

THE JOURNAL OF THE Society of Chemical Industry.

A MONTHLY RECORD

FOR ALL INTERESTED IN CHEMICAL MANUFACTURES.

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Sir Wm. Abney, K.C.B., D.C.L., F.R.S. "The Photography of Colour."

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- (1) "Reduction of Alumina by Calcium Carbide."
- (2) "Production of Ethylene from Inorganic Sources."

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SESSION 1901-1902.

Wednesday, Oct. 30th, 1901 :—

Mr. Arthur Adams. "Heat-producing Power of Fuel." Discussion.

Dr. J. Gordon Parker. "Effect of Extracts containing Sodium Bisulphite on Leather."

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COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

ARSENIC.

In view of the great public interest which has been aroused by the Arsenic Epidemic, it has been decided to republish, in pamphlet form, uniform with the Journal, the papers, discussions, and abstracts dealing with the detection and determination of Arsenic and other associated elements, which have appeared in the Journal since the beginning of this year. To these have been added extracts bearing on the subject from other sources, including a description, from Wanklyn's new book on Arsenic, of the Marsh test, in the inventor's own words, and dated 1836. Copies, price 1s. each, may be obtained from Messrs. Eyre and Spottiswoode.

ARSENIC COMMITTEE.

The Joint Committees of the Societies of Chemical Industry and Public Analysts have circulated a number of samples containing definite quantities of arsenic, and have carefully considered the results returned by the members.

The Committee believe that these results justify them in prescribing a method for dealing with the various substances, but before taking this course think it desirable to submit this method to somewhat more extended trials.

FOREIGN OFFICE REPORTS.

With reference to the notice from the Foreign Office which appeared on page 761 of this Journal, inviting Chambers of Commerce and other bodies to suggest special subjects upon which H.M. Consular Officers might be directed to report, it should be noted that such suggestions should be addressed to the Commercial Department of the Foreign Office. On page 859 of the Journal for this year will be found a report furnished by Consul-General Gurney, through the Foreign Office, at the request of this Society, on "Castor Oil Manufacture at Marseilles." It is hoped that members will avail themselves, through the Society, of the facilities thus placed within their reach by the Foreign Office.

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Obituary.

HUGH BARCLAY.

MEMBER OF THE SCOTTISH SECTION OF THE SOCIETY OF CHEMICAL INDUSTRY.

HUGH BARCLAY was born at Millhouse in 1861, a small village in the Kyles of Bute. His father was manager of the powder works of Messrs. Curtiss and Harvey. Having completed his earlier school education, he studied chemistry whilst residing for a lengthened period with a brother in Newcastle-on-Tyne. Going to Glasgow later on, he practised commercial chemical analysis in the laboratory of Messrs. Wallace, Tatlock, and Clark, the city analysts. In 1880 he obtained the appointment of chemist at the Harrington Ironworks of Sir James Bain and Co., and thenceforth devoted himself to the metallurgy of iron and its cognate branches. Having become a blast-furnace specialist, he was appointed manager of the Calder Ironworks of Messrs. William Dixon, Ltd., in 1890, and after ten years he became general manager, with an interest in the business—a cogent tribute both to energy and ability. His increasing success, unfortunately, was accompanied by increase of ill health, which his unflinching vivacity caused him to make light of; but the malady was an insidious one. He died, after a fortnight's illness, August 6, 1901, from heart failure, leaving a widow and two children. He was a Fellow of the Chemical Society, and a Vice-President of the Iron and Steel Institute in the West of Scotland. He had a very large circle of friends, and to them the world seems the poorer for the loss of a man of such high character and accomplishments.

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I.—PLANT, APPARATUS, AND MACHINERY.

PATENTS.

Incrustation, Scale, or other Foreign Matter from Steam Boilers, Tubes, and other Vessels or Objects; Removal of —. C. Elliott, Sanderland. Eng. Pat. 7951, April 30, 1900.

THE object to be cleaned is wholly or partially filled with, or enclosed in, salt water or other suitable electrolyte, in which one or more electrodes are suspended or arranged, connected to one pole of a dynamo or its equivalent, while the other pole is connected to the shell or body of the vessel or object. The electric current through the object, generates gas beneath the incrustation, scale, or other foreign matter, which is consequently loosened and falls off.—G. H. R.

Scale from Boilers; Improved Compound or Composition for Removing —. A. O. Hamilton, Dundee, N.B. Eng. Pat. 16,581, Sept. 18, 1900.

THE composition is prepared by dissolving 126 lb. of caustic soda in 40 gallons of water. According to one modification, 1 lb. of burnt sugar may be added to the solution; and according to another, in addition to the sugar, 1 to 4 lb. of "zinc" and 1 gall. of "paraffin oil" may be also added.—E. S.

Heating, Cooling, Evaporating, or Condensing Liquids or Gases; Apparatus for —. H. B. Kershaw, Stalybridge, Lancashire. Eng. Pat. 15,455, Aug. 30, 1900.

A TUBE for heating, cooling, or like apparatus is constructed of a main tube having annular or spiral grooves or corrugations, an internal tube, and a spiral tube of small diameter around the exterior. The internal tube may be omitted.

—R. A.

Vapour at any Desired Pressure from Liquids Heated under Pressure, but not Boiling; Process and Apparatus for Producing —. C. Steffen, Vienna. Eng. Pat. 15,646, Sept. 3, 1900.

THE following two modifications of the process described in Eng. Pat. 12,805 of 1900 (this Journal, 1901, 562) form the subject-matter of the present invention:—(1) The motor, which produces the cycle of flow and the increase of pressure of the liquid, is worked by any source of energy external to the system, instead of by the energy of the moving liquid. (2) The speed of flow of the liquid through the heater is regulated, and the valve between the heater and the vapour generator is loaded, so that the vapour evolved is of higher pressure than is required at the point of consumption, such excess of pressure being employed for working the motor.—R. A.

High-Pressure Gases; Vessels for the Reception of —. A. Ludwig, Bernburg (Anhalt), Germany. Eng. Pat. 16,908, Sept. 22, 1900.

THE vessel consists of a cylindrical metal receiver having a cover carrying the connections. A strap surrounds the vessel and cover, and wedges are driven between the strap and the cover to secure the latter. A similar strap and wedge arrangement may be employed for securing the pipe connections, &c. The vessel may be surrounded by a refrigerator, which may consist of an arrangement of plates having annular channels for the passage of the cooling liquid.—R. A.

Boiling Pans and Similar Apparatus. H. Cox, Enfield. Eng. Pat. 7996, April 18, 1901.

THE boiling pan is provided with one or more perforated, reticulated, or similar plates, connected to the pan so as to be removable. The plates serve to effect the mixing of the various ingredients treated, or, in the case of jam making, to separate the stones, seeds, &c., from the jam.—R. A.



Electric Furnace with Two Bed Plates. C. A. Keller, Paris. Under Internat. Conv. First Foreign Application (in France), May 21, 1900. Eng. Pat. 22,584, Dec. 11, 1900.

THE furnace is provided with two movable sole plates, formed of a number of fixed carbons, which receive the current by contact, on their faces, by means of thin copper conductors, and transmit it to small electrodes placed loosely on them, these being the only replaceable electrodes. They are preferably composed of the fragments of electrodes otherwise useless in the industry. The sole plates are respectively connected to one of the terminals of a source of electricity in such a way that the current flowing from one sole plate to the other, through the material to be treated, can heat the latter to incandescence and fusion. A melting bed is so arranged between the two mobile sole plates that

the resistance of the furnace can be regulated by moving them towards or from each other, and the contact of the material treated with the carbon of the sole plates, is avoided if necessary. The metallic contact pieces of the sole plates pass through channels formed in the brickwork of the furnace bed in such a manner as to prevent the falling down of the conducting body, or of the material to be treated.

—G. H. R.

II.—FUEL, GAS, AND LIGHT.

Water-Gas; Comparison of —, with other Combustible Gases. J. Körting. Zeits. Ver. deutsch. Ing. 1900, 44, 1301—1308, 1345—1348.

In the following table various gases used for power and lighting purposes are compared:—

	Producer Gas.	Dowson Gas.	Water-Gas.	Coal-Gas.	Carburetted Water-Gas.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
CO.....	23—30	23—27	40	6—8	23—23
CO ₂	2—7	6—7	3—7	1—1.5	0.2—2.2
H.....	2—6	17—18	50	46—49	34—33
N.....	50—65	47—52		..	2.5—5
O.....					
CH ₄ , &c.....	traces	0.5—2	3.6	31—39	17—21
C ₂ H ₄ , &c.....				3—5	13—16
Specific Gravity.....	1.0	0.83	0.51	0.4	0.53—0.6
Calories per cb. m.....	850—1,000	1,200—1,400	2,350—2,600	4,800—5,200	6,000
Temperature of flame.....	below 2,000° C.	below 2,000° C.	2,700°—2,800° C.	2,300°—2,400° C.	..

The author also describes, with diagrams of the plant and full details as to consumption of coal and coke for heating and gas generating, the four principal methods for the manufacture of water-gas, namely, Fischer's, Humphreys and Glasgow's (this Journal, 1895, 646; 1897, 720), Dellwik's (this Journal, 1896, 642; 1897, 900; 1899, 1003; and 1900, 647), and Strache's (this Journal, 1896, 441). The efficiency of each process is worked out and given as the ratio of the heat value of the fuel to that of the

corresponding amount of gas. In the following table the author compares the different gases, together with Dowson gas (this Journal, 1896, 892; 1898, 495; 1900, 523) and coal-gas, the figures referring to the latter being the average ones obtained from the statistics of 200 installations for town supply. The figures given in the table are the results of actual working, and are based on the following prices of raw materials and by-products:—Prices per 100 kilos.: steam coal, 1.7 marks; gas, 1.8; coke, 2.0; tar, 4.0;

	Calories per cb. m.	Efficiency.	Cost of Fuel.		Cost of 1,000 Candle-Hours.	
			Per cb. m.	Per 1,000 cals.	Batswing Burner.	Welsbach Burner.
Humphreys and Glasgow's process:		Per Cent.	Pfennige.	Pfennige.	Pfennige.	Pfennige.
Pure water-gas.....	2,500	55	1.77	0.71	..	3.54
Do. carburetted with German oil	5,000	..	4.0	0.80	37.5	7.4
Do. carburetted with foreign oil	5,000	..	6.2	1.24	57.0	11.0
Dellwik's process:						
Pure water-gas.....	2,350	51	1.66	0.71	..	3.48
Do. carburetted with German oil	5,000	..	4.21	0.87	40	7.7
Do. carburetted with foreign oil	5,000	..	6.32	1.28	60	11.6
Do. carburetted with benzoline	3,700	..	4.62	1.24	44	8.5
Strache's process:						
Pure water-gas.....	2,500	35	2.24	0.90	..	4.43
Do. carburetted with German oil	5,000	..	4.47	0.90	42	8.81
Do. carburetted with foreign oil	5,000	..	6.67	1.32	63	11.4
Do. carburetted with benzoline	3,700	..	5.20	1.40	49	9.4
Coal-gas:						
Without by-products.....	5,000	33.5	..	..	..	..
With by-products.....	5,000	66	1.9	0.36	17.8	3.4
Mixed coal- and water-gas.....	3,670	..	2.35	0.64	..	4.25
Dowson gas.....	1,250	70	0.51	0.44	..	..

ammonia, 18.0; benzoline, 25.0; German gasoline, 8.0; and foreign gasoline, 14.0 marks. All incidental losses are included in the consumption of fuel, and, in the case of water gas, the costs include the addition of carbylamine or other substance to odourise the gas. The carbureting is carried on till the gas has an illuminating value of 16 candle-power.

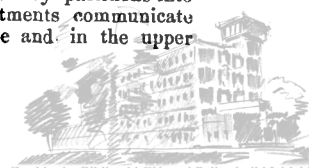
The cost of plant is slightly higher for coal-gas than for water-gas, and about four times as much for the latter as for Dowson gas, whilst for labour, the cost is about the same for water-gas and coal-gas, and slightly lower for Dowson gas.

The author concludes that for industrial purposes where a high temperature is required, water-gas is preferable to

Dowson gas. For town lighting, carburetted water-gas can compete with coal-gas only in very small installations, and where by-products are unsaleable; a carburetted water-gas plant can, however, often be of advantage as an auxiliary to a coal-gas installation.—A. S.

Gas-Washer; Rotatory —, with Loose Filling Material. G. Zschocke. J. für Gasbeleucht. 44, [23], 413—414.

THE washer described is of the "Standard" type, and its construction is clearly shown in the annexed figures. It consists of a cylindrical casing divided by partitions into compartments. The several compartments communicate by openings alternately in the middle and in the upper



part of the partitions. A shaft, which traverses the middle of the casing and is rotated by gearing, carries a number of perforated vanes in each compartment. The compartments are packed with a number of perforated balls, which are carried forward by the vanes, and roll upon one another as the shaft is rotated. The liquid used for washing the gas enters by a stand pipe at one end of the casing, and on reaching a given level in the first compartment, overflows into the next compartment, and thence

Fig. 1.

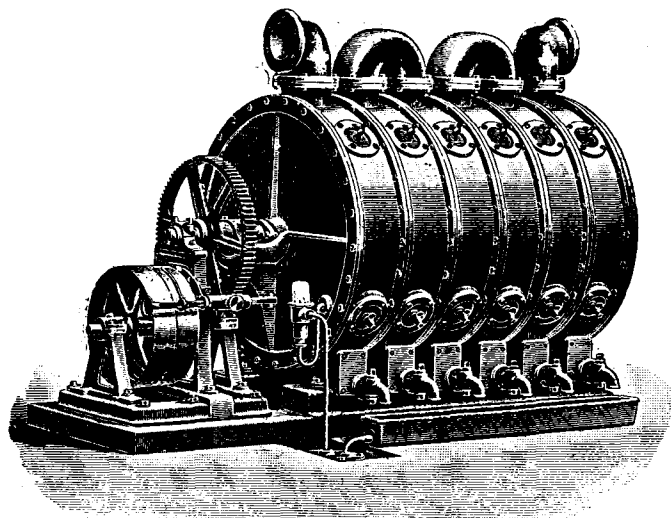
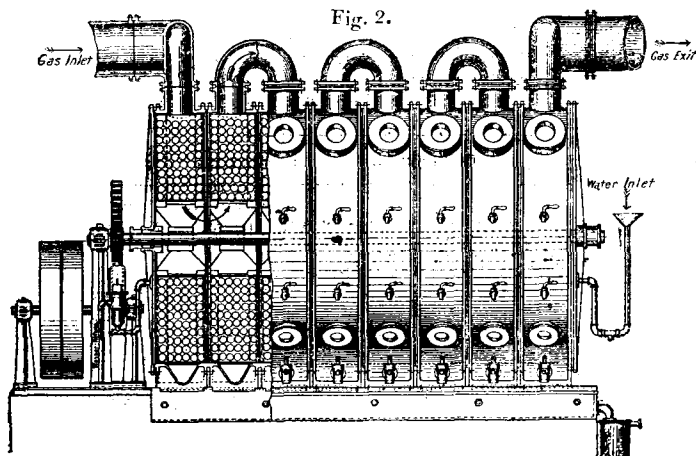


Fig. 2.



through the remaining compartments to an outlet at the other end of the casing. The gas enters at the top, at the end at which the liquor leaves the washer, passes down the first compartment to the opening in the middle of the partition, through which it passes to the next compartment, up which it travels to the opening near the top of the next partition, and so on through the several compartments in a reverse order to that in which the washing liquid traverses them. The rolling of the balls on one another cleanses them of tar and particles which would tend to obstruct a fixed filling. The filling may be renewed, if necessary, through suitable doors in the casing, without dismantling the whole washer.—J. A. B.

Gases; Determination of the Calorific Power of —
W. Hempel. *Zeits. angew. Chem.* 14, [28], 713—716.

JUNKER's gas-calorimeter gives very satisfactory results when a considerable quantity of the gas, of uniform composition, is available for the determination. It cannot be

used, however, with small quantities of about 2—3 litres, and is therefore not suitable for following the changes in composition which often occur in the course of a few minutes during the process of gas-production. The author has devised the apparatus shown in Fig. 1 for making rapid calorimetric determinations.

A burner, A, is so arranged that both oxygen, from the holder O, and the gas to be examined, from the reservoir H, can be supplied to it. The products of combustion are so small in volume that they are completely cooled within the copper tube, B (18 cm. long, and 3.3 cm. in diameter), which is closed by a plate at its upper end, and is soldered into a tripod. The glass cylinder E (34 cm. long and 5—6 cm. in diameter), capable of holding 500 c.c. of water, is fixed over the copper tube by means of a rubber stopper. A stirrer, F, serves for mixing the water during the combustion. The thermometer G is divided into tenths of a degree, and can be read to within about 0.02° C. The gas reservoir H is made of sheet zinc, and is provided with brass stopcocks, *i* and *k*.

The ignition of the gas to be examined is brought about by a very small hydrogen flame, fed by an ordinary hydrogen generator L. To ensure the use of exactly the same quantities of hydrogen and oxygen in all determinations, the stopcocks of O and L are opened just so far that no bubbles of gas escape from the tubes *r* and *s* in the cylinders *p* and *q*; *m* and *n* are very narrow capillary tubes.

The burner A is shown in detail in Fig. 2. A brass tube *h*, attached to the iron sole *g*, is provided with a small side tube *c* for the oxygen supply, and is fitted at its upper end with the porcelain piece *d*, to prevent the conduction downwards of the heat of combustion. The inner tube *a*, which also terminates in a porcelain or earthenware tube *e*, serves for the combustion of the gas under examination. The very narrow copper tube *b* supplies hydrogen for the igniting flame.

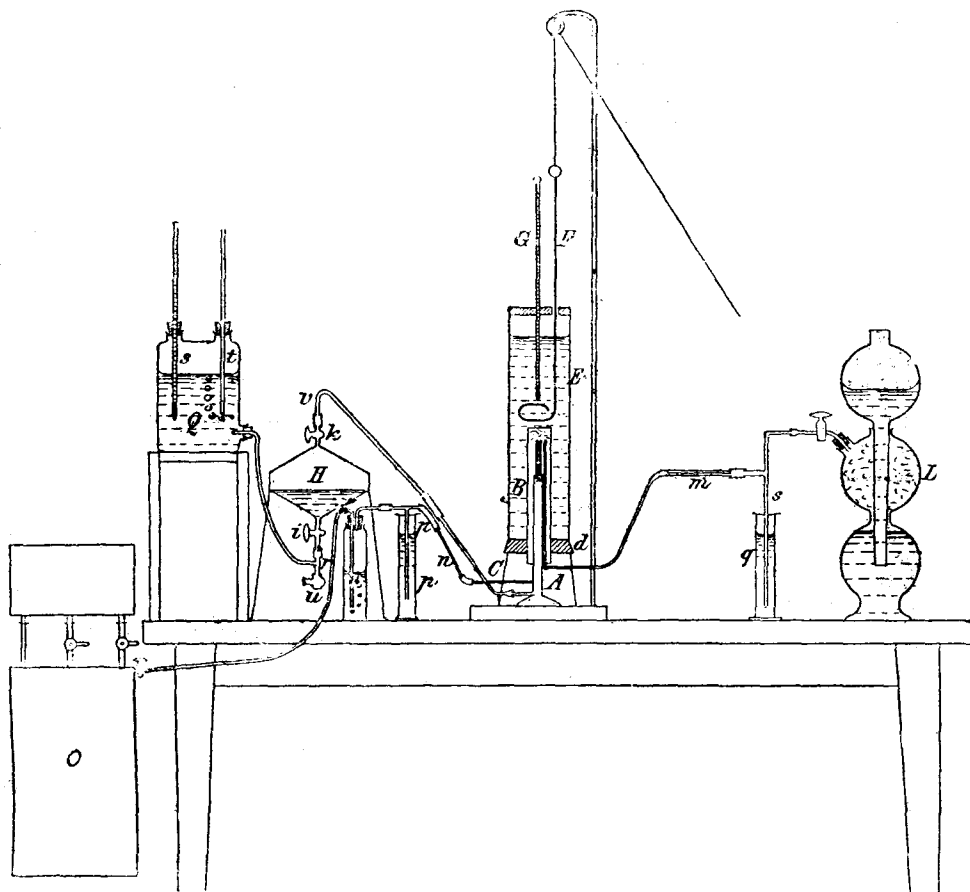
In testing a sample of gas, the reservoir H is filled with it, at slightly more than atmospheric pressure. The temperature and barometric pressure having been noted, the stopcock *i* is momentarily opened to bring the sample to atmospheric pressure, and then the three-way tube *r* is attached, to connect the reservoir with the bottle Q. The bottle is fitted with the tightly-inserted thermometer *s* and a glass tube *t*, so that the water may flow out at an equal pressure. By opening the pinch-cock *u*, the connecting tubing is filled entirely with water.

The cylinder B, not yet placed over the burner, is filled with 500 c.c. of water, and, after stirring, the temperature is carefully noted. A small hydrogen flame, about the size of a mustard seed, is now lit upon the burner, and a stream of oxygen, the flow of which must be determined once and for all by preliminary trials, is turned on. The supply of oxygen must be such that, during the combustion of the sample, a glowing splinter held at the mouth of the copper tube B will burst into flame. The cylinder E is now placed over the burner, the cocks *k* and *i* are opened, and after a few seconds the hydrogen is turned off. The hydrogen flame should be maintained within the calorimeter for the same number of seconds in all tests. The ignition of the sample is indicated by a slight colour, and the stirrer is now kept going continuously. As long as water is flowing into the reservoir H, air-bubbles will be seen to rise from the tube *t*, and the end of the experiment is indicated by the appearance of water in the connecting tube at *v*. The stirrer is then operated until the maximum temperature is indicated by G.

The apparatus is standardised by the combustion of pure hydrogen in precisely the manner indicated. For example, the author found, for one reservoir-full of hydrogen, measured at 6.1°C . and 755.2 mm. , an average

(hydrogen) flame being 30 seconds. Allowing for the difference in tension of aqueous vapour, and then correcting for temperature and pressure, the rise in temperature which the sample would have given, if measured in the

Fig. 1.



rise of temperature of 10.838°C . On testing a sample of producer gas, measured at 12.9° and 753.2 mm. , the rise of temperature was 4.21° , the duration of the igniting

reservoir at 6.1° and 755.2 mm. , becomes 4.35° . Taking the absolute calorific value of a litre of hydrogen as 3,087 calories, that of the sample is—

$$10.838 : 4.35 :: 3,087 : x = 1,239 \text{ calories.}$$

Fig. 2.

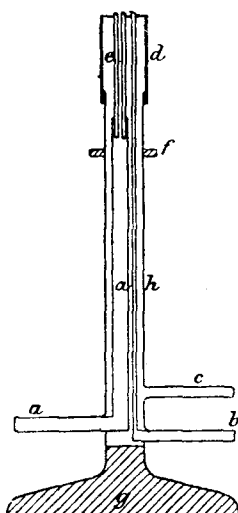
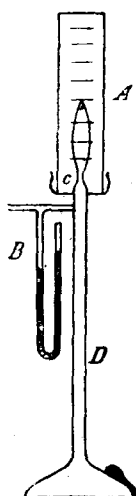


Fig. 3.



The Flame Calorimeter.—For the continuous control of gas manufacturing operations, the apparatus shown in Fig. 3 gives useful indications of the heating power of the gas. It consists of the stand D, a burner c, a graduated chimney A, and a manometer B, and it is based upon the principle that the greater the heating power of the gas, the longer is the flame, because a greater amount of oxygen is required for combustion. In making a determination, the gas is brought to the standard pressure, as indicated by B, and the height of the flame then gives directly the calorific power. The apparatus may first be standardised by means of gas of known calorific power. Variations in the specific gravity of the gas and in the atmospheric pressure influence the height of the flame.—H. B.

PATENTS.

Coal Powder; Apparatus for Aërating and Feeding — A. A. Day, New York, U.S.A. Eng. Pat. 6556, March 28, 1901.

POWDERED coal is fed from a hopper to an aërating chamber, and from the latter to an ejecting chamber, from which the mixture of air and powder passes to the furnace to be burned. The apparatus used consists in the combination of



the ejecting chamber, the ejecting mechanism with independent mechanism for positively regulating its speed, the separate aerating chamber on one side of the ejecting chamber and communicating with it by a central aperture, a series of revolving blades in the aerating chamber, positive feeding mechanism, an independent air supply to the aerating chamber, with regulating devices, and a deflector in the aerating chamber for throwing the entering coal towards the inner periphery thereof.—R. S.

Peat Fuel and the like; Impts. in —. F. McNamee, Dublin. Eng. Pat. 14,661, Aug. 16, 1900.

THE peat is first freed from water by draining and by means of hydro-extractors. It is then disintegrated or broken up, and mixed with stated proportions of unburnt pulverised or granulated limestone, mixed or blended with pitch, tar, creosote, oil, grease, or sugar. The mass is heated or passed through a pug mill, then cut or moulded into briquettes, which are afterwards dried, stamped, and, if desired, perforated to assist combustion.—R. S.

Fuel Blocks or Briquettes; Utilising for the Preparation of —, *the Sludge or Scum produced during the Treatment of Sewage by Biological or Bacterial Purifying Processes.* C. J. Whittaker, Lytham, Lancaster. Eng. Pat. 16,104, Sept. 11, 1900.

THE sludge or scum is dried, mixed with coal dust or small coal, &c., and moulded into briquettes.—L. A.

Fuel; Apparatus for Burning Pulverised —. O. Imray, London. From W. J. Donaldson, W. A. Mears, and G. S. Emerick, all of Philadelphia, U.S.A. Eng. Pat. 1482, Jan. 22, 1901.

FOR pulverising and burning fuel there is employed a combination of a pulverising mill, a separator, a fan, a regulating feeding worm, a speed-changing mechanism actuating the worm, and means for automatically controlling the speed-changing mechanism.—R. S.

Coke-Ovens; Horizontal —. F. J. Collin, Dortmund Prussia. Eng. Pat. 15,962, Sept. 7, 1900.

IN horizontal coke-ovens in which by-products are extracted, the heating flues are arranged so that the heating gases circulate only in horizontal and ascending directions, never in a descending direction. Several such arrangements of flues are illustrated.—R. S.

Coke-Ovens. H. Koppers, Carnap, Germany. Eng. Pat. 9822, May 11, 1901.

TO remedy certain defects in coke-ovens of the Coppée type, the tops of the heating flues are provided with cover plates, each of which has a central boring for the passage of the gases of distillation. Within the boring is a projection upon which rests an air tube. On the outside of the latter are projections to regulate the quantity of the distillation gases admitted to the flues or to entirely close the openings in the cover plate. Small openings for the passage of distillation gases connect the distilling chambers with one another. A large aperture in each outer cover stone allows the insertion and turning of the air tubes from outside the oven. When the air tubes are removed, closing plugs can be inserted to entirely shut off communication between the adjacent distillation chambers.—R. S.

Coke-Ovens; Heating of By-product-saving —. H. Koppers, Carnap, Germany. Eng. Pat. 10,336, May 18, 1901.

COKE-ovens adapted for the recovery of by-products are worked either with cold or hot air. In the former case, a quantity of air, about twice the volume of the heating gas, is supplied to the gas at one place for the whole plant; while in the latter case, a quantity of an inert gas, such as smoke from the chimneys, is added. This accelerates the combustion in the former case, but delays it in the latter, whereby in each case the heat is more completely utilised. To effect this, several single fireplaces are arranged one beside the other, and are connected with common distributing passages and partition walls

on the bottom of the heating flues. The gas and air jets are arranged horizontally and parallel to each other, and the ignition takes place at a point above the nozzles.

—R. S.

Coke-Oven adapted to be worked with or without Saving of By-products. H. Koppers, Carnap, Germany. Eng. Pat. 10,337, May 18, 1901.

THE coke-ovens are constructed with two independent heating devices, so as to save by-products or not, as desired. Beneath the heating flues is a channel, and curved channels connect this with the vertical heating flues terminating above the partition wall arranged on the bottom of the flues. Beneath the channels referred to are two sets of separate channels for the supply of heating gas and air for combustion, to a number of single fireplaces.—R. S.

Liquid-Fuel Furnaces and Muffle Ovens. M. Eunson, Glasgow. Eng. Pat. 15,052, Aug. 23, 1900.

THE muffle has an outer shell with flat or arched roof, and the floor of the muffle is supported on bricks arranged so as to form flues for the passage of the flame and hot gases rising from a fire-chamber situated underneath and fitted with a liquid fuel burner. The latter may consist of a shallow flat pan, divided into compartments by partition walls, and provided with baffles for the inflowing oil. One or more openings are provided for the admission of air to the burner (of which several modifications are described), and arrangements are made for the supply of oil from an oil tank to the burner.—C. S.

Fuel-Oil; Means for Separating —, *from Water.* Sir W. G. Armstrong, Whitworth and Co., Ltd., and E. L. Orde, Newcastle-on-Tyne. Eng. Pat. 15,868, Sept. 6, 1900.

THE combination claimed is that of an oil receptacle and a flexible suction pipe, fitted with a float adapted to rise and fall with the level of the oil, thus keeping the nozzle of the pipe at a constant distance below the surface of the oil; also of a steam coil for heating the oil in or surrounding the suction pipe.—C. S.

Mixing Gases; Apparatus for —. A. J. Boulton, London. From A. Molet, Buenos Ayres. Eng. Pat. 13,404, July 25, 1900.

THE apparatus is adapted for mixing and supplying two or more gaseous fluids (e.g., acetylene and air), irrespective of their nature and pressure, in predetermined proportions, and also for regulating the supply according to the consumption of the mixed product. It consists essentially of two drums revolving together on the same shaft, each being provided with a series of cells at its circumference, terminating at their opposite extremities in tubular prolongations or extensions arranged in opposite directions. The drums are partially immersed in water, &c. within a closed cylinder, and are driven by a gas passed through a central chamber and the cells of one of them, the other drum serving as a suction device to draw a gas from another source of supply into its central chamber. This chamber is in communication with the cells at the circumference of the motor drum, and is provided with a pipe for drawing off the gases. By enclosing one of the drums in a bell, the gases may be delivered separately and mixed outside the apparatus. By combining the apparatus with a speed-indicator, it will serve as a gas-meter to indicate the amount of gas used.—R. A.

Carburetted Water-Gas and other Gases; Apparatus for Treating Liquor obtained from the Washing, Scrubbing, Cooling, or Condensing of —, *in order to Separate the Tar therefrom.* F. Thuman, London. Eng. Pat. 12,994, July 18, 1900.

THE apparatus consists of a primary settling tank, divided into compartments by a series of partitions descending nearly to the bottom, and also provided with openings about half way up, which openings are on opposite sides of the tank, in adjacent partitions, so as to cause the contents to traverse a zigzag course. The tar deposited



in the various compartments runs into a sump and ascends an upcast pipe leading to a secondary separator, where it is heated by suitable means, to liberate the retained water, and is delivered to a settling tank. In the case of light tars, which rise to the surface of the primary settling tank, adjustable surface overflows are provided, leading to the secondary separator. An additional separator may be provided for clarifying the effluent water, if required.—C. S.

Vaporised Oil and Air ; Producing and Utilising —, for Heating, Lighting, and Motor Purposes. J. Wilkinson, Burton-in-Lonsdale. Eng. Pat. 13,113, July 20, 1900.

THE inventor prepares "self-burning" gas by passing air through a cylinder partly filled with a mixture of about three parts of light petroleum spirit (sp. gr. 0.650–0.680) and one part of petroleum (sp. gr. about 0.797). The cylinder is provided with an arch of absorbent material, which becomes impregnated with the oil and is traversed by a portion of the air driven through the vessel by a fan, the remainder of the air passing, in adjustable quantities, above the arch, so as to enable the richness of the mixture to be controlled. Arrangements are made for warming the incoming air, so as to counteract the reduction of temperature produced by the vaporisation of the oil.

The improved method claimed for the utilisation of the gas consists in projecting the same against the object to be heated, at a greater speed than the rate of propagation of flame, whereby the combustion ensues, with little or no flame, on the surface of the article in question. The gas is also suitable for use in gas engines.—C. S.

Carburettling a Gas by the Vapour of a Liquid ; Apparatus for —. F. K. Kurz, Lucerne. Eng. Pat. 15,645, Sept. 3, 1900.

THE gasifier contains a cylinder built up of superimposed rings of porous material, containing porous packing in grooves in the contiguous surfaces, down which cylinder trickles the liquid to be vaporised. The gasifier is counter-balanced, and, in descending, automatically opens the valve admitting the carburettling liquid, the converse operation being performed when the gasifier reascends.—C. S.

Combustible Gases from Hydrocarbon Liquids ; Generator for the Manufacture of —. P. Lazareff, Derbent, Russia. Eng. Pat. 15,813, Sept. 5, 1900.

THE generator consists of the combination of a firebox, fitted with a steam injector (pulveriser) for the hydrocarbon ; a decomposition chamber and superheater above the firebox ; a second chamber, surrounding the first, for fixing the gas produced in the latter, whilst both are provided with "openwork stacks of fireproof bricks, and supply pipes above the inner chamber for feeding liquid hydrocarbon in such a manner that the production of gas may be obtained either by heating the interior of the generator periodically to incandescence by means of the hydrocarbon and by subsequently admitting steam at the pulveriser and of hydrocarbon by the supply pipes, or in a continuous manner by means of an incomplete combustion of the hydrocarbon injected by the steam at the pulveriser and by the admission of liquid hydrocarbon through the supply pipes to carburet the gas."—C. S.

Gas Burners for Heating Purposes. H. Heidemann, Berlin, and G. Axdorfer, Innsbruck. Eng. Pat. 17,709, Oct. 5, 1900.

A TRANSVERSE bar is arranged within the burner tube and near the mouths of the gas and air nozzles to assist in mixing the gas and air, to prevent back-burning and explosion, and to produce a thin pointed flame.—C. S.

Acetylene Gas ; Process and Apparatus for the Manufacture of —. G. J. Atkins, Tottenham. Eng. Pat. 11,953, July 3, 1900.

CARBIDE is pulverised in apparatus from which atmospheric air has been expelled by hydrogen or other suitable gas, and is passed therefrom either directly into the generating apparatus or into storage receptacles. The generating apparatus may be one of a number of different forms which

are described. All aim at bringing the pulverised carbide into contact and intimate admixture with a decomposing agent in requisite amount proportional to the consumption of gas. For instance, a closed chamber, divided by shelves on which carbide and decomposing material are placed, is so suspended that it is tilted, and predetermined quantities of carbide and material are thereby mixed, through the movement of an expanding gas chamber or a gasholder through which the generated gas passes.—J. A. B.

Acetylene Generators. E. W. Sprott, Mayfield, Sussex. Eng. Pat. 12,993, July 18, 1900.

CARBIDE is discharged through a valve operated by the movements of the gasholder into a sludge tank immersed in water contained in a vessel in which the gasholder and a fixed bell set eccentrically over the sludge tank are sealed. The levers operating the valve on the carbide container are on that side of it on which the eccentric disposition of the bell gives the greater clearance. A purifying and condensing chamber is placed beneath the gasholder within the seal tank.—J. A. B.

Acetylene-Gas Generator. E. Fajole, Rouen, France. Eng. Pat. 13,239, July 23, 1900.

CYLINDERS containing perforated metal carbide holders stand in a tank of water having two compartments, from the bottom of the upper one of which a pipe leads to the lower part of the lower one. Water passes from the tank to the cylinders through a valve-controlled pipe, and the gas evolved passes into a receptacle placed within the tank, where it is washed, and thence through a purifier containing coke impregnated with iron sulphate into a regulator, by which the operation of the apparatus is controlled according to the consumption of gas. Safety valves and gauges are provided.—J. A. B.

Acetylene Gas Generators. T. E. Clark, Sudbury, Suffolk. Eng. Pat. 16,598, Sept. 18, 1900.

A GENERATING chamber containing water is fed with carbide through an open hopper, provided with a "splayed" plate to prevent gas entering the hopper. A series of boxes containing carbide, and having hinged bottoms, are arranged above the hopper, and the bottoms are opened in turn through levers operated by a drum with a spirally arranged series of projecting teeth. The drum is moved forward by means of a ratchet wheel, which engages a catch on the gasholder into which the gas evolved passes, so that each time the gasholder descends to a given point, the bottom of a carbide box is opened and carbide is discharged into the hopper.—J. A. B.

Acetylene Gas Generating Apparatus. J. M. Coghlan, Sayville, U.S.A. Eng. Pat. 17,999, Oct. 10, 1900.

A FIXED cylinder, open at the bottom, and containing carbide, dips into water in a tank which is raised or lowered according to the movements of the bell of the gasholder into which the gas evolved passes. A blow-off device is provided to prevent accident from over-pressure of gas.

—J. A. B.

Acetylene Gas Generator. S. Csáky, J. Sárkány, and S. Centián, all of Budapest. Eng. Pat. 19,853, Nov. 5, 1900.

A GENERATOR, in which cells containing carbide are arranged spirally, is supplied with water from the tank in which it is immersed, through a valve which is closed by the action of a float, until such float is depressed by a rod attached to the bell of the gasholder into which the gas evolved passes, whereupon the valve opens. The cells are exhausted in turn from the lowermost upwards, and on the last cell coming into action a bell is rung.—J. A. B.

Gas Generators. H. Poetter, Dortmund, Germany. Eng. Pat. 16,077, Sept. 10, 1900.

THE lower part of the generator, in which the grate is situated, is inclosed by an encircling jacket sealed above and below in water, and adapted to be raised so as to leave the grate exposed for cleaning purposes. The grate cone is



movable up and down by means of rack and pinion gearing, so that cinder or slag can be crushed or loosened, and the free annular space between the cone and the fixed portion of the grate can be regulated to suit the degree of fineness of the fuel.—J. A. B.

Purification of Lighting and Heating Gas. S. Danner and G. Kubelka, both of Kladno, Bohemia. Eng. Pat. 5689, March 18, 1901.

THE gas is forced by a blower or otherwise at great velocity against a stream of cleansing agent, which is delivered at great velocity from a jet. Preferably, the passage is reduced in cross sectional area where the streams first impinge on one another. The impurities accumulate in vessels at the base of the passage or chamber in which the streams of gas and purifying agent meet, and may be removed therefrom.

—J. A. B.

Acetylene and other Combustible Gases; Determination of Phosphorus and Sulphur in —. P. Eitner and G. Keppeler.

See under XXIII., page 938.

Gas-Igniting Devices. A. Martini, Berlin. Eng. Pat. 15,550, Aug. 31, 1900.

THE pill, with attached platinum wires, is suspended from a hinged plate counterpoised so that the dynamic force of the gases tips up the plate when the jet is lighted, and removes the pill from contact with the flame. A modification for use without a chimney is also described.—C. S.

Incandescent [Nernst] Lamps; Glow Bodies for Electrolytic —. B. M. Drake and Nernst Electric Light, Ltd., Westminster. Eng. Pat. 13,839, Aug. 2, 1900.

To harden the refractory filaments of Nernst lamps before use, they are baked at a high temperature in the electric arc. The carbons are separated about three-eighths of an inch and the rod is passed across between them so that the arc plays upon it and heats it uniformly to a very high temperature. The filament is given a large radiating surface, for a given cross-section, by shaping it "with a solid section, which is flat, being elliptical, or flat with rounded edges, or flat with square corners. Another form is like pinion wire in section, or like pinion wire with a central hole, or tubular with three or more leaves."—H. B.

Electric Illuminating Bodies; Manufacture of —. W. Boehm, Berlin. Eng. Pat. 12,241, June 15, 1901.

GLOW-BODIES of the Nernst type, made of lime, magnesia, zirconia, thoria, or the like, generally become the more conductive at a higher temperature the purer they are. By adding small quantities of the oxides of chromium, manganese, uranium, titanium, niobium, &c., glow-bodies are produced "which are considerably resistant against outer influences, are capable of being excited at a low temperature, are very fire-resistant and possess a high illuminating power." For instance, a suitable mixture consists of:—zirconia, 90 parts; magnesia, 5 parts; lime, 4 parts; sesquioxide of manganese, 1 part. These may be made into a paste with a solution of sugar, and then squirted into threads or rods.—H. B.

Incandescent Gas Lighting and the Manufacture of Burners and Incandescible Elements therefor. J. B. de Lery, London. Eng. Pat. 22,694, Dec. 12, 1900.

A NUMBER of burner nozzles are arranged in a circle about a common mixing chamber, and a mantle is suspended over each nozzle. This burner is adapted for use with mantles which have not previously had the cotton fabric burned out. In one form of burner the tubes constituting the nozzles pass outwards radially from the mixing chamber and then curve upwards for a short distance. Mantles suitable for use with this form are made of fabrics which have one or more slits reaching half-way up the mantle; these slits enable the mantle, when suspended over the burner, to straddle the nozzle, and on igniting the gas, the mantle shrinks up to the required dimensions, the pressure of the gas within the burning fabric preserving its cylindrical

shape satisfactorily. In another form of burner the nozzles stand up vertically from the mixing chamber, and for this form the mantles are not slit, no "straddle" being required.—H. B.

Incandescent Gas Lamps. W. P. Thompson, London. From S. Zielenziger, Berlin. Eng. Pat. 23,222, Dec. 19, 1900.

THE lamp described is intended for use with ordinary low-pressure gas; but it is provided with a chimney about 25 ins. in length, in order that the induced strong draught of air may produce the effects of high-pressure gas. That portion of the chimney which surrounds the mantle is enlarged into a globular form; and the lower end of the chimney is closed in almost entirely round the Bunsen tube, so that no material quantity of air shall have access to the outside of the flame. The gas-inlet nipple at the foot of the Bunsen tube is of the usual size, but the tube has a cross-sectional area of at least double the usual size, thus enabling a volume of air, more than sufficient for the complete combustion of the gas, to be drawn in and mingled with the latter. The lower part of the lamp is enclosed in an outer globe, above which rises a chimney surrounding the burner chimney.—H. B.

Incandescent Gas Burners. J. Fischer, London. Eng. Pat. 9222, May 3, 1901.

THE chimney of an ordinary incandescent gas burner is dispensed with, and upon the gallery base is arranged an openwork or perforated gallery, which carries a globe. The globe and gallery are fixed at such a height that the additional air supply passes directly to about the lowest level of the flame. The air-supplies to the mixing tube and to the base of the gallery remain as in ordinary burners.—H. B.

Incandescence Mantles; [Acetylene] Gas Burners for Use with —. G. F. Law, Cleveland, Ohio. Eng. Pat. 12,521, June 19, 1901.

