sewage solids and produces the same quality and quantity of gas as the organic matter of sewage. Its high oxygen requirements would greatly increase the amount of sprinkling-filter or activated-sludge treatment necessary. The cost of treating such a strong waste makes its recovery as a by-product in the industry itself J. H. LANE. advisable and necessary.

Utilisation of distillery by-products. E. HUM-BOLDT (Facts about Sugar, 1930, 25, 18—19).—In utilising the carbon dioxide from fermentation tanks, the impurities present can be separated by absorption by activated carbon, glycerin, or neutral paraffin oil, preferably the last-named as it retains the last traces of fusel oil and can easily be regenerated by heating. Yeast is not separated in modern distillery practice. The whole of the slop is concentrated to $d \cdot 33$ —1·38 in a triple-effect evaporator, the syrup obtained being sprayed into a brisk fire in a furnace having a good draught, a product containing 35—45% K₂O being thus obtained. Or the slops may be destructively distilled for the recovery of the usual products, using a welldesigned equipment requiring little auxiliary heat.

J. P. OGILVIE.

Titration of acids in wine. HIRSCH and RICHTER. Determination of alcohol in foods. TÄUFEL and DÜN- WALD .- See XIX. Alcohol determination. MEYER .-See XX.

See also A., Apr., 499, Refractometric measurement of invertase action (GORBACH). Effect of ethylene on activity of diastase and invertase (ENGLIS and ZANNIS). 500, Natural activators and inhibitors of proteolytic enzymes (GRASSMANN and others). 501, Higher alcohols of fermentation (SWENARTON). 502, Growth and acid production of Aspergillus niger under water (AMELUNG).

PATENTS.

Production of malt enzymes, diastases, or the like as by-products in brewing. E. JALOWETZ and M. HAMBURG (B.P. 303,110, 17.12.28. Austr., 28.12.27). -Malt is mashed with water under 35°, and after separation of the solution of enzymes and albuminous matter, the residue is used to produce beer wort by any of the known brewing methods. The enzymic solution is not added to the beer wort, but is concentrated as desired. C. RANKEN.

Enriching the flavour and improving the aroma of beer and the like. T. BREHENY (B.P. 326,587, 31.12.28).-Vapours from the contents of brewing and agitation vats are collected in the intermediate of three chambers of a condenser which consists of three concentrically arranged casings. Prior to incorporation in the finished beer, the condensed liquid is delivered to a chamber where it is cooled and divided into fine streams which absorb the cooled, non-condensible aroma gases.

C. RANKEN.

Wheat syrup (B.P. 326,264).—See XVII.

XIX.—FOODS.

Action of aldehydes on white bread. L. KARAC-SONYI (Z. Unters. Lebensm., 1929, 58, 517-524).-The action of aldehydes in preventing bread from becoming stale has been further investigated (cf. Katz, B., 1916, 901) in order to discover which aldehydes produce the most pronounced effect, and also to determine which constituent of the bread is affected. The influence of the aldehydes was followed by means of viscosity determinations, 10 g. of bread crumb being pressed through a fine sieve and brought into suspension in water, the total liquid weighing 100 g. Measurements on 48-hr. old, treated and untreated bread when compared with those on new bread showed that acetaldehyde and propaldehyde have a far greater influence than any of the others tested. Propaldehyde was then used with starch and with a fat-free albumin preparation made from the bread, and it was found that whereas the aldehyde, after acting for 48 hrs., could be easily removed from the starch, it was firmly attached to the albumin. When treated with certain aldehydes, especially acetaldehyde and crotonaldehyde, bread exhibits a change of colour which is not influenced by light, and which persists when the bread is dried at 60° and finely ground. Starch alone gave no colour effect, and that the albumin constituent is the part affected was confirmed by tests on fat-free gluten. Crotonaldehyde and acetaldehyde affect the physical character of the bread, rendering it tough and springy; this fact may

explain the differences between the author's findings by the viscosity method and those of Katz (loc. cit.) by the sedimentation method. The retardation of staling by aldehydes is only effective so long as the concentration of aldehyde is maintained, for when the aldehyde was removed at the end of 48 hrs., in a further 48 hrs. the viscosity was found to be the same as that of bread 4 days old. H. J. DOWDEN.

Determination of lecithin-phosphoric acid in ice cream and its intermediates. A. GRONOVER and P. LEDERLE (Z. Unters. Lebensm., 1929, 58, 448-453). In the determination of lecithin-phosphoric acid, dehydration by heating with sand or pumice leads to low values. More satisfactory results are obtained if the sample of ice cream (30-50 g.) or the intermediate (5 g.) be partially dried to a soft paste by heating with pumice (15-25 g.) on a water-bath, and then completely desiccated by adding anhydrous sodium sulphate. The dried material is ground and extracted with alcohol according to Arragon's method (cf. A., 1906, ii, 592), or, alternatively, Besson's extraction apparatus may be used as recommended by Grossfeld (cf. B., 1928, 313). After removal of the alcohol, the residue is ashed together with 3 c.c. of 50% magnesium acetate solution and the same volume of 8% alcoholic potash. Phosphoric acid is determined in the nitric acid extract; the authors found that Lorenz's method (cf. A., 1901, ii, 278) is very suitable. Instead of ashing, the destruction of organic matter can be conveniently effected by nitric and sulphuric acids. To the alcoholic extract 5 c.c. of concentrated sulphuric acid are added, followed by small quantities of nitric acid, heating gently meanwhile, and when most of the organic matter has been removed heating more strongly until the solution is colourless. Phosphomolybdate is precipitated in the solution after dilution and addition of pure nitric acid.

H. J. DOWDEN.

Constituents of cacao husk. C. GRIEBEL and P. CASAL (Z. Unters. Lebensm., 1929, 58, 478-484).-The determination of the mucous cell content of cacao products by microscopical examination has been previously described (cf. Griebel, B., 1927, 568), and the constitution of these cells has now been investigated in an endeavour to devise a more reliable test. A filtered aqueous extract of the fat-free husk when treated with a large volume of alcohol-ether gave a precipitate which showed the reactions of galacturonic acid. The analysis calculated on the ash-free material was arabinose 14%, methylpentose 7%, galactose 32%, and galacturonic acid (expressed as lactone) 47%. Three methods of determination now present themselves : (i) precipitation of the mucous material from the aqueous extract and weighing; (ii) oxidation by means of 25% nitric acid of the residue after evaporating the aqueous extract, whereby mucic acid is formed ; and (iii) distillation with 12% hydrochloric acid according to Lefèvre's method, whereby the carbon dioxide evolved is measured and used to calculate the galacturonic acid content. These methods were applied to the examination of the husks of 11 varieties of cacao. The first two methods were found to be inconclusive, duplicate experiments being not concordant. By the third method the "galacturonic acid number" (mg. of acid, expressed as lactone, in 1 g. of fat-free, dry husk) was found to correspond closely with the number of scleride (cf. B., 1926, 605). The method is, however, not applicable to products which have been treated with alkali, since in products so treated part of the pectin material is rendered water-soluble and gives rise to large amounts of carbon dioxide. H. J. DOWDEN.