IN the Bunsen burner described, the acetylene gas and air pass upwards into a mixing tube, the top of which is provided with a screw-threaded cap, which carries the usual wire gauze diaphragm, and which has a contracted outlet or ignition nozzle above the diaphragm. The height of the diaphragm above the air and gas inlet can be adjusted by screwing up or down the cap. The chamber at the foot of the burner is provided with a gas inlet nozzle and air inlet holes, as usual, with a perforated sleeve for adjusting the air inlets. Between this chamber and the mixing tube there is fixed concentrically a tube or chimney, which projects a short distance into the mixing tube ("for the purpose of assisting the induction of air"), constituting a narrow passage connecting the lower chamber and the mixing tube. With such a burner the mantles employed are preferably of greater length than those used with ordinary incandescence gas burners.—H. B.

Osmium Filaments of Electric Incandescent Lamps; Improved Means for Supporting the —. O. Imray, London. From Oesterr. Gasglühl. und Electric. Gesellschaft, Vienna. Eng. Pat. 20,277, Nov. 10, 1900.

OSMIUM filaments are rather fragile while cold, and when brought to a white heat are so flexible as to tend to lose their shape. To obviate these dangers, a support, composed of sintered or fritted refractory oxide, non-adherent to and chemically indifferent towards incandescent osmium, is prepared in the form of a filament, which is then sealed into a hollow glass stem. The latter is mounted within the lamp bulb in such a position that the free end of the oxide filament (which may have any desired shape) will engage and sustain the osmium filament against sagging or vibration. The support consists preferably of a mixture of 10 parts of thoria and 1 part of magnesia, but other refractory oxides may be used. In forming the support, a paste is made from the ground oxides and an organic viscous binding material, and filaments prepared therefrom are first dried and burned in free air, and then raised to a high temperature until fritted.—H. B.



III.—DESTRUCTIVE DISTILLATION. TAR PRODUCTS, PETROLEUM.

Petroleum, Large Spouting Well at Beaumont, Texas. A. F. Lucas. Trans. Amer. Inst. Min. Eng. Chem.-Zeit. Rep. 25, [26], 236.

THE strata pierced by the boring which produced the large "gusher" at Beaumont, contained fossil *Ostrea*, *Turritella*, and *Macra* species. The sp. gr. of the oil is 0.925 at 15° C.; the sulphur content is 2.04 per cent. The fractions obtained on distillation are:—At 150°—200° C., 6 per cent. (sp. gr. 0.851); at 200°—250°, 13.5 per cent. (sp. gr. 0.867); at 250°—300°, 28 per cent. (sp. gr. 0.886); at 300°—400°, 50 per cent. (sp. gr. 0.914); residue and loss, 2.5 per cent. From its properties the chief use of the oil would appear to be for heating purposes.—C. S.

Petroleum Refining with Lime. K. Charitschkoff. Naphta, 9, (11), 211—213.

To remove the difficulties said to be met with in the use of lime in the alkali treatment of petroleum distillate and fully utilise the advantages afforded by this reagent, the author recommends that the distillate should be thoroughly cooled before the introduction of the sulphuric acid, and proposes to combine the cooling process with the lime treatment by stirring up the milk of lime with the distillate for about an hour in the settling reservoir, allowing the sediment to subside, and then blowing in air until the cooling is complete.

The distillate contains the acids originally present in the crude oil, their proportion being greater in oil that has been long exposed to the air; further, the acids formed during distillation, and the acid products formed during the sulphuric acid treatment, together with the residual free acid therefrom. By neutralising with lime previous to the acid treatment, the two first classes of acids are removed, leaving only the third for neutralisation by the ordinary alkali treatment with caustic soda. The resulting saving in the latter reagent may be gathered from a comparative experiment made by the author with one litre of distillate, one half of which was refined with acid in the ordinary way, whilst the other half was first treated with milk of lime. On titrating 25 c.c. of each with alcoholic decinormal caustic potash, the untreated portion consumed 3.9 c.c. of alkali, whilst the treated portion required only 1 c.c. for its neutralisation.

It is erroneous to assume that freshly collected crude oil is free from organic acids, and that these are formed when the oil has been exposed to the air; the author has never succeeded in finding a neutral oil, though in some cases the proportion of acids may be very small. Even the alkaline water issuing from oil wells contains these petroleum acids. During distillation, the pre-existing acids pass over, and are augmented by those produced during that process, or rather during the condensation of the distilled vapours, this being the only stage at which oxidation can occur.—C. S.

Viscosimeter; The Engler-Ragosome —. A. Ragosome.

See under XXIII., page 933.

Asphaltums and Bituminous Chalks of Palestine; Sulphur in —. C. Elschner. Chem. Rev. Fett- u. Harz-Ind. 1901, 8, [8], 159—160.

To account for the amount of sulphur in these asphaltums, the author suggests the theory that the organic substance reduced part of the sulphates present to sulphides; and that then the sulphur was forced, by the immense pressure which predominated, into the organic mass and became a chemical constituent thereof. Possibly ammonium carbonate and organic nitrogenous bases, derived from the decomposition of the albuminous substances, also played a part in the process.—C. A. M.

Brown Coal Tar; Use of Superheated Steam in the Distillation of —. P. Huth. Chem. Rev. Fett- u. Harz-Ind. 1901, 8, [8], 158—159.

In the distillation of brown coal tar with superheated steam, attempts have already been made to rapidly remove the gaseous products from the cylinder by means of bellows and exhausters; but in spite of this, the gases and vapours undergo still further decomposition on the hot walls of the retorts. To obviate this the author introduces double concentric bells into the cylinder, so that the coal tar only comes into contact with these bells and not with the external over-heated wall. The steam is introduced between the external wall and the outer bell, and in particular at the bottom of the retort where the over heating would naturally be the greatest.—C. A. M.

Brown Coal Tar; Constituents of —. T. Rosenthal. Zeits. angew. Chem. 1901, 14, [27], 665—667.

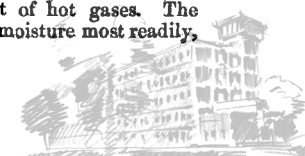
AMONG the products of the dry distillation of brown coal-tar, the author has identified the following classes of compounds:—(1) Aldehydes saturated and unsaturated, acetaldehyde being isolated among the former. (2) Ketones, of which acetone and methylethyl-ketone were isolated. (3) Methyl alcohol; and (4) Acetonitrile.

—C. A. M.

Wood Distillation; Impts. in and Suggestions for —. F. A. Bühler. Zeits. angew. Chem. 1901, 14, [25], 610—621.

THE author refers to an earlier communication on the distillation of wood (this Journal, 1900, 234), in which he showed that the advances in the price of the raw material and in wages rendered it necessary to secure the highest attainable yields of products and to replace manual labour by machinery wherever possible. He now describes by the aid of detailed diagrams a machine for charging horizontal retorts, comprising a shell which is packed with the charge of wood and is then introduced into the retort, which is of slightly greater diameter. The shell is then withdrawn and the charge left in the retort. The packing of the shell and the operation of charging, &c., occupies half-an-hour, so that one machine serves for charging 32 retorts, in which the charge is worked off in 16 hours. Its weight, when packed with a charge of about 2.2 cb. m., is about 4,600 kilos. and its cost is about 5,600 marks.

Much attention has been directed to the distillation of waste wood, such as the refuse from saw-mills, carpenters' and coopers' shops, and factories where tanning extracts are prepared. The chief difficulty lies in drying such refuse preparatory to distillation, as saw-dust, &c. contains 40 to 60 per cent., and refuse from extract factories 60 per cent. and upwards of moisture. Drying by means of steam is too costly, and direct heating is liable to cause loss of acetic acid and methyl alcohol as well as of moisture, owing to local overheating. The time of carbonisation becomes unduly prolonged if the refuse or wood contain more than 25 per cent. of moisture. Five days, with high heats, do not suffice to carbonise the core of a charge of sawdust containing 50 per cent. of moisture. The spent gases from the boiler and retorts might be utilized for drying the material. A works having 30 retorts should deal with about 30,000 kilos. of wood residues per diem, in 16 hours charges, and the flue gases from the boiler would amount to about 140,000 kilos. escaping at 250° C., and those from the retort installation to about 150,000 kilos., escaping at 350° C. Taking the specific heat of the escaping gases at 0.22, and assuming that they leave the drying plant at 50° C., it will be seen that they can give 16,000,000 calories, while 16,605,000 calories are required to reduce the percentage of moisture in the wood residues from 50 to 10. Hence it is clear that the flue gases are capable of furnishing about the required amount of heat if properly applied. It is most advantageous to bring the hot gases into direct contact with the material to be dried. The author gives diagrams of an apparatus for drying wood residues in this manner. The hot gases are driven by means of blowers into a long conduit, into which the residues are fed and are carried forward by the force of the current of hot gases. The lighter particles, which part with their moisture most readily,



are carried forward more quickly than the heavy ones, and consequently the hot gases play on the latter for a longer period. The rapid motion of the gases greatly increases the efficiency of the process, as it is well known that evaporation of liquids is promoted by strong currents of air. There is thus an ample margin of heat in the flue gases for drying the wood residues. The conduit may be arranged so as to convey the residues from the receiving place to the carbonising plant. The cost of the drying plant does not exceed 10,000 marks. 12 to 14 horse-power is required to work the blowers.

Wood residues may be carbonised in the ordinary vertical or horizontal retorts, but the author recommends, as economising space and labour, an arrangement of two retorts inclined at an angle of 45° , and uniting at the top in a common charging opening. He gives detailed diagrams of this arrangement. Likewise, for the sake of economy of space, he recommends vertical tubular condensers, one form of which he describes by the aid of diagrams.

The residues naturally yield the same volatile products as billets of wood, but the charcoal from them has a far more limited application. It has been made into briquettes, which serve well for some uses, but not for metallurgical purposes. They, however, are more costly than lump charcoal. The author has found that it is feasible to produce good serviceable briquettes by carbonising blocks pressed out of a mixture of equal parts of powdered charcoal and sawdust agglomerated with tar. He describes an arrangement of two inclined retorts, specially adapted for dealing with a charge of these briquettes in ten hours.

The distillation of wood tar is usually conducted in stills of cast iron, which suffer less than wrought iron from the action of the vapours of acetic acid. The author gives illustrations of distilling plant adapted to deal with the tar from a works carbonising 45,000 kilos. of dried wood residues per diem, that is to say, with about 4,000 kilos. of tar containing 10 per cent. of water. One still works off a charge of 2,000 kilos. in 12 hours. The charge must be heated gradually at first, otherwise it froths up and boils over to the receivers. Fires are not infrequent in the distilleries, and the tar stills should be placed at a distance from the other plant. A special form of still head, devised to minimise mishaps from frothing and explosions, is described by the aid of diagrams. The upper half of the still can be rapidly cooled by water, and is provided with a safety valve. The distillate is collected in a vessel with sight box, and three-way tap, which admits of the water and oil being drawn off into separate receivers. The aqueous portion of the distillate from the tar contains as a rule more acetic acid than the crude acid. The oily portion of the distillate boils between 120°C . and 330°C ., and is usually separated into light and heavy oil, the first coming over below 170° and yielding benzol, while the latter is worked up to creosote, guaiacol, &c., or is used for impregnating wood.

Plant for the distillation of 100 tons per diem of dried wood residues, containing originally 50 per cent. of water, according to the methods advocated by the author, would comprise 24 double retorts. The yield of charcoal would be 30 per cent. of the wood if the water left in the latter were taken at 10 per cent. The charcoal, mixed with an equal amount of dried wood residues and $33\frac{1}{3}$ per cent. of tar, would be carbonised in 12 settings, and the total yield of residual charcoal in a marketable condition would be 38,500 kilos. per diem. The crude acid and crude wood spirit would make up a yield of about 4 per cent. of acetic acid and 1 per cent. of methyl alcohol. A staff of only 120 to 150 men would be needed. The capital cost of boilers, engines, and apparatus would be about 650,000 marks; that of buildings, foundations, &c., about 400,000 marks. 25,000 kilos. of coal would be required per diem as fuel. 8,000 to 10,000 kilos. of wood tar would be produced daily. The expenses would vary greatly with local conditions, and hence it is not possible to give a general estimate of the returns. The yields given apply to hardwood residues (logs and cuttings); pine-wood residues would give the same amount of charcoal, but only 2 per cent. of acetic acid, and at the most $\frac{3}{4}$ per cent. of methyl alcohol.—J. A. B.

IV.—COLOURING MATTERS AND DYE-STUFFS.

Indigo from the Indigo Plant; New Method of Extraction of —. Calmette, Director of the Institut Pasteur, Lille, France. Fr. Pat. 300,826, May 31, 1900. Monit. Scient. 1901, 15, [716], 192.

THE plant is crushed and the pulp introduced into deep vats containing water which has been freed from calcium salts in order to prevent precipitation of indigo; the vats are provided with agitators. The mixture is filter-pressed, the solution passed into covered tanks, and the indigo precipitated by means of a current of air, the precipitation being facilitated by the addition of a very small quantity of lime, baryta, magnesia, or an alkali or alkaline-earth carbonate. The indigo is collected, and dried at 75°C .; it contains 5—7 per cent. of water. The liquid is returned to the oxidation vats. By this process, 6·6—8 kilos. of indigo, containing 80—81 per cent. of real indigo, are obtained from 1,000 kilos. of the plant, whilst even as much as 10 kilos. can be obtained from plants of superior quality, gathered immediately after blossoming.—A. S.

Indigo Plant; Treatment of —, by Diastase. Geugnier and Valette, Paris. Fr. Pat. 302,169, July 13, 1900. Monit. Scient. 1901, 15, [716], 194.

THE claim is for the addition to the indigo plant of laccase or other oxidising ferment, and even of a small quantity of hydrogen peroxide.—A. S.

Indigo in an Anhydrous Medium; Reduction of —. A. Binz. J. prakt. Chem. 1901, 63, [11 and 12], 497—516.

WHEN Indigo is dissolved in 50 times its weight of boiling naphthalene and treated with five times its weight of zinc dust, preferably in an atmosphere of nitrogen, hydrogen, or coal-gas, the original deep violet-blue colour becomes green. From a number of experiments under different conditions, the author concludes that this colour is due to the formation of zinc-indigo white, which can be extracted from the excess of naphthalene to a certain extent, although the greater part is decomposed. That zinc-indigo white is the chief product of the reaction is shown by the fact that when the mass is treated with soda lye it is converted into zinc hydrate and sodium-indigo white, part of the latter being decomposed by the hydrogen evolved. Since the reaction takes place in absence of moisture and zinc does not act on naphthalene, no hydrogen is evolved, and the formation of zinc-indigo white is not due to interaction between indigo white and zinc oxide. Moreover, it cannot be assumed that zinc abstracts oxygen from Indigo, yielding reducing products, since in that case more Indigo would be decomposed than analysis shows; and, further, zinc only reduces Indigo derivatives at a red heat, and then only with difficulty.

The paper contains the description of a method for obtaining dry indigo white. Precipitated with an acid from an Indigo vat, the precipitate is shaken with benzaldehyde added drop by drop. The stable green substance thus formed is dried on a porcelain plate, and subsequently extracted in a Soxhlet's apparatus with light petroleum spirit. This removes the benzaldehyde, leaving indigo white as a dry powder, which only turns blue slowly in the air. The product contains impurities, and on an average about 80 per cent. of indigo white. It is noteworthy that indigo white dissolves in naphthalene with a brilliant red colour.

—T. A. L.

Indigo containing Notable Amounts of Indirubin; Analysis of Samples of —. W. M. Gardner and W. Denton.

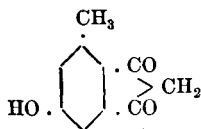
See under XXIII., page 939.

Carminone Compounds. C. Liebermann and J. Landau. Ber. 1901, 34, [10], 2153—2163.

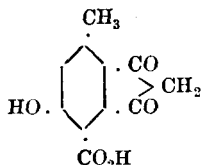
IN further continuation of work on the ketohydrindene derivatives of cochinelline acid, the authors find an almost



complete parallelism between the cochinellic ester hydrindene derivatives and those of phthalic ester. With a view of simplifying the nomenclature of these derivatives, they propose the name Carminone, represented by the formula—

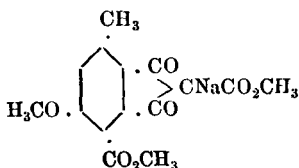


for the radicle of cochinellic acid diketohydrindene minus one carboxyl group, whence cochinellic acid diketohydrindene itself—

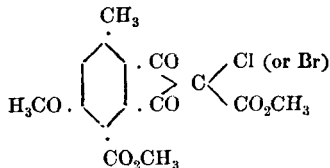


is Carminone carboxylic acid.

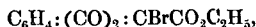
With regard to the preparation of the tetramethyl ester of cochinellic acid, they now find that an 80 per cent. yield of this substance is obtained by heating together an intimate mixture of cochinellic acid (1 mol.) and silver oxide (3–4 mols.) with an excess of methyl iodide in a sealed tube for 25 hours to 100° C. Unacted-on cochinellic acid can be removed by washing the ether extract with dilute sodium carbonate solution. The action of iodine on the trimethyl ester of sodium Carminone dicarboxylic acid—



yields the dimethyl ester of dioxetryscarminone carboxylic acid, a white powder melting at about 175° C., and behaving towards an excess of alkali similarly to trisdiketohydrindene. It dissolves in cold alkali with a yellow colour, which turns cochineal red on shaking the hot solution with air. Acids then precipitate a red substance soluble to a red solution in pure water, dyeing unmordanted or chrome-mordanted wool a pink shade. Chlorine or bromine react with the trimethyl ester of sodium Carminone dicarboxylic acid, yielding colourless needles, the chloro compound melting at 166° C. and the bromo compound at 170° C. having the formula—

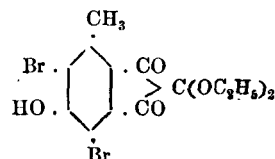


The latter exhibits the same phenomenon as the corresponding compound of ordinary diketohydrindene—



which, when treated with sodium iodide, exchanges bromine for sodium. When heated in a sealed tube with aqueous methyl alcohol for five hours to 100° C., it yields a white powder, melting at 276° C., of which the analysis best agrees with the formula of the dimethyl ester of an oxytriscarminone carboxylic acid. This product, on boiling with tolerably strong potash lye, gives a red solution, from which a red substance, soluble in pure water, is precipitated by acids. It dyes unmordanted wool a faint red, and chrome-mordanted wool a very faint pink. The product appears to exist in two tautomeric modifications.

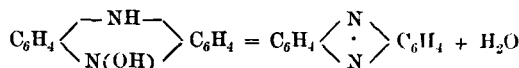
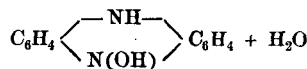
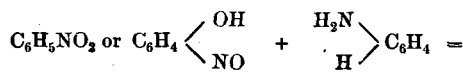
The further bromination in acetic acid solution of the trimethyl ester of bromocarminone dicarboxylic acid yields dibromocarminone carboxylic acid dimethyl ester melting at 143° C., from which the bromine can be removed by heating with methyl alcohol and silver oxide. Thus the two bromine atoms in this product react in the same way as two of the four bromine atoms in α -bromocarminone, which in the nomenclature proposed is tetrabromocarminone. This latter product, when warmed with sodium carbonate solution, decomposes into dibromo-oxyhomophthalic acid and a dyestuff giving brownish-red shades on unmordanted and a faint pink on chrome-mordanted wool. The same two bromine atoms can also be replaced by ethoxy groups by boiling α -bromocarminone with alcohol and silver oxide. The product has the formula—



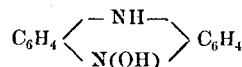
and separates from dilute alcohol in yellow needles, melting at 184° C. It does not dye on mordants, but gives faint yellowish shades on unmordanted wool.—T. A. L.

Nitrobenzene on Aniline in Presence of Alkali; Action of — A. Wohl and W. Aue. Ber. 1901, 34, [11], 2442–2450.

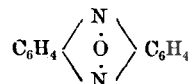
ACCORDING TO A. Wohl (Ber. 32, 3486; this Journal, 1900, 138), nitrobenzene is converted at a high temperature by the action of alkalis into *o*-nitrophenol, and with a view of investigating the course of the reaction, among other substances, aniline was added to the melt, in order to combine with any quinone derivatives which might possibly be formed. It is found under these conditions, when a mixture of about equal volumes of aniline and nitrobenzene is heated with powdered potash or soda and the melt, after washing with water, is extracted with dilute hydrochloric acid, that about 30 per cent. of the aniline is converted into phenazine. With β -naphthylamine, nitrobenzene, and alkali, α - β -naphthophenazine is formed, whilst *m*-nitrotoluene and β -naphthylamine yield a new tolunaphthazine. The reaction therefore is a condensation between the nitro- and the amino-compound, and the authors have succeeded in isolating an intermediate product, from which it appears probable that the aniline condenses with a hitherto unknown transformation product of nitrobenzene in the sense of the following equations:—



They have hitherto failed to isolate the product—



but by conducting the operation with very dry powdered caustic soda and at a low temperature, they have separated from the melt a substance containing one atom of oxygen more than phenazine, to which they assign the formula—



and term phenazine-N-oxide. It appears very probable that such a substance would be formed under the conditions existing in the melt, from the product of which the formula is given above, since from analogy the imino-hydrogen and the hydroxyl hydrogen of the secondary hydroxylamine would in alkaline solution be very readily oxidised. On the other hand, at a high temperature and with a rapid reaction, water would be split off to form phenazine. For the preparation of phenazine, equal parts of nitrobenzene and aniline are mixed with 4 parts of coarsely powdered sodium hydrate and heated to about 140° C. The melt becomes fluid, the temperature rising 10°–20° C., and solidifies in about 1–2 hours. The temperature is then raised to 160° C., and the black residue separated from the aqueous soda lye. After washing with water it is extracted with 20 per cent. hydrochloric acid, this solution warmed with dilute nitric acid, diluted with water, and precipitated with ammonia. The weight of the crude product is about 30 per cent. of that of the aniline taken, and, after subliming over iron filings, it yields yellow needles of phenazine, melting at 171° C. About 60 per cent. of the weight of the aniline can be recovered as azobenzene.

In order to isolate the intermediate compound, the same quantities of the ingredients are taken, the caustic soda, however, being perfectly dry and very finely-powdered. The mixture is warmed to 110°–120° C., until it becomes fluid, when the temperature is raised to 125° C., the operation being stopped when the melt turns viscid. It is then dissolved in about 10 times its weight of water and the residue filtered off. The hydrochloric acid extract on neutralisation with ammonia gives 2.7 grms. of crude product from 10 grms. of aniline. After several recrystallisations from alcohol, the product is obtained in yellowish-red needles melting at 226°·5 C., and subliming at 240°–250° C. If iron filings be added at this temperature, or if the temperature be raised to about 280° C., a sublimate of phenazine melting at 171° C. is obtained. Phenazine-N-oxide is not attacked by boiling for a short time with acetic anhydride, and on reduction with stannous chloride gives, like phenazine, the green double compound of phenazine and dihydrophenazine corresponding to quinhydrone.

Similarly a mixture of β -naphthylamine (10 grms.), nitrobenzene (8.3 grms.), and sodium hydrate (50 grms.), heated to 115°–140° C., yields naphthophenazine-N-oxide, melting at 182° C., and separating in green crystals, soluble in all solvents with the exception of water, together with more or less α - β -naphthophenazine, melting at 144° C.

By heating together β -naphthylamine (10 grms.), *m*-nitrotoluene (10 grms.), and dry sodium hydrate (50 grms.) to 135°–140° C., and treating the melt as above, about 3.5 grms. of a green to brownish coloured base is obtained. The product does not contain oxygen, and, after sublimation and recrystallisation from benzene, melts at 208°·5 C., and has the formula of a tolunaphthazine. In this case no intermediate product could be separated.—T. A. L.

Fluorescein, its Substituted Derivatives and their Leuco-bases; Sensitiveness of —, to Light. O. Gros. Chem.-Zeit. Rep. 1901, 25, 190.

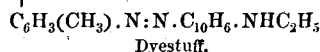
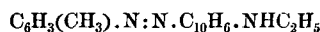
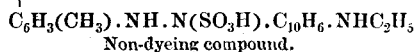
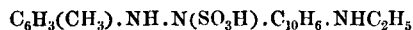
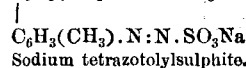
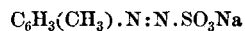
THE leuco-bases of the triphenylmethane dyestuffs are extremely sensitive to light; the rate of oxidation in the dark is considerably increased by the entry of a nitro group. The bleaching of the dyestuffs on exposure to light is due to oxidation. It is probable that the ions of leuco bases and dyestuffs take the first part in the reactions due to light. In the case of a leuco-base, the resulting dyestuff accelerates the oxidation so long as its concentration does not exceed a certain limit. The sensitiveness to light of both leuco-bases and dyestuffs is considerably increased by the presence of other dyestuffs. The reaction between mercuric chloride and ammonium oxalate is also accelerated by dyestuffs; this catalytic action is evident with exceedingly small proportions of the dyestuff, and with increasing concentration passes through a maximum. The catalytic action of the dyestuffs is probably due to the absorption of light; thus, the sensitiveness to light of the leuco-bases is caused by the light absorbed by the resulting dyestuffs.—A. C. W.

Chromogen, Producing a Carmine-Red Colouring Matter — in Schenckia Blumenaviana. H. Molisch. D. botan. Ges. Ber. 1901, 19, 149; through Chem.-Zeit. Rep. 1901, 25, [23], 201.

THE leaves of this plant are dark green when living, but change after death to carmine-red. Thus, a sprig placed in a cylinder of chloroform vapour undergoes this change in every part after a few hours, and the production of the colour still occurs after extracting the chlorophyll from the leaves with alcohol. If, however, the leaves are treated with 20 per cent. alcohol, the chromogen is extracted, and after several days is converted in the exterior liquid into a carmine-red colouring matter with a strong orange-red fluorescence. Since the change does not take place in fresh leaves thrown into boiling water, it is not improbable that the chromogen, or a ferment which acts upon it, is destroyed at that temperature. The conversion occurs in the absence of oxygen, and even in an atmosphere of pure hydrogen. The constitution of the colouring matter is not settled, but it is not ruberythric acid, nor is it closely related to Alizarin, Purpurin, &c.—C. A. M.

Sodium Tetrazotolylsulphite; Compound of — with Ethyl β -naphthylamine, and its Transformation into a Dyestuff. A. Seyewetz and Blanc. Comptes Rend. 133, [1], 38–41.

SODIUM tetrazotolylsulphite reacts with ethyl- β -naphthylamine to form an orange-yellow crystalline compound, which, by the action of light or by prolonged boiling with alcohol, yields a red powder, soluble in alcohol, acetone, or acetic acid, and decomposing without fusion at 150° C. This substance is identical with the dyestuff obtained directly by acting on tetrazotolidine chloride with the hydrochloride of ethyl- β -naphthylamine. The following formulæ show the relations of these substances:—



—J. T. D.

Light; Chemical Action of —. II. G. Ciamician and P. Silber.

See under XXIV., page 943.

PATENTS.

Orange - Yellow Dyestuffs belonging to the Acridine Series; Manufacture of —. C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin. Eng. Pat. 18,107, Oct. 11, 1900.

THE dyestuffs obtained from tetra-aminoditolylmethane and analogous compounds, according to Eng. Pat. 5114 of 1895 (this Journal, 1896, 349), only produce dull shades on leather or tannin-mordanted cotton. The patentees now find that when tetra-aminoditolylmethane is heated under pressure with methyl or ethyl alcohol in presence of hydrochloric acid, it is converted into bright orange yellow acridine dyestuffs, the shade varying from yellow to orange according to the quantity of alcohol employed. For instance, 20 kilos. of tetra-aminoditolylmethane (from *m*-tolylene diamine and formaldehyde), 32 kilos. of methyl alcohol, and 36 kilos. of concentrated hydrochloric acid (20° B.) are heated together under pressure to 150°–160° C. After cooling, the excess of alcohol is distilled off, the residue is dissolved in water, and precipitated with salt and zinc chloride. The dyestuff forms an orange-yellow powder, insoluble in ether or benzene, scarcely soluble in



glacial acetic acid, readily soluble in water or alcohol with a yellowish-green fluorescence. The product gives bright orange-yellow shades on tanned cotton.—T. A. L.

Brown Colouring Matter Directly Dyeing Cotton; Manufacture of a — C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin. Eng. Pat. 18,826, Oct. 22, 1900.

By heating 2.4.6-trinitrotoluene with eight times its weight of crystallised sodium sulphide, three of sulphur, and 19 of water for several hours to 180°–220° C., a product is obtained which dissolves in sodium sulphide and gives deep yellowish-brown shades on unmordanted cotton.

—T. A. L.

Brown Colouring Matter Directly Dyeing Cotton; Manufacture of a — C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin. Eng. Pat. 18,827, Oct. 22, 1900.

The azo dyestuff obtained by combining diazotised nitro-aminophenol ($\text{OH} : \text{NH}_2 : \text{NO}_2 = 1 : 2 : 4$) with *m*-tolylene diamine, when heated with sulphur and sodium sulphide, is converted into a new product dyeing unmordanted cotton fast olive brown. The shade is almost unchanged by subsequent treatment with copper or chromium salts, but by reacting with *p*-nitrodiazobenzene salts, bright yellowish-brown shades are produced.—T. A. L.

Colouring Matters [Blue-Green] of the Anthraquinone Series and of Intermediate Products relating thereto; Impts. in the Manufacture and Production of — J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 15,185, Aug. 25, 1900. (Second Edition.)

This specification is supplementary to Eng. Pat. 8051 of 1899 and to Eng. Pat. 21,572 of 1899 (this Journal, 1900, 892 and 341). The patentees now find that brown derivatives of 1.1'- or 1.3-diamino-anthraquinone or of mixtures of these can be obtained, and that these intermediate products on treatment with a primary aromatic amine yield dyestuffs of the anthraquinone series. For example, 10 kilos. of *p*-toluidine are fused and mixed with 1 kilo. of the product obtained by brominating the sulphonic acid solution of 1.1'-diaminoanthraquinone in presence of water. The melt is heated to boiling until the original red colour becomes bluish-green. After cooling, the melt is treated with alcohol, and the resulting dyestuff obtained in crystalline form can be rendered soluble by sulphonation.

—T. A. L.

Indigo Group and of New Indigo Colouring Matters, and Indigo therefrom; The Manufacture and Production of New Intermediate Products related to the — B. Wilcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 16,566, Sept. 17, 1900. (Second Edition.)

WHEN anthranilic acid is condensed with chlor-acetic acid for the preparation of phenylglycocoll-*o*-carboxylic acid, a by-product is occasionally formed having the formula $\text{H}_2\text{O} \cdot \text{C}_6\text{H}_4 \cdot \text{N}(\text{CH}_2\text{CO}_2\text{H})_2$, which may be termed anthranilodiacetic acid. It is produced in good yield by treating anthranilic acid with two molecular proportions of chloracetic acid or by condensing equimolecular proportions of chloracetic acid and phenylglycocoll-*o*-carboxylic acid, the condensations being effected in presence of alkalis. By treating the condensation product with an alkali or alkaline earth in aqueous solution, an indoxyl acetic acid is obtained, which on oxidation in alkaline, neutral, or acid solution yields Indigo diacetic acid.

If the dry salts of anthranilo-diacetic acid be heated in the caustic alkali melt (at 280°–330° C.), with or without the addition of quicklime, the melt finally yields indoxyl. Presumably, however, intermediate products, such as methyl indoxyl, are formed in this process, since at certain temperatures (200°–280° C.), the melt on oxidation yields a product consisting at least in part of dimethyl indigo.

—T. A. L.

1.8 Amido-naphthol-4-sulpho Acid and of Intermediate Products relating thereto; Impts. in the Manufacture of — B. Wilcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 16,921, Sept. 22, 1900.

By treating the α -sulphonic acid of 1.1'-naphthylene diamine with bisulphite in presence of acetone, it is converted into 1.1'.4-aminonaphthol sulphonic acid, that is the amino group which is α to the sulphonic acid group, is replaced by hydroxyl. The sulphurous acid ester of 1.1'.4-aminonaphthol sulphonic acid is formed as an intermediate product. The method is illustrated by the following example: About 238 kilos. of the α -sulphonic acid of 1.1'-naphthylene diamine are dissolved in 1,000 litres of water, together with the requisite quantity of calcined soda and mixed with 2,000 kilos. of sodium bisulphite solution (40° B.) and 60 kilos. of acetone. The mixture is stirred and heated for about half an hour to 60°–65° C., and then raised to 95°–100° C. until a sample is readily soluble in dilute hydrochloric acid. The reaction proceeds slowly and requires 2–3 days for its completion. A slight excess of hydrochloric or sulphuric acid is added, and the sulphurous acid liberated is boiled off. The brownish-yellow solution obtained containing the sulphurous acid ester of 1.1'.4-aminonaphthol sulphonic acid is treated with sodium carbonate, lime, or caustic soda, when the sulphurous acid ester is decomposed after a short time, and a crystalline precipitate of the 1.1'.4-aminonaphthol sulphonic acid is obtained on acidifying the solution.

—T. A. L.

Colouring Matters [Blue] and of New Products for Use in the Manufacture of Colouring Matters; The Manufacture and Production of New — B. Wilcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 16,998, Sept. 24, 1900.

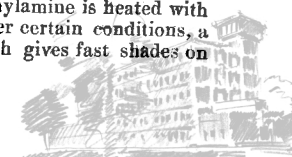
WHEN 1.3.4.6-dinitro-dichlorobenzene is treated with an alkaline thiocyanide (thiocyanate) in presence of a suitable solvent or menstruum (for example acetone), both chlorine atoms are replaced by the thiocyanogen group. The new product so obtained reacts (preferably in alcoholic solution and in presence of sodium acetate) with aromatic compounds containing a free amino group, such as *p*-aminophenol, its sulphonic and carboxylic acids, one of the thiocyanogen groups being replaced by the radicle of the aminophenolic compound. On heating these derivatives with sulphur and an alkaline sulphide, products are obtained which dye unmordanted cotton greenish-grey-black shades. These on oxidation with sodium peroxide, alkaline potassium ferricyanide, alkali permanganate, alkali persulphate, or alkali hypochlorite, give deep blue shades fast to washing, alkalis, and acids.—T. A. L.

Dyestuffs [Violet]; Manufacture of — R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 14,836, Aug. 18, 1900.

HYDROXY derivatives of substances containing an azine nucleus when heated with alkaline sulphides and sulphur yield violet to claret cotton dyestuffs. The presence of amino groups is advantageous, but not essential, whilst alkyl or alaryl groups attached to one of the azine nitrogens yield purer and brighter shades. For example, 10 kilos. of amino-hydroxyphenazine (Ber. 28, 2975) are gradually added to 50 kilos. of crystallised sodium sulphide, 20 kilos. of sulphur, and 10 litres of water, and slowly heated to 90°–100° C. The temperature is then raised to 140°–150° C., and the heating continued until the melt dissolves in water with a blackish-violet colour, and no yellow border bleeds out when spotted on filter paper. The melt is then dried at 170° C. It can be employed directly for dyeing purposes, and gives on cotton from a bath containing sodium sulphide, brownish-violet shades of great intensity and fastness to washing and milling.—T. A. L.

Dyestuffs [Blue]; The Manufacture of — R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 16,247, Sept. 12, 1900.

WHEN *p*-dimethylamino-*p*-oxydiphenylamine is heated with sulphur and alkaline sulphides under certain conditions, a pure blue dyestuff is obtained which gives fast shades on



cotton from a bath containing sodium sulphide or caustic alkalis. The following are the characteristics of *p*-dimethyl-amino-*p*-oxydiphenylamine, which is a new substance. It separates from water in greyish-white needles and from benzene in prismatic crystals, melting at 162° C. It is sparingly soluble in ordinary solvents at low, more readily at high temperatures. It gives easily soluble colourless salts with mineral acids, and dissolves in caustic alkalis in presence of air with a fine blue colour. For the production of the dyestuff, 25 kilos. of the product are gradually stirred into 50 kilos. of crystallised sodium sulphide, 12.5 kilos. of sulphur, and 10 litres of water heated to 90° C. The temperature of the melt is then raised to 110° C., and kept at 110°–115° C. by gradually adding water. After 24 hours, the melt is stirred into 500 litres of water and 50 kilos. of salt are added. The precipitate is filtered off, washed, and dried. The dyestuff thus obtained forms a shining coppery powder, soluble with a pure blue colour in concentrated sulphuric acid. It is incompletely soluble in pure water, but dissolves readily on the addition of sodium sulphide or caustic alkalis. The shade produced is similar to Methylene Blue, whilst the dyes are fast to milling, light, acids and chlorine, and are said to surpass Indigo both in shade and fastness.—T. A. L.

Dyestuffs [Violet-red, Blue] of the Anthracene Series; The Manufacture or Production of New — H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 15,391, Aug. 29, 1900.

ACCORDING to Eng. Pat. 23,927 of 1894 (this Journal, 1895, 1041), when quinizarin is heated with primary aromatic amines, one or both of the hydroxyl groups are replaced by aliphylamine radicles yielding blue and green dyestuffs. The patentees now find that when α -nitroquinizarin is treated in the same way, the nitro group is replaced, giving derivatives having the general formula $1' \cdot \text{RNH} \cdot \text{C}_6\text{H}_3 : (\text{CO})_2 : \text{C}_6\text{H}_3(\text{RNH})_2$ 1.4, where R represents any aliphyl radicle. These products on sulphonation yield dyestuffs which give red to violet shades on unmordanted and blue to bluish-green shades on chrome mordanted wool. By further treating the condensation products from α -nitroquinizarin and aromatic amines with aromatic amines, valuable green dyestuffs are obtained.—T. A. L.

Dyestuff [Brown, Black] for Wool; Manufacture of a — O. Imray, London. From the Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 18,624, Oct. 18, 1900.

THE *o*-*o*-diaminophenol sulphonic acid obtained by reducing *o*-*o*-dinitro-*p*-phenol sulphonic acid gives a tetrazo compound which combines with two molecular proportions of β -naphthol yielding a bluish-black powder soluble in water to a violet solution which is turned red by mineral acids. The dyestuff gives reddish-brown shades on wool which on subsequent treatment with chromium become fast violet-black.—T. A. L.

Carbazole from Nitrosocarbazole; Manufacture of a Nitro-derivative of — E. Wirth, Dortmund, Germany. Eng. Pat. 2899, March 25, 1901.

WHEN nitrosocarbazol (Eng. Pat. 14,462 of 1900; this Journal, 1901, 464) is treated in ten times its weight of benzene with its own weight of nitric acid (sp. gr. 1.36) and gently warmed, it is converted into nitro-carbazol, which is a yellow powder nearly insoluble in the ordinary solvents, readily soluble in boiling nitrobenzene or aniline, and not melting at 320° C. On reduction it yields the corresponding amino compound.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Soda-Cellulose; Composition of, and the Action of Ammonia upon — E. Thiele. Chem.-Zeit. 1901, 25, [57], 610–612.

THE compound produced by the action of strong caustic soda solution upon cellulose is assigned different formulæ

in the literature— $\text{C}_{12}\text{H}_{20}\text{O}_{10} \cdot 2\text{NaOH}$, $\text{C}_6\text{H}_{10}\text{O}_5 \cdot 2\text{NaOH}$, and $2\text{C}_6\text{H}_{10}\text{O}_5 \cdot \text{NaOH}$ —although analyses do not appear to have been published.

In investigating the action of ammonia on mercerised cotton, figures were obtained from which the composition of the cellulose-soda compound could be inferred. Strands of yarn, well boiled and purified, of 2–4 grms. weight, were dried at 105° C. to constant weight, and then mercerised for 20 minutes in strong caustic soda of known strength (about 30 per cent.). After squeezing between rubber rollers and estimating the increase of weight, they were washed for three periods of five minutes each in strong ammonia (25 per cent.) and squeezed after each wash, the superfluous liquid being carefully collected. The caustic soda removed by each portion of ammonia was then determined; finally the cotton was boiled with water and the alkali estimated in the solution without removing the cotton. Assuming the formula $\text{C}_{12}\text{H}_{20}\text{O}_{10} \cdot 2\text{NaOH}$, the theoretical quantity of combined soda was deducted from the increase in weight, thus giving the caustic soda solution mechanically absorbed, the caustic soda in which *plus* the theoretical amount of combined soda should be equal to the total quantity of soda found in the four estimations. The agreement is good considering the processes, and the most divergent case agrees much better by calculating from the above formula than by $\text{C}_{12}\text{H}_{20}\text{O}_{10} \cdot \text{NaOH}$.

Water and aqueous salt solutions convert soda-cellulose into cellulose hydrate— $\text{C}_{12}\text{H}_{20}\text{O}_{10} \cdot 2\text{H}_2\text{O}$ the parchment-like appearance of the soda-cellulose changes at the same time to that of ordinary cotton, the fibres contracting and crinkling. Even after three to four washes with fresh ammonia, the cotton retains its gelatinous nature and elasticity, so that it may be stretched to its original length without breaking, which is not possible with mercerised cotton washed without tension. Thus washing with ammonia does not “demercerise.” The analyses, of which the results are given above, show, however, that, after one wash with ammonia, far less alkali remains than is required by soda-cellulose. Since the formation of an ammonia-cellulose compound is excluded under these conditions, it can only be assumed that a cellulose hydrate is formed, which differs from the ordinary hydrate in being elastic. After washing with water, this hydrate also becomes inelastic, and if the fibre be stretched during washing, it too acquires a silky lustre.—A. C. W.

Fast Brown Dyes on Wool; Production of — C. Rumpf. Färber-Zeit. 1901, 12, [13], 197.

WHEN solutions of phenols containing several hydroxyl groups are boiled with hydrochloric or sulphuric acid and a small quantity of formaldehyde, faintly coloured condensation products are obtained, which are insoluble in acids and alkalis. These products when oxidised by the action of certain metallic salts or other oxidising agents, yield dyestuffs similar in character to those of the oxy-ketone series. Pyrogallol in this way yields a dark reddish brown dyestuff, resorcinol a somewhat yellowish brown, whilst pyrocatechol and hydroquinone give greenish browns. These colours, it is stated, may be produced directly on the wool fibre, and in this case it has been found that the treatment with acid is not essential, the reaction between the phenol and formaldehyde being brought about by wool mordanted with chromic acid or silk weighted with stannic hydroxide or phosphate. The wool or silk is boiled with the above proportions of phenol or formaldehyde and the colour developed in a boiling solution of bichromate. By this method, useful fast brown colours are obtained with very slight tendering of the fibre, and but little loss of dyestuff by precipitation.—R. B. B.