Use of formaldehyde titration for the testing of foodstuffs [such as honey, cacao, etc.]. A. NIET-HAMMER (Z. Unters. Lebensm., 1929, 58, 530—531).— It is shown that Tillmans' reaction (cf. B., 1927, 456) is most valuable in differentiating natural from artificial honey, the results being in agreement with those from Fiehe's test. The presence of pollen in honey has no appreciable influence on Tillmans' test, but it is observed that samples containing very large amounts of pollen require an abnormally large addition of alkali to restore the colour. Formaldehyde titration serves as a rough test for the presence of husk in cacao products, the alkali addition required to restore the colour being rather less for adulterated samples than for pure cacao.

H. J. DOWDEN.

Influence of neutral salts on the colorimetric determination of creatinine by Folin's method, and the determination of the degradation products of albumin by van Slyke's method in the presence of creatinine. K. and H. BECK (Z. Unters. Lebensm., 1929, 58, 409-425).-(i) To 15 c.c. of a 1.2% solution of picric acid were added 6 c.c. of 10% caustic soda solution and 10 c.c. of 0.1% solution of creatinine. After 5 min. the red mixture was diluted to 500 c.c. and its colour compared against 0.5N-potassium dichromate solution in a Duboscq colorimeter. Measured volumes of *M*-solutions of the sulphates, carbonates, chlorides, and phosphates of sodium, potassium, calcium, and barium were added to the mixture, and the variation in colour was measured in the colorimeter. The salts of the alkaline earths produce a greater reduction in colour than do those of the alkali metals, and in all cases the small initial amounts have relatively a much greater effect than the subsequent additions. Solutions of acid salts, e.g., sodium dihydrogen phosphate and potassium hydrogen sulphate, produced a colour inversion from red to yellow when a certain degree of acidity was reached. From the m.p. curves of mixtures of picric acid and creatinine it was deduced that over the range 0-20 mols. of creatinine in 100 mols. of picric acid only mixed crystals occurred ; the molecular lowering of f.p. for picric acid is $14 \cdot 2$ and the molecular heat of fusion $5 \cdot 02$ kg-cal. It is concluded that creatinine dissolves in the unimolecular state. Examination of the mixed melt by extraction with different solvents, fractional precipitation, etc. having lead to no definite conclusions, the red-coloured material was precipitated from aqueous solution by dilute sulphuric acid, freed from picric acid, and analysed. The resultant formula, C10H16O9N6 represents 1 mol. each of creatinine, picric acid, and water. The sodium derivative was then prepared in alcoholic solution by adding 200 c.c. of saturated creatinine solution to 100 c.c. of saturated picric acid solution mixed with 10 c.c. of 10% sodium ethoxide. After keeping in ice, the red precipitate was filtered off, dissolved in water, and the solution then acidified with sulphuric

acid, whereby the creatinine picrate was precipitated. The composition of the material obtained by these two methods agrees with the formula C₄H₇ON₃, C₆H₂(NO₂)₃·OH, H₂O, and the change of colour from red to yellow is accounted for by keto-enol tautomerism (cf. Greenwald, B., 1925, 525). The gradual fading of colour and the action of neutral salts are both ascribed to alterations in the dissociation constant of the creatinine-picric acid complex and to displacement of the equilibrium, creatine \equiv creatinine. (ii) In the examination of the hydrolysis products of meat extracts by van Slyke's method, it was found that creatinine is not completely precipitated by phosphomolybdic acid, and that when the filtrate residues are digested with lime decompositions occur in which the creatinine participates, rendering the results unsatisfactory. The nitrogen distribution in the hydrolysed extracts from beef, pork, and cod-fish are recorded, and are shown to vary with the degree of H. J. DOWDEN. concentration.

Preservation of raspberry juice with hydrofluoric acid. A. HANAK (Z. Unters. Lebensm., 1929, 58, 453-478).-The expressed juice of raspberries, which is used largely for flavouring purposes, is frequently preserved by the addition of small quantities of hydrofluoric acid. Before the juice is used the acid is removed by precipitation with calcium carbonate. An extensive study has been made of this precipitation, especially as regards the influence on it of the mineral constituents of the juice, magnesium, iron, phosphoric acid, silica, etc. It was found that the hydrofluoric acid is never entirely removed. The best results were obtained when to 100 c.c. of juice were added 0.025 g. of hydrofluoric acid and as precipitant 3 times the equivalent of calcium carbonate was employed. After acting for 3 days the filtrate was found still to contain 22% of the original acid. The presence of free hydrofluoric acid in the treated juice manifests itself by the etching of glass vessels. Physiological considerations lead the author strongly to oppose H. J. DOWDEN. this method of preservation.

Pectic juices in fruit jellies. F. MUTTELET (Ann. Falsif., 1930, 23, 79-81).—A method for differentiating between genuine, pure fruit jellies and jellies made with commercial pectin preparations is suggested, depending on the fact that the sorbitol content of the fruit jelly is considerably higher than that of the jelly made with pectin preparations. The sorbitol is determined by precipitation as dibenzylidenesorbitol, following the method of Vincent and Delachanal (A., 1898, 478).

E. B. HUGHES.

Use of indicators for the titration of the chief organic acids occurring in fruit and wine. P. HIRSCH and K. RICHTER (Z. Unters. Lebensm., 1929, 58, 433—448).—Formulæ and equations have been developed from a consideration of the "molar combining power" (cf. A., 1924, ii, 795). The electrometric results obtained by Auerbach and Smolczyk (cf. A., 1925, ii, 118; B., 1925, 153) have been used to calculate the values of this function for acetic, lactic, benzoic, tartaric, malic, succinic, and citric acids, and the results are represented graphically. By titration of the solutions to colour equality with buffer solutions of known $p_{\rm H}$ (e.g., 8.3, 5.02, and 3.2, using phenolCL. XIX .--- Foods.

phthalein, methyl-red, and dimethyl-yellow, respectively, as indicators) data were obtained from which the acid concentrations could be calculated. The influence of neutral salts on the dissociation of the acids was investigated by titration in the presence of saturated sodium chloride solution. Good results were obtained for a single acid in the presence of its salts and for mixtures of two acids, but the indicator method is not so accurate as the electrometric method. With mixtures of two acids the accuracy diminishes as the difference between the dissociation constants of the acids becomes less. H. J. DOWDEN.

Determination of alcohol in foods by "salting out" with potassium carbonate. K. TÄUFEL and H. DÜNWALD (Z. Unters. Lebensm., 1929, 58, 485-488). -The method of Nag and Lal (cf. J.S.C.I., 1918, 290 r) has been modified by Gadamer and Neuhoff (cf. B., 1926, 214) by introducing a preliminary distillation, after which an excess of anhydrous potassium carbonate is added to the aqueous alcohol and the volume of the alcoholic layer is used in calculating the percentage of alcohol. The original formula has now been simplified and the alcohol content in g./100 c.c. is given by $(v \times 74 \cdot 28)/M$, where v is the volume of the supernatant so-called alcohol hydrate at 20° , and M the volume of the original liquid. The method has been used for the examination of materials of high alcohol content, such as brandy, and the results were found to agree to within 1% with those determined by pyknometric methods, even when the distillate was contaminated with acetic acid. The results with liquids containing less than 20% of alcohol were not satisfactory owing to the large volume of material required; thus with beer a sample of 100 c.c. must be taken in order to obtain an alcoholic layer of 5 c.c. The large amounts of potassium carbonate needed involve prolonged shaking; emulsions are formed and the rise in temperature causes loss of alcohol by evaporation.

H. J. DOWDEN.

Discoloration and corrosion of the inner surfaces of containers for canned foods. W. D. BOGATSKY, W. A. BIBER, and L. G. KISCHINEWSKAJA (Z. Unters. Lebensm., 1929, 58, 506-517).-The black stains on the inner surfaces of tinned-iron containers have been investigated and were found to consist largely of metallic sulphide. By exposing containers for 1 hr. at 3 atm. pressure to the action of an emulsion of equal parts of 1% acetic acid and sunflower oil to which was added albumin, cystine, or allyl sulphide, it was shown that the discoloration is caused by the sulphur constituent of the can contents. Allyl sulphide in acetic acid also produced stains in the cold after 21 days, so that the high temperatures and pressures during processing are not responsible. A number of samples of tin-plate from different sources were compared as regards their liability to stain. The presence of lead or copper in the tin film does not appreciably affect the tendency to discolour, but the thickness and particularly the regularity of the deposit has considerable influence. The dark patches were found where the tin layer was thin and they were caused by mixtures of sulphides of tin and iron, the colour of the iron sulphide being visible through the thin layer of tin sulphide. Corrosion

of the inner surface of containers is caused by acid juices and involves dissolution of the tin coating. The resistance to corrosion of tin-plates of different origin was studied by determining the amount of tin passing into solution when they were exposed for 21 days to the action of 1% acetic acid. The amounts varied from 0.15 to 0.75 mg./cm.², but when an oil emulsion with 2% acetic acid was used the corrosion was much decreased and averaged 0.05 mg./cm.2 Tin-plate which has been given a coating of tin sulphide appeared to be resistant to subsequent corrosion and staining by acetic acid or by sodium sulphide in acetic acid, respectively. Although the colour of the film of sulphide is diminished by the action of an emulsion of oil and acetic acid containing albumin or onions, no blackening occurred. The sulphide layer appears to be unaffected during the sterilisation of fish and vegetable preserves by heating at 100° for 11 hrs. H. J. DOWDEN.

Absorption of aluminium from aluminium utensils in the cooking of foods. SERGER and NEHRING (Hansz. V. A. W. u. Erftwerk A.-G. f. Aluminium, 1929, 1, [7]; Bied. Zentr., 1930, 59, 125–127).---Numerous food preparations in aluminium and in enamelled vessels are compared. In no case was the aluminium absorbed by the foods sufficient to have any physiological significance. Repeated use of aluminium vessels does not influence the amount absorbed. A. G. POLLARD.

Foil-wrapped food material. I. Zinc foil. L. T. FATRHALL and L. C. WALKER (Food Ind., 1929, 1, 642— 645).—Ginger ale normally contained 0.5—2.3 pts. of zinc in 10⁶ pts., chocolate mints 16, chocolate 15.2— 32.4, and acid drops (candy) 3.6 in 10⁶. Ginger ale readily dissolves zinc foil. In 2 weeks wrapped chocolates contained 4.6—65 pts. in 10⁶. The amount of zinc retained markedly increases with rise of temperature, but the effect on health of the zinc intake from such foods is negligible. CHEMICAL ABSTRACTS.

Occurrence of antimony and tin in foil-wrapped cheeses. C. H. MANLEY (Analyst, 1930, 55, 191–192). —Samples of Gruyère cheeses wrapped in foil were found in every case to be discoloured, as was also the foil, and 15—160 pts. of tin per million were present. The foil consisted in one case of $96 \cdot 8\%$ Sn and $3 \cdot 2\%$ Sb, and the cheese in this wrapper contained 160 pts. of tin and 17 of antimony. D. G. HEWER.

Sardine waste products. S. YOSHIMURA, K. NI-SHIDA, and A. YAMADA (Bull. Kagoshima Agric. Coll., 1929, 7, 95—112).—Putrefaction results in decomposition of all the organic bases except cadaverine and putrescine. As a fertiliser the material is quickly effective.

CHEMICAL ABSTRACTS.

Bacteriostatic action of dyes. OWEN.—See IV. Preservation of fats. FIERO. Re-esterification of neutral fats. TÄUFEL and PREISS. Saponification of fatty substances. DE'CONNO and FINELLI. Colorimetry of oils and fats. PALLAUF. Hardened fats in cacao butter. GROSSFELD.—See XII. Feeding value of mangolds. HARWOOD and MARTIN.—See XVI.

See also A., Apr., 502, Utilisation of micro-organisms for human food materials. (TAKATA).

PATENTS.

Treatment of milk by ultra-violet light. J. O. and (MRS.) N. V. HICKMAN (B.P. 325,470, 12.9.28 and 12.2.29).—The irradiation of milk by ultra-violet light can be so regulated that the vitamin-*D* content is increased without having to protect against exposure to air, and with no effect on the taste, smell, or other characteristic properties, by exposing the milk, in a thin film and on one side of a milk cooler, at a distance of 11 in. from a 2000-c.p. quartz mercury-vapour lamp, with reflectors, for 8—30 sec. E. B. HUGHES.