Acetylene Black. J. Dépierre. Bull. Soc. Ind. Mulhouse, 1901, 189–190.

Acetylene Black is recommended for use in calico printing on account of its freedom from hard particles and regular composition. It is manufactured, according to Hubon, by introducing acetylene gas into an hermetically sealed vessel which has previously been deprived of air, until the gas is subjected to a pressure of two atmospheres, and then decomposing it by means of an induction spark or hot wire, a cubic



Fibre and Yarn ; Machine for Treating Slivers of —, with Liquids. H. F. A. à Brassard, Bradford. Eng. Pat. 12,550, July 12, 1900.

AN endless apron is provided with grooves longitudinally, in which the slivers of fibre and yarn are placed. The apron travels entirely in a bath, rising up at each end. Grooved rollers are provided along its course to prevent the slivers rising up in the liquid. The slivers are delivered through squeeze-rollers, and then, if necessary, passed on to another bath. If the material is to be mercerised, then, to keep the yarn on the stretch, the feed and delivery rollers are run at different speeds.—C. M.

Yarn used in the Manufacture of Carpets, Plush or Pile Goods for Upholstery, and similar Fabrics ; Apparatus for Printing and Treating —. O. Hallensleben, Hilden, Rheinprovinz, Germany. Eng. Pat. 17,873, Oct. 8, 1900.

AN elaborate machine, which performs mechanically the whole of the operations the yarn has to pass through, up to the weaving, that is to say, the yarn is printed, steamed, and washed in one passage through the machine. It is claimed that time, labour, and colour are reduced to a minimum by using this machine.—C. M.

Jute Fibres, Yarns, and Fabrics ; Softening or otherwise Treating —. E. König, Würzburg, Germany. Eng. Pat. 1081, Jan. 16, 1901.

JUTE, in the raw or manufactured state, is thoroughly saturated, at a temperature of 50°–75° C., with a 30–45 per cent. solution of caustic soda or potash, in which it is steeped for about an hour. It is then placed in sacks or "closed receptacles" and heated at 40°–45° C. for about 24 hours, in order to dry it and render the encrusting "vegetable glue" soluble. The fibres thus treated are next washed and passed into an emulsion composed of 100 parts of "alkali soap," 100 parts of olive oil, and 200 parts of water. After being slightly squeezed, they are heated at a temperature of 75° C. for 24 hours. They are then boiled in water for a short time and afterwards dried. By this treatment, it is stated, the "vegetable glue and the like" in the raw jute are replaced by oily substances, which soften the fibre and give it a silk-like appearance.—E. B.

Garments and other Articles Waterproof ; Compositions for Rendering —. G. F. Newman, Canterbury, New Zealand. Eng. Pat. 12,174, June 14, 1901.

THIS is an improvement upon the process described in Eng. Pat. 11,264, 1898 (this Journal, 1898, 775), which had the defect of leaving the goods sticky. The article is given one coat, hot, with boiled linseed oil, 3 galls.; castor oil, 1 gall.; "patent driers," 2 lb.; powdered sulphur, 4 oz.; burnt umber or sienna to shade. When perfectly dry, two coats of the following are applied: boiled linseed oil, 4 galls.; "patent driers," 2 lb.; powdered sulphur, 4 oz.; colouring matter to shade.—F. H. L.

Kiers for Boiling, Bleaching, and Dyeing. W. W. L. Lishman, Cornholme, T. W. Haughton, Culleybackey, J. J. Kirkpatrick, Ballyclare; and The Lishman Process Bleaching Co., Ltd., Cornholme. Eng. Pat. 15,486, Aug. 31, 1900.

THE object of this invention is to provide a kier in which bleaching, dyeing, &c. liquors may be thoroughly circulated and also rapidly brought to the temperature of boiling point.

A second false bottom, placed above the ordinary false bottom of a bleaching kier, is movable up or down by suitable mechanism actuated on the outside of the kier. The latter is furnished at the top and bottom with liquor inlet pipes, connected on the outside with a circulating pipe which communicates with a liquor supply vessel. A steam injector is placed in each of the liquor pipes to cause the liquor to be forced in at the top or the bottom of the kier as required. One of the inlet pipes communicates with a steam pipe and serves for the introduction of steam in one direction, a pipe in communication with

the circulating pipe supplying, when desired, a current of steam in the opposite direction. A "vomit" pipe is also attached to one of the inlet pipes.

When employed in dyeing or bleaching with liquors which are not to be boiled, the circulation is effected by means of a centrifugal pump.

A claim is made for the external covering of the kier with a layer of wood or other material supported by angle iron rings carried at the top and bottom of its side walls, the covering being further secured, when the kier is very high, by bolts passing through holes in the rings.—E. B.

Washing and Bleaching Vegetable Fibres and Textile Materials ; Compounds for —. F. L. Bartelt, Bristol. Eng. Pat. 15,759, Sept. 5, 1900.

TO a solution of an alkaline hydroxide is added metallic zinc, zinc dust, or a zinc salt, e.g., zinc sulphate. The whole is heated until the zinc is dissolved and then allowed to settle. The clear liquor is drawn off and silicate of soda added.

If the product is required in a solid form, an alkaline carbonate is also added in such quantity that the mass becomes stiff or pasty and hardens on standing.

Under some circumstances the zinc is dispensed with, and the solution contains only the alkaline hydroxide and silicate.—R. B. B.

Bleaching Slivers, Ends, Card Ends, and similar Textile Products, also Loose Cotton and the like Materials. F. Gebauer, Charlottenburg, Germany. Eng. Pat. 16,312, Sept. 13, 1900.

THE object of this invention is the bleaching of slivers, &c. under high pressure without disturbing the structure of the material. The material is contained in perforated cylinders or cans, in each of which is axially arranged a perforated pipe connected at its lower end with a pump, by means of which the bleaching liquor is delivered into the top part of a hermetically closed vessel containing several cans. The liquor thus penetrates the material from the outside to the centre of each can, and is then drawn by the action of the pump through the central pipes and conducted back to the closed vessel.

The high pressure bleaching vessel is internally lined with lead and provided with a hermetically closing lid. At the bottom are a number of short tubes on which are mounted the perforated cans. Connections are also made with the circulating pump and with an apparatus for heating the liquor while circulating, and by means of a bye-pass the liquor may be caused to circulate around the heating apparatus in case the latter is not required.

The perforated cans are preferably constructed of sheet iron coated with lead and the perforated pipes are centrally secured to the bottom of the cans and conically enlarged at the lower end so that they can be mounted over the short tubes at the bottom of the bleaching vessel.

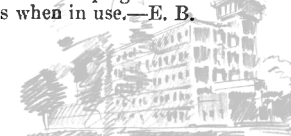
With the object of facilitating the filling operation, the central perforated pipes may be constructed separate and detachable from the cylinders, and provided each with a dish-shaped end piece. With this arrangement the cylinders are secured to the bottom of the bleaching vessel, and the perforated pipes are first inserted in the cans of the frame in which the sliver, &c. is produced and, when filled, the pipes are removed from thence, carrying the sliver resting on the end piece, and transferred into the cans of the bleaching vessel.—R. B. B.

Yarn ; Boiling and Dyeing —, and Apparatus therefor. R. F. Schüle, Kirchheim, Germany. Eng. Pat. 20,140, Nov. 8, 1900.

PARTLY an improvement in the cop dyeing apparatus described in Eng. Pat. 12,976 of 1900 (this Journal, 1901, 577).

The cops to be dyed are placed upon easily removable wires so that the dye liquors can penetrate them freely from both the inside and outside.

Mechanism is also provided for keeping the wires in position in the dyeing apparatus when in use.—E. B.



Alizarin Dyeing Processes; Impts. in —. F. Kornfeld, Prague, Austria. Eng. Pat. 15,639, Sept. 3, 1900.

A CLAIM is made for the application in dyeing cotton with alizarin, of "calcium saccharate" or the "calcium salts of another kind of sugar," in place of the lime or lime compounds hitherto used for the purpose. Thus, 35 kilos. of cotton, mordanted as usual with alumina in admixture or combination with fatty compounds, are dyed from a bath of 1,000—1,200 litres of water with 4.3 kilos. of alizarin (20 per cent. paste), 230 grms. of sodium carbonate (dissolved prior to its addition to the bath), 860 grms. of "calcium saccharate" (in solution) and, if desired, 80 grms. of tannic acid. Dyeing takes place in the course of 10—15 minutes, either at, or above, the ordinary temperature. After dyeing, the cotton is steamed for 1—2 hours at a pressure of $1\frac{1}{2}$ atmospheres.—E. B.

Dyeings obtained with Substantive Colouring Matters on Vegetable Fibre; Fixing of —. H. H. Lake, London. From The Farbwerke Mühlheim vormals A. Leonhardt and Co., Mühlheim a/Main, Germany. Eng. Pat. 17,701, Oct. 5, 1900.

IN order to improve the fastness to water of substantive dyes on vegetable fibres, the dyed material is treated with a solution prepared in the following way:—About one part by weight of aluminium sulphate and 1 part of sodium acetate are separately dissolved, each in about five parts of water, and after cooling, the two solutions are mixed and cold water is added until the total quantity is one hundred parts. The material is then treated with this liquid for an hour at the ordinary temperature. Since the fixing bath is slightly acid, colours which are not fast to acids will be somewhat altered by it, and in such cases the original tint may be restored by a weak alkaline bath.

The solution prepared as described, when standing at the ordinary temperature, gradually deposits hydrate of alumina or a basic salt of alumina in a very finely divided state, so that the conditions are very favourable for the formation of insoluble colour lakes on the fibre; by heating the solution, precipitation takes place too rapidly, and it is therefore advisable to operate in the cold.—R. B. B.

Dyeing Wool [Blue Colours from Azo Dyestuffs]. C. D. Abel, London. From the Actiengesellschaft für Anilinfabrikation, Berlin. Eng. Pat. 18,166, Oct. 12, 1900.

THE red-violet to blue-violet dyestuffs obtained by combining diazotised 2:3-aminonaphthol-6-sulphonic acid with certain 1:8-aminonaphthol-sulphonic acids, when treated with copper salts, undergo a characteristic transformation; the shades turn blue, and their fastness to light and soap is considerably increased.

This property may be made use of in wool dyeing; for example, 10 kilos. of wool are dyed in a vat containing 400 litres of water, 1 kilo. of sodium sulphate, and 0.2 kilo. of sulphuric acid with 1.25 kilos. of the azo dyestuff obtained from diazotised 2:3-aminonaphthol-6-sulphonic acid and 1:8-aminonaphthol-4-sulphonic acid. After dyeing in the usual manner, 0.1 kilo. of copper sulphate is added to the bath, which is kept boiling for half an hour longer. By this treatment, fast deep greenish-blue shades are obtained.

Other sulphonic acids of 1:8-aminonaphthol capable of replacing the one mentioned in the preparation of dyestuffs for this purpose are the 5-mono sulphonic acid and the 3:6, 3:5, 4:6, and 2:4 disulphonic acids.—R. B. B.

Dyeing Compositions; Manufacture of —. L. Aloy, Ostend, Belgium. Eng. Pat. 11,359, June 3, 1901.

THIS invention relates to the preparation of a composition suitable for home dyeing and popular use.—R. B. B.

Printing with the Colouring Matters known as Sulphide Colours. A. Sansone and The Clayton Aniline Co., Ltd., Manchester. Eng. Pat. 17,193, Sept. 27, 1900.

A PRINTING paste is prepared containing caustic soda, or a strongly alkaline compound such as sodium silicate, the presence of a reducing agent being unnecessary. The dyestuff is freed from admixed sulphur and sulphides, and either as the insoluble free acid or as a strong solution in

sodium sulphite, is mixed with an excess of caustic soda or silicate of soda (or a mixture of the two), and any suitable thickening agent. After printing, the goods are dried and then are steamed, washed, and, for greater fastness, passed through a hot fixing bath containing a bichromate, a salt of copper, or of iron, zinc, chromium, or other suitable metallic compound. Finally the goods are washed, soaped, rinsed, and dried. When the steaming operation is of short duration, e.g., when the Mather-Platt ageing machine is employed, it is advantageous to pad the goods, previously to printing, in a solution of glucose (containing 5—20 per cent.) and then to dry.

The process is especially adapted to those sulphide colours obtained as described in Eng. Pat. 21,832 and 22,460 of 1898; and 5039 and 18,658 of 1899 (this Journal, 1899, 909; 1900, 141 and 816), since these products, being free from sulphur and sulphides, do not require special purification.

It is claimed that the colours produced by this process are extremely fast to soap and alkalis, and do not stain the whites, and that the black prints thus obtained are equal in fastness to Aniline Black.—R. B. B.

Chlorine; Manufacture of —. G. J. Atkins. Eng. Pat. 13,815, 1900.

See under VII., page 897.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Staining Oak; Process for —, and giving Finished Oak Furniture an Old Oak Colour. W. Kolitsch. Mit. k.k. Tech. Gewerbe-Mus. in Wien, 1901, 11, [4, 5, and 6], 79—80.

THE beautiful brown colour which is produced on oak by the action of ammonia, is both air-, light- and water-proof. The author describes methods of staining finished oak furniture by the action of ammoniacal gas. The articles are placed in an air-tight case, inside which an atmosphere of ammonia gas is produced, either by pouring strong liquor ammonia into a shallow dish contained in it, or by leading the gas into it by pipes; the progress of the staining action may be seen by means of windows provided in the case.

—J. W. H.

Sheepskins; Preparing —, for Dyeing. Leather Manufacturer, 1901, 12, [7], 125.

See under XIV., page 913.

VII.—ACIDS, ALKALIS, AND SALTS.

Thirty-Seventh Annual Report on Alkali, &c., Works, by the Chief Inspector, June 28, 1901.

THERE are no marked changes in the industries covered by the present report as compared with preceding years. Three alkali works have closed, and two new scheduled works have been opened. The figures relating to escape of acid and noxious gases vary but slightly from those of preceding years, with a tendency to diminution on the whole; only four prosecutions have been found necessary under the Acts. There are, and must be, occasional accidental escapes of acid fumes beyond the prescribed limits; but these are vigilantly noted, and are often the occasion of suggestions being made tending to their suppression.

The chief inspector deals in this report with a matter—the presence of hydrochloric acid, free and combined, in coal smoke—the interests involved in which touch closely the community at large. It is stated that in estimating the escape of hydrochloric acid in some alkali works it has been found necessary to take account, in this respect, of the products of combustion of the coal used. Water pumped from the collieries near Normanton contained chlorine, chiefly in combination with calcium, magnesium, and sodium, varying "from 578.7 grs. to 25,871 grs. per gallon"; and some mine waters in Yorkshire and Durham gave

"3,624 to 4,150 grs. per gallon." Generally, chlorine is largely found in coals mined on the line of outcrop of magnesian limestone. Ignorance of this fact caused, in one instance, heavy loss. At an iron works, where coal was used in place of coke in the blast furnace, ammonia recovery plant, of the type largely used in Scotland, was installed, but the ammonia came off largely as chloride, which is not easily arrested when diffused in a current of gases giving great dilution. A table is given of the results of analyses of several samples of liquors derived from the destructive distillation of coal in gasworks or coke ovens fitted with recovery plant, showing that the ammonia fixed as chloride, ranges from 29.6 to 85.5 per cent. of the total ammonia. In the chimney gases examined in Yorkshire, from one-half to two-thirds of the total hydrochloric acid was found to be free, the remainder being chiefly combined with sodium as sodium chloride. On the other hand, coal from the western coal fields gives chimney gases containing only from 0.02 to 0.03 gr. of HCl to the cubic foot of gases. The question as to how far combustion of coal results in liberation of HCl (and of chlorine if magnesium chloride be present), "and to what extent the compounds are volatilised, passing away without change of character," is admittedly difficult to answer, except within certain limits. The practice, common in the salt districts, of checking black smoke by throwing salt on the fire, is reprehended, since thereby "one evil is checked by giving rise to a greater." Mention is made of a much advertised blue compound, for use in domestic fireplaces to check black smoke, done up in high-priced small packages, which proved to be a mixture of coarse salt with a cheap pigment.

The recent increased demand for arsenic free acids has stimulated action among manufacturers, and new plant has in some cases been set up, and modifications in the conduct of the process of purification by SH_2 have been tried. It has been necessary to guard very carefully against escape of the gas. In the purification of sulphuric acid, besides arsenic, the reagent precipitates lead, antimony, and selenium, and destroys sulphurous, nitrous, and nitric acids.

In tin-plate pickling, it is essential to use sulphuric acid free from arsenic, as otherwise arsenic is deposited on the sheet iron, which will not then take the tin coating. It appears that non-arsenical ores are now very difficult to obtain, and the sulphuric acid obtained from other ores must be freed from arsenic. A copy of the rules to be observed by the workmen at both sulphuric acid and hydrochloric acid works, for their own protection and avoidance of nuisance, in the use of H_2S , is given. A case is mentioned in which the inspector had to direct attention to the danger of tipping the waste sulphide of arsenic mud with hot cinders on a tip of waste material already on fire in one part. A case of gaseous poisoning occurred early in the year, in cleaning out a chlorine still; and it was subsequently found, after the inquest, that the liquid residue from the still gave off, on immersion of iron in it, hydrogen and arseniuretted hydrogen, which latter most poisonous gas should not, as the inspector observes, by *a priori* reasoning, have been evolved at all; "experiment, however, demonstrated the possibility of such evolution."

In arsenic works, while there is a diminution in the escape of arsenious acid, there is, in some works, an increase in the average acid escape, due to sulphuric anhydride, in consequence of an increase of the sulphur contents of much of the ore calcined. The condensation of the sulphurous acid evolved is largely effected in limestone towers, but in these a liability occurs for the formation of calcium sulphate, the coating of which on the limestone greatly detracts from its efficiency. Means for overcoming this difficulty are described.

In the nitric acid chlorine industry there has been no revival of activity. Electrolytic processes are striving to gain a footing, and when a process is worked continuously, it is found that the chamber space required per ton of bleach is considerably less than with the Weldon process. There has been much demand for nitric acid of high strength for explosives, and the Valentiner system of distillation has been considerably increased.

The Chance-Claus sulphur recovery process has been carried out in nine English alkali-waste works. The

residual gases from the sulphur "flowers" have not as yet been successfully utilised, though where practicable (which is rarely) they are conveyed to the pyrites burner of the vitriol chamber. "It is estimated that the portion uncovered is fully 12 per cent. of the sulphur recovered as sulphuretted hydrogen by the Chance process from the alkali waste, but leaving the Claus process as sulphuretted hydrogen and sulphurous acid in varying proportions." Reference is made to a passage in the 17th Annual Report, by Dr. Angus Smith, in which the greater diffusiveness of sulphurous acid over sulphuric acid is pointed out; and the quotation given, specially directs attention to the prevalence of injury to vegetation from the escape of sulphurous acid from ordinary chimneys, a matter that has not been brought under the Alkali Acts.

Sulphuric acid works have been busy, and the production considerable; but the high temperature of the summer months made the economic working difficult, and liable to excessive escapes, even with high nitre consumption. H_2S from the distillation of gas liquor has been utilised as a source of sulphur for acid making in several works. In times of active demand, the acid in the vitriol chambers is sometimes drawn down so low as only just to lute the gases, and this affects very unfavourably the chamber reactions, for, says the chief inspector, "the bottom acid in the chamber is by no means a spectator only (if I may so personify it) of the reactions taking place above it, but a very active participant, the value of whose silent aid is only felt when circumstances have withdrawn it, so quietly is its necessary function fulfilled." Extensive plant has been erected for the production of sulphuric acid by the catalytic process, and it is stated that, as is usual in the initial working of a new process, technical difficulties have been experienced. No absolutely new development has taken place in the concentration of sulphuric acid, one condition of which is the exposure of sufficient surface. The Kessler process has now taken a firm foothold in England, after successful working in Scotland; acid of 95 per cent. monohydrate is produced. Glass retorts for concentration are still in use, and are even being newly erected, in some large works. Webb's and Dyson's systems are also in operation. Guttman's system, in which a series of comparatively small earthenware beakers are spirally stepped in a gas-fired cast iron tower, has been on trial experimentally.

In sulphate and muriate of ammonia and gas-liquor works it is found that the utilisation of the H_2S in the vitriol chamber for conversion into sulphuric acid is the best method, provided the residual gases from the saturator contain so much as 20 per cent. of that gas; but the scale of working must be large. The method is applicable in the case of municipal authorities working up residuals of their own gas works. In the Claus process, the percentage of H_2S in the foul gases must not be under 16, to keep the precipitated sulphur fluid, that it may flow into the first section of the sulphur flowers chamber. When the system of oxide of iron purifiers is used, it is considered essential that the connection between the purifiers should be guarded, not by screw-down valves, but by water lutes; and two should be idle to each active purifier; a light roof over the purifiers, to promote air circulation, is also recommended. In some works the H_2S is burned in a special furnace, and the sulphurous acid produced, is led through limestone towers, which involves previous cooling of the hot gases, hitherto effected by the use of iron condensing pipes, which, however, are very liable to corrosion. A simple washer condenser has now been introduced, consisting of a circular stoneware tower, fitted with a water-luted distributing apparatus at the top, and having a series of perforated plates to bring into close contact the water and gases; this plan relieves the limestone tower of much of its work, and has other advantages, making it a "very great advance." The acidity of the cooling water used in the washer described, is readily neutralised by spent liquor from the gas-liquor stills. Indeed, plans have been proposed, and are under trial, to deal with the whole acidity by passing the acid gases up a second tower fed with spent liquors. Trials have been made, on a small scale, of the application of a ferric salt, as the sulphate, to the separa-



tion of sulphur from H_2S , the produced ferrous salt being regenerated to the ferric state by the electrolytic method that has been used in the Siemens-Halske process of gold extraction in South Africa. Another process (Hemingway's) consists in bringing the foul gases into contact with water containing ferrous sulphite in suspension, when sulphur is separated; but experiment has shown that material loss of sulphur ensues through formation of thiosulphate. The process has been subjected to elaborate trials by the chief inspector under varying conditions, and the results are tabulated.

The amount of sulphate of ammonia produced in the United Kingdom is shown in the following table:—

	1900.	1899.	1898.
Gas works	142,419	133,768	129,590
Iron works	16,959	17,963	17,983
Shale works	37,267	38,780	37,264
Coke oven works	10,393	7,849	5,403
Producer gas and carbonising works (bone and coal) ..	6,688	7,360	6,165
Total	213,726	205,720	196,357

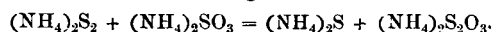
In Scotland there has been a sensible reduction in the ammonia recovered from blast-furnace gases, depending in part on the quality of the coal used; extension, however, of recovery plant attached to coke-ovens may be expected. Self-discharging saturators of the "Colson" type are increasing in number, and offer considerable advantages for a large make of sulphate of ammonia. In the district including North and East Lancashire and part of Yorkshire (District No. 4) the proportion of liquor ammonia produced is only 1 per cent. of the total. The old intermittent method of distillation is giving way to the continuous process.

The production of water-gas has increased, notwithstanding some hesitation on the part of manufacturers in introducing it, owing to the uncertainty still existing as to the intentions of Parliament as to the proportion of carbon monoxide it will be allowed to contain.

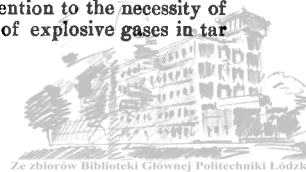
The importance of the "producer" or "Mond" gas production, with sulphate of ammonia recovery, especially for use in gas engines as originating power for electric plant, comparable in economy to the power obtained in other countries from water falls, is coming more and more into notice, and its use so far as made must increase the output of the sulphate. The chief inspector states that at the Winnington works of Messrs. Brunner, Mond and Co., where two gas engines of 400 to 500 horse power nominal (but more actually) have been working, tests show a thermal efficiency of 30·38 per cent., "one indicated horse power now being obtained from an expenditure of 0·88 lb. of common slack coal of so poor a quality that it only contained 62 per cent. of carbon." In this connection, attention is directed to Mr. H. A. Humphrey's paper read at the Institute of Mechanical Engineers, "On Power Gas and Large Gas Engines for Central Stations" (this Journal, 1901, 107). The process, as conducted [with ammonia recovery, is only feasible with large units of plant. Dr. Mond has made important contributions to discussions as to the best means of using the mechanical energy produced in gas engines, at a distance from, as well as near to, the source of origin, and a scheme seeking the sanction of Parliament has taken shape for providing a central producer-gas station, provided with ammonia recovery plant, in the Black Country, for distribution of gas to users of power. In respect to the direct utilisation of blast-furnace gases of iron works for production of power by means of gas engines, Scotland has not as yet "taken its due share"; but the subject is described as acquiring increasing importance. Prof. Meyer, of Göttingen, has found that, as compared with condensing steam engines of the best class, the ratio is at least 3 to 1 in favour of using blast-furnace gases in gas engines for power production: thus, 1 indicated horse-power is obtained from 3 cb. m. of blast-furnace gases used in a gas engine, as against 9 to 10 cb. m. when employed for raising steam supply to the best condensing steam engine.

Analyses are given of deposits in mechanical washers at producer gas works. In 100 grms. of undried mud, resembling coal dust in appearance, were found, sulphur as thiosulphate, from 0·00 to 0·73 gm.; as sulphite, from 0·00 to 0·68 gm. The inspector has previously shown that thiosulphate may be formed by reaction between ammonium sulphite and sulphide. In the liquors from which the samples of mud analysed were taken, one specimen contained sulphite in considerable proportion. The usual table is given of analyses of ammoniacal liquors, in which the column for ammonium ferrocyanide (only traces of which were found in a single sample) is deleted; but as ammonium sulphite has been found in some liquors, it has received a column. The difficult problems involved in the analysis of ammoniacal liquors from various sources receive further elucidation. Notwithstanding that a polysulphide and a sulphite cannot co-exist, sulphite (as already stated) is found in certain liquors, and its presence is liable to cause errors unless certain precautions are taken. Careful experiments have shown that in extracting ammoniacal liquors with CS_2 , there is in certain cases, and especially with shale liquors, liability to the formation of a sulphocarbonate and corresponding loss of sulphide. The use of CS_2 is therefore now abandoned, and separation of the sulphide from thiosulphate and sulphite is now effected by ammoniacal zinc chloride instead of neutral zinc sulphate. Also, "in the volumetric estimation of the carbonic acid the digestion at 98° C. with ammoniacal calcium chloride, necessary to decompose carbamates and complete the separation of the calcium carbonate, is now carried out in stoppered bottles kept immersed in the water-bath for 1½ to 2 hours at boiling temperature, this method being found to yield the most reliable results."

Experiments were made on the action of ammonium sulphite on ammonium sulphide, and on polysulphide, in presence and absence of air, in which the reactions were all carried out in stoppered bottles of known capacity, kept at a constant temperature by means of a water-bath. The conclusions appended to the table of the results obtained are:—1. In absence of air—ammonium sulphite has but little oxidising action upon ammonium sulphide in the cold. With rise of temperature the action is more marked, but is still inconsiderable. 2. In presence of air—oxidation is marked, but the rate of "conversion" in a given time is very little greater than it would be if the same volume of air were allowed to act by itself. 3. Ammonium sulphite and ammonium sulphide can co-exist in the same solution. A further series of tabulated experiments on the oxidation of ammonium polysulphide by ammonium sulphite, similarly conducted, leads to the following conclusion:—That ammonium polysulphide is at once completely converted into a mixture of ammonium thiosulphate and ammonium sulphide by the action of excess of ammonium sulphite, one-half of the sulphur of the thiosulphate formed being derived from the polysulphide, the remaining half from the sulphite:



Several salt works in Cheshire, originally belonging to individual owners, have now, as in the case of other works elsewhere, been merged into one ownership. The number of chimneys is very great, but the average escape of hydrochloric acid from them is well below the provisionally fixed legal limit. In some works, "multiple effect" evaporation has been introduced, a great, though avoidable drawback to which consists in the fouling of the tubes of the apparatus by sulphate of lime. One great advantage of the method would be the removal from the atmosphere of much aqueous vapour, which otherwise diffuses in it, and this would result in lessening the injurious effects of both hydrochloric acid and sulphur dioxide. In regard to cement works, not much progress in arrest of fumes is reported; but the Associated Portland Cement Manufacturers (Ltd.) have taken over the business of 30 firms, and it is expected that they will shortly introduce the use of continuous rotary kilns. An explosion attended with loss of life has occurred at a gas works in Lancashire, and the chief inspector directs attention to the necessity of guarding against the accumulation of explosive gases in tar wells.—E. S.



Sodium Nitrate; Decomposition of — by Sulphuric Acid. C. W. Volney. J. Amer. Chem. Soc. 1901, **23**, [7], 489—492.

The author has made further experiments on the distillation of sodium nitrate and sulphuric acid, and from his results draws the following conclusions:—During the first period of action of sulphuric acid on sodium nitrate, a polysulphate of the composition $\text{NaH}_3(\text{SO}_4)_2$ is formed thus: $\text{NaNO}_3 + 2\text{H}_2\text{SO}_4 = \text{NaH}_3(\text{SO}_4)_2 + \text{HNO}_3$; the nitric acid set free is the true "first hydrate," and distills at $81^\circ\text{--}88^\circ$. On raising the temperature, the second phase of the reaction begins, the polysulphate acting on the remaining nitrate according to the equation: $\text{NaH}_3(\text{SO}_4)_2 + \text{NaNO}_3 = 2\text{NaHSO}_4 + \text{HNO}_3$. The high temperature required by this latter reaction decomposes some of the nitric acid with the formation of water, so that the acid distilling over is diluted, and is sometimes called the second hydrate.—T. H. P.

Nitric Acid Manufacture by the Nebel Process. Rev. Prod. Chim. **4**, (11), 163.

The Nebel process is based on the observation that when bisulphate is heated to 300°C . with dilute sulphuric acid, water alone is eliminated, and there is formed a polysulphate that may be employed to replace concentrated sulphuric acid in decomposing sodium nitrate. In the course of this latter operation, it is found that when the strong nitric acid has been removed, the residual portion of this acid can be recovered in a dilute condition by exposure to a temperature of 300°C . in another vessel.

In view of this fact, the apparatus employed consists of three stills, two of them being placed above, and in communication with the third. One of the upper stills is charged with a mixture of polysulphate and sodium nitrate, and heated to $170^\circ\text{--}200^\circ\text{C}$. The contents are afterwards discharged into the lower still, which contains a small quantity of bisulphate, and is kept at a temperature of $280^\circ\text{--}300^\circ\text{C}$. The two upper stills are worked alternately, thus rendering the process continuous. The distillation takes $3\frac{1}{2}\text{--}4$ hours. A portion of the bisulphate from the lower still is converted into polysulphate, by heating with dilute sulphuric acid, and is then used to charge the upper stills.

The cost of the apparatus and of the nitric acid produced, is claimed to be cheaper than in the ordinary processes.

—C. S.

Soda Manufacture by the Ammonia-Soda Process; Progress in —. H. Schreib. Chem.-Zeit. 1901, **25**, [53], 566.

But little improvement has been made in this process during the last two years. Owing, however, chiefly to trade combinations, the price of calcined soda has increased by 15—20 per cent., and that of caustic soda by 10—15 per cent. Consumers have suffered more from a short supply than from the increase in price, as German manufacturers have not increased their output in proportion to the extended demand, preferring to allow the difference to be made up by imports. A table is given, showing the imports and exports of calcined, caustic, crude, and crystallised soda and bicarbonate from 1883 to 1900 inclusive. Caustic soda showed its maximum excess of exports over imports in Germany in 1894, when the excess amounted to 6,230 tons; in 1899 it had fallen to 2,618 tons, whilst in 1900 the imports exceeded the exports by 2,798 tons (1 German ton = 1,000 kilos.). The total production of all classes of soda showed its greatest excess of exports over imports, in Germany, in 1897, when it

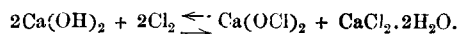
amounted to 49,490 tons. In 1900 the excess was 41,143 tons. The falling off is ascribed to the predominance in the German Syndicate of the Solvay Company, and the preference shown by the latter for its foreign factories rather than for the German ones.—W. G. M.

Sodium Hydroxide; Solid Hydrates of —. Forcand. Comptes Rend. **133**, [4], 223—226.

The paper presents a thermal study of heats of solution. The author's conclusions are:—1. The heat of solution of NaOH increases with rise of temperature, according to the formula $9\cdot78\text{ cal} + 0\cdot048(t - 10)$. This is the same coefficient of temperature variation as for KOH. 2. Besides the hydrates, $2\text{NaOH}\cdot7\text{H}_2\text{O}$ and $\text{NaOH}\cdot\text{H}_2\text{O}$, already known, there exists a hydrate $3\text{NaOH}\cdot2\text{H}_2\text{O}$. 3. On adding water in successive small portions to NaOH, the heat-evolution is less for the first than for the later portions added, up to $\text{NaOH}\cdot\text{H}_2\text{O}$. A similar phenomenon exists in the case of KOH, but only up to $\text{KOH}\cdot\frac{1}{2}\text{H}_2\text{O}$. The author can suggest no explanation of the phenomenon. 4. The curves of heat of dissolution of KOH and NaOH cut one another at the point $\text{ROH}\cdot\frac{1}{2}\text{H}_2\text{O}$; so that greater heat is evolved by the solution of the potassium or the sodium compound according as the substance contains less or more water than corresponds with that formula.—J. T. D.

Chloride of Lime; Composition of —. W. v. Tiesenholt. Sitzb. Phys. Chem. Ges. St. Petersburg, May, 1901. Through Zeits. angew. Chem. 1901, **14**, [27], 675—676.

ACCORDING to the author, the formation of chloride of lime can be expressed by the equation—



It invariably contains a slight excess of water. This facilitates the liberation of hypochlorous acid on warming, and the latter reacts with the calcium chloride as in the equation $2\text{HClO} + \text{CaCl}_2 = 2\text{Cl}_2 + \text{Ca}(\text{OH})_2$.

On the addition of calcium chloride there is a stronger evolution of chlorine. In all cases it stops, however, after a certain proportion of water has been used, but is again evolved on moistening the residue. "In this way the author has liberated 29·72 per cent. of the 34·13 per cent. of available chlorine by heating the chloride of lime with carbon tetrachloride."

He demonstrates the presence of calcium hypochlorite in chloride of lime, by treating the latter in chloroform solution with anhydrous alcohol, which combines with nearly the whole of the hypochlorous acid to form ethyl hypochlorite. In this case, too, the presence of a trace of water is essential, for the reaction does not take place if the materials be thoroughly dried. He has prepared dry calcium hypochlorite by the use of carbon monoxide, slaked lime and an equivalent quantity of calcium chloride. He thus obtained a mixture which, like ordinary chloride of lime, loses nearly the whole of its chlorine on treatment with carbon dioxide.—C. A. M.

Copper Sulphate and Sodium Sulphate; Solubility of Mixtures of —. Massol and Maldès. Comptes Rend. 1901, **133**, [5], 287—289.

The authors have determined the solubility of mixtures of copper sulphate and sodium sulphate, both salts being in excess, with varying proportions of each, and at various temperatures.

The results are summarised in the following table:—

Mixture.	Temperatures.							
	10° C.		15° C.		30° C.		50° C.	
	CuSO ₄	Na ₂ SO ₄	CuSO ₄	Na ₂ SO ₄	CuSO ₄	Na ₂ SO ₄	CuSO ₄	Na ₂ SO ₄
	Grms. per 100 grms. of Water.							
3CuSO ₄ + 1Na ₂ SO ₄	19·75	12·49	20·69	15·88	22·03	16·36	32·37	11·75
1CuSO ₄ + 1Na ₂ SO ₄	19·70	12·50	20·75	15·90	21·00	20·14	31·45	13·41
1CuSO ₄ + 3Na ₂ SO ₄	19·69	12·55	20·70	15·92	15·28	22·70	28·76	15·25



Thus it was found that the composition of the solutions obtained at 10° C. and 15° C. was the same whatever the proportions of the salts present (both being in excess), a fact which had already been observed by Rüdorff. But at temperatures of 30° and over—that is, at temperatures sufficiently high for the existence of the anhydrous modification of sodium sulphate (23°–32° according to the mixture), the composition of the solutions varied with the relative proportions of the salts used, the salt in excess causing a diminution of the solubility of the other salt. It is interesting to note that the total quantity of salts in solution was constant whatever the mixture employed, and that the two salts do not displace each other in proportion to their molecular weights but simply in equal weights.

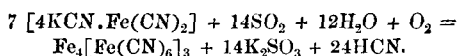
—J. F. B.

Potassium Ferro- and Ferri-Cyanides; Action of Light on Aqueous Solutions of — J. Matuschek. Chem.-Zeit. 1901, 25, [56], 601.

WHEN exposed to light, solutions of potassium ferro- and ferri-cyanides deposit ferric hydroxide, the former giving a fine grained precipitate, while the latter yields a flocculent deposit. Under the same conditions a solution of the ferri-cyanide is decomposed more readily by light than a solution of the ferro-salt containing the same proportion of iron.—T. H. P.

Potassium Ferrocyanide; Action of Sulphurous Acid upon — J. Matuschek. Chem.-Zeit. 1901, 25, [57], 612.

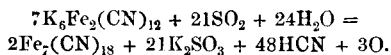
WHEN a solution of potassium ferrocyanide is heated with sulphurous acid, a white precipitate is formed at first, which then turns green. Hydrocyanic acid is evolved. On adding more sulphurous acid and exposing the whole to sunlight, both liquid and precipitate turn blue. On passing sulphur dioxide and oxygen through a hot solution of potassium ferrocyanide, a green (not blue) precipitate is formed. The blue precipitate was found to be Prussian blue, which is thus only formed in direct sunlight, when air has access. Sulphurous acid acts on potassium ferri-cyanide on heating or under the influence of direct sunlight (Chem.-Zeit. 1901, 587), but heat cannot effect the reaction on the ferrocyanide. Now solutions of potassium ferrocyanide separate ferric hydroxide on exposure to sunlight (Chem.-Zeit. 1901, 565), thus it may be assumed that the Prussian blue is produced, under the action of the oxygen of the air, from the salts obtained from this ferric hydroxide and the acids (sulphurous, formic) present. The following equation, which represents quantitatively the production of Prussian blue, thus gives only the final condition of a series of reactions—



—A. C. W.

Red Prussiate of Potash; Action of Sulphur Dioxide on the Aqueous Solution of — J. Matuschek. Chem.-Zeit. 1901, 25, [55], 587–588.

THE author finds that, in the absence of light, sulphur dioxide has no action on aqueous potassium ferri-cyanide, but that when the mixture of these two substances is exposed to light or when sulphur dioxide is passed into a boiling solution of the salt, a reaction takes place in which Prussian blue is precipitated; the oxygen of the air plays no part in the change, which is represented by the following equation:—



The fact that no smell of hydrocyanic acid can be detected is due to the hydrolysis of this acid in presence of dilute mineral acids with formation of ammonium formate.

—T. H. P.

Ferrates; Electro-chemical Production of — W. Pick.

See under XI. A., page 905.

Acids; Effect of Glassware Containers on — T. Tyrer and C. T. Tyrer.

See under VIII., page 899.

Hydrobromic Acid; Preparation of — E. M. Marshall.
See under XX., page 926.

Chili Saltpetre; Occurrence of Free Iodine in — F. W. Dafert and A. Halla.
See under XV., page 914.

PATENTS.

Brine; Process for the Purification of — G. N. Vis, Schweizerhalle, near Basle, Switzerland. Eng. Pat. 20,271, Nov. 10, 1900.

SODIUM sulphate is added to brine, in excess of the proportion needed to react with the calcium salts present, and after salting out the greater part of the calcium sulphate, the brine is agitated for some time with quicklime, added in such proportion "that the brine treated acquires a degree of free alkalinity corresponding to, or exceeding the proportion of gypsum remaining in solution," and carbon dioxide is then passed in, in sufficient quantity to form carbonates, but not bicarbonates, with the calcium and free alkali present. The precipitated calcium carbonate is separated, and after salt has been obtained by concentration, the mother liquor, rich in sodium sulphate, is used in the next operation. Reference is made to Eng. Pat. 7107, 1899 (this Journal, 1900, 146).—E. S.

Chlorine; Manufacture of — G. J. Atkins, Tottenham, Middlesex. Eng. Pat. 13,815, Aug. 1, 1900.

SODIUM or potassium chlorate and chloride, mixed, or in solution together, are treated with "an aqueous solution of sulphuric acid" to produce chlorine. The solution containing chlorine thus obtained, may be used in leaching ores, or for bleaching, disinfecting, or the like. The process may be varied by mixing sodium chlorate with potassium chloride, or potassium chlorate with sodium chloride, instead of having only one base present. The chlorine may, if desired, be separated from the solution for absorption by water or otherwise.—E. S.

Caustic Soda; Manufacture of — A. Brand, Dover. Eng. Pat. 19,322, Oct. 29, 1900.

BLACK ash is made in the usual way from a mixture of sodium sulphate, calcium carbonate, and carbon, and to the furnace mass "a further quantity of carbonate of lime and, if necessary, some carbon" is added, and after increased heating, the pasty mass is drawn from the furnace, and is lixiviated, to obtain a "strong caustic liquor." The weak washings are used to lixiviate the next charge.—E. S.

Packing Material; for Gay Lussac, Glover, and the like Towers. J. M. Gibson, Buckley. Eng. Pat. 23,052, Dec. 17, 1900.

TO increase the efficiency of absorption towers, the surfaces of the packing material are formed with horizontal grooves or recesses; drawings of packing rings with external grooves of varying form are given in the specification.—J. W. H.

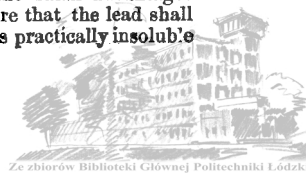
Copper Sulphate and other Metallic Sulphates; Process for Making — H. J. U. Palas and F. A. J. Cotta. Eng. Pat. 17,485, Oct. 2, 1900.

See under XI. A., page 906.

VIII.—GLASS, POTTERY, ENAMELS.

Lead Compounds in Pottery; Report to His Majesty's Principal Secretary of State for the Home Department on the Work of the Government Laboratory on the Question of the Employment of — T. E. Thorpe.