[Manufacture of] cheese. T. VINK (Dutch P. 15,844, 12.8.25).—Addition of small quantities of alum to the curd used in the manufacture of cheese results in the production of a high-grade, homogeneous cheese.

A. R. POWELL.

Extraction of caffeine from coffee beans. W. KLAPPROTH (B.P. 314,059, 4.6.29. Ger., 22.6.28).— Water (cold or at 65°) is circulated over raw coffee beans and the caffeine removed from the aqueous extract by means of a suitable solvent. This aqueous extract is repeatedly used for fresh charges of coffee, thus removing only caffeine. The extracted beans are then dried and roasted. E. B. HUGHES.

Production of coffee beans free from or poor in caffeine with an extract percentage corresponding to that of untreated coffee beans. G. and I. NEU-STADT (B.P. 314,308, 24.6.29. Ger., 22.6.28).—Coffee is extracted by water at 60—90°, the aqueous extract being decaffeinated and then returned to the wet coffee. In order to bring the coffee to its original content of extractive matter additional caffeine-free extract, similarly obtained from about one tenth to one fifth the quantity of beans used, is also added. After soaking at 60—90° for 3 hrs. the beans are drained, washed, and dried. E. B. HUGHES.

Soluble coffee. E. KLEIN (U.S.P. 1,742,261, 7.1.30. Appl., 1.7.27).—Raw coffee is soaked, allowed to germinate for 3—5 days to render the proteins soluble, dried, and roasted. The product after grinding may then be rendered soluble by treatment in the cold with dilute nitric acid (11% wt./vol.) and an alkaloid (quinine), and subsequent neutralisation by caustic soda and ultimately drying. E. B. HUGHES.

Preservation of green peas by canning. G. D'ONOFRIO (B.P. 325,622, 8.12.28).—Before canning, the peas are boiled in a dilute citric acid solution of a green dye (e.g., Guinea Green B) and a yellow dye (e.g., Naphthol Yellow S extra). The colour may be fixed with aluminium chloride. The peas are then washed and canned in a salt solution rendered acid with citric acid and autoclaved at 115°. Varnished cans must be used to prevent reduction of the dyes by the metal of the container. E. B. HUGHES.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Philippine camphor. A. P. WEST and H. TAGUIBAO (Philippine J. Sci., 1930, 41, 103-118).—Camphor in young Philippine trees is located almost entirely in the leaves (2-7% of crystal camphor in moisture- and oilfree leaves). About 1% (on the wt. of crystal camphor) of camphor oil $(\alpha_{20}^{30} + 26 \cdot 01^{\circ})$ and a small quantity of volatile oil (0.22%) on dry leaves) are also obtained on distillation. Leaves of some trees gave no crystal camphor, but only camphor oil (0.77-7.0%) on dry leaves) having $d_{30}^{30} 0.8858$, $n_{D}^{30.5} 1.4652$, and $\alpha_{20}^{30} - 19.2$.° E. H. SHARPLES.

Solution of arsenious and mercuric iodide. M. G. ACTON, JUN. (Amer. J. Pharm., 1930, 102, 159-164).—In the U.S.P. X method for the assay of Donovan's solution, after reduction with formaldehyde the solution should be filtered and not decanted, to prevent loss of mercury. An examination of the keeping properties and stability of the solution showed that the solution deteriorates rapidly irrespective of the conditions of storage; during a period of 3 months oxidation of 60% of the arsenious iodide was noted. During oxidation there is an increase in acidity due to the production of arsenic acid. In a sample at least two years old free iodine was detected, and only about 5% of the original arsenious iodide content remained in the arsenious condition. E. H. SHARPLES.

Increasing the yield in alcoholic preparations [of drugs]. F. GRAF (Pharm. Ztg., 1930, 75, 275—276). —The problems occurring in the alcoholic extraction of drugs and the control of pressing and extracting processes by density determinations are discussed. E. H. SHARPLES.

Determination of ether and alcohol in Spiritus æthereus and Tinctura valerianæ ætheræ. F. WRATSCHKO (Pharm. Ztg., 1930, 75, 319).—An amplification of the earlier account of the author's light petroleum method (Pharm. Presse, 1928, 384).

S. I. LEVY.

Alcohol determination and the alcohol value in Tinctura iodi, D.A.B.VI. W. MEYER (Pharm. Ztg., 1930, 75, 273-275).- A mixture of 10 g. of iodine tincture and 5 g. of a cold solution of sodium thiosulphate (1:2) is shaken until colourless and after about 15 sec. 5 g. of 15% potassium hydroxide are added. The liquid is then distilled according to the official method and the alcohol content is determined in the first 13 c.c. of distillate by the addition of potassium carbonate. The alcohol figure should not be below 10.1%. By this method no side-reactions occur, the distillate is not cloudy, acid, nor decomposed, and the residual liquid contains no free sulphur, sulphurous acid, hydriodic acid, iodoform, nor methylene iodide. The causes and prevention of the formation of these by-products in the usual methods for the determination of alcohol are E. H. SHARPLES. discussed.

Official tests for resins of jalap, podophyllum, and scammony. D. B. DOTT (Pharm. J., 1930, 124, 213—214).—The residue, after stirring 1 g. of powdered jalap resin with 30 c.c. of ether, decanting after 15 min., extracting with a further 20 c.c. of ether in successive quantities, and evaporating the extracts, should not exceed 0.05 g. The following test with jalap resin is suggested : 1 g. of the powder is boiled with 30 c.c. of carbon tetrachloride for 30 min., cooled, filtered, and washed with 15 c.c. of solvent. The extracts on evaporation should yield about 3% of the powder used. In the ammonia-solubility test for podophyllum resin it is

necessary to fix quantities and times. 0.5 G. of the powdered resin is stirred with 30 c.c. of the ammonia solution and, after 30 min., is filtered through a tared filter, using 30 c.c. of water for transferring the solid and washing. The dried residue should not (for Peltaium resin) exceed 0.55 g. [255%]. Emodi resins by this test gave 40-48% of insoluble matter. By the ether test, using 0.5 g. with 30 c.c. of ether, Peltatum gave 66-77% of extract, Emodi 55-59%. Notes on the coagulation test to distinguish the above two varieties of resin are given. In the examination of scammony resins, 85.4% was the lowest figure observed in the ether test using 30 or 40 c.c. of ether with 1 g. of resin as indicated in the jalap resin test. Similarly, the boiling carbon tetrachloride test gave 52.8-60.9% of extract for four samples. E. H. SHARPLES.