THE author has carried out inquiries and experiments with regard to the employment of lead compounds in the manufacture of pottery. The report is divided into three parts. The first, which forms the main subject of the report, deals with the proposed special Rules I. and II. The intention of Rule I. is to ensure that in the first place all lead used in the processes indicated shall be fritted, since even the more soluble kinds of fritted lead have some small advantages over "raw" lead. Rule II. is to ensure that the lead shall be fritted so as to produce a frit which is practically insoluble



in dilute acids. This is done by properly apportioning the lead and the other materials.

The second part deals with the composition and solubility of lead frits. The third has regard to the influence of grinding on the solubility of lead in frits. In 1899 (this Journal, 1899, 494—495) the Home Office proposed that the use of raw lead should be discontinued, and all lead in future fritted, after a lapse of time sufficient to enable manufacturers to accommodate themselves to the change. The proposed rules provide that fritting should be made compulsory, and that the frits should conform to a maximum standard of solubility. The principle of Rule I. is accepted by the manufacturers, who propose, however, the addition of the words "with some siliceous substance" after fritted. Dr. Thorpe contends that this addition is not sufficiently precise, and would allow of raw lead being fused with a minimum or even a merely nominal quantity of silica. Manufacturers object *in toto* to Rule II. Dr. Thorpe gives a list of continental works with the kind of ware made, and the kind of lead used, showing that in works where fritted lead is employed, plumbism had largely or entirely disappeared.

For the solubility determinations, the solvents selected in the earlier stages of the experiments were solutions of hydrochloric, acetic, and lactic acids, of various strengths ranging up to 1 per cent. Afterwards only a 0.25 per cent. solution of hydrochloric acid was employed. The method eventually found most practicable for the purpose in view was to shake the finely powdered silicate for an hour with a thousand times its weight of the solvent at the ordinary temperature, using for this purpose an agitator worked by a small hot-air motor. The sediment was then allowed to settle for an hour, the liquid filtered, and the amount of lead in the filtrate determined. In most cases the lead was separated as sulphide and weighed as sulphate.

The conditions which led to the particular method of estimating solubility are the following:—

Time.—One hour's shaking at the ordinary temperature followed by an hour's settling was found long enough to dissolve the whole of the lead from easily soluble frits. From sparingly soluble frits it dissolved nearly, though not quite, as much lead as two hours' shaking. It thus served to discriminate between the two classes of frits and the length of time met the requirements of a practical working method.

Temperature.—The ordinary temperature was chosen as being a more practical one for laboratory purposes than that of blood heat, and less liable to variation during experiments. Less lead is no doubt dissolved from slightly soluble frits than would be dissolved at the blood temperature.

Quantity of Acid.—The quantity "1,000 times its weight" was chosen (1) in order to ensure that under all circumstances an excess of acid should be present; and (2), in order that the excess should be so great as to prevent any considerable weakening of the acid through the neutralising action of soluble constituents of the glaze.

Strength of Acid.—The strength of acid adopted for the test is that which is generally taken to be the average strength of the hydrochloric acid in the gastric juice, this acid being without doubt the active agent in dissolving lead in the stomach.

Specimens of the frits in actual use in the factories of Boch Frères (Belgium) and La Société Céramique were obtained, and also a specimen of new frit at the time being tried at the Rörstrand Works. The solubility of the lead in these frits when finely ground and treated with dilute acid as laid down in Rule II. was determined with the following results:—

Frits.	Lead Oxide present.	Lead Oxide dissolved.	Solubility calculated for Glaze containing—		
			10 % PbO.	15 % PbO.	20 % PbO.
	%				
Boch Frères, Belgium..	22.4	0.7	0.3	0.5	0.6
La Société Céramique..	19.0	1.2	0.6	0.9	..
Rörstrand.....	41.1	2.1	0.5	0.7	1.0

Thus the solubility of any one of these frits would be less than 1 per cent. If either the first or third were used in the same way for a glaze containing as much as 20 per cent. of lead oxide, the solubility would still not exceed 1 per cent. The second frit contains too little lead to furnish 20 per cent. of lead oxide. Although the three frits show that even the 1 per cent. limit is practicable, and that this standard is actually reached (though not enforced) on the Continent, it was thought desirable to allow a margin for possible accidental deviations. The limit of 1 per cent. was, therefore, doubled, and a standard of 2 per cent. suggested as a criterion of safety whereby glazes might be judged. The possibility of conforming to Rule II., as shown by results obtained by English manufacturers since the issue of the Home Office proposals in Dec. 1899 are illustrated by tables, experiments, and extracts, giving: (1.) Examinations of frits and glazes of low solubility. (2.) Progress shown by manufacturers in obtaining soluble glazes. (3.) Statements of manufacturers. (4.) The more general introduction of "leadless" glazes. (5.) The possibility of diminishing the quantity of lead actually used. A large number of glazes from various firms have been examined from time to time, and a marked improvement in "solubility" is observed. Evidence is given that it is possible to diminish the amount of lead soluble in dilute acid. For example, when it is a question of a glaze containing 22 per cent. of lead oxide showing 4 per cent. of "soluble lead," then if the glaze be made with only one-half the quantity of the same frit, so as to contain 11 per cent. of lead oxide, the amount of "soluble lead" will also be reduced to one-half, *i.e.*, to 2 per cent. The glaze, which did not originally conform to the 2 per cent. standard, is made to do so by decreasing the (unnecessarily large) amount of lead. The average quantity of lead oxide in 15 specimens of china and earthenware glazes was found to be about 18 per cent., the highest amount being a little over 22 per cent.

Objections have been raised that the frits from Boch Frères factory and from La Société Céramique contained too much silica and too little lead for English requirements. This objection has been completely met by showing that frits may contain much less silica and much more lead than these, whilst still remaining only slightly soluble. Twice as much lead, and less than four-fifths as much silica, are amounts frequently met with.

A number of tables are given showing the results of the examination of various silicates. Crude monosilicate of lead was found to yield practically the whole of the lead to the action of 0.25 per cent. hydrochloric acid. The examination of complex silicates illustrated an important principle, namely, that the quantity of lead dissolved has no necessary relation to the quantity of lead in the silicate. The comparison of a large number of analyses and experiments showed that the insolubility of the lead depends not upon any one oxide or group of oxides, but upon the maintenance of a certain proportion between the whole of the basic oxides on the one hand, and the whole of the acidic oxides on the other. Methods of calculating these ratios with tables are given. The conditions upon which the production of nearly insoluble lead silicates suitable as frits depends, are:—First. The preservation of the proper relation between the acidic and the basic constituents.—Second. The fusion of the materials for such a time and in so thorough a manner as to allow of the chemical reactions being completed. To these may be added in certain cases, the treatment of the silicate with acid in order to extract small quantities of admixed or loosely combined lead compounds from the bulk of the product. Provided that the foregoing conditions are satisfied, then, without prejudice to the insolubility in the standard solvent of the lead in the silicate—

(1.) The quantity of lead oxide in the silicate may have any value up to 50 per cent. or even higher.

(2.) The other bases (lime, alumina, and alkalis) may vary considerably, replacing one another, and also the lead oxide, within very wide limits.

(3.) The influence of basic oxide, irrespective of that of the silica with which it may be associated, still remains to be ascertained, but it may be pointed out that basic oxide up to 6 per cent., the highest amount met with in the specimens examined, may be present without apparently



exercising any special influence in promoting the solubility of the lead.

The objections advanced by Messrs. Jackson and Rigby (this Journal, 1901, 43), that the solubility of a glaze depends upon the fineness to which it is ground is exhaustively dealt with in detail. In general terms the answer is as follows:—First. There is a certain modicum of truth in the contention. But it is an academic and not a practical matter. The variation of solubility with fineness is relatively slight, and considering the limits of grinding obtaining in practice, is of no real significance:—Second. Whether or not the solubility of a glaze increases with fineness is immaterial, provided that glazes are obtainable which when ground to the fineness required in practice conform to the proposed standard of insolubility. It is of no consequence that such glazes have lower solubilities when more coarsely ground, and, as a fact, such glazes are actually in use by English manufacturers.—C. T. T.

Glass Making; Copper Oxide for — G. Raufer.
Zeits. angew. Chem. 1901, 14, [30], 753–754.

REFERRING to Drave's assumption (this Journal, 1901, 809) that the frequent failure of copper oxide to produce the desired green colour in glass to which it has been added, is due to the presence of cuprous oxide in the commercial oxide used, the author points out that few, if any, of the commercial oxides are quite free from suboxide. The failure is more probably due to the presence of reducing compounds, through the insufficient addition of nitrates, or through reducing gases having had access to the charge in the melting furnace, as for example, through the use of coal firing where open melting pots are used. A sudden failure of copper oxide as a colouring medium is more often the result of a change in the construction of the furnace, or in the method of firing, or to the disuse of nitre, than to an alteration in the composition of the oxide. Every care should therefore be taken to guard against reducing influences in the furnace.—W. G. M.

Glass; Opal- and Alabaster- —, with Durable White and Coloured Flashing Glass for Lamp Globes and Fancy Articles. Sprechsaal, 34, [1], 3–4.

Opal Glass.—Sand, 100 parts (kilos.); potash, 45; 98 per cent. soda, 3; bone ash, 26; calc spar, 3; nitre, 1.5; minium, 1.5; arsenic, 1.5; manganese oxide, 0.15 parts.

Durable White Glass for Same.—Sand, 100 parts; potash, 40; soda, 5; calc spar, 15; nitre, 1.5; minium, 1.5; arsenic, 0.5; manganese oxide, 0.10; antimony regulus, 0.075 parts.

Alabaster Glass.—Sand, 100 parts; potash, 56; bone ash, 6; natural alum, 8; nitre, 3; calcined borax, 1; manganese oxide, 0.075; antimony regulus, 0.05; tin oxide, 0.125 parts.

Durable White Glass for Same.—Sand, 100 parts; potash, 40; calc spar, 15; minium, 2.5; nitre, 1.5; calcined borax, 1; arsenic, 0.5; manganese oxide, 0.08; antimony regulus, 0.06 part.

Coloured Adjuncts for the White Glasses.—Turquoise Blue: Black copper oxide, 1 part; best smalt, 0.005 part. Cornflower Blue: Black copper oxide, 0.8 part; best smalt, 0.4; black nickel oxide, 0.025 part. Violet Blue: Black copper oxide, 0.8 part; best smalt, 0.4; green nickel oxide, 0.035 part. Pigeon Blue: Black copper oxide, 0.6 part; black nickel oxide, 0.3 part. Florentine Blue: Black nickel oxide, 0.3 part; best smalt, 0.3; black copper oxide, 0.4 part. Venetian Blue: Black nickel oxide, 0.4 part; best smalt, 0.4; green nickel oxide, 0.2 part.

By taking 50 per cent. more, these blues may be used direct for colouring the opal and alabaster glass.

Moss Green: Chromic acid, 1.5 parts. Leaf Green: Green copper carbonate, 0.8 part; chromic acid, 0.5 part. Sap Green: Barium chromate, 0.8 part; yellow iron oxide, 0.5 part. May Green: Black copper oxide, 20 parts; barium chromate, 0.6; red iron oxide, 0.4 part. Green: Green copper carbonate, 2 parts; barium chromate, 1; red iron oxide, 0.5 part. Florentine Green: Cupric chromate, 2.4 parts; green copper carbonate, 1.2 parts. Venetian Green: Best copper acetate, 4 parts. Antique Green: Manganese oxide, 3.3 parts; red iron oxide, 2.2;

barium chromate, 0.5 part. Oriental Green: Ferric chromate, 3.3 parts; cupric borate, 2.2 parts. Japanese Green: Ferro-ferric oxide, 2 parts; cupro-cupric oxide, 1 part. Chinese Green: Cupro-cupric oxide, 3 parts; ferric oxide, 1 part.

Topaz Yellow: Sulphur, 1.5 parts; antimony sulphide, 2.5 parts. Quince Yellow: Cadmium sulphide, 3 parts; zinc sulphate, 1 part. Fruit Yellow: Titanic nitrate, 3 parts; lead nitrate, 1 part. Annatto Yellow: Uranium oxide, 1 part; antimony glass, 1 part. Antique Yellow: Manganese peroxide, 3.5 parts; ferric oxide, 2; antimony oxide, 0.5 part. Japanese Yellow: Potassium antimoniate, 2 parts; ferric oxide, 1.5 part. Chinese Yellow: Antimonic acid, 3 parts; ferric hydrate, 1.5 parts. Oriental Yellow: Sulphur, 1.5 parts; antimony sulphide, 2; antimony glass, 1 part. Florentine Yellow: Titanium oxide, 2 parts; antimonic acid, 1 part. Venetian Yellow: Cadmium oxide, 2.5 parts; uranium oxide, 0.5 part.—C. S.

Thermometer Glass at Higher Temperatures.

W. McClellan. J. Franklin Inst. 1901, 152, [1], 63–72.

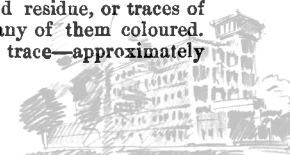
THE range of mercurial thermometers at the upper limit is sometimes increased by filling the tube, above the mercury, with nitrogen, and so, by increasing the pressure, raising the boiling point of the mercury. A thermometer used for some time in the metal pot of a linotype machine showed an alteration of 17° in the reading, and this led to the present investigation. The gradual alteration of the zero of glass thermometers is well known, and is due to the slow dissipation of tensions in the glass, imperfectly removed during the first annealing. Wiebe has found that Jena normal thermometer glass showed a rise of 0.04° in the zero-point during 285 days, and that Thüringen glass showed six times and English glass four times as much when at the normal temperature, whilst at 360° C. the Jena glass zero rose 2.21°, and that of the Thüringen glass 7.3° in 19 hours. He also found that of ordinary thermometer glass and "fine annealed" glass, the latter was by far the more constant. Baryta-Borosilicate 122 III. glass appeared, from his experiments, to be the best for thermometers. The author's observations on the gradual change of zero, when plotted on a curve, show that the alteration is at first rapid, and that, as the tensions are removed, the rate of alteration gradually decreases until the zero at last remains practically constant. The period at which this point is reached, varies inversely with the temperature. Experiments have shown that a good thermometer glass may be heated to about 600° C. before it begins to become plastic. Schott has stated that thermometer glass should be made with sodium salts, and should contain no potassium, as the samples containing the latter metal, show a greater alteration of zero.

The author makes the following recommendations: The glass for thermometers should be well selected; the empty bulb and tube should be carefully annealed by cooling very slowly; after being filled and sealed, the thermometer should be kept at a temperature as high as may be convenient for a time depending on this temperature. For ordinary thermometers (to be used up to 100° C. only) the ordinary method of seasoning (keeping them for six months at normal temperatures) may suffice, although the operation would be shorter at a higher temperature. High-temperature thermometers should be kept in an air-bath (or otherwise) at 450° C. for three or four days, after which they may be calibrated with the expectation that they will be subject to but slight alteration of the zero subsequently.

—W. G. M.

Acids; Effect of Glassware Containers on — T. Tyrer and C. T. Tyrer. Brit. Pharm. Conference, Dublin. Chem. and Druggist, 1901, 59, [1123], 234.

IN order to examine the action of acids upon glass, samples of pure sulphuric acid (sp. gr. 1.843), pure hydrochloric acid (sp. gr. 1.16), pure nitric acid (sp. gr. 1.42), and pure hydrobromic acid (sp. gr. 1.077) were placed in green, white, amber, and blue glass Winchester quart bottles, and exposed for seven months to diffused light. None of the acids showed appreciable or increased residue, or traces of iron, lead, or manganese, nor were any of them coloured. The hydrochloric acid showed a faint trace—approximately



1 in 2,000,000—of arsenic, but the others were quite free from this impurity. The authors observed incidentally that the presence of hydrochloric acid considerably enhances the delicacy of the Marsh-Berzelius test for arsenic.—A. S.

Porcelain Sand and the Composition of Porcelain Body.
E. Linder. *Sprechsaal*, 34, [2], 36.

THE ordinary porcelain sands, according to geological and geographical position, contain from "6—11 per cent. of potash (any soda also reckoned as potash)," 2—6 per cent. of alumina, and 78—90 per cent. of silica, and also traces of iron. Since the low proportion of alkali necessitates the employment of high kiln temperatures, an addition of lime is sometimes given, to increase the fusibility of the mass, but such additions should be made with care, otherwise the ware is liable to deformation when exposed to strong fire.

Where the sand is interspersed with veins of iron or ferruginous or manganiferous clay, these impurities may generally be removed, those of the first-named class by sifting, and the others by washing. The author is of opinion that the calcination of sand for porcelain is not a rational procedure, and that sand requiring this treatment is better replaced by quartz and felspar.

As an instance of the effect of the firing temperature on the properties of the product, it is stated that the following porcelain body, consisting of porcelain sand, 56 per cent.; Halle kaolin, 42 per cent.; lime, 2 per cent., which is largely used in Thuringia, furnishes, when fired at a temperature below sintering heat, a ware noted for its capacity to stand fluctuations of temperature, which property it, however, loses if the ware be brought to sintering point in the kiln.

The following recipe gives a very fine ware that will stand the heat of the kiln: Zettlitz kaolin, 30 per cent.; English kaolin, 20 per cent.; levigated porcelain sand, 40 per cent.; Scandinavian felspar, 10 per cent. It is not expensive, especially when the sand can be obtained locally.—C. S.

Copper Oxide [for Glass Making], Commercial; Determination of Cuprous Oxide in —. D. Miklosich.

See under XXIII., page 934.

PATENT.

Glass, Porcelain, or like Material; Process for Uniting Pieces of —, for Mosaic Work and the like. L. Stein and W. Storr, both of Berlin. Eng. Pat. 12,017, June 12, 1901.

THE process consists in heating the glass or other material, after applying to the joining edges a fusible and electrically conductive cement, and then depositing a strip of metal by electrolysis upon the conducting cement. The cement may be a mixture of flux, 10 parts; chalk, 10 parts; any suitable metal oxide, 30 parts; precious metal in powder, 40 parts; and soluble glass, 10 parts.—E. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Refractory Clay; Softening Point of —. E. Cramer. *Thonind. Zeit.* 1901, 25, 706. *Chem.-Zeit. Rep.* 1901, 25, [58], 215.

FOR practical purposes it is almost as necessary to determine the temperature at which refractory clay softens as that at which it melts. This the author has done with some 25 samples of different materials by pressing them into cylinders, heating them several times in a porcelain oven at a temperature of Seger cone No. 16 while they were supported at the ends only, and measuring the distortion after each heat. The investigation is not yet finished, but in the meantime it is clear that clays become more refractory the oftener they are fired; Salzmund clay is the solitary exception to this rule, and it resists three heatings before beginning to soften. An addition of sand may increase the heat-resisting power. The effect of adding fireclay is not always advantageous; it depends on the kind of fireclay, that prepared from shales being useful.—F. H. L.

Quartz and Quartzite on Heating; Behaviour of —. E. Cramer. *Thonind. Zeit.* 1901, 25, 864. *Chem.-Zeit. Rep.* 1901, 25, 215.

THE author has examined a large number of samples of quartz, quartzite, sandstone, &c.—substances which are used in the manufacture of Dinas bricks—to study their behaviour on repeated heating; and he has found that identical materials show extraordinary differences in their changes of specific gravity, apparent density, bulk, porosity, and linear expansion. After eight heatings at a temperature registered by Seger cones Nos. 16—17, the specific gravity of quartz varied between 2.45 and 2.66, whereas the weight per unit of volume varied more, the relationship of the latter constant to the specific gravity depending on the greater or smaller degree of porosity. On a first heating, the increase in bulk was extremely irregular; one specimen, melting at cone No. 36, increased only 3.1 per cent.; another, melting at No. 35, increased 9.5 per cent. It would seem that the purest materials have a tendency to swell only a little at first, and afterwards to gain in volume continuously. For practical purposes this is clearly objectionable. It was also observed that many quartzites ceased to lose specific gravity. The increase in volume does not depend simply on an enlargement of the pores of the stone; it depends also on an increase in the bulk of the substance itself, and in all probability is due to a change from the crystalline to the amorphous state. The author has ascertained the lowest point to which the specific gravity of quartz can fall when it is converted into amorphous silica. Pure molten quartz gave values of 2.054 and 2.167; molten Hohenbocka sand, 1.927 and 1.912. The difference can easily be explained by the presence of air bubbles in the molten sand, and by the existence of portions of incompletely melted quartz in the interior of the mass.—F. H. L.

PATENTS.

Wood; Apparatus for Impregnating — and the like with Preservatives or other Fluids. G. F. Lebioda, Boulogne-sur-Seine, France. Eng. Pat. 10,448, May 20, 1901.

THE invention has special reference to Eng. Pat. 5193 of 1900 (this Journal, 1900, 248), and relates to improvements in the construction of the bell-shaped cutters there described, and in the distribution of the impregnating liquid.—J. W. H.

Dyeing or Preserving Timber. J. Pfister, Vienna. Eng. Pat. 11,045, May 29, 1901.

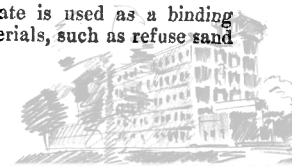
IN the processes usually employed for dyeing or preserving timber, it is subjected to the action of the necessary liquid in a pressure cylinder. The liquid enters at both ends, and a portion in the centre of the log often remains unaffected, an accumulation of sap and possibly air taking place in this portion. According to this invention, a cap of rubber, canvas, or other waterproof material is applied to one end of the timber before immersion in the liquid. If now the liquid in the closed cylinder is submitted to pressure, it will enter the unprotected end of the timber, and will penetrate a certain length with decreasing intensity. The cap is now removed and put on the other end of the timber, and the liquid again submitted to pressure. It is claimed that in this way the timber is finally thoroughly and uniformly dyed or preserved throughout its entire length.—R. B. B.

Bricks and Blocks; Preparation of — for the Lining of Metallurgical Furnaces. B. Talbot, Egham. Eng. Pat. 14,503, Aug. 14, 1900.

TO render them more durable, the bricks, after being burnt, are impregnated with a hot liquid hydrocarbon, which becomes solid on cooling; coal tar, to which has been added a little resin, is mentioned as a suitable impregnating material.—J. W. H.

Bricks or Building Blocks; Manufacture of Fire and other —, and Cement or Mortar therefor. W. W. Pilkington, Prescott, and W. R. Ormandy, St. Helens. Eng. Pat. 17,120, Sept. 26, 1900.

A SOLUTION of an alkaline silicate is used as a binding agent in the case of those materials, such as refuse sand



from glassworks, which would become too fusible by the addition of clay. The inventors find that the state of division of the material has a marked influence on the result.—J. W. H.

X.—METALLURGY.

Iron Ores (Fine Grained) for the Blast-Furnace and Siemens-Martin Steel Process; Briquetting of —. Klein. Oesterr. Zeit. für Berg- u. Hüttenw. 48, 652; through Zeits. angew. Chem. 1901, 14, [30], 754—755.

THE object of briquetting is either to render fine-grained ores suitable for the blast furnace (but briquettes are not very suitable for the purpose), or to enable the ore to be substituted for scrap in the open-hearth process. To this end, the ore is mixed, before consolidation, with lime and with carbon insufficient in quantity to reduce the whole of the iron oxide present. In the open-hearth furnace, the briquettes act favourably, owing to the reduction of the average proportion of carbon in the charge by the addition of the reduced spongy iron, and also by the oxidation of a portion of the remaining carbon by means of the excess oxide contained in them.—W. G. M.

Steel (Cast); Influence of Silicon on the Mechanical Properties of —. A. Wahlberg and E. Heyn. Stahl u. Eisen, 21, 450; through Zeits. angew. Chem. 1901, 14, [30], 755.

THERE is still much uncertainty as to the exact influence of silicon upon the mechanical properties of iron and steel. Experiments are described with samples of steel in which the percentage of carbon is kept fixed, while that of silicon varies. It appears that, in many cases, irregularities ascribed to the immediate influence of silicon are really due to other causes, as, e.g., to the conditions which have led to the introduction of an unusually large proportion of silicon into the metal (such as an extra hot acid-Bessemer blow), to the way in which the steel has been treated in the furnace, or to the presence of occluded gases in the metal. The immediate influence of silicon appears to be in the direction of raising the breaking strength, but decreasing the toughness of the metal. This influence first makes itself felt in the steels richer in carbon at about 0.6 per cent. Si; but beyond this an increase in the percentage of silicon is not accompanied by a proportionate increase in the effects of the addition.—W. G. M.

Steel and Iron; Carbon Determination in —. Schmitz. See under XXIII., page 934.

Ores for Cyaniding; Advantages of Roasting —. E. Janitzky. Trans. Australasian Inst. Mining Eng. 1901, 7, 101.

IF the ores be roasted previous to cyaniding, the consumption of cyanide is less, the solution percolates more readily, and less caustic soda is required for neutralisation.

In order to ascertain whether the ore is properly roasted, 100—250 grms. are dissolved, the solution filtered, and cyanide of potassium of the same strength as used in the treatment on the large scale, added. If no cloudiness is produced, the ore is well roasted; if the solution is coloured brown, the consumption of cyanide will be large; and if the solution gives a blue or bluish-green precipitate, the ore is imperfectly roasted.—A. S.

Gold Dredging in New Zealand. W. Wylie. Trans. Australasian Inst. Mining Eng. 1901, 7, 102—112.

AT the present time, in the middle island of New Zealand, there are about 240 dredges, costing from 5,000l. to 14,000l. each, in course of construction or ordered. Dredges are at work or about to work on the following rivers:—Molyneux, Clutha, Kawarau, Manuarheka, Dart, Shotover, Lindis, Waiau, Mataura, Waipori, Nevis, in Otago and Southland; in the Westland and Nelson on West Coast, and the Totaru, Hokitika, Grey, Ahura, Buller, Inanghwa and Orwell Creek. There are also a great number of gold-bearing flats which are being dredged. The author states that with modern, up-to-date dredges, designed to suit the ground, the work should pay well.—A. S.

Gold; Extraction of —, by Sodium Hyposulphite [Thio-sulphate]. E. Janitzky. Trans. Australasian Inst. Mining Eng. 1901, 7, 99—101.

THE author recommends a solution of sodium thiosulphate to which has been added perchloride or bromide of iron and an acetate, as a suitable medium for the extraction of gold and silver. Such a solution is stated to have a greater solvent power than one of potassium cyanide, is not poisonous, and can be prepared in large quantities at a very low price. A solution of 1 or 2 per cent. of sodium hyposulphite, $\frac{1}{4}$ per cent. of iron perchloride, and 1 or 2 per cent. of acetate of soda or lime, diluted to 10 times its volume, will dissolve, in 6—12 hours, 15 or 20 times as much gold as a 1 or 2 per cent. solution of cyanide in the same time. The precipitation of the dissolved gold can be effected by zinc shavings or by electrolysis.—A. S.

Tellurium in the Ores of the Hauraki Goldfields, New Zealand. F. B. Allen. Trans. Australasian Inst. Mining Eng. 1901, 7, 94—98.

THE author has examined a large number of ores as to the presence of tellurium, the rich sulphide ores being employed. In no case was the percentage of tellurium large enough to indicate in what combination it existed, but it is noteworthy that copper was present, in greater or less quantity, in every ore in which tellurium was detected.

The ores at the following places contained tellurium:—

1. Coromandel. Quartz containing 25 per cent. of mispickel. 200 oz. of gold and 90 oz. of silver per ton; small amount of tellurium.

2. Tapu. Quartz containing dense iron and copper pyrites. $2\frac{1}{2}$ oz. of gold, 250 oz. of silver, and $7\frac{1}{2}$ oz. of tellurium per ton.

3. Waiomo. Small sample of white quartz, from the Gem mine, showing sulphides of silver, but no visible gold along a dark band. 15 oz. of gold, 600 oz. of silver, and 12 oz. of tellurium per ton.

4. Waiomo. Monowai ore containing quartz, sulphides of iron, copper, lead, and zinc, with a trace of antimony. 4 oz. of gold and 30 oz. of silver per ton; tellurium, less than 1 per cent. of the bullion.

5. Broken Hill, Waiomo. White quartz with blue-black specks containing iron and copper pyrites and sulphides of silver. 2 oz. of gold, 40 oz. of silver, and 4 oz. of tellurium per ton. Two other ores contained small quantities of tellurium.

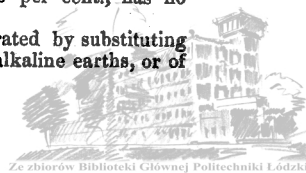
Figures are also given relating to ores in which no tellurium could be detected. The results obtained indicate that tellurium is not present in the auriferous quartz in sufficient quantity to exercise a prejudicial effect on the extraction of gold.—A. S.

Silver Plating by Reduction. C. Göttig. Zeits. angew. Chem. 1901, 14, [27], 672—673.

OWING to the difficulties in the way of plating large metallic objects with silver by electrolytic methods, various preparations have been put upon the market, which are reduced when rubbed upon the surface of copper alloys, and leave a deposit of metallic silver. The author calls attention to certain disadvantages in the preparations hitherto patented for this purpose. In the first place, the silver chloride used in them gradually loses its efficacy, owing to the reduction, by the action of light, of its solubility in solutions of alkali salts. Moreover, alkali chlorides act but slowly as solvents for silver chloride in certain cases (unless assisted by potassium cyanide, which is objectionable as being poisonous, or substances, such as ammonia, which attack the surface of the metal), and the reduction is therefore slow.

It has been found by the author that the reducing action of light upon the silver chloride can be prevented or lessened by the addition of iron chloride or copper chloride. Any subchloride formed is then reconverted into chloride, as in the equation $\text{Ag}_2\text{Cl}_2 + \text{Fe}_2\text{Cl}_6 = 4\text{AgCl} + 2\text{FeCl}_3$. Tin chloride, in concentrations up to 60 per cent., has no protective influence.

The reduction process can be accelerated by substituting certain chlorides of the metals of the alkaline earths, or of



the magnesium or aluminium groups, for the alkali salts hitherto used. These effect a more speedy solution of the silver chloride, and, in consequence, a more rapid deposition of silver. These salts were mentioned in an old English patent (8064, Aug. 15, 1840), but the author has found no reference to their superiority over alkali salts. He has embodied the improvements mentioned above in a German patent (No. 118,922), which is also protected in other countries.—C. A. M.

Platinum Residues; Method of Working up —. A. Berthold. *Zeits. angew. Chem.* 1901, **14**, [25], 621–622.

THE residues are filtered, and the filtrate retained. The residue on the filter is treated with *aqua regia* and filtered, the filtrate is evaporated, and the cake-like residue obtained is treated with hot water, which is then added to the original filtrate. To this are added zinc dust and concentrated hydrochloric acid. No preliminary evaporation is made, as it would induce separation of potassium-platinum chloride, and the reduction would in that case have to take place in the hot instead of in the cold. The impurities remain in solution, and as soon as the reduction is shown, by the solution becoming colourless, to be complete, and the precipitate has settled out, the supernatant liquid is carefully poured off. The precipitate is boiled well in concentrated hydrochloric acid, and is then washed repeatedly by decantation with hot water until it barely shows the chlorine reaction; but, as potassium chloride cannot be completely got rid of by decantation, the precipitate is brought on to a Gooch crucible, previously dried at 100° and weighed, and washed. If filtration takes place very slowly, the crucible and contents are ignited. The platinum is thus rendered more compact, and may be readily washed. As soon as it is free from chlorine, it is ignited and weighed. The crucible is then brought into *aqua regia*, and a solution made of known strength.

The advantages of the foregoing method are avoidance of tedious evaporation, and reduction in the cold. The author is of opinion the reduction of platinum salts in acid solution by electricity might afford a satisfactory means of separating platinum from residues.—J. A. B.

Copper; Production of —, at Ashio, in Japan. E. Bahlseu. *Berg- u. Hüttenm. Zeit.* 1901, **60**, 261–273; through *Chem.-Zeit. Rep.* **25**, [23], 203.

OF the Japanese metal industries the production of copper (27,560 tons in 1899) is the most important. The chief copper mine is in Ashio, in the west of the Shimotsuke province, whilst the smelting works are in Honzau. Iron, coke, and coal are brought to the mines from Tokio. The mines, which were discovered more than 290 years ago, have, since 1877, been in private hands.

The mountain range of Ashio is composed of palæozoic strata interspersed with granite. A network of seams of copper has been formed in these, of which about 30 are worked.

The ores are rich hard copper ores with silicious gangue, and contain 33 per cent. of copper ore and from 0.05 to 0.06 per cent. of silver. In 1884 modern machinery was erected, and the manufacture of copper sulphate was discontinued. Two classes of copper ore are obtained, one containing 11–12 per cent., and the other 1½ per cent. of copper. The former is enriched up to 20 per cent. and the latter to 12 per cent.

Before the introduction of European smelting methods, in 1887, a circular hole lined with clay and stones was charged with leather bags containing 3 parts of roasted ore and 1 part of roasted stone. After the smelting, the slag (containing 4 per cent. of copper) was removed, the stones heaped in layers, and the “black copper” collected. Now the roasting is done in reverberating furnaces. The ore (720 kilos.) is then fused with 186 kilos. of slag, 90 kilos. of limestone, and 126 kilos. of coke. The slag from this process still contains 0.4 per cent. of copper, whilst the copper matte contains from 50–58 per cent. The latter is broken up, fused in cupel furnaces, and air blown through it in a Bessemer's converter, the blast being continued for 55 minutes. The converter holds a charge of 1½ tons, and the copper produced contains 99 per cent. of copper and 0.1

per cent. of silver. The gases escaping from the converter and from the roasting furnaces are washed with lime-water before escaping into the atmosphere.—C. A. M.

Bismuth; Method of Extracting —, from its Ores. Eulert. *Rev. Prod. Chim.* **4**, [11], 164.

THE finely ground bismuth ore is placed in a series of wooden vats, arranged in steps, and each holding about a ton; and a current of extracting liquor, consisting of sulphuric acid, water, sodium chloride, and potassium nitrate, is allowed to traverse the series. The chlorine disengaged by the liquor liberates the bismuth, and the resulting solution, clarified by the filtering material contained in the vats, is finally delivered into a water tank, where the bismuth is precipitated as oxychloride, and may be recovered for sale in this condition, or converted into the metallic form by smelting with lime or carbon.—C. S.

Aluminium and Molybdenum; Alloys of —. L. Guillet. *Comptes Rend.* 1901, **133**, [5], 291–293.

CONTINUING his investigations on the alloys of aluminium and molybdenum obtained by the reduction of molybdic acid by metallic aluminium (this *Journal*, 1901, 814), the author remarks that some of the products have a crystalline form and are not attacked by dilute hydrochloric acid; this is the case with the button which was obtained from the mixture intended to give the composition AlMo_2 , and which was found on analysis to have the composition AlMo_3 . All the buttons, after treatment with dilute hydrochloric acid, left a distinctly crystalline residue; thus, AlMo was obtained from a mixture prepared to give Al_2Mo , and occurred as a fine crystalline mass of threads. The product from the mixture made to give AlMo , left a residue of the composition Al_2Mo . The composition of the products varied enormously according to the size of the grains or powder of aluminium employed, and the author's results are classified according to three grades of aluminium. The mixture which was to yield AlMo_3 , using aluminium powder, gave a button consisting entirely of small, well-defined crystals. This product evolved no gas on treatment with dilute hydrochloric acid. On analysis it was found to be extremely rich in molybdenum, and had a composition corresponding to the formula AlMo_{20} . In several experiments, agglomerations of metallic crystals were observed on the surface of the mass; these were compounds of aluminium and molybdenum, always richer in aluminium than the main product of the reaction. At least six definite alloys have now been isolated, viz., Al_7Mo , Al_3Mo , Al_2Mo , AlMo , AlMo_2 , and AlMo_{20} .—J. F. B.

Residuals from the Use of White Metal; Utilisation of —. J. Richards. *J. Franklin Inst.* 1901, **151**, [6], 445–455; and **152**, [1], 59–63.

Tin Clippings and Galvanised Iron Scrap.—A process worked profitably for a long period, and only stopped because of the nuisance caused to neighbours by acid fumes, consisted in immersing the tinned iron clippings in hydrochloric acid until free from tin, then in water, next in water with a little lime, then again in water, and finally, for a moment only, in copper sulphate solution. The several vats were placed in circular fashion, and were all served by a central crane, the clippings being packed loosely, to the extent of 200 lb., in a wooden cage which could be slung from the crane. The object of dipping in the copper sulphate solution was to give a thin coating of copper, which protected the iron from rust, until, after consolidation under a drop-press, it could be reheated and forged into blooms. The acid solution was used until much tin had dissolved in it, and the resulting chloride of tin solution was employed for the immersion of galvanised iron scrap, whereby the zinc replaced the tin, forming zinc chloride solution, which was sold for disinfectant and fireproofing purposes. The precipitated tin was collected and remelted, 600 lb. of ingot tin being recovered from 10 tons of scrap. The cleansed iron was sold for 10 dols. per ton and the zinc chloride for 20 dols. per barrel.

Galvanisers' Wastes.—The sal ammoniac skimmings from the surface of the zinc, consisting mainly of oxide of zinc dissolved in ammonium chloride and double chloride of



zinc and ammonium, were leached with hot water and steam, whereby the chlorides were dissolved, and could be used again as flux after evaporating off the solvent. The separated solid matter, consisting of zinc oxide with dirt and shots of metal, was tumbled in a revolving barrel. The shots of metal were thus cleansed, and could be remelted on the top of molten zinc, and the oxide of zinc, which became crushed to powder, could be sold for 30 dols. per ton to the zinc-paint maker. The average yield from the skimmings was:—Zn = 20; NH_4Cl and ZnCl_2 = 30; ZnO = 35; and iron scale and dirt, 15 per cent. Many old waste heaps were profitably treated in this way. Zinc oxide skimmings were simply tumbled in the barrel, and the separated shots remelted. Zinc dross, or zinc-iron alloy of higher specific gravity than zinc, which separates at the bottom of the zinc bath, was formerly treated only by distillation. After many experiments with steam, sulphur, and cyanides acting upon the molten metal, the method adopted consisted in introducing a mixture of sulphur, potatoes, and leather scrap below the surface of the liquid metal. In about 15 minutes the action is finished, a little aluminium is introduced (to break up dissolved oxides), and after standing for a short time, the pure metal is ladled off into moulds, leaving most of the impurities at the bottom. The aluminium is best introduced in the form of an alloy with zinc (98Zn : 2Al). The purified spelter averaged in one case (from 40 car-loads) Zn = 98.35, Pb = 1.5, and Fe = 0.15 per cent.; spelter refined a second time by the same process contained from 99 to 99.75 per cent. Zn, the only impurity being lead. A third refining was not successful in increasing the percentage of zinc in the product above 99.85 per cent. Scrap zinc of commerce is treated in the same way. Battery zincs are put in the pot at night, with a cover attached to a condenser, for the recovery of the mercury contained in them.

Zincous Lead.—The lead that sinks to the bottom of the galvanising baths contains much zinc. It is remelted in a wide pot at a temperature only just above the melting point of lead. An iron ring, 2 ft. in diameter and 6 ins. in depth, is placed on the surface of the metal, and the zinc is skimmed off from within the ring as fast as it rises to the top in a pasty condition. The residual lead necessarily retains about 2 per cent. of zinc, but readily finds a market; or it may be refined in the usual way.

Britannia-Metal and Pewter.—Any coating of electro-deposited silver is "stripped," and the white metal is used to make type, stereotype, or Babbitt-metal. Skimmings from solder-pots are crushed and washed free from shot metal on a sieve. The oxides are then dried and reduced with carbon in a furnace. The resulting metal is usually impure; the impurities were at first removed—arsenic, by treatment with zinc sulphate; antimony, by sulphur; and iron, by superheated steam or by chlorine. Now, a specially constructed furnace is used to reduce the oxides, iron and copper being removed in the slag, and a condenser is employed to prevent the escape of condensable products. The resulting metal is liquated to separate it from iron, copper, and antimony, and may then be further refined by a process similar to that above described for the purification of zinc.

—W. G. M.

PATENTS.

Iron; Introducing Carbon and Fluxes and Mixture of Carbon and Fluxes into Blast Furnaces in the Manufacture of —. W. J. Foster, Darlaston, Stafford. Eng. Pat. 9346, May 21, 1900.

SOLID carbon, which has been rendered as free as possible from hydrocarbons and moisture by previous heating to a high temperature or by any suitable process, is introduced, with or by the blast or by outside mechanical means, into the blast furnace directly into the boshes or hearth beneath the burden and adjacent to the zone of fusion. By this means a saving in fuel is effected, although the introduction of fuel with the charge at the top of the furnace is not altogether superseded.

Fluxes or other slag-making materials, in a suitable and effective condition, may be introduced in a similar manner either independently or mixed with the prepared carbon.

—A. W.

Cast Iron; Treatment of —, for the Purpose of obtaining an Alloy. G. Grunauer, Berlin. Eng. Pat. 1375, Jan. 21, 1901.

To finished liquid cast iron is added solid or liquid nickel, to produce an alloy which may contain 40 to 50 per cent. of nickel, and up to 60, but not less than 50 per cent. of iron, the alloy thus obtained somewhat resembling wrought iron in its properties.—A. W.

Iron; Manufacture of Wrought —. E. D. Wassell, Pittsburg, U.S.A. Eng. Pat. 10,983, May 28, 1901.

LIQUID cast-iron is blown with air in a suitable furnace, which may be a combination of a Bessemer converter and an open-hearth, until it partly loses its fluidity and forms a pasty mass, when the slag is withdrawn and oxide of iron supplied to the surface of the remaining metal, the mass being then heated on the hearth in the usual way and with the aid of the regenerators, and agitated or stirred for the further and complete elimination of impurities and formation of wrought iron, which is finally balled.—A. W.

Iron; Process for Hardening —. O. Schramm, Berlin. Eng. Pat. 11,687, June 7, 1901.

Rods of welded iron are placed in a crucible between layers of powdered horse chestnuts, and, after heating to a bright red heat until the required degree of cementation has been attained, are suddenly cooled by immersion in cold water, to obtain the desired degree of hardness.—A. W.