Quinoline-hydrogen peroxide reagent : a distinguishing colour test for aloes. E. J. SCHORN (Pharm. J., 1930, 124, 212-213).-An anhydrous solution of hydrogen peroxide is prepared by extracting a 30% solution with quinoline and drying the extract. This reagent, diluted to 1% concentration, is standardised by dissolving in dilute sulphuric acid and determining the liberated iodine after the addition of potassium iodide. On warming a few mg. of finely-powdered aloes with a small amount of the reagent at 60° for 3-5 min. a colour is produced which is characteristic for each variety, e.g., Aloe climensis and A. vulgaris give a purple colour which becomes rose-pink on acidification with 1% sulphuric acid; A. ferox and A. spicata give a greenish colour changing to greenish-yellow on acidification; A. Perryi gives a brown colour and remains brown on acidification. All the species of aloes examined, when treated with dilute ferrous sulphate solution followed by addition of hydrogen peroxide, gave a dark colour which became rose-pink when acidified.

E. H. SHARPLES.

Assay of mixtures of cinchona alkaloids. J. A. GOODSON and T. A. HENRY (Pharm. J., 1930, 124, 351-352).—The application of the methoxyl determination in the assay of cinchona alkaloids is illustrated by the examination of the alkaloids from 3 kg. of a hybrid bark. The total alkaloids were fractionated by the Howard and Chick method and from the methoxyl determination of the two fractions, viz., crude quinine sulphate and crude cinchonidine tartrate, the relative percentage proportions of the corresponding alkaloids were calculated. Analysis of a number of Tanganyika barks are given, also notes on "cinchona febrifuge."

E. H. SHARPLES.

Isomeride of yohimbine. R. LILLIG (Mercks Jahresber., 1929, 42, 20–26; Chem. Zentr., 1929, ii, 2465).—Commercial yohimbine contains an isomeride, α -yohimbine, m.p. 246° (decomp.), $[\alpha]_{20}^{\infty}$ —25.05° in alcohol (hydrochloride, m.p. 286° (decomp.), $[\alpha]_{20}^{\infty}$ +58.3° in water; nitrate, decomp. 276°; picrate, decomp. 213°). α -Yohimboaic acid, C₂₀H₂₄O₃N₂, has m.p. 280°, $[\alpha]_{20}^{\infty}$ +56.9° in pyridine. A. A. ELDRIDGE.

[Isomeride of yohimbine.] H. KREITMAIR (Mercks Jahresber., 1929, 42, 20–26; Chem. Zentr., 1929, ii, 2465).—α-Yohimbine (cf. preceding abstract) has practically the same physiological action as yohimbine, but disturbs respiration much less markedly.

A. A. ELDRIDGE.

Testing of "nicotine-free," "de-nicotinised," and "harmless " commercial tobacco products. K. BAUMANN and J. KUHLMANN (Z. Unters. Lebensm., 1929, 58, 524-529).—Commercial tobacco products described as "nicotine-free" etc. have been found to contain almost as much nicotine as ordinary tobacco. The flavour of tobacco, cigars, and cigarettes designated as "strong," "medium," "mild," etc. is closely asso-ciated with the nicotine content, the "stronger" the tobacco the higher is the nicotine content, but the classifications by different manufacturers are by no means uniform. An analysis has been made, by the method of Pfyl and Schmitt (cf. B., 1927, 955), of numerous commercial brands of tobacco described as "free from nicotine," "de-nicotinised," etc., and the results revealed that whilst none of the samples contained less than 0.75% of nicotine, about one third of them contained 0.76 - 1.00%, one third more 1.01 - 1.25%, and the remainder contained up to 1.75% of nicotine. It is emphasised that statutory definition of the nicotine limits for various grades of tobacco is urgently needed. H. J. DOWDEN.

Determination of nicotine in tobacco and tobacco smoke. K. BRAUER (Pharm. Zentr., 1930, 71, 209– 213).—Results of long experience of the methods described in the literature are given; those of Pfyl and Schmitt (B., 1927, 955), with some modifications, are found reliable. Attempts to prepare nicotine-free tobaccos are criticised, and it is concluded that whilst chemical methods may give acceptable products, the finest tobaccos cannot be de-nicotinised without affecting the aroma. S. I. LEVY.

Essential oils. Anon. (Bull. Imp. Inst., 1930, 28, 8-27).-Lavender oil from S. Africa.-Steam-distillation of the flowers of Lavandula vera grown on an experimental plantation yielded 0.70% (on fresh wt.) of an almost colourless oil having d_{15}^{15} 0.8901; $\alpha_{\rm D}$ -7.25°; $n_{\rm D}^{20}$ 1.463; acid value 0.7; esters (as linally acetate) 49%; solubility in 70% alcohol at 20°, insol. in 10 vols., in 80% alcohol at 20°, 1 in 0.9 vol. The oil compares favourably with the French lavender oil. Lavender oil from Cyprus.-Two samples of oil, one from L. vera growing at 442 ft. above sea-level and the other growing at 3500 ft., had, respectively: d_{15}^{15} 0.8959, 0.8976; $\alpha_{\rm D} = -0.35^{\circ}$, -0.50° ; $n_{\rm D}^{20}$ 1.4655, 1.466; acid value 0.6, 0.3; ester value 22.0, 17.8; ester value after acetylation 165.1, 150.9; esters (as linalyl acetate) 7.7%, 6.2%; solubility in 70% alcohol at 20°, both soluble in 2.3 vols. The marked odour of cineole rendered them inferior in aroma to English and French lavender oils. Peppermint oil .-- Two samples of peppermint oil from plants grown in Cyprus had the following respective constants: d_{15}^{15} 0.961, 0.928; $\alpha_{\rm D}$ +14.5°, -10.9° ; $n_{\rm D}^{20}$ 1.482, 1.468; ester value after acetylation 132.5, 140.0; menthol 41%, 43.5%. Oil of pennyroyal from South Africa. - Distillation of the fresh pennyroyal plant grown in Cape Province yielded 0.47% of a clear, pale yellow oil having d_{15}^{15} 0.9378, $\alpha_{\rm D}$ +20.7°, $n_{\rm D}^{20}$ 1.4855, ketones (as pulegone) 93%,

solubility in 70% alcohol at 15° 1 in 1.8 vols. Palmarosa oil (Rosha) from India.-A sample of palmarosa oil prepared by steam-distillation of plantation grass had d_{15}^{15} 0.8861, $\alpha_{\rm p}^{20}$ +0.35°, $n_{\rm p}^{20}$ 1.4745, acid value 1.3, ester value 11.6, ester value after acetylation 266.5, total geraniol 91.6%, and solubility in 70% alcohol at 15°1 in 1.8 vols. Cuscus (vetiver) roots from Travancore.-Steam-distillation of ground vetiver roots (moisture 5%) yielded 1.6% of a dark, reddish-brown, viscous oil having d_{15}^{15} 1.0377, n_{D}^{20} 1.525, acid value 74.7, ester value 15.0, ester value after acetylation 108.3. Anisescented bay oil from Dominica.-The clear, reddish-brown oil distilled from the "Bois d'Inde Anise" grown in Dominica had d_{15}^{15} 0.9968 $n_{\rm D}^{20}$ 1.527, phenols (by absorption) 10%, methoxyl 17.9%, and consisted chiefly of myricene, estragol (about 15%), and methyleugenol (13%). It contained only a small quantity of eugenol. Pimenta acris leaves (moisture 18.9%) from Egypt on steam-distillation yielded 3.06% of oil having d_{15}^{15} 0.9956, $\alpha_{\rm D}$ —1.82°, $n_{\rm D}^{20}$ 1.522, and phenols 70%. The aroma was good and the quality comparable with that of West Indian bay oil. Cumin oil from Cyprus .--- A pale, yellowish-brown sample of cumin oil from Cyprus had d_{15}^{15} 0.9443, $\alpha_{\rm D}$ +3.15°, $n_{\rm D}^{20}$ 1.5125, cuminaldehyde 40%, and solubility in 80% alcohol at $15^{\circ} 1$ in $1 \cdot 2$ vols. E. H. SHARPLES.

Essential oils. A. M. BURGER (Riechstoffind., 1929, 4, 121; Chem. Zentr., 1929, ii, 2517—2518).—Huon pine oil has $d^{20} 1.034$, $\alpha_D^{20} + 0.6^{\circ}$, $n_D^{20} 1.535$; the chief fraction (90%, b.p. 133—135°) is eugenol methyl ether. Massoia bark oil has $d^{15} 1.075$, and contains eugenol (62%), safrole, and hydrocarbons. A. A. ELDRIDGE.

Determination of ascaridole in chenopodium oil. T. T. COCKING and F. C. HYMAS (Analyst, 1930, 55, 180– 186).—About 2.5 g. of the oil are dissolved in sufficient 90% acetic acid to produce 50 c.c. of solution, and 5 c.c. of the solution are added to a mixture of 3 c.c. of 5N-potassium iodide, 5 c.c. of concentrated hydrochloric acid, and 10 c.c. of glacial acetic acid cooled to —3°. After mixing, the stoppered tube is left for 5 min. and the liquid titrated with 0.1N-thiosulphate. Each c.c. of thiosulphate is equivalent to 0.00665 g. of ascaridole. A blank test should be made ; the experimental error should not exceed $\pm 1\%$. Dilution of the reaction mixture before titration gave low results. The small liberation of iodine by non-ascaridole constituents of essential oils may be safely ignored. D. G. HEWER.

See also A., Apr., 469, Brucine and strychnine salts of inositolphosphoric acids (Seligson). 486, Compounds of phenols with quinine and cinchonine (Tomesik). Microchemical reactions of aconitine (WAGENAAR). Potentiometric determination of alkaloids (MARICQ). Arsenic derivatives of pyridine (BINZ and others). 498, Toxicity of lead compounds (Buck and KUMRO). 503, Disinfecting properties of chloropicrin (SMORODINCEV). 504, Assay of thyroid gland (HARINGTON and RANDALL). 505, Determination of iodine in thyroid gland (MIDDLETON). Follicular hormone : its preparation and determination (FRATTINI and MAINO). 506, Determination of antineuritic vitamin-B (EVANS and LEPKOVSKY). Determination of vitamin-D (HELLER and CASKEY). 507, Ethereal oil and crystalline ester from heart wood of *Vouacapoua americana* (SPOELSTRA). 508, Pyrethrin content of pyre-

of *d*-norisoephedrine in *Catha edulis* (Wolfes). PATENTS.

thrum flowers (GNADINGER and CORL). Occurrence

Manufacture of [therapeutically active] basic nitro-derivatives of 9[ms]-aminoacridine. I. G. FARBENIND. A.-G. (B.P. 304,280, 4.1.29. Ger., 18.1.28. Addn. to B.P. 283,510; B., 1929, 577).-A nitrated 10-chloro- or 10-alkoxy- (or aryloxy)-acridine is condensed with an amino-acid, -ester, or -nitrile, and the nitroacridylamino-acid is converted into its (B-diethylaminoethyl)amide or other basic amide. 10-Chloro-3nitro-8-ethoxyacridine condenses with glycine to give 3-nitro-8-ethoxy-10-acridylaminoacetic acid, m.p. 274-275° (decomp.); the corresponding acid chloride hydrochloride, m.p. 217-218° (decomp.), is converted into β -diethylaminoethylamide, m.p. 153° [+2H₂0; the dihydrochloride, m.p. 233° (decomp.)], the γ -diethylamino- β -hydroxy-n-propylamide, m.p. 143° (decomp.), the N-methyl-N-(β -diethylaminoethyl)amide, m.p. 120° (dihydrochloride, m.p. 123-124°), the bis-(β-diethylaminoethyl)amide [trihydrochloride, m.p. 229° (+4H20, decomp.)], and the β -dimethylaminoethylamide, m.p. 175° (decomp.) [dihydrochloride, m.p. 198° 3-Nitro-10-phenoxyacridine, m.p. 195— (decomp.)]. 186°, with glycine gives 3-nitro-10-acridylaminoacetic acid, m.p. 218-219° [hydrochloride, m.p. 235° (decomp.); acid chloride hydrochloride; B-diethylaminoethylamide m.p. 177° (decomp.) (dihydrochloride, m.p. 220°)]. The m.p. 177° (decomp.) (uniqui construction of the second are described are $decomposition = \frac{1}{124} \frac{1}{156} \frac{1}{$ $(\beta$ -diethylaminoethyl)amine, b.p. 154-156°; and diethylaminoethyl)amine, b.p. 76°/2 mm.; dimethylaminoethylamine, b.p. 106-107°. C. HOLLINS.