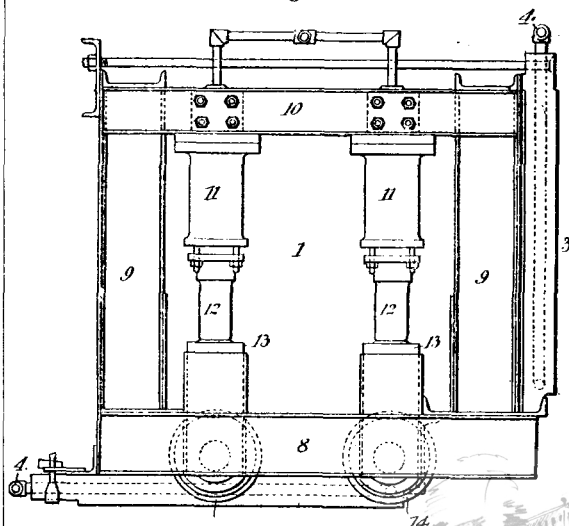
Steel Furnaces; Open-Hearth —. F. L. Saniter, Seaton Carew, J. L. Smith, R. Bedford, both of Eaglescliffe, and The South Durham Steel and Iron Company, Ltd., Stockton-on-Tees. Eng. Pat. 12,823, July 17, 1900.

THE hearth is divided into two or more sections or baths by the construction of banks or low walls of the same material as the hearth, each section being provided with its own tap-hole. The banks are submerged when the hearth is fully charged, so that the whole is then a continuous bath of metal, but on tapping from one of the sections, the metal falls only to the level of the banks in the other sections whilst being emptied from the one. The result is that a layer of metal covers the greater portion of the furnace bottom during tapping, and remains behind ready to be mixed with the fresh charge. Suitable channels or gutters are provided in the tops of the banks, to enable the metal to flow freely under the slag.—A. W.

Furnaces; Open-hearth, Melting, or other —. B. Talbot, Pencoyd, U.S.A. Eng. Pat. 13,050, July 19, 1900.

THE improvement is applicable to the author's rocking or tilting open-hearth furnace or to other furnaces, and consists

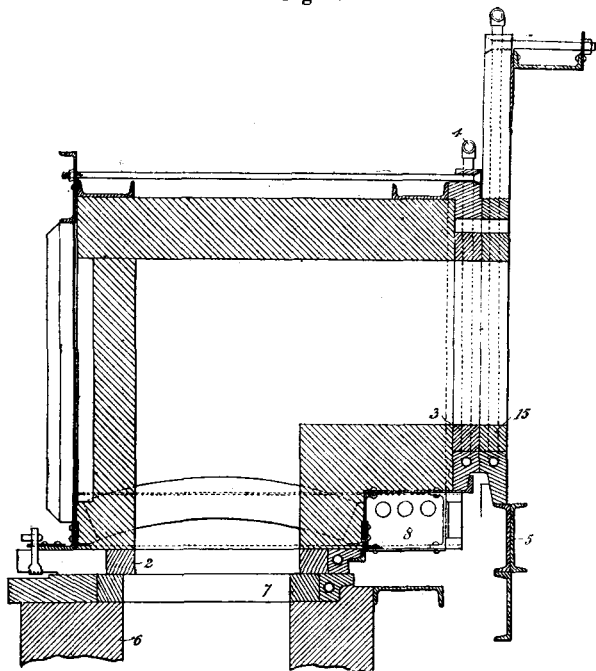
Fig. 1.



of a movable flue structure at each end of the furnace, which can be drawn back out of contact with the same whilst it is being tipped or tilted. Fig. 1 is a side elevation of one of the flue structures, and Fig. 2 is a side sectional elevation of the same. It consists of a chamber, made of refractory material in a suitable framework, and provided with chills or water-cooled frames 2 and 3, consisting of metal castings with water circulating from the pipes 4. The frame 2 is in contact with a similarly cooled frame or chill 7, at the opening of the fixed flue 6, and the frame 3 is placed against the chill 15, forming the entrance to the furnace 5.

The chamber is carried on a carriage consisting of a base frame 8, and uprights 9, which guide an upper framework 10, to which the chamber portion is attached, the frame 10 being carried on the heads of hydraulic cylinders 11 at each end, the rams, 12, of which abut against blocks, 13, carried by the base frame. The latter carries the wheels, so that the flue structure can be lifted vertically from the fixed flue by the pressure in the cylinders, and can be drawn away horizontally from the furnace opening.

Fig. 2.

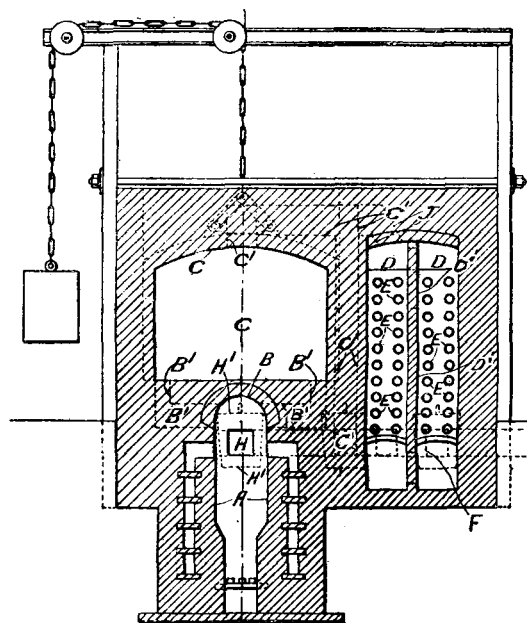


The movable flue structure is by preference constructed internally with three separate passages, the centre one for the gas and the other two for the air, so that the gases shall not mix or combine until they are in the furnace, corresponding passages being provided in the furnace until approaching the hearth, all the points of contact of the passages of the movable and fixed portions being made by chills or cooling frames as described.—A. W.

Iron and Steel Surfaces; Furnace for Oxidising —.
J. Meikle, Glasgow. Eng. Pat. 19,248, Oct. 27, 1900.

THE furnace is for heating and oxidising surfaces of iron and steel goods, and is specially constructed with flues and dampers for controlling and directing the products of combustion alternately to the heating oven and through a chamber containing steam pipes, as shown in the accompanying drawing. The generator furnace A is constructed in the usual way, and above its crown, B, is a heating chamber or oven, C. The products of combustion pass by the flues B' into the oven C, over the articles to be heated, and through a flue C' into an adjoining chamber, D, divided into two compartments by a central wall, D', in both of which are fireclay pipes, E, through which steam passes on its way to the oven, C, through a flue, J, when necessary.

At the back of the furnace are three flue dampers of a cylindrical or conical shape, preferably hollow, and connected at their upper ends to pivoted levers provided with counter-balance weights or to screw spindles, by which means the direction of the products of combustion can be controlled and guided on their way to the exit flue, F.



After the articles to be oxidised have been raised to a red heat, the products of combustion are stopped from entering the flue C', and are led off, by opening a damper, H', in the flue H, direct into the chamber D. Steam is then passed through the pipes E into the top of the hot oven C, whence it escapes through B' into A and further into D with the combustion products, thus further assisting in heating E.—A. W.

Gold, Silver, Lead, Zinc, and other Metals; Extraction of —, from Sulphide Ores. J. C. Clancy and L. W. Marsland, both of Sydney, N.S.W. Eng. Pat. 9503, May 7, 1901. (Under International Convention.)

THE process is claimed for the recovery of the above metals essentially in the following step-by-step operations:—(a) Heating the ore, with the addition or admixture of lead sulphate, in a furnace, wherein hot air is blown through the mixture under pressure, so as to convert the lead and zinc and other volatile metals contained in said mixture more or less wholly into fume. (b) Collecting the fume and the gaseous products of decomposition of the ore in a sulphuric acid chamber, thereby causing the sulphuric acid formed from the sulphurous acid gas evolved from the ore in the furnace to convert the formed metallic oxides into their corresponding sulphates, or in the alternative, passing the fume and the gaseous products into a vat or vessel containing sulphuric acid, and there arresting the metallic oxides as sulphates, and afterwards converting the sulphurous acid gas into sulphuric acid. (c) Recovering the metallic contents from the residue remaining in the furnace, either (1) by pulverising and concentrating the same, and then smelting the concentrate thus produced; or (2) by smelting the whole of the residual matter in the furnace in which the ore has been treated, or in any other furnace adapted for smelting purposes.

The lead sulphate may be added in a quantity proportional to its molecular weight with the metallic sulphide in the ore or in any other quantity, and the mixture may be heated in any kind of furnace or receptacle to any degree of temperature, to convert the whole, or nearly the whole, of the volatile metals into fume, and the

same processes of metal extraction of the residue employed in conjunction therewith.—A. W.

Alloy; Manufacture of an Improved [Al-Mg] —.

E. Murmann, Vienna. Eng. Pat. 15,171, Aug. 25, 1900.

THE alloy is composed of aluminium, magnesium, and zinc in various proportions, within the following limits:—aluminium 100 parts by weight, magnesium 1 to 10 parts, and zinc 1 to 20 parts. It is an aluminium-magnesium alloy in which the magnesium is partially replaced by zinc, whereby the difficulties of producing large castings, owing to porosity, are overcome and metals with equal tenacity, &c. obtained.

—A. W.

Zinc-Lead Sulphide Ores and Tailings; Treatment of —.

T. Twynam, Moortown. Eng. Pat. 14,983, Aug. 22, 1900.

THE raw finely ground ore is mixed with sufficient zinc chloride and heated to just about or below a visible red heat with exclusion of air, whereby the lead sulphide reacts and forms lead chloride, which can be subsequently dissolved out and thus separated from the zinc sulphide.

The residue from the original and new zinc sulphide may be used as a zinc ore after roasting to expel sulphur, but is preferably roasted to form sulphate and oxide. The sulphate can then be dissolved out and used for converting the lead chloride into sulphate, or the mixture of sulphate and oxide can be used with the production of a mixture of sulphate and oxide of lead fit for smelting. The zinc chloride solution so obtained is concentrated and used for the treatment of fresh ore.

Tailings containing zinc sulphide may also be advantageously used, after roasting to sulphate, for the decomposition of the lead chloride.—A. W.

Metals; especially Mercury, Antimony, and Cadmium; Obtaining Volatile —.

J. Armstrong, London. Eng. Pat. 15,879, Sept. 6, 1900.

THE claims are for the application of the apparatus or of a modification of the same to, and for, the improved process of obtaining mercury, cadmium, antimony, and other volatile metals other than zinc, as described and claimed in a previous patent, Eng. Pat. 3462, 1900, for the extraction of zinc only (this Journal, 1901, 367). In the modified furnace a sump or well with a tap hole is provided at the bottom of the furnace for the separation of the non-volatile metals, the volatile metal being carried off through the lateral exit pipe into the condenser, which consists of a chamber with baffle walls and an outlet leading through a trap containing some of the liquid metal at a little above its freezing point. The upper part of the furnace above the bosh is preferably divided into two compartments only, one for the ore and carbon, and the other for the fuel, which meet below in the bosh. There is one exit pipe at the top of the bosh on the fuel side, so that the vapours of the volatile metals pass through the incandescent fuel.

In the condensation of mercury, the drawing off the vapours of the volatile metals through a volume of cool metallic mercury by means of a partial vacuum is claimed for adaptation to any known method of reduction and volatilisation.—A. W.

Steel or Iron covered on one or both Surfaces with a fixed Proportion of Copper; Manufacture of Sheets or Plates of —.

E. Martin, Paris. Eng. Pat. 11,603, June 26, 1900.

IN the above manufacture a sheet of electrolytic copper, which may be of predetermined thickness, is covered with a galvanic coating of copper and heated, when it is applied to the surface of a steel or iron ingot, the surface of which has also been covered with a galvanic deposit of copper and heated separately to the same temperature, the whole being then suitably heated or pressed to bring the two galvanic surfaces together. The mass is subsequently rolled.

Several sheets can be simultaneously prepared in this way by the further introduction, between each set of ingots with its copper sheets, of an auxiliary unprepared steel sheet heated to a less degree than the ingots, and pressing the whole together, the copper-steel ingots being then taken out and rolled separately.—A. W.

Metals; Uniting or Welding —. W. Griffiths, Pittsburg, U.S.A. Eng. Pat. 12,147, June 14, 1901.

THE metal, such for instance as steel, in the form of billets, bars, or sheets, is thoroughly cleaned, and one or more recesses cut into the same, the faces of which are then coated with a metal or alloy having a lower fusing point, such as copper, by placing in a bath of copper sulphate. A plate of copper, or a metal which will weld to the metallic coating, is then placed in the recess and secured by pressure, after which the whole is heated, and the metals finally united by pressure or rolling. It is not necessary to cut the recesses, as the outside surface can be similarly coated and treated, and the copper plate can be placed on in sections, with spaces between them where the metal will be ultimately cut into lengths and trimmed. Such sections, however, should be joined together by a strip or strips of copper in the centre or at the sides, to prevent their dislodgment during rolling, &c. The welding is thus more perfect, and the waste of copper when cutting and trimming the finished bar is minimised.—A. W.

Bricks and Blocks; Preparation of —, for the Lining of Metallurgical Furnaces. B. Talbot, Egham. Eng. Pat. 14,503, 1900.

See under IX., page 900.

Electric Furnace. [Electrodes.] La Soc. Electro-Metallurgique Française. Eng. Pat. 16,293, 1900.

See under XI. B., page 907.

Chlorine; Manufacture of —. G. J. Atkins. Eng. Pat. 13,815, 1900.

See under VII., page 897.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Acetylene; Electro-Chemical Behaviour of —. A. Coehn. Zeits. für Elektrochem. 1901, 7, [49], 681—684.

A CERTAIN E.M.F. (about 1·7 volt) is required to drive an appreciable current through a solution of caustic potash. When acetylene gas is led over the anode, it acts as a depolariser with the result that a sensible current is obtained at about 1·22 volt. By maintaining the E.M.F. between these two values (e.g. 1·35 volt), it was found that the acetylene was converted quantitatively into formic acid according to the equation: $C_2H_2 + 6OH = 2HCOOH + 2H_2O$.

In normal sulphuric acid solution, it was found that with an E.M.F. of 1·60 volt, acetylene was converted quantitatively into acetic acid. The depolarising action and the formation of acetic acid is probably due to the formation of aldehyde in the first instance, thus, $C_2H_2 + H_2O = CH_3COH$. On oxidation the aldehyde then forms acetic acid, $CH_3COH + 2OH = CH_3COOH + H_2O$.

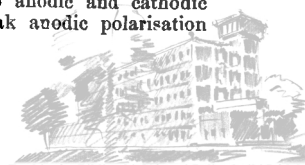
Details of experiments, conducted in the presence of the halogens, are promised in another communication, as are also measurements on an acetylene gas battery.—J. S.

Ferrates; Electro-Chemical Production of —. W. Pick. Zeits. für Elektrochem. 1901, 7, [51], 713—724.

IN confirmation and in extension of Haber's experiments on the electro-chemical production of ferrates (this Journal, 1900, 1110), it was found that:—

1. All forms of iron, when employed as anode in a concentrated solution of caustic alkali, yield alkali ferrate, but this substance is most readily formed with a cast iron anode, less readily with steel, and with still greater difficulty with wrought iron.

2. Wrought iron and steel, which at first do not yield ferrate, can be made to do so by subjecting them alternately and at intervals of a few seconds to anodic and cathodic polarisation, or by maintaining a weak anodic polarisation for a long time in strong alkali.



3. Iron which has been used for the production of ferrate acquires a dark colour, becomes passive, and is, to a great extent, proof against rusting. The current yield of ferrate is greater when caustic soda is employed instead of caustic potash and is also greater the more concentrated the electrolyte.

4. With a current density of 0.1 amp. per square dm., the current efficiencies are, for cast iron, about 47 per cent.; steel, about 26 per cent.; and wrought iron, about 14 per cent. when the electrolyte is caustic soda. Similarly, the efficiencies in caustic potash are, cast iron, about 37 per cent.; steel, about 13 per cent.; and wrought iron, about 2 per cent.

5. Increase in temperature increases the yield of ferrate. Electrolytically deposited iron, in a platinum dish, gave a minimum of ferrate at 0°, 16 per cent. at 30°, and 80—100 per cent. at 70° C.

6. The current yield of ferrate added to the current yield of oxygen, amounted to 100 per cent. Alkali ferrite is not formed as a primary product of electrolysis.

7. The potential ferrite $\rightarrow$ ferrate is -0.78 volt. The potential of concentrated alkali solution against active iron is about 0.6 volt. Increase of temperature up to 70° C. produces scarcely any alteration in these values. The potential of passive iron, which has been employed for the production of ferrate, towards ferrate solutions, has, at lower temperatures, nearly the same value as ferrite $\rightarrow$ ferrate, whilst at higher temperatures (70°) it is displaced towards the cathode side by several tenths of a volt. This accounts for the higher current yield at increased temperatures.

—J. S.

Ferrite Solutions. F. Haber. Zeits. für Elektrochem. 1901, 7, [51], 724—726.

THE author (this Journal, 1900, 1110) has already stated that solutions of alkali ferrates on boiling are converted into alkali ferrites. Quantitative experiments are now described which confirm this view.—J. S.

Nickel Ammonium Sulphate; Electro-Chemical Behaviour of —. W. Pfannhauser. Zeits. für Elektrochem. 1901, 7, [50], 698—710.

THE author has investigated the behaviour of nickel ammonium sulphate solution on electrolysis, and has arrived at the following conclusions:—

1. The addition of ammonium sulphate to a solution of nickel sulphate, causes the formation of a complex double salt, nickel ammonium sulphate $(\text{NH}_4)_2\text{Ni}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ and increases the specific conductivity of the electrolyte.

2. In concentrated solution the double salt dissociates according to the typical decomposition of complex salts into the ions, NH_4^+ , NH_4^+ , and $\text{Ni}(\text{SO}_4)_2^-$. In dilute solution the salt decomposes and dissociates gradually, according to the degree of concentration, and hence the decomposition into the component salts is either partial or complete. It is therefore to be assumed that if the electrolyte is not subjected to mechanical circulation, the complex salt will be decomposed at the cathode, corresponding to a decrease in concentration, whilst it will be re-formed at the anode, since the solution there becomes more and more concentrated. In this way the frequent crystallisation of the double salt on the anode may be explained.

3. At the anode an oxidation of nickelous to nickelic sulphate takes place, i.e., each atom of nickel takes an additional positive charge and causes a polarisation in consequence of the oxidation cell which is formed. The nickelic sulphate so formed is, however, unstable and undergoes hydrolytic dissociation, with the result that $\text{Ni}(\text{OH})_3$ is deposited as a black film on the anode. If the solution is acid with sulphuric acid, the oxidation does not take place to the same extent, since the sulphuric acid, being the more easily dissociated component, carries the bulk of the current. In other words, the dissociation of the complex salt is diminished, so that only the ions NH_4^+ , NH_4^+ , and $\text{Ni}(\text{SO}_4)_2^-$ are present, whilst the nickel ammonium sulphate carries only

a very small fraction of the current. In this case the decomposition of the nickelic sulphate takes place with formation of nickelous sulphate, sulphuric acid and oxygen.

4. As long as the operation is conducted with normal, low current densities, the separation of nickel on the cathode is of a purely secondary character. In the event of higher current densities being employed, the solution in the neighbourhood of the cathode is depleted of metal salt more rapidly than it can be replaced by diffusion. When this occurs, the complex salt is decomposed into the component salts, viz., NiSO_4 and $(\text{NH}_4)_2\text{SO}_4$, which then take part in carrying the current, although the NiSO_4 does so only to a minor extent as long as the solution is somewhat concentrated. Whenever NiSO_4 takes part in carrying the current, a primary deposition of nickel occurs, and this increases the more dilute the solution in the neighbourhood of the cathode becomes. Since a primary separation of nickel causes the deposit to be powdery and black, it follows that by employing a dilute solution and a high current density a less valuable deposit of nickel will be obtained.

5. By circulating or stirring the electrolyte, the differences in concentration are equalised, and hence a higher cathode current density may be employed. The same result may be attained by heating the electrolyte, which also causes a diminution of the electromotive force of polarisation.

6. Stirring or circulating the electrolyte causes a diminution of the polarisation, since the NiSO_4 produced on the electrolysis of the complex salt is removed from the anode, and hence the formation of nickelic sulphate is diminished.

7. A formula for calculating the E.M.F. is given, which is applicable when both of the electrodes are composed of nickel. In other cases corrections and modifications must be introduced which are represented in a more general formula.

8. In all galvano-technical methods where the electrolyte contains a metallic salt capable of different stages of oxidation, a counter electromotive force is produced which is derived from an oxidation cell, and which, when different metals are employed as cathodes, varies according to the difference in the rise of potential between the latter and the normal electrolyte.—J. S.

PATENTS.

Copper Sulphate and other Metallic Sulphates [Electrolytic]; Process for Making —. H. J. U. Palas and F. A. J. Cotta, both of Marseilles, France. Eng. Pat. 17,485, Oct. 2, 1900.

THE electrolyser is divided into three compartments by two vertical and parallel porous partitions. In the middle compartment dilute sulphuric acid, or an acidulated solution of an alkali sulphate, is caused to circulate; one side compartment contains copper scraps, forming the anode, and acidulated solution of cupric sulphate; the other side compartment is charged with a solution of an alkali sulphate. A small proportion of copper sulphate dialyses into the middle compartment, and the copper is precipitated from this solution, on its withdrawal, by H_2S , or electrolytically. The circulation is so maintained that the cupric salt in that compartment shall not exceed 1 decigramme to the litre. "The speed of the circulation is about 40 litres per hour for an elementary electrolyser, which allows 25 to 30 ampères to pass at four volts." Caustic alkali is obtained in the compartment charged with an alkali sulphate. Reference is made to Eng. Pat. 9806, 1899 (this Journal, 1900, 442).—E. S.

Electrolysis; Apparatus for —. [Electrodes.] P. Schoop, Dozweil, Switzerland. Eng. Pat. 14,463, Aug. 13, 1900.

IN this apparatus, which is an improvement on that described in Eng. Pat. 13,074, 1899 (this Journal, 1900, 544), the electrodes are arranged in long, narrow, parallel channels of insulating and resistant material, in such a way that the liquid continually flowing through each channel is electrolysed while it is in the form of filaments. The electrodes are wetted on both sides by the liquid to be electrolysed, and are thus active on the whole surface.—G. H. R.



Insulating Materials or Non-Conductors of Heat; Manufacture of — O. Horstmann, Cologne. Eng. Pat. 14,722, Aug. 16, 1900.

THE insulating material consists of a mixture of about 65 parts of the "commercial tar-like product composed of asphaltum and paraffin oil" with about 35 parts of ground cork. It is cast into flat sheets in suitable moulds which have been oiled before filling, and rolled smooth with a roller similarly prepared. If required for curved surfaces, the sheets are heated in a special apparatus to their softening point and bent in the form desired.—F. H. L.

Plates; Porous Metal —, for Electric Accumulators [Felted Metal]. F. W. Böhne, Freiburg, Germany. Eng. Pat. 16,534, Sept. 17, 1900.

THE plates are made of felted metal, an entirely new product formed from the fibres obtained by the process described in Eng. Pat. 25,075, 1899, which can provide a large porous service, with little weight and sufficient durability.—G. H. R.

Electric Batteries. G. Heidel, St. Louis, U.S.A. Eng. Pat. 5017, March 9, 1901.

THE cell, which is made of any suitable conductive material, forms one element of the battery of which the other is formed by an electrode placed in the cell, and insulated from it. The cell is insulated from surrounding objects by ribs located outside at intervals at the sides and bottom. Recessed bosses are formed on the ribs into which insulator plugs are inserted.—G. H. R.

Electrolytic Cells [Oscillating]. P. M. Justice, London. From The Castner Electrolytic Alkali Co., Niagara Falls, U.S.A. Eng. Pat. 10,976, May 28, 1901.

THE cell, preferably rectangular, is mounted on an insulating block, which can be vertically adjusted. A downwardly directed knife edge bearing beneath the oscillating portion of the cell rests in a recess in the block, and a safety link with a slot and pin attachment permits "lost motion." The cell has three or more supports, on two of which it is free to oscillate, while the third comprises a rod connected to the cell by a ball and socket connection, and means are provided for vertically reciprocating the rod, which has an extensible connection for adjusting the inclination of the cell on its three supports. There is a stationary supporting frame on which the cell is mounted, and a shaft for the cell is mounted in bearings adjustably secured in the frame, and means are provided for adjusting the supports of the cell on it. A gas eduction pipe, the apertures of which make an articulate connection with the cell, rests loosely in one or more lutes or seals provided for it.—G. H. R.

Incrustation, Scale, or other Foreign Matter from Steam Boilers, Tubes, and other Vessels or Objects; Removal of —. C. Elliott. Eng. Pat. 7951, 1900.

See under I., page 878.

(B).—ELECTRO-METALLURGY.

Iron and Nickel; Simultaneous Electro-Deposition of —, from a Solution of the Sulphates. F. W. Küster. Zeits. für Elektrochem. 1901, 7, [49], 688—692.

CONTINUING the experiments described by Toeffer (this Journal, 1900, 156) and himself (this Journal, 1901, 50), the author now finds that if a large cathode surface be employed instead of the platinum wire point formerly used, the decomposition potentials are lower, but the results in general remain the same. Experiments with zinc are also described, and it would appear that the velocity of deposition has an influence on the results.—J. S.

PATENTS.

Electric Furnaces. [Electrodes.] J. Imray, London. From La Société Electro-Metallurgique Française, Froges, France. Eng. Pat. 16,293, Sept. 13, 1900.

THE electric furnace consists of a crucible, having supported above it two electrodes connected in series, each capable of

being separately raised or lowered, and each provided with a volt-meter "in shunt" between it and the metal in the crucible. It may be modified for use with alternating and polyphase currents by having the electrodes arranged to be raised or lowered together, with a single volt-meter "in shunt" between either of them and the metal.—G. H. R.

Sulphide Ores [Pb, Zn]; Treatment of —. J. Swinburne and E. A. Ashcroft, both of London. Eng. Pat. 17,611, Oct. 4, 1900.

THE process is cyclic and is claimed as a whole and in parts. It consists of placing the crushed sulphide ore in a bath of fused chloride of zinc and adding sulphur chloride, which reacts with the sulphides forming their chlorides and sulphur. The latter vaporises and is condensed. The bath is purified from iron and manganese according to and claimed in specification 17,612 (see following abstract). The bath of purified chlorides is desilverised by lead, freed from lead by zinc and the fused zinc chloride mixed with alkaline chloride and electrolysed to produce zinc and chlorine. The latter is then used with some of the condensed sulphur for the regeneration of sulphur chloride.

—A. W.

Sulphide Ores; Treatment of —. J. Swinburne and E. A. Ashcroft, both of London. Eng. Pat. 17,612, Oct. 4, 1900.

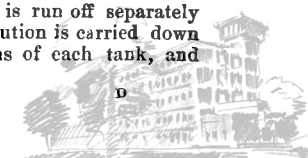
OXIDE of iron or manganese is produced by treating fused chlorides containing them with oxide of zinc, or by treating fused chlorides containing mixed sulphides with chlorine and oxygen. The oxides are thereby precipitated, leaving a purified chloride of zinc or lead, or both, for electrolytic decomposition after separation from the solid matter by distillation. (See preceding abstract).—A. W.

Metals [Cu, Ni, Ag, &c.]; Recovering and Separating —, from their Ores and Concentrates thereof. H. A. Frasch, Hamilton, Canada. Eng. Pat. 22,699, Dec. 12, 1900.

THE process, for which there are 21 claims, is more particularly applicable to the treatment of copper nickel ores or matte, and consists of depositing the various metals according to their electro-positive nature in a series of tanks specially constructed for the circulation of two electrolytes, so that whilst the deposition of metal is taking place in one compartment the extraction of them from the ore or matte as the anode is taking place in the other. The flow of the electrolytes through the series of tanks is regulated by the difference of their specific gravities, by means of an apparatus between each, as shown in the accompanying drawing. The tanks are arranged at decreasing levels, and contain a lower perforated inlet pipe 7, a discharge pipe 8, an electric conductor 9, surrounded by the anode 10, consisting of the ore or matte containing the metals to be extracted. Above this is a porous diaphragm 11 composed of sand to prevent the upper and lower liquors mixing, the cathode plates 12 being suspended in the upper portion of the bath, primarily composed of brine.

The automatic flow regulator consists of an outside casing 23, connected by a tube 24, with the lower portion of the cathode section of the higher tank 3, and connected with an overflow tube 25, with the next lower tank 4. In the interior is a float 26, buoyed by an air chamber 27 in the fluid contents of the outer casing. This float is connected by a flexible tube 28 and pipe 29, with the exit tube of the anode section of the higher tank 3, and by an overflow 30 and tubes 31 and 32, with the inlet tube of the anode section of the lower tank 4. By this means the overflow of the two liquors from the anode and cathode sections of the one tank to the corresponding sections of the tank next below is controlled and regulated by their specific gravities.

In the process of treatment the first or highest tank of the series contains a solution of brine, by which with the electric current, a solution of the metallic chlorides is obtained in the anode section, and caustic soda in the cathode section. The latter solution is run off separately out of the series, but the chloride solution is carried down the series through the anode sections of each tank, and

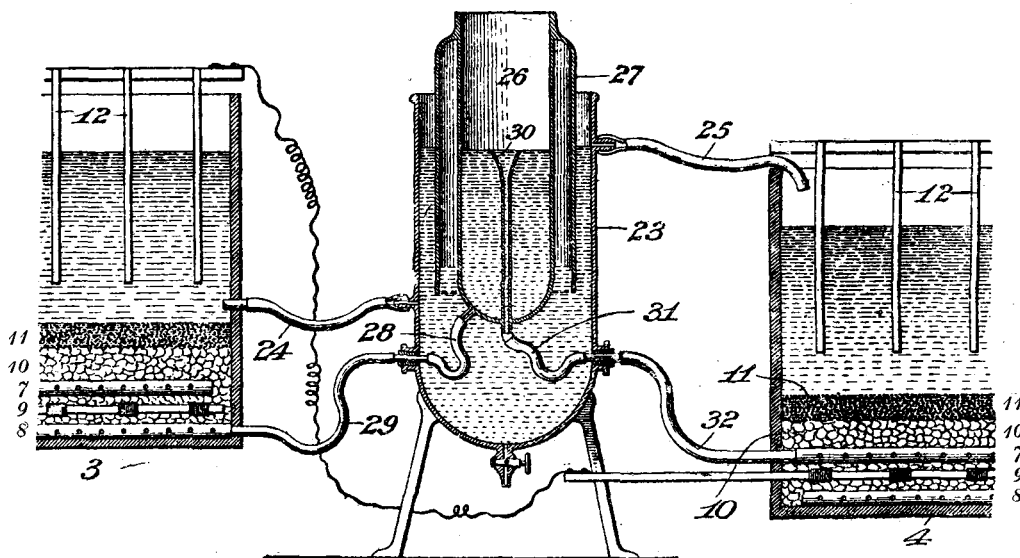


gradually gets enriched until the final discharge. This enriched chloride solution is pumped back into the cathode section of the second tank, and flows down and forms the upper electrolyte of the remainder of the series, so that in the tanks from No. 2 downwards the metals are being dissolved from the matte in the anode sections, and are being deposited on the plates in the cathode sections. The latter can be so arranged that the metals can be deposited in the different tanks according to their electro-positive nature. After the deposition of the silver and copper, the solution is removed for the oxidation, and precipitation of the iron, after which it is introduced into the lowest of the series of tanks for the deposition of the nickel. The process may be

reducing agent. A current is passed through the intermediate mass, which produces a fused body of mineral slag, through which the passage of the current is continued, and a body of the charge material is maintained next it to be reduced by the heat generated by the passage of the current.—G. H. R.

Iron or Steel in a Molten State; Process for Purifying or Removing Impurities from —, and Apparatus therefor. A. G. Greenway, M.D., Lladdrindod Wells. Eng. Pat. 13,653, July 30, 1900.

IMPURITIES are removed from iron and steel while in a molten state in a reverberatory or similar iron furnace lined



varied, and the original chloride solution obtained by chemical means, or the caustic solution from the first tank may be carried through the series for the production of strong alkali.—A. W.

Elements [Na, Zn, P, &c.]; Obtaining [Electrolytically] Volatile —, from their Ores and Compounds. British Aluminium Company, Ltd., London. From A. H. Cowles, Cleveland, U.S.A. Eng. Pat. 9903, May 13, 1901.

THE process of obtaining a volatile electro-positive element from its ores or compounds, consists in passing an electric current through the fused mass, sustained at a temperature higher than the volatilising point of the element, and employing a porous cathode, through which the vapours of the element pass, as they are formed, into a condensing chamber on the other side.

A separate claim is made for obtaining sodium from a mixture of the fluorides of sodium and aluminium by this process. An iron receptacle, connected with the negative pole of the battery, has a false bottom, upon which is laid a bed of porous carbon forming the cathode. The mixture is placed upon this bed and fused only in the central portion, the unfused material against the wall of the receptacle acting as a protective coating, both from contamination of the bath by the iron, and from the direct action of the current. The anodes are of carbon, and dip direct from above into the fused portion of the bath. The sodium vapour, as it is formed, passes downwards through the porous carbon cathode, and is condensed in a small air-tight chamber underneath.—A. W.

Ores or Compounds; Process for the Reduction of —, by Means of the Electric Current. H. A. Irvine, Niagara Falls, U.S.A. Eng. Pat. 13,032, June 26, 1901.

A TEMPORARY conducting heap or mass of granular carbon is placed next to, or surrounded by, a charge of material having fusible mineral constituents, and containing a

with basic material, by passing a strong current of electricity through them. One pole enters the furnace, and forming either single or multiple points of electrical contact with the lining of it, constitutes one of the electrodes. The other electrode is made of a metal conductor coated with basic material which is refractory in the metal, and is also a conductor of electricity, and it is suspended, free and unattached, in the midst of the furnace and molten metal, through which a strong current is passed when the two electrodes are coupled up with a dynamo or other powerful source of electricity.—G. H. R.

Matrices; Separating the — from Galvanoplastically Precipitated Metals. C. E. Steinweg, Lüdenscheid, Germany. Eng. Pat. 13,365, July 1, 1901.

THE metal is precipitated around the flat side of the matrices which are formed of thin sheet metal, divided at the back by grooves into several divisions, which can then be easily torn off the precipitated metal.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Sunflower Oil. F. Jean. Ann. Chim. anal. appl. 1901, 6, 166. Chem.-Zeit. Rep. 1901, 25, 209.

THE oil obtained by the first pressure of the seeds is a pale yellow, clear, and neutral liquid, suitable for dietetic purposes. That won by subsequent expression is darker in colour, and is fit for burning and making varnishes. Sunflower oil has a specific gravity of 0.925 at 15°, and a rotatory power of + 22°; its saponification value is 192.0, and its iodine value 124. Its fatty acids melt at 22°, the sample examined contained 3.1 per cent. of free acid calculated as oleic; the unsaponifiable matter was 0.72 per cent. Treated with one drop of sulphuric acid, sunflower oil yields a golden yellow colour surrounded by a grey-blue ring with violet spots. Mixed with sulphuric acid, it gives



a yellow-red mass which does not become brown. Sun-flower oil reduces alcoholic silver nitrate.—F. H. L.

Cardlenut Oil. J. Lewkowitsch. Chem. Rev. Fett- u. Harz-Ind. 1901, 1, [8], 156.

The author obtained 58.6 per cent. of oil by extraction from the kernels of the nuts of the *Aleurites moluccana*. The constants differed from those recorded by De Negri, especially the iodine value. The comparative figures are given in the subjoined table:—

	De Negri.	Lewkowitsch.
Specific gravity	0.920—0.926 at 15° C.	0.92565 at 15.5° C.
Saponification value	184—187.4	192.6
Hegner value	..	95.5
Iodine value	136.3—139.3	163.7
Butyro-refractometer reading ..	76—75.5 at 15° C.	76 at 25° C., 78.5 at 20° C.
Acetyl value	..	9.8
Oxidised fatty acids (insoluble in petroleum spirit) ..	..	0.21 per cent.

The residual oil-cake had the following composition:—Oil, 8.80; moisture, 10.00; ash, 8.28; nitrogenous substances, 46.16; fibre, 1.47; and starch, sugar, &c. (by difference), 25.29 per cent. The ash contained 23.52 per cent. of K_2O and 53.04 per cent. of P_2O_5 .—C. A. M.

Japan Wax; Variations in the Composition of —. C. Abrens and P. Hett. Zeits. angew. Chem. 1901, 14, [27], 684—685.

With the object of determining the cause of the variations in the recorded constants of Japan wax, the authors have extracted the fat themselves from the fruit of the Japan wax tree (*Rhus succedanea*), partly by boiling it with water, and partly by extraction with ether. In this way they obtained about 25 per cent. of a soft greenish-yellow substance which gave the following values:—Iodine value, 11.9—12.8; acid value, 11.2—12.0; saponification value, 206.6—212.0.

Part of the substance was then bleached in the sun with the result that the iodine value fell to 7.6, whilst the acid value rose to 13.8, and the saponification value showed 208.1. Another portion decolorised by boiling with animal charcoal in an ethereal solution gave an iodine value of 11.1. It is stated that Japan wax with an iodine value of 4 is not met with in commerce at the present day. In explanation of the difference between the results obtained now and formerly, it is suggested that possibly the manufacture of the wax is now carried out in a different manner in Japan; and that to meet the increasing demand, accelerated processes with methods of artificial bleaching may have been introduced.—C. A. M.

Linseed Oil and its Adulterants. P. C. McIlhenny, Report to Commissioner of Agriculture, New York State, U.S.A., 1901, 1—31.

ALTHOUGH oil from American seed is gradually replacing that from foreign seed in the United States, Calcutta seed-oil still commands a higher price owing to its lighter colour. Calcutta oil, as a rule, is sold in the raw condition, and is largely used by the varnish makers. The total yield in 1898 is estimated at 13,000,000 to 14,000,000 bushels of flax seed, whilst the output for 1899 probably amounted to 15,000,000 bushels. Each bushel of seed produces about 2.3 gallons of oil.

Extraction.—The oil is obtained by extraction with solvents or by expression.

Analysis.—In the author's opinion the most valuable data for judging as to the purity of linseed-oil are the following tests:—(1) specific gravity; (2) iodine and bromine values; (3) per cent. of unsaponifiable organic matter; (4) saponification value; (5) acid value; (6) per cent. of insoluble bromine derivatives; and (7) amount of volatile oil (turpentine and benzene). He has applied most of these tests to a large number of oils obtained from various manufacturers in New York States and gives the following conclusions:—

Specific Gravity.—This should vary between 0.931 and 0.937 for raw oil, and between 0.931 and 0.950 for boiled oil at 15.5° C.

Bromine Addition and Bromine Substitution Values (this Journal, 1900, 176).—The former should lie between 100 and 110, whilst the latter should not, as a rule, exceed 5.

Non-Volatile Unsaponifiable Matter.—This should be less than 2.5 per cent. in either raw or boiled oil.

Saponification Value.—Should not be less than 187 for raw or 186 for boiled oil, and in neither case should it exceed 196.

Insoluble Bromine Derivatives.—The author regards Hegner and Mitchell's method (this Journal, 1899, 77) as a valuable test for the detection of other seed-oils in linseed oil.

Acid Value.—This should be less than 5, as a rule, in either raw or boiled oil, though old oil may give figures as high as 7.

Action on Polarised Light.—The author considers that the test is chiefly of value for the detection of rosin oil, which is dextro rotatory.

Methods are given for the detection and determination of various adulterants.

Effect of Temperature on the Specific Gravity of Linseed Oil.—This is shown in the subjoined table in which water at 15.5° C. is taken as unity throughout:—

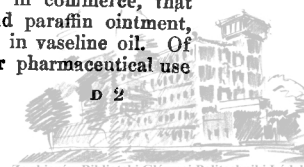
Oil.	Sp. Gr. at 15.5° C.	Sp. Gr. at 28° C.	Sp. Gr. at 100° C.	Difference for 1° C. from 15.5°—28° C.	Difference for 1° C. from 28°—100° C.	Difference for 1° C. from 15.5°—100° C.
American raw linseed	0.9336	0.9255	0.8736	0.000650	0.000721	0.000711
Raw Calcutta "	0.9328	0.9239	..	0.000698	..	..
" American "	0.9336	0.9255	..	0.000650	..	..
" " "	0.9345	0.9263	..	0.000656	..	..
Boiled " "	0.9385	0.9297	..	0.000707	..	..
" " "	0.9375	0.9293	..	0.000653	..	..
Raw " "	0.9327	..	0.8732	..	..	0.000704
" " "	0.9332	0.9245	0.8731	0.000693	0.000714	0.000711
Boiled " "	0.9336	0.9258	0.8735	0.000625	0.000725	0.000614
Menhaden	0.9316	0.9235	0.8712	0.000646	..	0.000716

Correction for Temperature with a Hydrometer.—The following constants are to be added to, or subtracted from the readings of a glass hydrometer (correct at 15.5° C.) when immersed in linseed oil, for each degree from 40° to 80° F.

The correction for 1° F. was found to be 0.000361; and for 1° C., 0.000650.—C. A. M.

Vaselines; Tests for and Properties of Natural —. — Hæhnel. J. Pharm. Chim. 14, [2], 74. Pharm. Post, 1901, 281.

Two kinds of vaseline are met with in commerce, that obtained directly from petroleum, and paraffin ointment, which is merely a solution of paraffin in vaseline oil. Of these the former is to be preferred for pharmaceutical use



on account of its homogeneous consistence. To determine the value of a sample, the following tests should be applied. *Colour*, when solid and when melted; *solidifying point*; *reaction* of an ethereal solution towards iodeosin; *odour*; *action* of permanganate by heating together equal parts of vaseline and 1:1000 solution of KMnO_4 . White vaseline should not decompose the reagent in less than 15 minutes, the yellow variety in less than six minutes. *Viscosity* should be taken at two temperatures, *viz.*, 60° and 70°C. , *Fractional distillation*; the quantity distilling below 180° and below 200°C. should be noted. A good vaseline should be free from sulphur compounds; it should, therefore, give no brown colour when heated on the water-bath with ammoniacal silver nitrate solution. The *iodine number* varies and is the highest (7 to 12) with American products. The *refractive index* at 55° should lie between 1.459 and 1.478. The *saponification number* should be 0. To distinguish between natural and fictitious vaselines, the index of viscosity is sufficient to decide the purity, any product showing a viscosity figure below 3 at 60° must be considered adulterated with paraffin ointment. Also when the index of viscosity falls below 1.4, adulteration must be assumed.

—J. O. B.