Manufacture of synthetic menthol. HowARDS & Sons, LTD., J. W. BLAGDEN, and W. E. HUGGETT (B.P. 325,509, 19.11.28).—Crude menthol (e.g., from hydrogenation of thymol, menthone, etc.) is converted by treating with phthalic anhydride into hydrogen phthalates which are cooled to 80° and crystallised by addition of light petroleum. C. HOLLINS.

N-Hydroxyethyl derivatives (B.P. 300,503).—See III. **Caffeine from coffee beans** (B.P. 314,059 and 314,308).—See XIX.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Influence of the sensitisation of photographic plates on their spectral sensitivity and gradation. A. F. BÜRKI and V. R. PFRUNDER (Helv. Chim. Acta, 1930, 13, 237-267).—The ordinary methods of sensitometry have been compared with one another and the sources of error investigated. A source of light similar to daylight has been obtained by the use of a 3.5-volt filament lamp and a filter of ammoniacal copper sulphate solution. With the aid of this lamp the sensitivity of different photographic emulsions has been measured both by the Scheiner sensitometer and the Eder-Hecht wedge sensitometer, and the results are compared with one another and with the commercial data. The sensitising

influence of a number of substances on different emulsions has been examined. Dyes such as erythrosin, pinachrome, pinachrome-violet, and chlorochrome increase the total sensitivity. The greatest increase is observed in the yellow, and emulsions originally only sensitive to blue become sensitive to green, yellow, and red at the expense of the blue. An aqueous dye solution may act as a sensitiser, whilst the alcoholic solution may be inactive. Dyes belonging to the safranine and eosin group have no effect. Dilute hyposulphite solutions also slightly increase the sensitivity. Pinacryptol-green is a powerful desensitiser. Experiments have been made in hypersensitisation with ammonia, and in ultrasensitisation with ammoniacal silver chloride solution, of various kinds of plates. The sensitivity for all wave-lengths appears to be increased without increasing the time of fixing. By a preliminary illumination with a faint green light of the plate to be ultrasensitised the sensitivity is still further increased, but the stability of the emulsion is not very great, the sensitivity being reduced with time. A method for determining gradation for any wave-length, and dispensing with the use of filters, has been devised. A number of gradation curves have been obtained for different plates sensitised by different methods, and the influence of different methods of sensitisation on the blackening curves has also been examined. Curves showing change of gradation with time of illumination for a constant intensity of light, and change of gradation with intensity of light for equal times of illumination, have been obtained for different coloured light. The intensity curves are found to be steeper than the time curves. The absorption spectrum of the new sensitiser chlorochrome has been determined, and its maximum absorption has been found to correspond to maximum sensitisation.

M. S. BURR.

See also A., Apr., 396, Sensitising photographic plates (LUEG).

PATENTS.

Manufacture of a dye for colouring photographic prints. M. MICHELS (G.P. 458,989, 7.8.26).—Finelydivided starch loosely coloured with a basic dye is made into a paste with water and hydrochloric acid, or substances which produce this acid are added. The product serves to colour copper-toned papers. A. R. POWELL.

Production of pictures consisting of dyes in F. LIERG (B.P. 298,979, photographic manner. 20.8.28. Austr., 18.10.27).-Dye components in insoluble form are added to the silver emulsion; after exposure the silver image is first developed and the coloured image is then produced by suitable treatment, e.g., by diazotisation or oxidation. Thus benzidine urate or resinate with a metal salt of β -naphthol, or benzidine phosphotungstate with the aluminium salt of H-acid, benzidine abietate with ethyl salicylate, or ethyl anthranilate with aluminium naphthoxide, are added separately as fine dispersions or solutions in alcohol to the sensitising bath. After exposure and hardening, the print is immersed in nitrous acid, which penetrates only the unhardened parts, forming a reversed colour image. Insoluble salts of aminodiphenylamine and p-toluidine may be oxidised to give a red image. The nitrite for azo dye development may

be added to the emulsion in the form of insoluble cobaltammine salts etc. C. HOLLINS.

Production of light-sensitive layers by means of diazo compounds. KALLE & Co. A.-G. (B.P. 302,184, 10.12.28. Ger., 10.12.27).—Paper etc. is impregnated with diazo compounds of aminohydroxynaphthoic acids, *e.g.*, 1-amino-2-hydroxy-3-naphthoic acid, in acid, neutral, or alkaline solution; if an acid solution is used the paper must be treated with ammonia before exposure. Washing with water develops a bluish-black positive (after exposure under a negative) which may be toned with a solution of a copper salt. C. HOLLINS.

Production of photographic plates, films, or papers for photography in natural colours. W. R. B. LARSEN (B.P. 316,277, 8.11.28. Denm., 28.7.28).-The colour screen is prepared from a mixture of red-, green-, and violet-dyed gelatin particles which have been partially decolorised by a chemical treatment in such a way that the full colour may be later restored; e.g., if aniline-red, acid-green, and crystal-violet be the dyes used, the colour may be weakened by treatment with an alkali and subsequently restored by an acid. At the same time a red sensitiser, e.g., pinacyanol, and a green sensitiser, e.g., erythrosin, are incorporated in the red and green screen particles, respectively. The silver halide emulsion is coated upon the screen prepared from an even layer of these particles upon a suitable base, and by diffusion of the dyes into the emulsion during the drying process becomes sensitised to red and green light under the red and green particles. Soluble bromides or alkali salts may also be incorporated in the screen particles to exert a control, by simultaneous. diffusion with the dyes, on the sensitivity of the emulsion in the region of the filter. A slow-acting hardening agent is used in the preparation of the screen particles in order that the diffusion of the sensitising dyes may take place before the hardening is complete. After exposure, development, and fixation the tint of the screen dyes is adjusted to the required intensity. J. W. GLASSETT.

Decoration of fabrics by the action of light and the reduction of silver salts. M. MICHELS (G.P. 460,309, 13.5.27. Addn. to G.P. 441,150; B., 1927, 861).—The silver image produced on the material in the manner described in the prior patent is treated with lead ferricyanide, which converts the silver into a mixture of lead and silver ferrocyanides, the material is then dipped into cupric chloride solution to produce copper ferrocyanide, and the silver chloride is removed by means of thiosulphate. The image can then be coloured with any suitable basic dye. A. R. POWELL.

[Production of positives in] colour [for kinematographic or still] photography. W. CHAPMAN (B.P. 327,200, 3.1.29).

Cellulose films (B.P. 301,878).-See V.

XXII.—EXPLOSIVES ; MATCHES.