Oils, Fats, and Waxes; Elimination and Determination of Water in —. C. B. Davis.

See under XXIII., page 941.

Oils; Maumené Test for —. C. A. Mitchell.

See under XXIII., page 939.

Free Alkaline Hydrate and Carbonate in Soap; Effect of Sodium Chloride in the Determination of —. F. E. Robertson.

See under XXIII., page 936.

Viscosimeter; The Engler-Ragosine —.
A. Ragosine.

See under XXIII., page 933.

PATENTS.

Wool; Removing Fat from —, and Apparatus for that Purpose. C. D. Abel. Eng. Pat. 17,764, 1900.

See under V., page 891.

Oleaginous Matter; Bleaching of —. The Cotton-Seed Co., Ltd., London. From J. C. W. Stanley, New York. Eng. Pat. 11,419, June 4, 1901.

CLAIM is made for a process of circulating the oil or wax in a thin film over a transparent surface, and subjecting it to the action of light during its passage, whilst in certain cases air or other gas is introduced under pressure to effect simultaneous oxidation.

In the special form of apparatus described, the oil is contained in a tank with a conical lower end which is closed. Above this tank are three bleaching chambers formed of a series of vertical posts supporting panes of glass, and closed with air-tight covers. A second tank is supported above the bleaching chambers, and is connected with a pump which draws the oil from the lower tank. Each of the bleaching chambers has an interior pipe or trough, connected with fan-tail distributors to spray the oil against the vertical panes of the chamber. The oil is returned to the lower tank through pipes which project a short distance into the bottom of the chambers and are controlled by valves. Electric arc lamps are supported within the chambers, and it has been found that three lamps of about 1,500 candle power will bleach the oil flowing over a superficial area of about 400 sq. ft. in 5 to 8 hours. The material in the lower tank is heated by means of a steam-coil when necessary, and means of cooling the bleaching surfaces are provided.—C. A. M.

Lubricant, and Process of Making the same. M. S. Hudnall and H. Calvert, Wichita, Texas, U.S.A. Eng. Pat. 22,867, Dec. 14, 1900.

THE composition claimed is specially intended for moving machinery, and is stated to keep the parts and bearings

cool. It is prepared by adding "signal oil" (1 quart) to slaked lime ($2\frac{1}{2}$ lb.), then moderately heating the emulsion with black oil (1 gall.), and finally pouring the mixture into a hot solution of $2\frac{3}{4}$ lb. of soap in 5 pints of water.

—C. A. M.

Candles; Especially those for Burning in Spring Lamps. H. Palmer and W. Calderwood, Stratford, Essex. Eng. Pat. 23,789, Dec. 29, 1900.

THE candle is provided with a base of cement to which the wick is attached.—C. A. M.

Soft Soap; New Manufacture of —. F. A. Hulme, Stockport. Eng. Pat. 17,278, Sept. 29, 1900.

A soft soap is made by mixing a vegetable oil and resin in equal weights, heating and stirring till the resin is dissolved. Caustic potash solution, free or practically free from caustic soda, is now added, and finally a strong lye to finish off.

—A. S.

Soap for Use in Sea-Water; Composition for the Manufacture of —. L. M. Baptistine - Blanc - Raynaud, Pragnignan, France. Eng. Pat. 2847, Feb. 9, 1901.

"A SOAP for use in sea-water" is prepared by boiling the following ingredients in approximately the proportions named:—Cocoonut oil, 39.375 kilos.; water from the rivers Narbuti and Foux in equal parts, 41.071 kilos.; caustic soda, 9.017; and salt-water containing 12 parts of salt to 88 parts of water, 10.714 kilos.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

Oil Colours in Tubes; A Siccative [Elwococca Oil] for —. M. Kitt. Chem. Rev. Fett- u. Harz-Ind. 1901, 8, [8], 157.

MANY of the mineral colours, when worked into a paste with oil, show a tendency to separate again when stored in tubes. The most common means of preventing this is to add from 5 to 10 per cent. of wax to the mixture. Taking the saponification value of linseed oil as 195, and that of the wax as 95, the approximate proportions of the constituents can be calculated from the saponification value of the mixture. For this purpose the oil colour is expressed on to filter-paper and extracted in a Soxhlet apparatus with ether, the ethereal extract evaporated, and the residue saponified and titrated in the usual manner. In practice the addition of wax is said to have the objections of not drying sufficiently hard and of not adhering to a second coat of paint. This can be obviated by the substitution of Japanese wood oil (tung oil) for the wax, advantage being taken of the property possessed by that oil of solidifying on exposure to light. The cold-pressed oil is exposed to direct sunlight in glass tubes about 1 cm. in diameter, and yields in a few weeks a suitable product, which has the further advantage of increasing the drying properties of the oil colours. Linseed oil containing 10 per cent. of the solidified oil completely dried in 40 hours, whilst ultramarine oil paint, containing the same proportion, dried in $29\frac{1}{2}$ hours.—C. A. M.

Paris Green; Determination of Arsenious Oxide in —. S. Avery and H. T. Beans.

See under XXIII., page 936.

PATENTS.

Colour Substance [Iron Oxide Pigment] from Ferrous Liquors. H. J. Haddan, London. From A. S. Ramage, Cleveland, Ohio, U.S.A. Eng. Pat. 23,858, Dec. 31, 1900.

"WASTE iron pickle liquor," either chloride or sulphate, is treated with a current of air and steam, and while the operation is proceeding, a solution of sodium or other carbonate is run in to exact neutrality. Simultaneously more water is introduced at the boiling point, double in volume to that



of the liquor under treatment. Provided that no excess of carbonate is employed, a yellow precipitate, having the definite composition $\text{Fe}_2\text{O}_3 \cdot \text{Fe}_2(\text{OH})_6$, is deposited, which is collected, washed, and dried. This pigment is claimed to possess valuable and new properties; it does not require levigating or grinding, is quite free from acid or undecomposed sulphate, and can be ground into oil as it is, yielding a paint of an opaque bright yellow colour. It may also be lightly furnace to give oxide reds of different shades. If the original pickle is a sulphate liquor, and if barium or calcium chloride be substituted for the sodium carbonate, a pigment is obtained of about three times the usual bulk, containing the alkaline earth metal as sulphate. Similarly, with a chloride pickle, the barium or calcium remains in solution as chloride, and may be thrown down with a soluble carbonate as "blanc fixe" (barium carbonate), or "pearl hardening" (calcium carbonate).—F. H. L.

Zinc and other Ores; Treatment of —, chiefly for the Direct Production of Zinc White, and Furnaces therefor. W. B. Middleton and the Non-Injurious White Paint Syndicate, Ltd., London. Eng. Pat. 12,274, June 15, 1901.

A FURNACE of the reverberatory type, but without a bridge, and with a fire chamber about 3 ft. deep, is used. The fire chamber is loaded with fuel, and a charge of roasted blende, oxidised ores, or calamine is put on the hearth. When it becomes hot it is raked off the hearth on to the top of the incandescent fuel, and a fresh charge is put into the furnace, with more fuel in the fire chamber. As soon as the hot ore reaches the fuel, zinc fumes are evolved and travel over the hearth into a suitable condensing chamber. The fire bars of the furnace are carried loosely on notched bearers, beyond which their ends project; thus they can be rotated by means of levers so as to break up and remove gangue.—F. H. L.

Paint; Preservative —, for applying to India-Rubber Tyres. H. R. A. Philp, Pailton, near Rugby. Eng. Pat. 16,844, Sept. 21, 1900.

TEN parts of dry white lead are ground with 1 part of turpentine, thinned with 20 parts of mineral naphtha, and mixed with 160 parts of ordinary rubber solution, more turpentine or naphtha being added if the whole is too thick. The composition is applied with a stiff brush to the sides of the covers of double-tube pneumatic tyres, to fill up the cracks which appear there as the covers wear. Two coats are given, being put on while the tyres are properly inflated.

—F. H. L.

(B.)—RESINS, VARNISHES.

Linseed Oil and its Adulterants. P. C. McIlhinney.

See under XII., page 909.

(C.)—INDIA-RUBBER, &c.

Caoutchouc from the Congo. Imp. Inst. J., Sept. 1901.

SINCE the beginning of 1900, the production of caoutchouc in the Congo State has been officially supervised, the "Service de Controle Forestier" having been organised for that purpose, and that Institution having already brought about changes greatly to the benefit of the rubber-planting industry.

Louis Gentil, Forest Inspector in the Congo State, describes the production of rubber as now carried on there.

Practically the whole of the rubber exported is obtained from the climbing plants of the genus *Landolphia*, of which there are four varieties. Other climbing plants, yielding inferior caoutchouc exist, but in small quantities; probably there are 3,000,000 plants under cultivation at the present time in the equatorial districts.

There are three distinct forms of rubber-yielding plants that are most largely cultivated.

First the white caoutchouc locally known as matofemongo, obtained from the *Landolphia owariensis*. The fruit, which contains the seeds and a sugary-acid juice, is round and reddish coloured, and is about the size of an orange. The

milk of this liana, or climbing *Landolphia*, is whitish and is coagulated into rubber by pouring it into boiling water.

Another variety of *Landolphia owariensis*, which produces a milk yielding rosy caoutchouc, bears a small fruit, yellowish to reddish-green in colour, and containing an acid juice; this plant, known locally as mongew or bongow, yields the most valuable rubber, specimens of it having recently been quoted at 4s. 5d. per lb. It is precipitated or coagulated by boiling water.

The third variety, *Landolphia florida*, known as mon-dongo, boole, &c., yields a black caoutchouc, which, like the white and rosy varieties, is coagulated by boiling water; but it is not coagulated by the acid juice of costus canes, a fluid which is extensively used to obtain the rubber from the milk of the two varieties of *Landolphia owariensis*.

It is because of the properties of coagulation just mentioned that merchants strongly advise that the different varieties be collected separately, otherwise it happens that an inferior rubber is produced by a mixture of two or more kinds of caoutchouc.

The coagulation by means of the costus canes is readily carried out:—A banana leaf is fitted into a hole made in the ground, shaped like a small basin; into this the milk is poured. A portion of the costus cane is then squeezed over the liquid; the drops of juice immediately coagulate the rubber, which is afterwards pressed free from adhering liquid. All forms of caoutchouc coagulate on evaporation, producing the purest form of rubber.

The lianas are propagated upon a large scale from the seeds, of which from 10 to 20 exist in every fruit of the mature plant. It is essential that the seeds should be planted in the prepared area when they are ripe, and before they have had time to get dry. After the seeds are planted, germination occurs in about a fortnight, and when the little plants have eight leaves, they are in a suitable condition for planting out.

Large tracts of forest are marked out, and round each tree a space is cleared free from brushwood and undergrowth. From two to twenty little seedlings are planted round the tree (the number varies with the nature of the tree), and these, in growing, twine up even to the summit of the tallest trees, and in a few years create a dense stagnant undergrowth that is particularly favourable to their successful cultivation. At the end of nine or ten years they are fit to be tapped for the caoutchouc.

At present the caoutchouc is only obtained by incisions in the stem of the liana, and it is greatly to be hoped that during the next few years a method of treatment may be adopted whereby the milk may be drawn from the tissues of the leaves and bark. In the above-mentioned manner trial grounds, to the extent of 74 acres, have been planted with the *Landolphia*, at the rate of 5,000 plants per acre.

Rubber; Plants which furnish Congo —. Gummi-Zeit. 1901, 15, [42], 712–713.

CONGO rubber is chiefly derived from plants belonging to the order *Apocynaceæ*, but there are other sources, such as certain members of the genus *Ficus* and other undetermined plants. Hallier indicates 15 species and one variety, but all of these do not furnish rubber. In many cases the material necessary to classify them botanically has not yet been obtained. Of the six species mentioned by Schlechter (West African Rubber Expedition, 1899–1900) as commercial sources of rubber, *Landolphia tomentosa* A. Duvèrre is probably identical with *L. Hendelottii* A.D.C., and *L. Comorensis* K. Sch. with *L. Florida* var. *leiantha* Oliv. The statements of travellers as to the commercial value of their products are also much at variance. *L. Klainii* is certainly found in various parts of the Free States, the rubber obtained from it being called "Kasai red." The name "red rubber of Kasai" belongs to the produce of *L. Gentil* (syn. *L. Owariensis*) or "Matofemongo" (Schlechter, loc. cit.). The two plants are difficult to distinguish, but the former is characterised by its egg-shaped ovary and gigantic fruit.

L. Owariensis apparently furnishes most of the rubber obtained in West tropical Africa, several writers agreeing as to its high quality.



L. Hendelotii grows near the Stanley Falls, and yields nearly all the rubber exported from between the mouths of the rivers Senegal and Niger, viz., about 2,000,000 kilos. yearly, worth 12 to 18 million francs (Chevallier).

L. lucida also furnishes Congo rubber, but little is known of the plant.

Authorities differ as to the commercial value of *Capodinus lanceolatus*, said to yield a rubber of good medium value, and found between Lusambo and Luluaburg as far as the Manyema district, and in many other localities, in some places already growing scarce, owing to methods of collecting the juice.—R. L. J.

Rubber Industry of Rhodesia. Impt. Inst. J., Sept. 1901.

THE following is a summary of a report, dealing with the species of rubber indigenous to North-West Rhodesia, by Mr. Harding, the Acting Administrator.

There are three distinct species of rubber plants indigenous to this country, viz., *Landolphia florida*, *Capodinus lanceolatus*, and *Kickxia elastica*. The first-named is a kind of vine rubber usually found growing in marshy tropical localities. It grows in close proximity to a small tributary of the Zambesi, north-west of Nyakatoro, and also on an east bank tributary of the Kabompo River, called the Mumbasi. No doubt this species may be found in considerable quantities in the basins of the numerous tributaries of these two rivers, as quantities of the prepared rubber have been found in possession of the natives inhabiting these districts.

The *Landolphia florida* is collected and prepared by the natives. The cutting of the vine is accompanied by great waste, for it is promiscuously hacked, the best and largest branches being selected for subsequent preparation, while the smaller ones, which would attain maturity in another year, are left to rot on the ground.

The juice of the plant cannot be extracted by incision, and so the preparation of the rubber is conducted as follows:—"The selected material, in lengths of 3 ft. to 4 ft., is soaked in water for 48 hours, and then hammered to remove the bark. The "blanket," as the rubber is termed at this stage, is then immersed in water and boiled for three or four days, until the bark is completely removed. While the rubber is still warm, it is rolled into sticks about six inches long, called *matallas*, which are hung up to dry and subsequently made into what are known as "chetotes," which are sold to the Mombari traders. The price of this class of rubber at Benguela would be from 2s. 9d. to 3s. 6d. per lb.

Kickxia elastica is a tree rubber found in close proximity to the *Landolphia florida*; it has been noticed in the possession of natives north-west of the Zambesi, near the Kasai River.

The rubber is procured by making an incision in the tree, and is of better quality than either of the products obtained from the two other species. It is free from dirt and bark, and the only objectionable ingredient present is grease, which is introduced into the material at the time of collecting, and also when moulding it into various shapes.

This kind of rubber is often used by the natives to mix with inferior samples, thereby improving their market value.

Capodinus lanceolatus is found in considerable quantities between the Kwando and Kwito Rivers, and is generally met with throughout the Barotse country west of East Lunga River. This plant is also a species of vine rubber, and although admittedly of inferior quality, still it will thrive in a very poor soil, and should eventually prove a valuable asset to Western Barotseland. To substantiate this statement it is pointed out that both east and west of the Kwito River the Portuguese have erected stations with the object of collecting this rubber.

Capodinus is a phanerogamous plant, and grows from 6 ins. to 8 ins. in height; the roots are found 4 ins. beneath the surface of the soil, and they extend evenly and uniformly over a considerable area.

The process of preparation of this root is the same as that described under *Landolphia florida*.

There is little doubt that North-West Rhodesia is a rubber-producing country, and only an early settlement of

the internal conditions of the country is necessary to secure a successful future for the development of this industry.

Rubber Bands. Gummi-Zeit. 1901, 15, [43], 722—723.

ELASTIC rubber-bands require to be made of very good material, and at the best are greatly affected by atmospheric conditions. The red variety has long been in favour, but the quality of the rubber has of late deteriorated, either because of faulty workmanship or the use of inferior material. The grey bands, which are identical with the black except that the latter are extracted with alkali, are most used now. They are incorporated with sulphur by the aid of a kneading machine or immersed in molten sulphur. Extraction with alkali sometimes removes too much sulphur, so that after a time their state of vulcanisation deteriorates. Experience shows that vulcanisation is best effected by means of sulphur vapour.

Slight differences in the colour of the red bands are due to changes which take place during vulcanisation, or to variations in the colouring matter itself (antimony red).

—R. L. J.

PATENTS.

Vulcanising Rubber Materials or Compositions. A. O. Bourne, Bristol, Rhode Island, U.S.A. Eng. Pat. 7159, April 4, 1901.

DURING the process of vulcanisation, the articles are placed in a strong cylinder, where they are subjected to the action of air, or air and steam, at a pressure of from 5 to 100 lb. per square inch, and a temperature of from 105° to 150° C. Sometimes the goods are "condensed" by treating them with air at from 10 to 100 lb. pressure and at a temperature of from 40° to 100°, afterwards raising the temperature to the point at which vulcanisation commences. It is generally better to vulcanise at a relatively low temperature and a high pressure than *vice versa*; and since, when both temperature and pressure are high, vulcanisation proceeds too rapidly, steam cannot be employed alone. Articles treated in the manner described are claimed to be much stronger than those manufactured by ordinary processes.—F. H. L.

Rubber Substitutes; Manufacture of — C. and R. Paulitschky and F. Wüste, Vienna. Eng. Pat. 6955, April 2, 1901.

THIS composition consists of disintegrated leather, 50 parts; waste rubber, 35 parts; cork, 0.5 part; asbestos, 5 parts; and "rubber-linseed oil," 10 parts. Waste (sole) leather is disintegrated by machine till the material consists of fibres still partially connected, then softened by soaking and agitation for a considerable time in tanners' dressing (bruised barley, leaven, and water), quickly dried, steeped for some time in "Lederöl" (train oil freed from acid by treatment with warm water), and pressed from excess of oily matter. The cork, in pieces as large as hazel nuts, is boiled in the thickened root sap of the *Landolphia* plant, to make it elastic and durable, then dried slowly. The waste rubber, in moderate-sized lumps, is boiled for 15 minutes in a 1 or 2 per cent. solution of caustic soda. The "rubber-linseed oil" is prepared by dissolving about 95 parts of rubber in 5 of linseed oil at a temperature of 40° to 60° C. These various materials are mixed together in the proportions indicated; the product is shaped in calenders having adjustable heated rollers, and finally treated with sulphur chloride diluted with carbon bisulphide for the purpose of vulcanisation. The finished material is stated to possess greater elasticity and durability than the rubber substitutes hitherto manufactured.—F. H. L.

Gutta Percha or the like; Extracting —, from Leaves and Twigs containing it. G. Mitchell, London. Eng. Pat. 13,204, June 28, 1901.

THE leaves or twigs are dried, reduced to powder, and extracted with carbon bisulphide. The solution is separated by subsidence or by centrifugal action, filtered through charcoal, and distilled. The inventor is aware that carbon bisulphide has been proposed as a solvent, and charcoal as a filtering medium, before; he therefore only claims the process outlined above as a whole.—F. H. L.



XIV.—TANNING, LEATHER, GLUE, SIZE.

Glove Stock; Preparing "Schmaschen" Skins for —.
Leather Manufacturer, 1901, 12, [6], 107, [7], 127—128.

THE "schmaschen" skins, which are principally skins of still-born lambs, are sorted, in order to separate the long wool from the short wool skins, and soaked in water for about 48 hours, afterwards being laid in piles of 15—20 skins, flesh side up, and a mixture, made by adding sufficient quicklime to a solution of gas-lime of 30° B. to make a paste, is applied.

The skins, after coating on the flesh side with the lime paste, are laid flesh to flesh in pile, in which condition they are left for 6—8 hours, when the wool can be removed. The goods are limed for eight days, being moved daily, after which they are washed in water in a wash wheel, the water being changed three times.

After washing, the goods are bated in an infusion of dog dung for about two hours, afterwards being scudded on the beam, washed in warm water, and lightly drenched, when they are ready to be tawed.

After the tawing process, they are taken out, and dried, preferably in the open air, and, when dry, stored for about five weeks in a dry room.—M. C. L.

Leather; Black Glycerin —. Leather Manufacturer, 1901, 12, [7], 129.

A VERY firm, tough leather can be produced by impregnating skins taken direct from the beam house, with glycerin, to which has been added either boric acid, picric acid, or salicylic acid. This leather is known commercially as transparent leather.—M. C. L.

Lactic Acid as a De-liming Agent. Leather Manufacturer, 1901, 12, [7], 133.

LACTIC acid as a deliming agent is preferable to mineral acids, which attack the skin, injuring the fibre and rendering the resulting leather hard and brittle.—M. C. L.

Sheepskins; Preparing —, for Dyeing. Leather Manufacturer, 1901, 12, [7], 125.

SHEEPSKINS intended for manufacture into coloured leathers are best sorted immediately after bating. The tanning, which is best done with sumach, is the next operation, after which the skins should be well washed, and set out on the flesh side on a stone or glass table, a zinc-covered table being liable to cause dark spots on the leather. After setting, the goods are drummed in lukewarm water for about two hours, and afterwards slicked with a brass stone, or wooden slicker, after which they are ready for the colouring, which may be done either by dipping or brushing, the former giving more uniform results.

If the brush method is to be employed, the skin is set out on an oval zinc-covered table, and the colour is applied with a soft hair brush. If the skins are to be dyed by dipping, a pair of skins, paired together flesh to flesh, are dipped for about 10 minutes in the dipping trough, which contains 6 to 8 litres of water at a temperature of about 40° C., to which is added a sufficient quantity of a 1 per cent. solution of the aniline dyestuff, previously prepared.

After dyeing, the skins are washed in cold water, set out on the flesh side, given a coat of linseed oil, again set out, and afterwards dried.

When dry, the skins are whitened on the flesh side, and seasoned with either of the following three seasonings:—10 litres of water and 1 litre of milk; or the whites of three eggs, 8 litres of water, and 1—4 litres of milk; or 8 litres of water, 20 grms. of gelatin, and 5 grms. of brown sugar. After seasoning, the goods are allowed to dry, and are then rolled, afterwards being cork-boarded, set out, and reboarded.

In order to stiffen the goods somewhat, a mixture consisting of 20 litres of water, 950 grms. of Iceland moss, and 20 grms. of starch, after boiling and filtering, is applied to the flesh side, and the goods hung up to dry immediately.

—M. C. L.

PATENTS.

Hides, Skins, Furs, and the like; Treating and Preserving —. H. R. Riches and the Wool, Hide, and Skin Syndicate, Ltd., London. Eng. Pat. 13,361, July 24, 1900.

THE flesh side of the skins is thoroughly cleaned and then dusted over, by means of a blast-nozzle or other sprinkling device, with a fine powder of the following composition:—Charcoal (animal or vegetable), 40 per cent.; borax, 30 per cent.; alum or aluminium salts, 25 per cent.; cloves, 5 per cent.

The skins are allowed to lie for a time, and then packed for storage or transport.

It is claimed that skins treated in this manner keep perfectly, and can be handled by the tanner with a minimum of preparation.—R. L. J.

Treating and Colouring Hides and Skins; Apparatus for —. C. A. Allison, London. From The Scott Leather Machine Co., New York, U.S.A. Eng. Pat. 10,152, May 16, 1901.

THIS invention relates to that class of apparatus for treating hides or skins, in which the hide or skin is drawn, by means of a belt or carrier, under mechanisms for seasoning, rubbing-in, and stretching the skin, and for spreading and finishing it, during its progress through the machine. The chief points are: The construction of the seasoning rolls of felt divided by narrow metallic strips secured in reverse spiral directions and sunk below the level of the rolls, the construction of the rubbing-in rolls, i.e., spirals of rectangularly cut felt arranged with "break joints," mechanism for the equalisation of the upward pressure on the carrier under the rubbing-in rolls, a pump and continuous pressure in the feed pipe, a drip mechanism, and the means for diverting the drip from one of the seasoning rolls when it is lifted.

—R. L. J.

Artificial Leather, Floor Coverings, and the like; Method of Manufacturing —. A. M. Posener, London, and F. W. Clerke, Tottenham. Eng. Pat. 16,525, Sept. 17, 1900.

THE following materials are used, in the proportions stated:—

As a Base.—A woven fabric, preferably jute, 2 lb.

Mixture A.—Body or covering material, 3 lb. (This consists of whiting, 1½ lb.; ochre, 1 lb.; Venetian red, ½ lb.)

Irish moss, ¼ lb., is dissolved in hot water (5 quarts), strained, and mixed with the above substances.

Mixture B.—Boiled oil or equivalent material, 1¾ lb.; resin, ¼ lb.; colouring body, as in A, 2¼ lb.; driers as necessary.

The base is impregnated with A at 90° F., dried, and pressed or passed through pressure rolls. One side is then coated with B (cold) and dried. The other side is now treated in exactly the same way. The two surfaces are smoothed with pumice stone, used wet, dried, and each separately coated with B as before, pumice-stoned once more, dried, and finished with a thin coat of B, but with oil substituted for the resin. The whole is then printed upon, if so desired, and left to dry and season thoroughly.

—R. L. J.

Floor Coverings, Artificial Leather, and the like; Methods of Manufacturing —. A. M. Posener, London, and F. W. Clerke, Tottenham. Eng. Pat. 16,526, Sept. 17, 1900. (Compare preceding abstract.)

THE following materials are used, in the proportions stated:—

As Base.—A woven fabric of wool, cotton, or other vegetable or animal fibre, 5 lb.

Mixture A.—Glue, 1 lb.; body and colouring material (whiting, ochre and Venetian red), 5 lb.; silicate of soda, ½ lb.; hot water, 1 quart.

Mixture B.—Boiled oil or equivalent substance, 2½ lb.; colouring body as in A, 3½ lb.

The base is impregnated with A at 90° F. for 30 mins., dried and compressed. One side of the material is now rubbed with pumice stone, dipped in mixture B (cold), and



dried. The other side is then treated in the same way. The two operations are repeated separately and in order. The material, after drying, is printed upon, if necessary, and left to season.—R. L. J.

XV.—MANURES, Etc.

Chili Saltpetre; Occurrence of Free Iodine in —. F. W. Dafert and A. Halla. Zeits. landw. Vers.-Wes. Öst. 4, 732—734. Chem. Centr. 1901, 2, [5], 368.

THE authors observed with a sample of Chili saltpetre, "which possessed a strong odour of iodoform," that iodine sublimed on the glass stopper of the containing bottle. The sample contained 0.4 per cent. of KIO_3 ; KI could not be detected. The liberation of free iodine from the iodate was caused by organic impurities, in this instance by some grains of barley. Saltpetre of this nature cannot be recommended as a manure, although the danger of injurious action is very small, and can be obviated by long exposure to the air.—A. S.

Wine Vinasses and Wines Spoilt by Sickness, as Manure; Utilisation of —. F. Garrigou. Comptes Rend. 1901, 133, [4], 252—254.

THE author draws attention to the fact that enormous quantities of vinasse from brandy distilleries and still larger quantities of wine rendered unsaleable by sickness, are thrown away into the rivers in the south of France, making an estimated total of $13\frac{1}{2}$ million hectolitres annually. These liquors represent about 17,000 tons of organic matter, more or less nitrogenous, and 8,000 tons of saline constituents, largely potash. It is easy to save and utilise these wasted products almost without cost. All that is required is to allow them to evaporate spontaneously in shallow pools banked up with clay after the manner of salt marshes. At the end of the hot season, there would remain a concentrated natural manure, enriched as regards nitrogenous constituents by the dead bodies of numberless insects. The evaporation might perhaps be conducted in wide iron pans, heated from below by the combustion of dried vine leaves and stalks, which would themselves contribute a quantity of valuable ashes. For this auxiliary evaporation of the liquor, about 40 million kilos. of vine stalks would be available—the product of 12,654 hectares—yielding 5,800 tons of ash. The grand total of potash would then amount to 2,200 tons, and of phosphoric acid to 1,231 tons. The nitrogenous organic constituents accompanying these would have a value at least as much again. Lastly, the mares could easily be burnt too, and the ashes added to the manure.—J. F. B.

Phosphoric Acid; Determination of —, in Superphosphates, Compound Manures, and Precipitated Phosphates, by Cold Precipitation as Ammonium Phosphomolybdate. L. Ledoux.

See under XXIII., page 936.

Superphosphates; Determination of Water-soluble Phosphoric Acid in —. L. v. Széll.

See under XXIII., page 936.

PATENT.

Manures; Impts. relating to Artificial —. C. Roth. Berlin. Eng. Pat. 12,895, July 17, 1900.

THE object of this process is to render less soluble the ordinary soluble artificial manures such as nitre, sulphate of ammonia, &c. This is done by mechanical means.

The manures are granulated and then treated either with organic or inorganic materials, or a mixture of both.

As examples, the granulated manure is moistened with a solution of sodium silicate and then dusted over with Portland cement, producing a thin covering of insoluble calcium silicate.

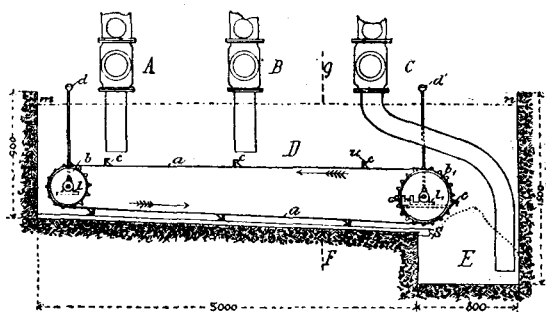
The manure treated in this way may then be subjected to the action of molten pitch to which has been added, fat ceresin, ozokerite, &c. to lower the melting point. Pitch and resinous materials may be used by themselves, or the manure may be treated with soap and then with powdered alum.—C. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Milk of Lime [Sugar Manufacture]; Apparatus for removing Sand and Grit from —. E. Biža and F. Věček. Zeits. Zuckerind. Böhmen, 1901, 25, [9], 485—488.

THE apparatus described below was devised by the authors for removing sand and grit from milk of lime, and during the present season it has proved itself well suited for the purpose.

The prepared milk of lime is run into a cemented pit having a well E, and a shallower pit, D, with a gently sloping bottom. The deposit in D is carried forward by scrapers, c, and falls into the well E, from which it is removed from time to time.



The scrapers consist of a number of strips of sheet iron 6 mm. thick, and 55 mm. broad, riveted to Ewart's chains, a, which run over toothed pulleys, b and b'. The pulleys b' are 390 mm. in diameter, and must be brought partly over the well, so that the scrapers may carry the sand over the edge.

If this is not done, or if the deposit be allowed to accumulate in the well up to the dotted lines, the purification of the milk of lime is incomplete.

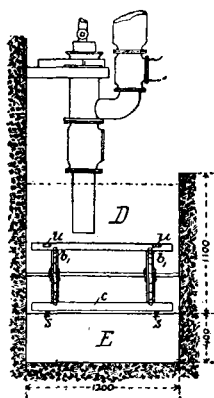
The pulleys b are 290 mm. in diameter, and on the same axle, in an adjacent well, is the driving pulley, 580 mm. in diameter. The arrangement has a motion of 4 m. per minute. The bearings of the axle of pulleys at l are fixed, those of pulleys at l' adjustable, in order to keep the chain tense.

The suction pipes A and B dip only 500 mm. below the surface of the milk of lime, in order to avoid carrying up sand; but pipe C reaches to 250 mm. from the bottom, for emptying.

The advantages derived from the arrangement are that the milk of lime is obtained quite pure and uniformly mixed, the

pumps work smoothly and regularly, the valves and connections are only slightly worn, and the pipes do not become choked.

There is little disturbance of the steam pipes, valves, and connections during saturation, and the slime-press works more quietly and regularly. The alkalinity of the saturated juice shows no sudden undesirable fluctuations, as were formerly the case, from subsequent solution of lime particles in the juice. The air passages of the presses do not choke, so that the pressure is more uniform and there is less risk



of damage to the plates and frames. From the greater regularity of the filtration, fewer cloths are required.

1,400 hectolitres of milk of lime are prepared daily, giving 15 quintals of waste, of which 8 quintals are sand and grit.—L. J. de W.

Saccharification by Seminae under the Influence of Sodium Fluoride, on the Carbohydrates of the Horny Albumin of Leguminous Seeds. H. Hérissay.

See under XXIV., page 944.

Sugar Cane; Valuation of — F. N. G. Gill. J. Soc. Arts, 1901, 49, 662.

THE most obscure point in the valuation of sugar canes is the assessment of their yield in white dry sugar, and as such yield is the basis of valuation of any raw sugar, as "jaggery" or "muscavado," which may, in the first place, be manufactured from cane, the point is a most important one.

The difficulty hitherto felt in making any assessment is no doubt owing to the generally accepted assumption that the amount of treacle separated during manufacture was dependent mainly on the "ash" and "glucose" in the juice, or the amount and constitution of the "ash" and "unknown."

It is owing to the want of a practical method of arriving at the refining value of cane juices and their products, that analyses have hitherto been stated in the usual ultimate constituents, instead of the proximate ones of "sugar" (properly so called), "treacle," and "water." By "sugar" is meant white, dry, sugar, and by "treacle," the mother liquor exhausted of all practically crystallisable sugar. The sugar which may be won will be the sugar existing in the juice, less that spoiled and lost in manufacture.

From a number of analyses of cane treacle quoted, it will be seen that the most marked and constant relation between sugar withheld from crystallisation to the other constituents of the treacle is that of sugar to water present, sugar very nearly twice the weight of the water. For ordinary working there should not be more than 20 per cent. of water and 40 per cent. of sugar, so that a treacle from such working would show:—apparent solids, 80 (sugar 40, glucose and non-saccharin 40); water (apparent), 20.

If a complete analysis of a cane juice be made, treacle existing in the juice can be deduced from the glucose and non-saccharine bodies present on the basis of the above typical analysis. A partial analysis is, however, sufficient. The determination of density to arrive at the apparent dissolved solids, and polarisation (direct polarisation is practically sufficient) to arrive at the total saccharose, give data for determining the purity and the difference between this figure and 100 is a sufficient measure of the glucose and non-saccharine bodies present, and therefore a direct measure of the sugar belonging to the treacle, whence crystallisable sugar existing in the soluble solids of the cane juice = purity coeff. — $(100 - \text{purity coeff.})$, and if there be ascribed 5 per cent. to the raw sugar, the result multiplied by 0.95 will give the crystallisable sugar existing in it, and the refining value of this raw sugar will be this figure, less losses, &c.

These losses in a modern factory working with char for white and nearly white (after-boilings) sugars, thoroughly water-washed in the centrifugals, and for exhausted treacle, are about:—Loss of saccharose as crystallisable, by inversion, 3.7 per cent.; loss of saccharose, as crystallisable, by solution in the water associated with the resulting glucose, and with lime taken up, 2.5 per cent.; loss of saccharose absolutely, 1.3 per cent.; so that the approximate refining value will be about 7.5 per cent. lower. A juice, with a purity of 87.7, would therefore show:—Crystallisable sugar existing (1) in its dry solids $87.7 - (100 - 87.7) = 75.4$, (2) in its contained jaggery, $75.4 \times 0.95 = 71.6$, and the refining value of its contained jaggery would be $71.6 \times 0.925 = 66.2$.

Or, if desired, to express the results in lb. per gallon of juice:—Specific gravity, 1.0837 = 20.1 per cent., dissolved solids = 2.178 lb. dissolved solids per gallon, containing, as seen above, 75.4 per cent. $\times 0.925 = 69.7$

per cent. practically crystallisable sugar, whence juice would yield:—White, dry sugar, per gallon 1.52 lb., treacle solids (allowing 3 per cent. loss) 0.593 lb. and the 3 per cent. loss, 0.65 making up the total to 2.178 lb., and then, if desirable, the statement may be modified to show contents of the juice in sugar of any quality.

Any increase in refining value through possible elimination of impurities in course of manufacture of the sugar, as in the defecation of the cane juice, and in its treatment with animal charcoal, is ignored, because such elimination is small, and the effect of it is allowed for, as far as can be judged, in the restriction of total losses of refining value to 7½ per cent. The refining, as at present practised, of cane juice and of raw cane sugars is mainly a redistribution of impurities, and not their elimination in any material degree.

In the above method of assessment of refining value, no regard is paid to the constitution of the non-saccharine bodies, and all melassigenic values are dispensed with, and this view is warranted by the analyses of cane treacle. This view receives further corroboration from a comparison of the amount of crystallisable sugar found in various mixed "cane raws" by the author's calculation and direct determination by Scheibler's washing out process.

In the author's opinion, what has militated against the progress of the cane-sugar industry more than anything else has been a want of proper recognition of what is sugar. With those interested in the industry, scientifically as well as industrially, "sugar" has been just that mixture of sugar (saccharose) crystals, and treacle, which is the "sugar" production of their district, though such "sugar" might consist of 45 per cent. only of white, dry sugar, and 55 per cent. of treacle, or of 99 per cent. of white, dry sugar, and 10 per cent. treacle. The consequence is that there is extreme confusion as to the sugar production of an unit area of cultivation in different places, and, worst of all, there is confusion as to relative merits of descriptions of cane and methods of cultivation, which has led to a most mischievous obscuring of the important point of where mere weight of yield of the unit area of cultivation should give way to quality.—L. J. de W.

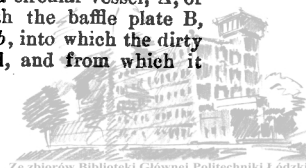
Sugar in Beets; Rapid Determination of — Hiltner and Thatcher's Paper (this Journal, 1901, 754); Notes on — E. E. Ewell. J. Amer. Chem. Soc. 1901, 23, [6], 432—436.

THE author points out that Hiltner and Thatcher (*loc. cit.*) are in error in regard to the allowance to be made for the liquid matter in the beet pulp, the means of determining the amount of such allowance being also inaccurate. The corrections are based on the percentage of water in the beet instead of on the percentage of liquid (juice) in the beet; the substances (sugar, &c.) dissolved in the water present in the beet must necessarily increase the volume of that water as calculated from its weight at a given temperature. Further, the determinations of water in the beets, as given by these authors, are not in accord with their numbers for the amount of fibre; the totals of average water, average sugar and average non-sugar are too high, the differences (more) from 100 being in some cases less than 2 per cent. The author goes on to show that in extreme cases the error attending the use of the Sachs-Le Docte method of allowing for the liquid in the pulp will not be greater than that incurred by working according to Hiltner and Thatcher. The author has made use of a balance without weights in the way described by Hiltner and Thatcher, and has found it to be wholly inaccurate.—T. H. P.

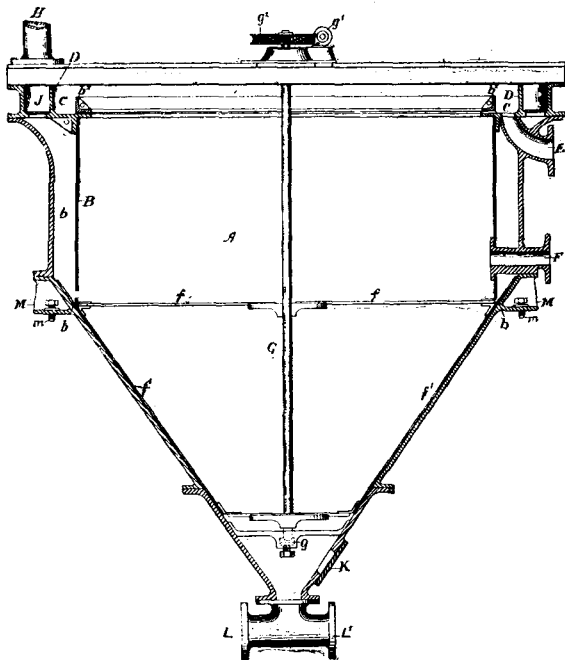
PATENTS.

Sugar Juice or other Liquids; Continuous Subsiders for Cleansing — J. Pickering, Glasgow, and P. Macgregor, Dalmuir, by Glasgow. Eng. Pat. 4834, March 7, 1901.

THE patentees describe a subsider, shown in sectional elevation in the figure, consisting of a circular vessel, A, of cast-iron or other material, fitted with the baffle plate B, arranged to form an annular space, b, into which the dirty sugar or other solution is introduced, and from which it



passes quietly and slowly through the narrow aperture *b* into the main portion of the vessel. As the main vessel fills, the clear juice flows over the top lip *b*² of the baffle plate into the discharge gutter *C*, from which it is discharged into the supply tank by means of the pipe *E*. *f*¹ *f*² represent continuously or intermittently actuated scrapers or stirrers, which are carried by the vertical shaft *G*, driven by the worm *g*¹ and worm wheel *g*², and are placed close to the sides of the vessel to prevent either these latter or the aperture *b* from becoming clogged by deposit. *H* is the



inlet pipe to the channel *J* through the perforated bottom of which the juice passes into the annular space *b*. *F* is a discharge pipe for use when the vessel is being emptied. The door *K* admits of the V-shaped vessel being cleaned and the shaft *G* adjusted. The outlet *L* leads to the gutter for washing out and *L*¹ to the filter presses. *M* *M* are two of the four supporting castings, which are fitted with screws *m* to allow the lip *b*² to be accurately levelled.—T. H. P.

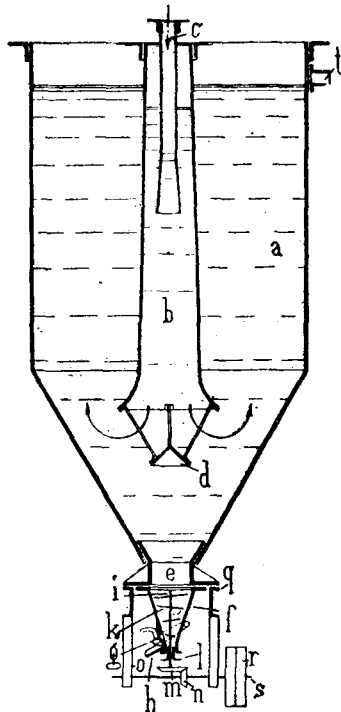
Lime Scum and Lime Sediment of Sugar Factories; Complete Extraction of Sugar from —. C. Steffen, Vienna. Eng. Pat. 10,883, May 25, 1901.

CLAIM is made for an improved process of extracting sugar from the lime scum and lime sediment of sugar factories, consisting in completely extracting the sugar from this scum in the known manner in filter presses or the like by means of sufficiently large quantities of water, whereupon the sweet water containing the sugar and cooled to temperatures below 30° C, is treated with such quantities of lime powder that the sugar is precipitated as sucrate of lime, which after being separated from the liquid in filter presses, yields a very pure sucrate of lime capable of serving to defecate or separate the raw juice.—T. H. P.

Starch Manufacture; Impts. in —. W. H. Uhland, Leipzig-Gohlis, Germany. Eng. Pat. 14,428, Aug. 11, 1900.

CLAIMS are made for: (1) A process for the continuous separation of starch from raw starch or impure solutions of starch from potatoes, wheat, maize, and similar materials, the mixture of starch and water being passed down a conical pipe of increasing section, and afterwards deflected radially by means of a conical body. The liquid then ascends in a vessel of increasing sectional area in which it suffers such a reduction in velocity that the downward motion of the starch particles caused by gravity overcomes

the motion of the fluid, which continually flows away through a pipe in the upper part of the vessel, whilst the starch in a highly concentrated condition is continually drawn off from the lowest part of the vessel, and can be further treated; (2) Treatment of the residuum which flows off with fresh water, followed by renewed separation,



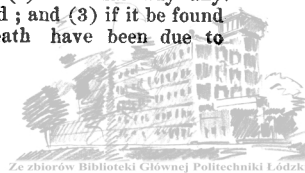
until pure starch solution and residues remain; (3) For carrying out the process described in (1) and (2), a vessel *a* of any desired section with a bottom converging to a point, and with a conical pipe, *C*, suspended in it; a conical deflector; *c*, an outlet, *i*, and an overflow pipe, *t*, for the purpose of reducing the velocity of the fluid flowing through, and thereby effecting the separation of the suspended starch or residues; (4) Also a combined outlet arrangement consisting of a circular body, *f*, a very acutely conical body, *h*, and regulating gear at *i*, which can be controlled and set by means of the hand wheel, *k*, and worm and worm wheel for enabling a continual and uniform outflow of concentrated starch milk from the apparatus; (5) The combination of several of the apparatus described in (3) and (4) either side by side or one above the other, for mixing the separated starch solution with fresh water, and further separating the starch from the liquid.

—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Arsenical Poisoning from the Consumption of Beer and other Articles of Food or Drink. First Report of the Royal Commission. Part I. Report. (See also this Journal, 1901, 644.)

IN February of this year a Royal Commission, consisting of Lord Kelvin, Sir W. Hart Dyke, Dr. T. E. Thorpe, Mr. H. C. O. Bonsor, Drs. Church and Whitelegge, was appointed to ascertain, with respect to England and Wales: (1) The amount of recent exceptional sickness and death attributable to poisoning by arsenic; (2) whether such exceptional sickness and death have been due to arsenic in beer, or in other articles of food or drink, and, if so, (a) to what extent; (b) by what ingredients, or in what manner the arsenic was conveyed; and (c) in what way any such ingredients became arsenicated; and (3) if it be found that exceptional sickness and death have been due to



arsenic in beer, or in other articles of food or drink, by what safeguards the introduction of arsenic therein can be prevented.

The Commission has now examined 51 witnesses, and summarises in this first report, dated 6th July 1901, the conclusions arrived at from the evidence already received under the following heads.

A. The Extent of the Recent exceptional Sickness and Death in England and Wales attributable to Poisoning by Arsenic.—In the county boroughs of Manchester and Salford, which were the most seriously affected by the epidemic of the latter part of 1900, the medical officers of health estimate that at least 3,000 persons suffered by it; steps are being taken to obtain further information.

B. The Causation of the Recent Epidemic of Arsenic Poisoning.—The evidence has been uniformly to the effect that the epidemic was attributable to beer contaminated with arsenic at numerous breweries, and when the arsenicated beer was withdrawn from sale, the epidemic speedily died out. In all cases where sickness has been traced to beer from particular breweries, the latter have been users of brewing sugars supplied by Bostock and Co., Ltd., of Garston, near Liverpool. The quantity of arsenic detected in specimens of the above-mentioned sugars has been relatively large, the percentages of arsenious oxide varying from 0.008 (0.56 grain per lb.) to 0.131 (9.17 grains per lb.). The implicated Bostock sugars owe their contamination to the use, in their manufacture, of sulphuric acid supplied by Nicholson and Sons, Ltd., of Leeds, such acid, as taken from Bostock's works, containing, in one case as much as 2.6 per cent. of arsenious oxide. The transactions between these two firms being about to come before a court of law, the Commissioners have not sought to apportion between the firms, or between individuals, the responsibility for the acts of omission or commission which have entailed sickness or loss of life. Conclusion as to the exact amount of arsenic present in the inculcated beer being rendered difficult by the fact that different analysts have employed different methods of analysis, the Commission proposes "to make further inquiry into the relative value of different quantitative tests for arsenic in beer, as to the most trustworthy methods to recover all the arsenic present in a given sample of beer, and as to the possible existence of arsenic in beer in some combination with organic matter in which it might escape determination by certain of the tests commonly employed." Dr. Tunncliffe has stated that he has detected a relatively considerable quantity of selenium in a sample of Nicholson's acid, in a sample of Bostock's glucose, and in a sample of beer manufactured with Bostock's sugars; no evidence confirmatory of this has been received; on the contrary, the absence of selenium from samples of Bostock's brewing sugars and of Bostock-brewed beer has apparently been proved in a considerable number of instances.

C. Medical and Toxicological Aspects of the Epidemic.—Some of the sufferers by the epidemic were heavy beer drinkers, whilst others were probably quite moderate consumers. Reports of researches received, indicate that in certain conditions the elimination of arsenic from the body may take place much more slowly than has been hitherto generally supposed, and the evidence "suggests caution as necessary in comparing the effect of arsenic in small quantities taken at irregular intervals along with beer and in uncertain relation to food, with the effect of its medicinal administration under medical supervision." With many of the beer drinkers attacked, the symptoms were hardly, if at all, to be distinguished from those of the disease known as "alcoholic peripheral neuritis," which, although customarily associated hitherto with the consumption of large quantities of alcohol by spirit drinkers, had by certain physicians in Manchester and Salford, from their local experience of the disease before the 1900 epidemic, come to be regarded as essentially one which affected beer drinkers. Further facts are hoped for with regard to the suggestion by the evidence that in Manchester and Salford, for some years before 1900, alcoholic peripheral neuritis has been more common than in large towns in other parts, where excessive drinking is apparently no less common than in Manchester.

D. Arsenic in Beer previous to the Epidemic.—Beer other than that brewed with the contaminated Bostock sugars of 1900 has in the past undoubtedly contained, and does now contain, small quantities of arsenic.

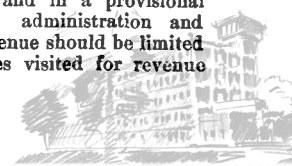
E. Ways in which Arsenic is liable to gain access to Beer.—Arsenic may be introduced into beer by way of (1) brewing sugars, (2) malt, and (3) other ingredients, such as chemical substances used for various purposes. As regards brewing sugars, where the source of risk is mineral acid, the evidence shows that such acid can be commercially obtained free from arsenic. Further, the Commissioners state "we are of opinion that the use in the malting kiln of fuel selected on account of its freedom from arsenic, supplemented by a careful process of screening, brushing, and cleansing of the malt, will insure the protection of the public from danger due to the presence of arsenic in malt," and by the exercise of care in the other ingredients liable to contain arsenic, no risk of contamination need arise. In rare instances very minute amounts of arsenic have been detected in hops, and it is hence desirable that the hop drier also should exercise care in the selection of the fuel he uses.

F. Arsenic-free Beer.—Since the epidemic, brewers and others have adopted precautions to obviate the access of even minute amounts of arsenic to beer. Although some tests for arsenic are very delicate, so that any beer, however carefully prepared, would, if examined in sufficient quantity, be liable to show minute traces of arsenic, "in the absence of fuller knowledge than is at present available as to the possible effect of consumption of mere traces of arsenic, we are not prepared to allow that it would be right to declare any quantity of arsenic, however small, as admissible in beer or in any food, and we think it should be the aim of the manufacturer to exclude arsenic altogether." As regards beer, the Commission recognises the desirability of ultimately defining, in terms of a standard quantity of beer and of a standard test, a proportion of arsenic to be regarded as altogether inadmissible, but considers the institution of further inquiry as essential before recommending the standard test to be imposed.

G. Arsenic in Articles of Food and Drink other than Beer.—In instances where arsenic has been detected in articles of food or drink other than beer, the amounts reported have been minute, and have not seemed to indicate material danger to public health. By inviting the co-operation of public analysts throughout the country and in other ways, steps are being taken to obtain further information as to "whether or not in the case of a given article of food there is risk of access of arsenic, owing to lack of knowledge or of care on the part of the manufacturer, and to determine the extent of risk in the absence of suitable precaution."

H. Administrative Considerations.—The report goes on to consider how far the recurrence of such an epidemic as that of 1900 may be avoided in future by the action of existing authorities: (a) under the Sale of Food and Drugs Acts, by the County or Borough Councils, or by their public analysts; (b) under the Public Health Acts, by town councils or urban and rural district councils, or by their medical officers of health; (c) under the Revenue Acts, which can afford security only as regards articles subject to duty, by officers of the Revenue. The Commissioners think that some improvement in administrative measures is called for, and consider it essential to await further evidence before making final recommendations. As a provisional measure they suggest that the Board of Inland Revenue should possess and exercise powers to specify in detail those ingredients of beer liable to contain arsenic, and "to prescribe for every such ingredient, and for the different materials used in their preparation, an adequate test which should ensure their freedom from arsenic, and to prohibit, under penalty, the use in a brewery of any material which infringes the prescribed test."

In an added memorandum, dated 10th July, 1901, by Dr. Whitelegge, the latter expresses the opinion "that at the present stage of the inquiry, and in a provisional recommendation, the reference of administration and standards to the Board of Inland Revenue should be limited to materials found upon the premises visited for revenue



purposes," namely, breweries and brewing sugar factories. He further states that it remains to be determined whether careful selection of fuel used in malting, or subsection of it to some safeguarding process, would not be a surer basis of precaution than reliance upon certificates of compliance with a standard chemical test, the value of which in practice must depend upon the proper choice of samples taken from a large bulk of fuel.—T. H. P.

Malt-Kilns; Arsenic in — T. Fairley. Analyst, 1901, 26, [304], 177—180.

It is pointed out by the author that when fuel containing arsenic has been used for a long period in a malt kiln the walls and tiles may become so coated with arsenic that a change to a purer fuel will not lead to security from contamination of the malt.

In older unglazed tiles, weighing about 13 lb. and measuring about 1 sq. ft., he has found from 109 to 36 grains of arsenic trioxide, whilst in glazed tiles the amount, after removal of exterior dust, ranged from 25 grains to none, according to the perfection of the glaze. In his opinion, all tiles into which arsenic has penetrated should be removed from the kiln. Although the arsenic on the malt is generally external, he considers that reliance should not be placed on any mechanical brushing or screening to effect its removal.

In the analysis of the tiles from 2 to 5 grms. were treated with 20 to 50 c.c. of 25 per cent. sulphuric acid, the volume of the liquid made up to 50 or 100 c.c., and a measured portion with the powder in suspension, tested by Marsh's method, about 2 inches of the exit-tube of the flask being heated for 30 minutes. The mirrors obtained were then compared with standard arsenic mirrors.

For gravimetric determinations from 10 to 20 grms. of the finely powdered tile were distilled with pure hydrochloric acid containing ferrous chloride, and the arsenic in the distillate precipitated and weighed as sulphide.

In examining the dusts, 5 grms. were treated with 10 to 50 c.c. of strong sulphuric acid and about 20 c.c. of nitric acid (sp. gr. 1.43). After oxidation of the organic matter the nitric acid was boiled off, and the liquid cooled, diluted, boiled to expel oxides of nitrogen, and made up to 50 or 100 c.c. In the gravimetric tests 5 grms. of dust were distilled with hydrochloric acid as in the case of the tiles.

Purification of Sulphuric Acid from Arsenic.—In order to obtain sulphuric acid free from arsenic, the author took advantage of the fact that this acid can be distilled quietly in the presence of alkali bisulphates, whilst arsenic in the form of arsenic acid does not volatilise under these conditions.

A retort was about half filled with the commercially "pure" acid, and 25 to 30 per cent. of sodium or potassium bisulphate, or proportionately less sulphate, introduced. After the addition of a small quantity of potassium permanganate or bichromate, to ensure the complete oxidation of the arsenic, about two-thirds of the sulphuric acid were distilled over.

In the purification of ordinary commercial acid it was found that ammonium sulphate could take the place of other alkali sulphates, and that it also destroyed any oxides of nitrogen that might be present.

Amount of Arsenic Trioxide in Tiles and Dusts.—The percentage results obtained by the author by the Marsh method described above, are shown in the subjoined summary:—

- A. Floor tiles, unglazed: 0.12; 0.064; 0.04.
- B. Floor tiles, glazed and cleaned: 0.03; 0.02; 0.02; 0.01; 0.008; none.
- C. Floor tiles, dust from under surface: 1.0; 0.8; 0.75; 0.7; 0.3; 0.2.
- D. Malting room, dust from walls above floor: 0.06; 0.04; 0.035; 0.03; 0.02.
- E. Chamber or space below malting room, dust from walls, &c. (often chiefly culms): 0.05; 0.035; 0.03; 0.025; 0.012; 0.008; 0.007; 0.04; 0.0025. The dust giving 0.04 per cent. was sifted to separate the culms, and then showed 0.07 per cent.
- F. Malt-screening machines, dust containing much organic matter: 0.01; 0.004; 0.0016.

Several of these determinations were repeated gravimetrically, and gave results in close agreement with the above.—C. A. M.

Yeast; A Conjugating — B. T. P. Barker. Proc. Royal Soc. 1901, 68, [447], 345—348.

COMMERCIAL ginger was placed in sterile saccharose-Mayer solution, and kept at 25° C., until the organisms on the surface attained vigorous growth; the organism, which is the subject of the paper, was separated by means of fractional plate-cultures of beer-wort gelatin; a pure culture was obtained from a single cell in a hanging drop of beer-wort gelatin. Reproduction by budding in the usual yeast-like manner took place best at 25°—30° C., the limits of temperature being 37°—38° C. and 10°—13° C. In hanging drops of distilled water details of the conjugation were observed at 25° C.; the cells originally homogeneous, began to grow vacuolated and develop bright-looking granules; in 12 or more hours a beak-like tubular process began to form, which grew until it came in contact with the beak of a neighbouring cell, when fusion of the protoplasmic contents of the beaks took place, and the protoplasm of the cells began to contract and form small rounded masses which eventually developed into spores. The spores germinate normally; occasionally fusion of spores takes place before germination. It is proposed to place the organism in a new genus, *Zygo-saccharomyces*.—J. W. H.

Yeast; Nitrogenous Nutrition of — P. Thomas. Comptes Rend. 1901, 133, [5], 312—314.

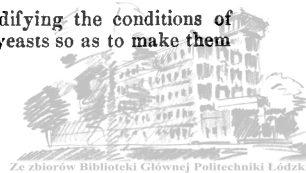
THE author has studied the assimilation of pure nitrogenous materials by yeast, fermentation being restricted, as far as possible, by suitable exposure of the cultures to air in shallow layers. When urea was employed as the nitrogenous nutrient it was found, with concentrations of sugar (glucose) of about 10 per cent., that fermentation was very slow and the assimilation of nitrogen very weak, the yeast produced being poor in nitrogen. Under the same conditions, however, but with 20 per cent of sugar, the results were very much more favourable.

Keeping the other conditions constant and increasing the quantity of urea added, it was found that the quantity of yeast formed, tended towards a maximum, as did also the quantity of nitrogen assimilated and the percentage of nitrogen in the yeast. When this maximum was reached, increasing quantities of urea produced no effect; the value of this maximum appears to depend on the quantity of yeast sown and the nature of the nitrogenous nutrient.

When the urea was replaced by the corresponding ammonium salt—ammonium bicarbonate—the concentration of 20 per cent. of sugar was still the most favourable for good assimilation. On increasing the quantity of ammonium salt, the weight of the yeast produced and, above all, the assimilation of nitrogen were also increased. This increase is not indefinite, but also tends towards a maximum, much higher, however, than in the case of urea. The author concludes that the percentage of nitrogen in the yeast is very variable, changing with the nature of the nitrogenous nutrition. It does not appear, as Hayduck thought, to have any direct relation to the fermentative power of the yeast. In the case of mixtures of nitrogenous nutrients the problem is more complicated; it has been shown for grape must that the yeast makes use preferably of the ammoniacal nitrogen, the organic nitrogen of the must being scarcely attacked. The author cites experiments which appear to show that ammoniacal nitrogen is necessary for the yeast, even when the latter has an abundant supply of another form of nitrogen. A series of cultures containing equal quantities of acetamide, received in addition, increasing quantities of ammonium acetate. When the ammonium salt was either absent or in small proportions the acetamide was barely attacked, but with larger quantities of ammonium salt an assimilation of nitrogen simultaneously took place from both forms of nutrient.—J. F. B.

Bottom Brewery Yeasts; Preparation of —, which Ferment at High Temperatures. G. Jacquemin. Bull. Soc. Chim. 1901, 25, [14], 734—736.

THE author has succeeded in modifying the conditions of existence of bottom fermentation yeasts so as to make them



capable of fermenting at temperatures above 20° C. without in any way interfering with the quality of the beer produced. His method of treatment consists, first, in preparing a pure culture in the usual way and then, in successive cultures, replacing a gradually increasing proportion of the nutrient wort by an equal quantity of wort containing tartaric, citric, or lactic acid, so that, after about 20 operations, the yeast is cultivated in a medium having an acidity equivalent to 7 grms. of tartaric acid per litre. The temperature is also gradually raised along with the acidity, the yeast finally obtained, growing readily at 25° C., or even higher temperatures. The property of fermenting at high temperatures possessed by such yeast is retained even through a number of generations grown in neutral wort, and its other properties are not modified; it remains at the bottom when used to ferment brewery wort prepared in the ordinary way but not cooled below 20°–25°. As long as the beer is kept, during storage and transit, at a temperature of 1 or 2 degrees lower than that of fermentation it will remain clear. It is hence possible for the brewer to modify the temperature of working so as to dispense entirely with the necessity of refrigerators, even in southern climates.

—T. H. P.

Yeast; Oxydase Reactions of —. *The Functions of the Oxydase.* J. Grüss. *Woch. für Brau.* 1901, 18, [26], 335–338.

THE author draws attention to the close parallel between the physiological processes in the fermenting yeast cell and the germinating barley corn. In both cases very similar oxydases, accompanied by masking reducing bodies, are formed, sugar is assimilated and transitory reserve material stored up. Further investigations have shown that top-fermentation yeast containing active oxydase brings about the oxidation of aldehyde to acid. The action of the enzyme on amines was studied with asparagine. The results showed that the asparagine was absorbed or decomposed with production of an acid, which, however, could not be identified. If this acid were aspartic acid it would merely indicate hydrolysis, but if, as is more probable, it were malic acid it would show oxidation. The oxydase reaction of yeast is better preserved after immersion in asparagine solution than in water, which is evidence in favour of its specific activity towards the former. The production of malic acid and its subsequent reduction by the “reducing body” would account for the presence of succinic acid in fermented liquids. Yeast oxydase has an action upon several other bases besides the “tetra base” (Tetramethyl-*p*-phenylenediamine) employed, but the author has found no convenient substitute for this as a test reagent. Trials were made with several other species and races of yeast in addition to the bottom-fermentation beer yeast and the top-fermentation distillery yeasts [Races II. and V.] with which the main experiments were carried out. Some of these other yeasts gave no reaction at all. Certain wild yeasts reacted very strongly with the “Tetra soda paper,” and a red Torula was most remarkably active. The characteristics of various oxydases may be very conveniently studied in the different parts of the tissue of potatoes, testing their reactions after heating for various periods at various temperatures under alcohol. The oxydases are divided into two classes: those which react with guaiacum and also apparently with “tetra-base,” to which belong laccase and the oxydase of the parenchyma of potatoes; and the so-called “amino” oxydases like spermatase and yeast oxydase, which do not react with guaiacum but do with “tetra base” and certain other amines.

—J. F. B.

Beer Yeast in Pressed [German] Yeast; Detection of —, by *Bau's Method.* S. Küttner and C. Ulrich. *Zeits. öfentl. Chem.* 7, 185–186. *Chem. Centr.* 1901, 2, [5], 363.

THE authors examined Bau's method by subjecting a 1 per cent. solution of raffinose to the action of a pure culture top-fermentation yeast and of pressed yeast admixed with known quantities of beer yeast. The results obtained prove the complete reliability of the method.—A. S.

Beer Yeast in Pressed [German] Yeast; Detection of —. H. Herzfeld. *Zeits. öfentl. Chem.* 7, 220–221. *Chem. Centr.* 1901, 2, [5], 363.

THE author agrees with Küttner and Ulrich (see preceding abstract) that pressed yeast of authentic purity would not be indicated as questionable by Bau's method. He also uses the following method, which gives results agreeing well with those obtained by Bau's method. 10 c.c. of a 1 per cent. solution of melitriose are well agitated with 1 gm. of the yeast, and the mixture introduced into an Einhorn's fermentation saccharimeter, in the same manner as in urine analysis. If the saccharimeter be placed in a thermostat at 30° C., then a pressed yeast containing at least 5 per cent. of beer yeast would develop in 24 hours, at least 4–5 c.c. of carbon dioxide; pure pressed yeast, prepared by the old (Vienna) process, never more than 3 c.c.; and yeast prepared by the aëration process, (“Luftheffe”) not more than 4 c.c.

The author cannot entirely agree with Langfurth's condemnation of Bau's method as regards its value for commercial yeasts (this *Journal*, 1901, 843). For yeasts prepared by the old process, the results obtained by Bau's method are irresistible. If, with a “Luftheffe,” complete fermentation has taken place after 24 hours, the yeast may be regarded as suspicious, and should be further investigated. The factory whence the yeast came should be ascertained, and the yeast of this factory examined by Bau's method. If complete fermentation has taken place after 24 hours, it is still not proved that there has not been an admixture of beer yeast, and recourse must be had to other means for absolute proof. If the yeast of the factory has not caused complete fermentation after 24 hours, and it remains unchanged in a sufficient series of generations, then the suspected yeast must be regarded as adulterated.—A. S.

Beer; Nathan's Process for Brewing —, in a Closed Vessel. P. Lindner. *Woch. für Brau.* 1901, 18, [28], 354–356.

THE author describes his experience of Nathan's process and apparatus (Hansen's Apparatus), gained during a visit to a Zürich brewery, where the plant had been, commercially, in operation for some months, and had given entire satisfaction. The principle of the process is to carry on fermentation under aseptic conditions, such as obtain in Hansen's and other pure yeast cultivation apparatus. The fermenting vessel is a cylindrical tun of iron, cast in one piece, of about 100 hectolitres capacity, provided with an airtight cover and a four-bladed propeller or “rouser,” of which the shaft passes through the cover. The whole of the internal surfaces are heavily enamelled with 5 superimposed layers of glaze, the inner one white, the other four of glass, fired at a very high temperature so as to fuse the whole into one mass. Experience has shown that this glaze resists great extremes of temperature without cracking or peeling, for long periods. The vessel, externally, is fitted with a wrought-iron jacket into which steam (up to 3 atmospheres pressure) or cold water can be admitted, for boiling or cooling purposes. In operation the hot wort from the copper is charged into the apparatus, if necessary, again boiled to ensure sterilisation, and cooled down to the pitching temperature. During cooling, filtered (germ-free) air is drawn in near the bottom of the tun; and the rouser kept going in order to facilitate cooling, for which 3–4 hours are requisite. The wort is then pitched with 10–15 litres of yeast drawn into the apparatus by suction, and thoroughly roused. Fermentation is under absolute control as regards temperature, degree of aeration and rousing, &c., and when complete, the beer is carbonated and filtered; or it may be filtered into another similar apparatus and there carbonated, pasteurised, or otherwise treated.—H. T. P.

Beer; Practical Control of the Keeping Qualities of —. C. Bergsten. *Woch. für Brau.* 1901, 18, [30], 384–385.

IN order that the brewer may have a check on the keeping properties of his beer, and deal with fraudulent claims for deterioration, the author advises that samples be taken from each batch systematically, and kept under observation for a



month at the temperature of the room. Two methods are recommended:—According to the first, the sample is taken from the vat as it is racked off and placed in sterilised bottles of 10 c.c. capacity and tightly corked. The bottles are placed on a shelf pierced with holes, each labelled with the day of the month, one sample being taken every day. In this way the beer is preserved in presence of its own gas, which is its natural protecting agent. The length of time during which the beer remains good without formation of cloudiness or sediment, is taken as a measure of its permanence; the deposit formed is then examined with the microscope. The second method is designed more especially for bottled beers; a sample is taken in the bottling cellar each day and kept in white glass bottles of about one-third of a litre capacity, which have merely been washed in the ordinary manner. The bottles are corked and stored on racks in a dark room and kept under observation in the same way. Except in the hot weather, beer ought to keep good for about three weeks under these conditions. The author speaks highly of the great utility of Tornøe's beer-refractometer, which gives very accurate results for the rapid determination of the alcohol and the true extract of beer; he advises that all beer returned as bad by the retailer should be checked, in order to see whether there has been any admixture of water or residues of other beers which might have caused infection.—J. F. B.

Beer or similar Beverage; Process for Manufacture of —, with simultaneous Production of Pressed Yeast. F. Sauer. Ger. Pat. 121,524, 1900; through *Woch. für Brau.* 1901, 18, [27], 346—347.

In Germany the ordinary bottom-fermentation beer yeast is of little value for the manufacture of pressed yeast, and top-fermentation yeast of the distillery type is invariably employed. This invention has for its object the production of Lager beer by fermentation in two stages, first with a distillery yeast for the manufacture of pressed yeast, and finally with a bottom-fermentation beer yeast. The wort for the distillery yeast is prepared with kilned malt only, without green malt, but with the addition of raw grain; its treatment is otherwise the same as in the manufacture of pressed yeast, and it is of course an unboiled and unhopped wort. After fermentation with the distillery yeast, the wort is separated from the yeast and heated in a closed vessel to sterilise and coagulate albuminoids. There is then added a very concentrated hopped beer wort of a density of about 30° Balling. This wort is mashed at 70° C., so as to be especially rich in isomaltose and dextrinous constituents. After mixing with the highly attenuated distillery wort, the proportion of unfermentable carbohydrates should be about the same as in beer wort. The mixture is finally fermented in the Lager vats with ordinary beer yeast at a temperature of 4°—5° C., and is ripened by secondary fermentation in the ordinary way.—J. F. B.

Breweries; Risk of Microbial Infection in Top-Fermentation —. R. Schönfeld. *La Bière*, 9, [6], 85—87. (See also this Journal, 1901, 490.)

Infection of Wort through delay in Pitching.—Unless immediately pitched with yeast, the wort entering the fermenting tun in a cooled state is exposed to infection by wild yeasts and bacteria; hence any delay in pitching is dangerous. Even in the case of beers intended for immediate sale, and when the amount of yeast has to be reduced in order to prevent undue fermentation in the trade casks, about $\frac{1}{10}$ th to $\frac{1}{15}$ th the total quantity requisite for the whole brew should be added as soon as the first portion of the wort is run into the tun. In any event it is better to commence brewing at a later hour than to leave the cooled wort in an unprotected condition.

Infection in the Fermenting Vessels.—If the head of yeast be left too long before removal, it is liable to infection especially where there is a possibility of access of dust from outside the fermenting room. This yeast will then infect the latter batches which it is employed to pitch, and the necessity for changing it will soon become apparent. To guard against this danger, the yeast should be skimmed off as soon as the head begins to subside.

Bacterial Infection in Cask Fermentation.—Where the fermentation is conducted in casks, thorough sterilisation is essential. The washing and steaming by which this is effected are, however, frequently performed in a very perfunctory manner, the water being insufficiently hot and the steaming applied for only a few seconds. The risk is accentuated by the difficulty of inspecting the interior; and should an infected wort be introduced into the cask, even prolonged washing and steaming may prove ineffective especially in the case of old or defective barrels.

Another danger arising during the cleansing method of cask fermentation is the facility afforded for the development of bacteria on, and in, the wood of the cask during the time the beer is throwing up the head and undergoing aeration, which bacteria readily infect the beer subsequently placed in the cask.

Infection of Yeast during Storage.—Where yeast, intended for pitching has to be kept some time before use, it should be stored at as low a temperature, and in as pure water as possible; otherwise the water will extract sufficient soluble matter from the yeast to form a highly suitable nutrient medium for the bacteria with which it is probably already infected, and the yeast will be spoiled.—C. S.

Lactic Acid Bacteria of Distillery Mash, Milk, and Beer. W. Henneberg. *Woch. für Brau.* 1901, 18, [30], 381—384.

The author gives a descriptive summary of the morphological and physiological properties of the principal species of lactic acid bacteria.

Bacillus Delbrücki (Leichmann), named by Lafar, *B. acidificans longissimus*, is the bacillus employed for the acidification of distillery yeast mash. It grows best with a limited quantity of air, and the most favourable temperature is about 45° C. It forms lactic acid from most of the sugars, but not from milk sugar; cane sugar is not inverted. No volatile acid is produced and the acid is not consumed; the maximum acidity produced in mash was 1.4—1.6 per cent. The quantity of acid and the rate of formation varies with the temperature. The author describes a new variety of this species which grows better in presence of air, and produces less acid than the original.

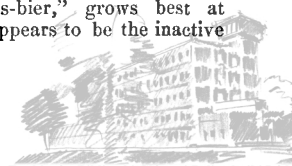
Bacillus lactis acidii (Leichmann), the bacillus of milk, turned sour at 50° C., has longer cells than the preceding species. The development proceeds best at 43°—48° C. at first, and later at 36°—39° C. It produces acid from milk sugar; no volatile acid is formed and the acid is not consumed. The maximum acidity is rather less than that produced by the last species. In this case, also, aeration restricts the acidification; this species is more resistant to lower temperatures.

Pediococcus lactis acidii (Lindner), the "spherical" bacterium of distillery mash, occurs as round cells grouped in chains of 2 or 4. It produces lactic acid from milk sugar but not from cane sugar or maltose. The best temperature for its development is between 34°—40° C., little or no volatile acid is produced. There is really little danger from this organism in the distillery, unless it obtain a large start from the first; it is very frequently predominant on barley, rye, and malt.

Bacterium lactis acidii (Leichmann), the bacterium of milk turned sour at ordinary temperatures, does not grow in beer or hopped wort. It grows best at 35°—38° C.; the acidity produced is always very low, never over 0.3 per cent. The acid formed appears to be consumed to some extent; the acid is inactive lactic acid, no volatile acids being formed.

Saccharobacillus pastorianus (van Laer), the lactic bacillus of "turned" Belgian beer, grows best at 29°—33° C.; it forms lactic acid from most of the sugars, but only a little from starch and milk sugar. The production of acidity is almost as high as with *B. Delbrücki*. In concentrated, unfiltered mash much carbonic acid is evolved, formic and acetic acids and alcohol are also formed. Another variety of this species occurs as shorter, unconnected cells.

Saccharobacillus pastorianus, variety *berolinensis*, the lactic bacillus of Berlin "Weiss-bier," grows best at 21°—24° C.; the acid produced appears to be the inactive



modification, volatile acids and alcohol are also formed. The maximum acidity developed in mash was 0·8–1 per cent. This species occurs on grain and malt but is easily suppressed by other organisms.

Bacillus Lindneri, the lactic bacillus of "turned," hopped Lager beer, grows best at 21°–23° C. Pale Lager beer is often rendered quite cloudy by this bacillus and the flavour is changed in a characteristic manner, dark beers are more resistant. Carbonic acid is evolved; the maximum acidity produced is less than 1 per cent.—J. F. B.

Beer; Atmospheric Infection of —, and its Dangers.

A. Fernbach. *Ann. de la Brasserie*, 4, [8], 169–172.

In view of the greater danger from air-borne micro-organisms in the case of breweries situated in towns, the author recommends the abolition of the open cooler, or at least the removal of the wort therefrom before it has cooled down to a temperature at which bacterial development becomes possible. Air filters should also be subjected to frequent inspection, the yeast changed at short intervals, and a careful examination made of the surrounding air in order to ascertain the most likely quarter for microbial infection to arise. This investigation can either be conducted by the Pasteur method of taking samples of air, or, more conveniently, by exposing plates, coated with sterilised wort-gelatin, for a definite time, e.g., five minutes, in positions affording the greatest probability of infection, and examining the cultures so obtained.—C. S.

Beer; Starchy and Dextrinous Cloudiness in —.

K. Kurz. *La Bière*, 9, [5], 66–69.

It appears certain that dextrinous cloudiness in beer cannot be due to the erythro-dextrin II., which is readily soluble in dilute alcohol, nor to the achroodextrins (these being completely soluble in water), but to erythro-dextrin I., this being present in a state of diffusion (not solution) from which it gradually separates in the form of solid particles, which remain in suspension for a considerable time, thus producing cloudiness.

The formation of this intermediate product of saccharification, or rather its non-conversion into more advanced products, is due to imperfect action of the malt diastase, which may be crippled at various stages of the malting and mashing processes. Thus, imperfect or excessive steeping, insufficient ventilation or handling on the malting floor, may lead to this result. Again, insufficient preliminary drying (withering) of the malt before kilning, leaves the diastase more susceptible to the influence of heat than when drier, and by facilitating the gelatinisation of the starch, produces flinty malt, which is less permeable by the diastase and therefore more likely to lead to starchy haze in the beer. It is therefore necessary to reduce the percentage of moisture in the malt to 5–8 per cent. in the case of pale malt, and 12–18 per cent. in dark malt, before exposing it to a kiln temperature of 50° C. Another essential feature in kilning is sufficient ventilation to remove the moisture as soon as evaporated, and the arrangement of the heating apparatus so as to prevent local overheating whilst the malt is still damp. Occasionally, when the constituents of the grain are imperfectly modified, the condition may be improved by storage, which allows the diastase to recuperate.

To protect the diastase, the mashing temperature should not be allowed to exceed 75° C., the water being added slowly and the stirrer kept in rapid motion; if the malt be defective, the rise in temperature should not exceed $\frac{3}{4}$ ° C. per minute. In the decoction method, the volume of the mash should be restricted and the heat applied slowly, a stoppage of 15–25 minutes being allowed between 70° and 75° C. to ensure conversion, a longer time being granted if there is any reason to fear starchy haze. The proper degree of conversion is indicated by a brown colour reaction with iodine. Imperfect action on the part of the stirring apparatus may cause starchy haze, by leaving the grains insufficiently disintegrated and thereby retarding the action of the diastase, the result being that either the deposited starch is drawn off with the goods into the copper, where it is gelatinised without conversion, or else it is extracted by the sparging liquor and, if the latter be too hot, will also be gelatinised and remain unsaccharified.

A point of interest, especially to small brewers using only a single thermometer, is recorded in the case of a brewery where, despite all precautions with regard to temperature, the beer from good malt was invariably subject to starchy haze, until it was ascertained that the thermometer in use registered about 8° too low.—C. S.

Beer; Filtering —. M. Lamont. *La Bière*, 9, [2], 21–23.

The advantages of filtering—which is mainly confined to low-fermentation beers—are that clarification is insured without alteration in flavour; in fact the flavour is improved owing to the removal of all organisms and matters in suspension.

On the other hand, the operation is attended with the following inconveniences: The beer suffers a certain loss of flavour. Again, filtered beer loses its keeping properties, the larger yeast cells being removed whilst some of the smaller bacteria traverse the pores of the filtering medium and infect the beer, and as the secondary fermentation cannot take place, the bacteria have the field to themselves. Consequently, filtration with a sole view to improving the stability of the beer is a dangerous operation, and its utility is restricted to clarification.—C. S.

Fermenting Vats; Varnished —. Brand. *La Bière*, 9, [2], 18–21.

The author's own experience of the effect of varnished fermenting vats on the fermentation process, is that the attenuation is practically unchanged, but that the consistence of the (low-fermentation) yeast leaves much to be desired, the yeast being too liquid at first, though an improvement is observed as time goes on. The head and "break" of the beer are normal. These results agree with those obtained in a Nuremberg brewery, and it is therefore considered that, in view of the greater facility for cleaning afforded by the use of varnish, the practice is an advisable one.—C. S.

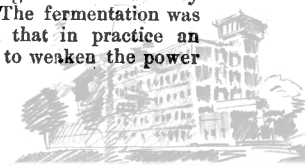
The "Tourne" Ferment; Influence of the Composition of Wine on the —. J. Laborde. *Ann. de la Brasserie*, 4, [7], 149–156.

The influence of alterations in the proportion of alcohol, acidity, tannin, and sugar, on the development of the "tourne" ferment was examined by the author, working with a wine of the following initial composition: alcohol, 11·00°; total acid, 3·55 grms.; volatile acid, 0·95 grm.; tannin, 3·60; sugar, 2·50; potassium bitartrate, 4·89 grms. The wine, which was already infected with the ferment in question, was placed in 200 c.c. flasks, and sterilised by exposure to a temperature of 65° C. for two minutes. After inoculation, the samples were kept at 25°–28° C. for different periods, not exceeding eight months, the amount of volatile acid being determined in each case as affording the best criterion of the activity of the ferment.

Influence of Alcohol.—The results show that the presence of up to 16 per cent. (by vol.) of alcohol—i.e., about the highest limit usually found in red wine—does not prevent the development of the ferment, the presence of the organism being revealed by the microscope; whilst the amount of potassium bitartrate had decreased from 1·89 grms. per litre to 0·86 grm. The determination of the nature of the volatile acids by the Duclaux method, indicated a proportion of 3·01 grms. of acetic acid to 0·30 grm. of propionic acid, a mixture known to be present in all wines infected with the ferment.

Influence of the Acidity.—The increase of volatile acid falls away up to 5·65 grms. of total acidity, at which point it disappears entirely; hence the activity of the ferment appears to be paralysed by about 5 grms. of acid per litre, though this is not altogether the case.

Influence of Acidity during Fermentation.—Experiments made with grape must containing up to 8 grms. of acidity per litre, however, showed that the microbes are capable of still acting in presence of 6 grms., though in this case they cannot do much injury to the wine. The fermentation was unusually slow, and it is considered that in practice an acidity of 5 grms. per litre will suffice to weaken the power



of the organisms, both during the fermentation and the storage of the wine. Below this limit the development of the ferment was inversely proportional to the acidity, and where the acidity had been completely neutralised, mannite sickness supervened.

Influence of Tannin.—The presence of even as much as 7.20–7.75 grms. of tannin per litre does not seem to affect the activity of the ferment; indeed, in one instance where the wine was inoculated with yeasts and bacteria, the total acidity was greater in presence of 7.20 grms. of tannin than of any smaller quantity. This result, however, is due more to the retarding influence of the tannin on the yeast, whereby alcoholic fermentation was arrested, the sugar present then falling a prey to the microbes. It may therefore be concluded that the tannin of wine does not prevent the development of the ferment.

Influence of added Oak Tannin.—An addition of about 1 gm. of gallotannin per litre will paralyse the microbe; but unfortunately the addition of a larger quantity than about $\frac{1}{2}$ a gm. is rendered impossible by the resulting bitterness and astringency imparted to the wine. A white wine already attacked by the microbe may be rendered resistant thereto by an addition of 3–4 grms. of gallotannin per litre, but in this case also the same objection applies.

Influence of Sugar.—To investigate the action of the ferment on the two sugars constituting the invert sugar of wine must, a sample of wine containing 3 grms. of total acidity, and 0.70 gm. of volatile acidity per litre, was treated with increasing quantities of glucose or levulose, up to 10 grms. per litre, and then inoculated with the ferment. The results show the predilection of the microbe for sugar, the amount of total acidity produced in the case of the sugared samples being quite fivefold that formed in the check sample without added sugar. The proportion of volatile to fixed acid decreases as the amount of sugar increases up to about 5 grms. per litre, beyond which limit greater constancy is attained. This is because, when the amount of sugar is small, the microbe also attacks the potassium bitartrate present. Weight for weight, levulose yields a slightly larger quantity of volatile acid than glucose, the converse holding good with regard to fixed acids, whilst in total acidity, the results are nearly equal in both cases. The volatile acidity is mainly due to the presence of acetic acid, with mere traces of a higher acid, probably propionic acid.

The method of taking the volatile acidity as a measure of the activity of the ferment in question is not always exact, since a portion of this acidity may be masked in prolonged experiments by esterification, and it is therefore preferable to determine the total volatile acid by first rendering, say, 10 grms. of the sample decidedly alkaline by double the amount of soda required for neutralising the free acid, then adding 10 c.c. of water, concentrating to half the volume by boiling, adding 0.5 gm. of tartaric acid, and determining the volatile acidity by the Duclaux method. The application of check tests to ascertain whether the extra acidity has resulted from oxidation, showed that the whole of the acidity is due to the action of the ferment, and that the latter continues to be active in certain cases where, according to the determination of the free volatile acids, it would appear to have already ceased. The weakening effect of acidity and gallotannin is analogous to the action of heat during pasteurisation to arrest the development of microbes.

The author concludes that attempts at protecting the wine from the effects of the ferment in question should be made in the fermentation stage; in subsequent stages a little benefit may be derived from the addition of acid and tannin, but the practicable limit is soon reached in both cases on account of the resulting action on the flavour, so that efforts must be mainly directed to multiplying the treatments usually practised for the preservation of the wine, pasteurisation being resorted to in difficult cases.

—C. S.

Wine Must; Concentration of.—J. Dugast. *Ann. de la Brasserie*, 4, [6], 124–127.

THE author concentrated several varieties of wine must at a temperature of 40°–45° C., under a pressure of 30 mm.

mercury, until the volume had decreased to one-fifth, the product being a thick syrup in the case of poor musts, and a jelly in the case of rich musts. The concentrated musts have kept well in partly filled, closed vessels, and, when diluted and fermented, yielded wines comparable with those furnished by the same grapes in the ordinary way. The method has the advantage that the strength of the wine may be varied according to the degree of dilution, and also that the wines clarify more quickly than in the ordinary process, the effect of concentration being apparently to increase the rapidity of deposition of the substances usually remaining in suspension, and to precipitate at once the bodies usually becoming insoluble during fermentation. For this latter reason, the concentrated must from red grapes gives wine lighter in colour than the corresponding wine prepared in the ordinary manner. In the case of red wines, it is necessary to retain the grape skins, the most suitable method being to heat the mass to 65°–70° C. three times in succession and then incorporate it with the corresponding concentrated must; the mixture will keep well for two months at least, and will furnish a satisfactory wine.