Propagation of detonation across a gas-gap between two cartridges of explosive. G. Sr. J. PERROTT and D. B. GAWTHROP (J. Franklin Inst., 1929, 208, 643-660; cf. B., 1927, 350).—The method used was mainly that previously described. The initiating cartridge, 17.8 cm. long, was placed either in a paper tube (3.2 cm. diam.) or in one of Shelby steel, 3.5 cm. internal diam. and 0.6 cm. thick. The gap was filled with air, hydrogen, carbon dioxide, or helium. The explosives used were (i) " 40% straight dynamites," and (ii) "permitted" ammonium nitrate compositions. In paper tubes, with initiating and receiving cartridges of the same explosive, detonation of the latter always occurred in hydrogen, air, and carbon dioxide with (i) at distances up to 137, 107, and 61 cm. respectively, and with (ii) up to 25, 51, and 30 cm. It failed to occur with (i) at over 203, 178, and 122 cm., or with (ii) at 38, 64, and 46 cm. Detonation of (ii) by (i) occurred at distances up to 107, 76, and 61 cm. Corresponding distances in the steel tube were about 10 times as great. The velocity of transmission of the disturbance across the gap is greatest in gases of low density, and with hydrogen is at first greater than that of detonation, decreasing less in the steel than in the paper tube. It is concluded that there is for each explosive a critical velocity of the shock-wave above which this detonates the receiving cartridge, and below which detonation may be effected by a later disturbance-perhaps by the gaseous products of the explosion.

C. A. SILBERRAD. See also A., Apr., 438, New phosphonium salt (EVRARD).

PATENTS.

Acceleration of the precipitation of nitroglycerin. CARBONIT A.-G., Assees. of G. VON LÖBBECKE (G.P. 458,520, 30.7.28).—The glycerin or the acid mixture is treated with acetamide, dicyanodiamide, or carbamide, or with other organic compounds which during the nitration are decomposed completely with the evolution of indifferent gases. A. R. POWELL.

Manufacture of self-combustible mixtures. (A) MINIMAX A.-G., and (B) DEUTS. PYROTECHN. FABR., Assees. (B) of J. THIECKE and H. HERZOG (B.P. 299,396, 24.10.28. Ger., 25.10.27. Cf. B.P. 314,604 and 315,232; B., 1929, 706, 769).—A combustible mixture for the generation of heat, pressure gas, or nitrogen consists of finely-divided animal charcoal and ammonium nitrate, mixed preferably in the proportion of about 15 pts. of the former to 85 pts. of the latter. Other kinds of charcoal may be added to modify the rate of combustion. The mixture is compressed into solid bodies which are given a waterproof cover.

A. B. MANNING.

XXIII.-SANITATION; WATER PURIFICATION.

Chlorinated copperas in the treatment of soft, highly coloured water. A. C. DECKER (J. Amer. Water Works' Assoc., 1930, 22, 218—221).—Preliminary experimental work with a highly coloured creek water which it was desired to render potable showed that whilst good colour removal could be obtained by using $5 \cdot 5$ grains of alum and $3 \cdot 0$ grains of lime per gall., the substitution of ferrous sulphate for alum seemed to set the colour. If the ferrous sulphate were chlorinated, excellent results were obtained in conjunction with either lime or sodium aluminate. On the large scale satisfactory results were obtained, using $0 \cdot 7$ — $0 \cdot 8$ grain of ferrous sulphate per gall oxidised with $0 \cdot 11$ — $0 \cdot 126$ grain of chlorine per gall. and succeeded by $0 \cdot 33$ — $0 \cdot 4$

grain of sodium aluminate or 0.55 grain of lime per gall. No difference in result was observable whether the plant was operated continuously or not, and it is estimated that the use of chlorinated copperas results in a saving of \$10 per million gallons. C. JEPSON.

Peculiar lactose-fermenting anaerobe from filtered and chlorinated water. R. S. SPRAY and P. C. LAUX (J. Amer. Water Works' Assoc., 1930, 22, 235— 241).—Positive "presumptive" tests in the drinking water of Williamson, W.Va., which had been previously chlorinated so as to have a residuum of 0.4 p.p.m. as indicated by the o-tolidine test, were shown to be due to the presence of a slender, Gram-negative bacillus of about 0.6 by 6—8 μ . The organism has not yet been recognised, and its significance in the water supply as well as its source is undetermined. It is apparently harmless, but causes inconvenience by producing numerous false "presumptive" tests. C. JEPSON.

Rapid determination of the colon group [in water]. M. LEVINE (J. Amer. Water Works' Assoc., 1930, 22, 234).—The standard "presumptive" and "partially confirmed" *B. coli* tests may be obtained simultaneously in 24 hrs. if 0.1 c.c. of the preliminary enrichment broth (after about 10 hrs.' incubation at 37°) be smeared over the surface of an eosin-methylene-blue agar plate and both plate and tube incubated at 37° for the remainder of the 24 hrs. Those tubes which show gas (24 hrs.' presumptive test) should show colonies of the colon-aerogenes group (partially confirmed test) on the corresponding plate. C. JEPSON.

Disposal of sugar-factory waste waters. Mont-GOMERY.—See XVII. Beer-slop waste. HATFIELD. —See XVIII.

See also A., Apr., 434, Routine preparation of conductivity water. (STUART and WORMWELL). 443, Determination of alkalis in waters (MALJAROV). 477, Rotenone and insect poisons (BUTENANDT and HILDEBRANDT). 503, Disinfecting properties of chloropicrin (SMORODINZEV).

PATENTS.

Fungicides, disinfectants, and the like. NEWTON CHAMBERS & Co., LTD., and M. W. BLYTH (B.P. 326,460, 6.9.28).—An aqueous suspension of a neutral inorganic compound, e.g., lithopone or barium sulphate, stabilised by means of an organic colloid, is used as a vehicle for a phenolic disinfectant or fungicide, e.g., Izal or Lysol. The preparation may be coloured.

F. G. CLARKE.

Purification of boiler-feed water. P. MÜLLER GES.M.B.H. (Austr.P. 109,459, 2.5.21).—The water is passed through a softener which replaces the calcium and magnesium salts by sodium salts. When the water in the boiler contains a high proportion of these salts the pressure is reduced so as to evaporate as much more of the water as possible; the resulting steam is used for preheating fresh quantities of purified feed water, and the hot concentrated salt solution for preheating water passing to the purification plant.

A. R. POWELL.

Filtration of water (B.P. 325,937). Air washing (B.P. 325,884). Air filter (B.P. 326,047).—See I. Purification of waste liquors (B.P. 326,112).—See II.