As to whether the process would be profitable on a manufacturing scale, the author inclines to the affirmative provided the work be undertaken by large growers or an association of smaller growers, to lay down the necessary plant, especially if other uses could be found for the plant during the off season. In hot countries the adoption of this method would enable the fermentation to be carried on in other places with a more favourable climate for vinification, or during the cooler season of the year.

Concentration by congelation was attempted but found less economical.—C. S.

Wines; The Acidity of.—E. Kayser and G. Barba. *Rev. de Viticulture*, 15. *Ann. de la Brasserie*, 4, [12], 271–278, [13], 293–298.

THE chief point investigated by the authors was the effect of adding tartaric acid to must and wine deficient in acidity. In the case of Petit Bouschet of 1898 vintage, containing 145.71 grms. of sugar per litre, the result of adding acid to the must showed practically no loss from the theoretical standard; but in the wines, a reduction of 18.8 per cent. of acidity was found in the sample receiving 0.1 per cent. of tartaric acid (per 100 of grapes), whilst in the sample receiving 0.5 per cent. of acid, the acidity increased 68.5 per cent. as compared with the check sample, though as compared with the corresponding musts, there was a decrease of 18.8, 43.3, and 19.7 per cent., thus showing the absence of any definite ratio between the acid added and that ultimately found. In the 1899 vintage, the sugar content was 129.79 grms. per litre, and the addition of 0.1, 1.2, and 0.5 per cent. of acid led to a percentage decrease of 19.8, 22.1, and 22.9 per cent. respectively, in the must (after four months storage as before). In the wines, the percentage decrease, compared with the corresponding musts, was 35.8, 18.1, 32.4, and 18.0 per cent., but as compared with the check sample, an increase of 24.6, 17.4, and 100 per cent. respectively. In the 1900 vintage the sugar content was 121.7, and the addition of tartaric acid 0.124, 0.248, and 0.620 per cent.; the musts showed a decrease of 13.22, 5.99, and 6.42 per cent. from the theoretical yield. Compared with the musts, the wines showed the following diminution in total acidity: 30.9, 24.1, and 28.5 per cent. The amount of free tartaric acid found in the wines was

$$\frac{1}{1.4} \quad \frac{1}{2} \quad \frac{1}{1.8}$$

respectively of the quantity added.

Part of the check sample of the last-named wines also received additions of tartaric acid (1, 2, and 5 grms. per litre). The resulting percentage increase of total acidity was 13.6, 29.9, and 69.4 per cent, or more in proportion than in the first series. The increase in the free tartaric acid present amounted to 0.634, 0.927, and 4.294 grms., or 63.4, 46.3, and 86.0 per cent. of the added acid remained uncombined, the rest having gone to form ethers and potassium bitartrate. In this series a diminution in the amount of potassium bitartrate was found in proportion as the percentage of free tartaric acid increased. An addition of citric acid was found to reduce the solubility of this salt

in this wine, though not in another kind of wine examined for this purpose; it is therefore considered probable that the peculiarity in question is due to the composition of the Petit Bouschet wine.—C. S.

Salicylic Acid in Wines; Sensitiveness of the Different Methods of Detecting—. A. J. Ferreira da Silva.

See under XXIII., page 938.

Propyl Glycol; Oxidation of—, by *Mycoderma aceti*. A. Kling.

See under XXIV., page 944.

Wine Vinasses and Wines spoiled by Sickness; Utilisation of—, as *Manure*. F. Garrigou.

See under XV., page 914.

Alcohol and Water; Boiling Point Curve for Mixtures of—, W. A. Noyes and R. R. Warfel.

See under XX., page 928.

PATENTS.

Wines and Spirits; Rapidly Ageing—, and *Apparatus therefor*. F. Ivison, Jerez de la Frontera, Spain. Eng. Pat. 17,472, Oct. 2, 1900.

CLAIMS are made for a process for ageing wines and spirits by exposing them to a confined atmosphere which by reason of its access to deliquescent compounds, such as the hydrates of soda or potash or deliquescent chlorides, exercises a selective action on the evaporation from the liquid; also for apparatus consisting of closed vessels for holding the wine or spirit which is separated from the deliquescent compounds, by means of a porous partition.—T. H. P.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

The Standard for Milk. (See also this Journal, May 1901, 493.)

THE Board of Agriculture was empowered by the Sale of Food and Drugs Act, 1899, to fix a standard for milk, so that when a sample contains less milk-fat and milk-solids than the limit fixed by the standard, the milk is presumed to be not genuine unless the contrary is proved. The regulations which apply to Great Britain were published in the *Gazette* of August 6th, and come into operation on September 1st. The following is the wording of the regulations:—

1. Where a sample of milk (not being milk sold as skimmed, or separated, or condensed milk) contains less than 3 per cent. of milk-fat, it shall be presumed, for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine, by reason of the abstraction therefrom of milk-fat, or the addition thereto of water.

2. Where a sample of milk (not being milk sold as skimmed, or separated, or condensed milk) contains less than 8.5 per cent. of milk-solids other than milk-fat, it shall be presumed, for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine, by reason of the abstraction therefrom of milk-solids other than milk-fat, or the addition thereto of water.

3. Where a sample of skimmed or separated milk (not being condensed milk) contains less than 9 per cent. of milk-solids, it shall be presumed, for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the

contrary is proved, that the milk is not genuine, by reason of the abstraction therefrom of milk-solids other than milk-fat, or the addition thereto of water.

Albuminoids; Precipitation of Some—, by *Chloroform*. F. Krüger. Zeits. Biolog. 41, [N.F. 23], 341–359. Chem. Centr. 1901, 2, [5], 359.

SALKOWSKI has pointed out (this Journal, 1901, 379) that chloroform possesses the property of precipitating albuminoids. The author draws attention to the fact that he, in conjunction with his pupils, Graubner and Meinshäuser, made some experiments on this subject 10 or 11 years ago, some of the results being published at the time. He now gives fuller details of the investigation. A description is given of the preparation of a new albuminoid, *mucosalbumin*, which is precipitated by chloroform. Egg albumin is also precipitated by chloroform; blood serum gives only a slight turbidity. Haemoglobin is quantitatively precipitated by chloroform, not only at 50°–55° C., as stated by Formánek, but also at the ordinary temperature. The albuminoids precipitated by chloroform resemble, as regards solubility, those coagulated by heat.—A. S.

Gelatin; Conversion of—, into a readily-soluble, only slightly adhesive, and non-gelatinising Food Products. Brat. Rummelsburg, Berlin. Ger. Pat. 121,997, June 6, 1900. Zeits. angew. Chem. 1901, 14, [31], 788.

AN aqueous solution of the gelatin is heated for several hours in the presence of small quantities of acid or alkali at temperatures below 100° C. The liquid is then neutralised, freed from the resulting salts, and evaporated to dryness. —C. A. M.

Bread; Yield of—, from *Flour*. Balland. Comptes Rend. 1901, 133, [4], 251–252.

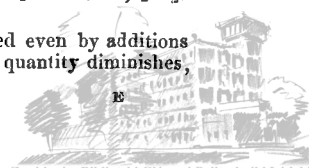
THE author has determined the weight of the loaves made from various weights of dough, prepared with the same flour and the same yeast under identical conditions. The dough contained 45 per cent. of water and the loaves received a normal baking of 30 to 60 mins. according to their size. They were weighed 12 hours after baking and the yield varied with the size and shape of the loaf.

Weight of Dough.	Round Loaves.		Long Loaves.	
	Diameter of Loaf.	Yield per Cent. on the Dough.	Length of Loaf.	Yield per Cent. on the Dough.
Kilos.	Cm.		Cm.	
2.0	28	85	62	81
1.5	24	84	60	79
1.0	22	80	50	75
0.5	17	78	32	73
0.25	12	76	22	70

In most cases the crumb contained the same proportion of water as the original dough, but in the smallest sizes it was less, since the large proportion of very dry crust had absorbed some of the moisture from the crumb. The yield of bread, therefore, is closely dependent on the relative development of the crust as compared with the whole loaf, and this varies with the size and shape. The wheat flour employed was bolted at 70 per cent. and contained 26 per cent. of gluten. With flours bolted at 80 per cent. and those richer in gluten, the dough and the crumb contain normally rather more water (46–47 per cent.). In the case of unbolted flours termed “whole-meal,” the proportion of water often rises to 50 per cent. and more, and the yield of bread increases to the same extent.—J. F. B.

Flesh Preservation; Notes on the Value of Boric Acid, Borax, and Sodium Sulphite for—. L. Lange. Arch. Hyg. 1901, 40, 143. Chem. Zeit. Rep. 1901, 25, [58], 214.

Ox blood cannot be completely sterilised even by additions of 4 per cent. of boric acid; but that quantity diminishes,



sometimes largely, the number of colonies that develop. Many kinds of micro-organisms appear to be encouraged in growth by 0.25 or 0.5 per cent. of boric acid. Between 0.5 and 1 per cent., the colour of the blood is somewhat preserved; above 1 per cent., appearance of a fætid odour is postponed. Less than 1 per cent. of borax is as useless as similar amounts of boric acid; between 2 and 4 per cent. it is superior, but is never fatal to all bacteria. More than 0.5 per cent. of borax preserves the colour; more than 1 per cent. prevents all putrid odour for a month. Even 4 per cent. of sodium sulphite is neither fatal, nor does it preserve the colour or prevent foul smell in the slightest.

Boric acid is not suitable for the treatment of minced meat, for the surface becomes grey-brown in 24 hours; and certain growths appear even when 4 per cent. is employed. It is undecided whether boric acid might be adapted for flesh in larger masses, and whether it might at least preserve the interior of the pieces. Borax is equally useless for chopped meat; even 3 per cent. may permit infection, and 4 per cent. a putrid odour in three days. Sodium sulphite preserves the colour and fresh odour for two days at the most; then putrefaction proceeds more rapidly than in the presence of the other substances.

Boric acid hinders the spontaneous coagulation of milk, and at 2 per cent. entirely prevents it. Coagulation by means of rennet, however, is assisted by less than 2 per cent. of boric acid, and only inhibited by the addition of 4 per cent. Increasing doses of borax show a slightly increasing retardation of rennet coagulation. Sulphite has no effect upon spontaneous coagulation, but hinders that induced by rennet; and in quantities of more than 1 per cent. causes the casein to appear as a fine powdery precipitate instead of the usual curd.—F. H. L.

PATENTS.

Food Extract from Yeast, Dregs, Settling, or like Waste Materials from Breweries, Distilleries, and Wines; Manufacture of a —. L. Aubry, Munich, Germany. Eng. Pat. 13,475, July 26, 1900.

BEER, spirit or wine-yeast, is first freed from bitter principles by sifting or by treating with a 1 per cent. solution of ammonium carbonate and pressing dry. The crumbly material so obtained is mixed with from 5 to 10 per cent. of common salt and allowed to stand some time. The mixture is then diluted with an equal part of hot water, boiled for two hours, and filtered. The extract is evaporated, allowed to settle, and again filtered.

The residue of coagulated albumin and remains of cells are treated with enzymes to obtain a further extract.

—W. P. S.

Meat Extract; Preparation of —. A. Heyen, Lausanne, Switzerland. Eng. Pat. 9091, May 2, 1901.

THE process claimed, consists in adding 20 to 25 per cent. of dextrin, glycogen and inulin to meat extract. These soluble carbohydrates, either together or separately, may be added at any stage of the manufacture of the extract, but preferably during the final evaporation.—W. P. S.

Albumin; Method of Producing an Easily Digestible Peptonised Preparation of —. H. Wilhelm, Prague, Austria. Eng. Pat. 13,906, Aug. 2, 1900.

"KEFIR" is an alcoholic beverage manufactured by the Caucasian hill-tribes by fermenting cow's milk by means of the "Kefir" mushroom or berry. The patentee increases the food value of the same by adding albuminous substances. After the milk has been fermenting for several days, the milk serum separates as a clear liquid and is removed. This serum then receives the addition of fresh milk curd, egg-albumin, etc. On standing, fermentation again takes place, and is aided by the addition of milk-sugar. When complete solution of the curd and albumin has taken place, the lactic acid produced, is neutralised with a dilute solution of soda or preparations of iron, and the liquid is then concentrated below 50° C. to complete dryness.—W. P. S.

Cocoa: Manufacture of —. M. L. H. Lich and A. van de Werk, trading as F. Korff and Co., Amsterdam, Holland. Eng. Pat. 14,519, Aug. 14, 1900.

COCOA powder and sugar are boiled with water, the cocoa-butter is removed by filtration under pressure, and after concentrating by evaporation, the mixture receives the addition of a small quantity of pancreatin, sodium bicarbonate and vanilla. The product is then bottled.

—W. P. S.

Non-alcoholic Aromatic Juices and Drinks from Fruits; Manufacture of —. C. Enoch, Hamburg, Germany. Eng. Pat. 14,788, Aug. 17, 1900.

ACCORDING to this process fruit juices or extracts are diluted with water, about 1 per cent. of tartaric acid is added, and the whole heated under pressure at a temperature of 100° to 120° C. for several hours, until a sample taken out and cooled is perfectly clear when filtered. When the digestion is thus found to be complete, the whole is cooled and filtered.—W. P. S.

Margarine or other Artificial Butter; Manufacture of —. M. Poppe, Bielefeld, Germany. Eng. Pat. 15,649, Sept. 3, 1900.

FOR the purpose of flavouring margarine or other artificial butter, the patentee adds to the same, volatile fatty acids obtained from real butter by saponifying the latter, decomposing the soap with acid and distilling. The distillate from 100 grms. of butter will flavour 100,000 grms. of margarine, so as to confer a flavour (taste and smell), it is said, like that of natural butter.—W. P. S.

Eggs and other Articles of Food; Preservation of —. W. L. Wise, London. From B. Bache-Wiig, Bön, Norway. Eng. Pat. 8937, April 30, 1901.

TWO eggs to be preserved are first heated in "a fluid" (water is referred to), at a temperature of from 60° to 65° C., and then immersed in a solution of waste sulphite lye from the manufacture of wood pulp. Previous to use, the lye is heated to get rid of injurious volatile matters.—W. P. S.

Milk, Cream, and like Substances; Process and Apparatus for Preserving —. H. Marquardt, Cologne, Germany. Eng. Pat. 9215, May 3, 1901.

THE milk or other substance to be preserved, is first pasteurised, then cooled to 4° C. and filled into a strong cask-shaped wooden vessel, having an opening at its end, which can be closed by means of a cover fitted with a tightening-up screw spindle and handle. This cask is completely filled with the milk, and the cover is screwed down. The pressure thus produced prevents the formation of colonies of bacteria.—W. P. S.

Sterilising and Cooling Liquids [Milk, &c.]; Process and Apparatus for —. J. C. Miller, Canton, Ohio, U.S.A. Eng. Pat. 11,944, June 11, 1901.

THE process claimed consists of the following steps: "Suddenly raising the temperature of the liquid uniformly to the required degree, subjecting it to the atmospheric air to liberate therefrom all gases and fumes, and suddenly, and continuously, without pause, reducing its temperature."

—L. A.

Wheaten Flour; Densimeter for the Valuation of —, for Bread Baking. E. Fleurent. See under XXIII., page 941.

(B.)—SANITATION; WATER PURIFICATION.

Natural Waters; Determination of Ammonia, Nitric, and Nitrous Acids in —. L. W. Winkler.

See under XXIII., page 937.

Water; Determination of the Carbonic Acid in —. J. W. Ellms and J. C. Beneker.

See under XXIII., page 937.



PATENTS.

Fuel Blocks or Briquettes; Utilising for the Preparation of —, the Sludge or Scum produced during the Treatment of Sewage by Biological or Bacterial Purifying Processes. C. J. Whittaker. Eng. Pat. 16,104, 1900.

See under II., page 882.

Water; Apparatus for Softening or Purifying —. A. Harris, London. Eng. Pat. 14,417, Aug. 11, 1900.

In order that the relation between the volume of lime water and the volume of water to be softened may remain constant, independently of variations in the rate of flow of the water, the inventor constructs the revolving distributor described in his specification, Eng. Pat. 8354, of 1900, in such a way that the compartment in which is received the portion of the total water destined to form the lime water, can be varied in size, so that it may be adjusted to suit any water. The revolving part of the distributor is also constructed so that the upper chamber into which the water flows is of less diameter than the lower chamber, and the delivery nozzles are arranged in pairs at different levels instead of all at the same level. To maintain the lime water of constant strength, the lime and water are kept vigorously stirred in the following automatic manner. All the water, except the fraction which goes to the lime mixer, is delivered into a vertical funnel-tube which terminates near the bottom of a closed box, and the air in the box is thus forced out through another tube and through the lime and water, stirring them up. When the air has all been expelled from the box, the water rises in a siphon pipe, which discharges the box into the softening tank and draws another charge of air down the funnel-tube. An arrangement is also described for automatically flushing the filter which comprises part of the apparatus.—L. A.

Water; Apparatus for Softening and Purifying —. C. H. Koyl, New York, U.S.A. Eng. Pat. 11,353, June 3, 1901.

In Eng. Pat. 11,112 of 1900 (this Journal, 1900, 843), the inventor has described a water-softening apparatus in which the bottoms of the reaction tank and the settling tank are conical, and are connected by a large pipe. The water in flowing from the former to the latter has to pass through the mud at the bottoms of these tanks, which assists in arresting the fine precipitate. In order to increase this coagulating effect, an independent "agglomerating tank" is now interposed between the reaction tank and the settling tank, through which the water passes, and in which the mass of precipitate is allowed to accumulate indefinitely.—L. A.

(C.)—DISINFECTANTS.

Antifouling Coating for Metal Structures. C. A. Day, London. From the Coleman International Ship and Pile Coppering Co., Boston, U.S.A. Eng. Pat. 10,962, May 28, 1901.

THE submarine metallic structure which has to be protected from the attack of sea water and aquatic growths is first thoroughly cleaned by scraping, and then given a coating of paint. When the paint has dried to a tacky condition, a layer of ground mineral matter such as sand, vegetable substance such as sawdust, or manufactured insulating material such as compressed fibre, is applied to the surface by blowing or otherwise, the object being to provide insulation between the iron structure and the copper of the final coat so as to prevent electrolytic action. After the first coating of paint with its adhering insulation, has become thoroughly dry, a second layer of paint is laid on; and then a layer of powdered copper is applied as before. In many cases it is desirable to use somewhat coarse copper dust at first, following it by an application of finer particles so that all the surface shall be covered with metal. Finally the copper is driven into the second coating of paint by rolling, hammering, or pressure, which serves to knit the fragments together, and to present a smooth

surface to the sea. The composition of the paint is not specially claimed, but an oil varnish of linseed oil, 40 galls; kauri or Zanzibar copal, 100 lb., reduced with turpentine, &c., is applicable.

Eng. Pat. 14,069, 1899, is referred to.—F. H. L.

Antifouling Coating for Metal Structures. C. A. Day, London. From the Coleman International Ship and Pile Coppering Co., Boston, U.S.A. Eng. Pat. 10,963, May 28, 1901.

THIS specification is identical with Eng. Pat. 10,962, 1901 (cf. preceding abstract) except that a more specific claim is made for the employment of a vegetable substance such as lignum vitæ or oak sawdust, shoddy, flax tow, papier maché, &c., as the insulating material between the iron structure and the copper of the composition.—F. H. L.

XIX.—PAPER, PASTEBOARD, Etc.

Cellulose. R. Wolfenstein and G. Bumcke. Ber. 1901, 30, [11], 2415—2417.

IN Tollens' classification of the cellulose group of carbohydrates (see this Journal, 1901, 740) the hydrocelluloses are regarded as hydrated or hydrolysed derivatives, whilst the oxycelluloses are merely oxidised products. It is hardly probable that the natural hydrolysing tendencies of the acid reagents employed should be inhibited by the presence of the oxidising agents. Again, Tollens suggests that the cellulose in these products may be present combined with the oxidised portion in the form of an ester, but this view implies condensation rather than hydrolysis and the molecule of the product must be at least twice as large as that of the original cellulose. If this were so, the oxycelluloses ought to be more resistant to hydrolysing conditions than the celluloses, whereas the reverse is certainly the case. The authors' view is that the cellulose molecule is so condensed that oxidation cannot take place without previous rupture of the molecule by hydrolysis at the position of the "ester-like" oxygen atom. There can be no simple oxidation of the cellulose without hydrolysis, and the term "oxycellulose" is regarded as misleading.

The authors would classify this group of carbohydrates as follows:—

A. Celluloses.

B. Hydrated Celluloses (Hydrocelluloses);

- (a) reducing ("hydracellulose");
- (b) reducing and with carboxylic groups;
- (c) with carboxylic groups but non-reducing (acid-cellulose);
- (d) neither reducing nor with carboxylic groups (lactone configuration).

"Hydracellulose" being produced by so mild a reagent as a 3 per cent. solution of hydrogen peroxide, is regarded as a purely hydrolytic product without the formation of any more highly oxidised groupings.—J. F. B.

Wood Pulp; Specks of Monosulphite in —. Papier-Zeit. 1901, 26, [62], 233.

WHEN viewed by transmitted light, there may occasionally be seen in paper innumerable small dark specks, which appear white, and are not very noticeable by reflected light. These specks are due to the presence of small particles of calcium monosulphite or sulphate in the wood-pulp used for making the paper. If the liquors be not sufficiently rich in sulphurous acid, or if too much of this gas be allowed to escape during the boiling, gypsum or calcium monosulphite may be deposited amongst the fibres, and not be completely removed by the subsequent washing. Small clots of this deposit appear in the form of specks in the finished pulp, and cannot be kept out of the paper.

Such specks may be identified by picking out with the point of a knife, dissolving in hydrochloric acid, and testing with iodine-starch paper for monosulphite, and with barium chloride for gypsum. The prevention lies with the pulp manufacturer, and more attention must be paid to the quantity of sulphurous acid in the boiling liquors. The



presence of these lumps in the pulp is best observed by peeling off thin layers from the sheet, moistening and examining by transmitted light.—J. F. B.

Transfer Paper. Papier-Zeit. 1901, 26, [57], 2156—2157.

TRANSFER-PAPER, used for applying decorative designs to metallic objects (e.g., sewing-machines, coal-boxes, &c., which are finally lacquered) is made from unsized cellulose, with a small proportion of rag, treated with one or more coats of such materials as gum arabic, wheat-starch, glycerin, albumin, hollyhock root, and barytes (blanc fixe). These may be detected by simply tasting, or, in the case of starch and barytes, by easy chemical methods. The cheaper qualities have a single dressing of gum arabic, of wheat-starch, or a mixture of the two. Better qualities are coated twice with starch, and then gum arabic, or barytes followed by starch, starch and then gum, or again, barytes and a mixture of starch and gum. The most expensive paper has three coats, such as starch, albumin, gum; or barytes, starch, gum, of which the last formula probably gives the best results. The barytes, carefully ground to a smooth paste, is first applied. The paper is then sized, hardened with chrome-alum, and treated with spirit, glycerin, or wax in solution. Glycerin makes the paper hygroscopic and liable to stretch, which must be guarded against. The sheet is now calendered to give it a smooth surface, the coats of starch and gum applied in order, and then dried thoroughly. Excess of heat causes it to curl up, whilst the humidity of the workroom requires careful regulation.

The starch used must be of the best quality, but medium varieties of the more expensive gum may serve, if thoroughly filtered.

The finished product is tested in various ways. If a moistened finger pressed on the prepared surface removes much substance the sizing is at fault. (Lifting test.) Gentle rubbing between thumb and finger should also not disturb the surface to any great extent. (Rubbing test.) The best indication is obtained by glueing a piece of moistened paper with best fish-bone glue to the prepared surface, and stripping it when dry. (Glue test.) The final test is that it transfers readily and completely.

—R. L. J.

Paper; Specific Gravity of —. Papier-Zeit. 1901, 26, [57], 2154.

FIBRES of different origin are known to differ in specific gravity, and yield different bulks of paper, but the difference is small, and the question has scarcely any practical importance, so that little is known accurately on the subject.

The specific gravity of the resulting paper, or, in other words, the area of paper derived from a given weight of material, depends far more on details of manufacture, such as whether the fibres have been ground or cut, whether closely or loosely felted, and on the amount of mineral constituents added. From the point of view of paper-testing, other qualities, namely, purity of colour, strength, and homogeneity, &c., are more important than specific gravity.—R. L. J.

Substances resembling Celluloid; Preparation of —. Zühl and Eisemann, Berlin. Ger. Pat. 122,166, Oct. 28, 1900. Through Zeits. angew. Chem. 1901, 14, [31], 788.

CLAIM is made for the use of certain solid ketones to replace camphor either partially or altogether in the manufacture of substances resembling celluloid. The following derivatives of naphthalene have been found specially suitable:—Methylnaphthyl ketone, dinaphthyl ketone, methyloxynaphthyl ketone, and dioxynaphthyl ketone.

—C. A. M.

PATENTS

Paper-making Materials; Washing of —, and *Recovery of Soap and Alkali from the Water used.* A. B. Knopf, née Fuchshuber, Hamburg-Eimsbüttel. Eng. Pat. 13,255, July 23, 1900.

WASTE stuff for the manufacture of paper, such as old printed paper, rags, cordage, &c., is washed in a solution of soap, and the impurities are loosened and removed with

the liquors. The wash liquors, containing the soap, are treated with common salt to throw down the soap; this is separated and treated with a base (caustic lime or baryta) capable of forming an insoluble soap with the fat-acids, carrying down with it the colouring matters and impurities. The caustic lye is then available for soap making; the insoluble soap is separated, decomposed by acid, and the fat-acids are obtained in a pure state by distillation *in vacuo* or with superheated steam.—J. F. B.

Paper; Manufacture of —. F. Billing, Birmingham. Eng. Pat. 249, Jan. 4, 1901.

THIS invention relates to the manufacture of an improved paper, which contains a woven or plaited material in the interior of its substance, with the object of increasing its strength. For this purpose the textile or plaited material is fed off from rolls or other medium on to the travelling pulp as it is carried forward to the ordinary rolls, in such a manner that the pulp and textile material are absolutely incorporated together as the paper is formed.—J. F. B.

Hydrocellulose; Production of —. H. H. Lake, London, from R. Stahmer, Hamburg, Germany. Eng. Pat. 19,039, Oct. 24, 1900.

ACCORDING to this process, hydrocellulose is prepared by treating cellulose with glacial acetic acid containing free chlorine, and heating the mixture with agitation at a temperature of 60°—70° C. The quantity of acid employed is four or five times the weight of the cellulose, it does not require to be fully saturated with chlorine; if the temperature be allowed to exceed the above limits, oxidation will occur with formation of brown products. The nature of the hydrocellulose produced may be varied by varying the duration of the reaction.—J. F. B.

Celluloid; Manufacture of —. F. Zühl, Berlin. Eng. Pat. 17,948, Oct. 9, 1900.

As substitutes for camphor in the manufacture of celluloid, the author claims the use of the esters of the phenols or their substituted derivatives with monovalent or polyvalent aliphatic acids. Phenolic esters of formic, propionic, carbonic, tartaric, citric, and other acids are specified, the acetates having been claimed in a previous specification.

—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

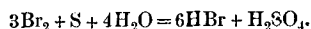
Hydrobromic Acid; Preparation of —. E. M. Marshall. Brit. Pharm. Conference, Dublin. Chem. and Druggist 1901, 59, [1123], 246.

IN the preparation of hydrobromic acid by Fletcher's process—passing sulphuretted hydrogen gas into water containing bromine until the liquid is no longer red, and then distilling off the hydrobromic acid from the sulphuric acid, the other product of the reaction—as much as 20 per cent. of the bromine may be converted into sulphur bromide. The author collected some of the sulphur bromide and purified it by distillation, the fraction distilling between 195° and 200° C. being taken as pure sulphur bromide. It forms a red liquid, sp. gr. 2.4, which is decomposed by the passage of a current of air. With water it forms hydrobromic acid, sulphuric acid, and sulphur. The latter dissolves in the sulphur bromide, rendering the conversion of the last of the bromine into hydrobromic acid rather slow, the water having some difficulty in penetrating the plastic mass; but on standing for a short time, the mixture becomes solid enough to be broken up, and the reaction is then soon completed. Sulphur bromide may be most conveniently prepared by adding 2 parts of sulphur to 5 parts of bromine, a small amount of heat being evolved during the combination.

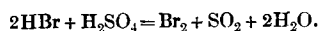
The author recommends the following process for the preparation of hydrobromic acid. A small quantity of hydrobromic acid is first made by means of sulphur bromide and water; the acid liquid is poured off from the sulphur, and bromine is added to it, preferably from a separating



funnel delivering below the surface of the liquid. The liquid is agitated, and a very small amount of sublimed sulphur added, when combination takes place according to the equation—



More bromine is then added, followed again by sulphur, and so on until the liquid has a sp. gr. of about 1.61. This marks the point of equilibrium between the sulphuric and hydrobromic acids, after which there is a tendency for the following reverse reaction to take place:—



The hydrobromic acid is distilled off and purified by redistillation, yielding a pure, colourless acid of 40 per cent. strength. Care should be taken that no sulphur bromide enters the distilling flask, otherwise free sulphur will distil and contaminate the hydrobromic acid with sulphurous and sulphuric acids. It is stated that 1 oz. of sulphur is capable of converting over 17 oz. of bromine into hydrobromic acid.—A. S.

Cerium; Preparation of Pure Oxide of — J. Sterba. *Comptes Rend.* **133**, [4], 221—223.

CERIC oxide, prepared from monazite and purified by Debray's method, showed a strong absorption spectrum. Six treatments by Mosander's method failed to remove this, but by a modification of Wrouboff and Verneuil's method (*Comptes Rend.* **124**, 1230), consisting in the oxidation of cerous nitrate to ceric nitrate by electrolysis, a perfectly pure cerium compound was obtained. The ceric oxide so prepared showed at first a pale yellow or rose colour; but the authors traced this to the formation of a small amount of nitride, and found that when this impurity was removed, the oxide was snow white. The oxide was partially reduced by heating with zinc, or in hydrogen, from CeO_2 to Ce_2O_3 .—J. T. D.

Bismuth Salicylate; New — P. Thibault. *J. Pharm. Chim.* **14**, [1], 22—25. (This Journal, 1901, 603.)

By employing the method for the production of pure bismuth oxide, first described by him (this Journal, 1901, 149), the author has succeeded in preparing bismuth salicylate $\text{Bi}_2\text{O}_3 \cdot 3(\text{C}_7\text{H}_6\text{O}_2)$ in the form of a rose-grey crystalline powder, composed of small transparent prisms, which are unaffected by cold alcohol and by ether; they are slowly decomposed by cold water, more rapidly on warming; stable when dried at 100°C . 15 grms. of crystalline bismuth nitrate are precipitated from nitric acid solution by means of caustic alkali, after boiling; the impure oxide is transformed into the pure crystalline oxide by the method previously described. This is then heated on the water bath with 10 grms. of salicylic acid suspended in about 200 c.c. of water for some time, until no opaque yellow needles of uncombined bismuth oxide are observable on microscopic examination. The hot liquid is then decanted, the precipitate is washed, first with cold alcohol, and finally with ether, collected, and dried at ordinary temperatures or in the drying oven.—J. O. B.

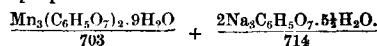
Mercury Salicylate; Solubility of — J. A. Larin. *Chem.-Zeit. Rep.* **1901**, **25**, 193.

FRESHLY prepared mercuric salicylate is almost insoluble in caustic soda or the carbonates of sodium, by which, however, it is very readily decomposed. An addition of common salt dissolves the mercuric oxide formed in solutions of bicarbonates alone. An old preparation was, however, not dissolved by bicarbonate and common salt, and was not decomposed by normal carbonate. Freshly prepared mercuric salicylate dissolves very readily in sodium chloride solution at the ordinary temperature, but is not completely so even in 3—4 parts of boiling water. A 20 per cent. solution in common salt remains undecomposed for some time, but a turbidity appears in about two months. The solubility of a fresh preparation was found to decrease after about 2—3 months. Mercuric salicylate is almost insoluble in water and chloroform; it dissolves in 45 parts of 95 per cent. alcohol and in 100 parts of ether. The

fresh preparation gives a more intense reaction with ferric chloride than the old, and the reaction is not affected by common salt. Preparations of greater age than several months should not be used in therapeutics. Common salt appears to be the best solvent.—A. C. W.

Manganese Citrate; A Soluble —; also some Compounds of Manganese with Iron. F. B. Power. *Brit. Pharm. Conference, Dublin. Chem. and Druggist* **1901**, **59**, [1123], 242—244.

Soluble Manganese Citrate.—To a solution of 100 grms. of crystallised manganous sulphate, one of 140 grms. of crystallised sodium carbonate is added gradually, with constant stirring, the precipitate washed by decantation and the moist mass added to a solution of 62.8 grms. of citric acid, the mixture filtered and the precipitate washed with a little water and dried at a gentle heat. The manganese citrate forms a white crystalline powder, containing 23.17 per cent. of Mn, as compared with 23.3 per cent. of Mn, calculated for $\text{Mn}_3(\text{C}_6\text{H}_5\text{O}_7)_2 \cdot 9\text{H}_2\text{O}$. The soluble citrate is prepared by adding to the moist manganese citrate, prepared as above, 105 grms. of crystallised sodium citrate, and heating the mixture on the water bath until complete solution is effected. The liquid is then diluted sufficiently to filter readily, and at once spread on glass plates, in order that it may dry in the form of scales. The salt when in solution oxidises readily and becomes brown, but in the dry state it is quite permanent when protected from light. It has a composition corresponding very nearly to the following molecular proportions:—



It forms pearly scales, readily soluble in water, and contains from 12—13 per cent. of manganese, according to the care exercised in its preparation, the thickness of the scales, and the temperature at which they are dried. The salt is not precipitated by ammonia, nor at once by potash, although gradually forming with the latter a brown precipitate; it is either not precipitated by the alkali carbonates, or gives but a slight turbidity. It is, however, at once and abundantly precipitated by ammonium sulphhydrate and by potassium ferrocyanide. The author states that the precipitation of manganese by ammonium sulphhydrate in presence of alkali citrates depends upon the greater or less amount of the latter that may be contained in the solution, and this explains the discrepancies which have been previously observed in this respect.

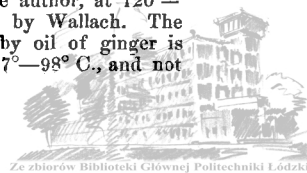
Soluble Iron and Manganese Citrate.—To the moist manganese citrate prepared in the manner described above, a solution of ferric citrate containing an equivalent of 49.3 grms. of iron is added, and the mixture is heated on a water-bath until solution is effected. The liquid is filtered, evaporated to a syrup, spread on glass plates and dried. The salt forms yellowish-brown scales, readily soluble in water. The solution becomes deep red on addition of ammonia; with potassium ferrocyanide it gives a light blue precipitate, changing to deep blue on addition of acid.

Soluble Iron and Manganese Phosphate.—This salt, which, like the U.S.P. preparation, is really a citro-phosphate, is prepared in an analogous manner to the iron and manganese citrate, manganese phosphate produced from manganese sulphate and sodium phosphate being treated with ferric citrate. It forms greenish-yellow scales, slowly soluble in cold, readily in hot water, and like the iron and manganese citrate, usually containing about 14 per cent. of iron and 7 per cent. of manganese.

The advantages claimed for the above preparations are their ready solubility in water, freedom from objectionable taste, and relative uniformity in the amount of their constituent elements.—A. S.

Phellandrene Nitrite. O. Schreiner. *Pharm. Arch.* **4**, 90.

PHELLANDRENE nitrite purified by repeated crystallisation from hot alcohol, melts, according to the author, at 120° — 121°C ., and not at 105°C ., as stated by Wallach. The crystalline nitroso compound yielded by oil of ginger is really a zingiberene nitrite melting at 97° — 98°C ., and not



phellandrene nitrite. The lower boiling fraction of ginger oil gives a crystalline nitroso compound which melts at 105°C .—A. S.

Alcohol and Water; Boiling Point Curve for Mixtures of — W. A. Noyes and R. R. Warfel. J. Amer. Chem. Soc. 1901, 23, [7], 463—468.

THE authors have determined the boiling point curve for aqueous alcohol, and find that 96 per cent. alcohol (97.45 per cent. by volume) has a minimum boiling point, namely, 78.174°C ., whilst that of absolute alcohol and also of 90.7 per cent. alcohol is 78.36°C .—T. H. P.

Cinchona and Quinine in Java. Chem. and Druggist, 1901, 59, [1122], 164—169.

THIS is an account of the cultivation of cinchona and manufacture of quinine in Java, being based upon information supplied by F. L. Seely. The daily output is stated to be about 4,000 oz. of quinine of good quality. The parcels of bark arriving at the factory are each assayed and the various lots are then so mixed that an average amount of alkaloid is represented in each day's work. The bark is ground, sifted, moistened with alkali, and introduced into large digesters containing hot crude petroleum, and provided with agitators. When the alkaloid is extracted, the contents of the digesters are allowed to settle and the petroleum extract decanted off and washed with weak sulphuric acid. The petroleum is returned to the digesters to be used over again. The crude quinine sulphate is crystallised out from the acid solution and purified by recrystallisation in large porcelain-lined pans, the mother liquors being also worked up. The crystals are separated from the mother liquor in centrifugal machines. The quinine sulphate as taken from the centrifugal machines is nearly dry, and the drying is completed according to a method invented by A. R. van Linde, by means of which the current of air and other conditions in the drying chamber can be so regulated that the finished product contains 14—16 per cent. of water of crystallisation. The pure quinine sulphate is finally weighed and packed. The principal characteristic of the building in which the operations of crystallising are carried out is its extreme cleanliness. Cloths are stretched over each row of pans to keep out the dust and light, and the pans are washed with soap and water every time the solutions are changed.

—A. S.

Morphine; Extraction of —, from Solutions. W. A. Puckner. J. Amer. Chem. Soc. 1901, 23, [7], 470—473.

THE author has made a number of experiments to ascertain whether, in the extraction of morphine from its solution by means of a mixture of alcohol (20 vols.) and chloroform (80 vols.), the alkaloid may be liberated by means of ammonia instead of fixed alkali. The results show that while ammonia combines with morphine to form a salt which is not readily taken up by the solvent mixture, it does so to a much smaller extent than caustic soda does. In presence of but a slight excess of ammonia, approximately 98 per cent. of the alkaloid is removed by the first three extractions, while even if 10 times as much ammonia as is necessary be employed, three extractions remove over 90 per cent. of the morphine, and five extractions practically the whole. The effect of the presence of excess of ammonia may be overcome by the addition of sodium bicarbonate.

—T. H. P.

Pseudaconitine and Japaconitine; Pharmacology of — considered in relation to that of Aconitine. J. T. Cash and W. R. Dunstan. Proc. Roy. Soc. 1901, 378—384. (See also this Journal, 1898, 387.)

PSEUDACONITINE is the alkaloid, $\text{C}_{36}\text{H}_{49}\text{NO}_{12}$, contained in *Aconitum ferox*. When heated in the dry state at its melting point (202°C .), it evolves 1 mol. of acetic acid and leaves the alkaloid pyropseudaconitine. When a salt of pseudaconitine is heated in a closed tube with water, as in the case of aconitine, partial hydrolysis occurs, with the loss of 1 mol. of acetic acid and formation of the base veratryl-pseudaconine. Complete hydrolysis, effected by heating veratryl-pseudaconine with alkalis, produces veratric or dimethylprotocatechuic acid and the

base pseudaconine. Thus pseudaconitine contains the veratric radical in place of the benzoic radical of aconitine.

Japaconitine is obtained from Japanese aconite, *A. japonicum* or *A. Fischeri*. Although this alkaloid is regarded by Lübke and by Freund and Beck as identical with aconitine, the authors consider it a distinct alkaloid of the formula $\text{C}_{37}\text{H}_{49}\text{NO}_{11}$. It contains, similarly to aconitine, the acetyl and benzoyl groups, but the central nucleus appears to be different.

The physiological actions of these three alkaloids are almost identical.—A. C. W.

Pyraconitine and Methylbenzaconine; Pharmacology of — considered in relation to their Chemical Constitution. J. T. Cash and W. R. Dunstan. Proc. Roy. Soc. 1901, 384—399.

PYRACONITINE is obtained by heating aconitine at its melting point, when the acetyl group is expelled as acetic acid. Pyraconitine thus differs from benzaconine by 1 mol. of water.

Methylbenzaconine is produced on heating aconitine with methyl alcohol in a sealed tube; by a remarkable reaction, the acetyl group is replaced by the methyl group.

These alkaloids were specially purified, and their hydrobromides employed in aqueous solution. The removal of the acetyl group from aconitine in the formation of pyraconitine almost entirely abolishes the great toxicity of aconitine; the characteristic features of aconitine poisoning are not produced by pyraconitine. Benzaconine and pyraconitine produce very similar physiological effects, the latter being the more active (about six times more toxic).

Aconitine is roughly 80—100 times more toxic than methylbenzaconine; the latter induces an effect resembling that produced by curare; it is about three times as toxic than benzaconine.—A. C. W.

Atropine Sulphate; Tests for —. T. Gadamer. Archiv der Pharm. 239, [5], 336.

THE German Pharmacopœia IV. requires atropine sulphate for medicinal use to be prepared from the base melting at 115.5°C ., and that it must itself melt at 180°C . These melting points exclude, as far as possible, the presence of hyoscyamine. That these requirements do not accord with the experience of E. Merck in the extraction of the alkaloid, is evident from the facts communicated by him to E. Schmidt, that absolutely inactive atropine prepared for research work had the m.p. 112 — 113°C . His commercial atropine, on his own showing, is never quite inactive optically, and, therefore, not quite free from hyoscyamine.

According to Merck the double gold salt prepared from the pure base melts at 134° — 136°C . The corresponding sulphate obtained by crystallisation from suitable solvents, and not by precipitation, melts when heated gradually, at 185° to 187° , but if the heat be very slowly increased, the m.p. is lowered to 182° — 183° , and with quickly rising temperature is increased to 188° — 189°C . The author has prepared optically inactive atropine, and finds that the white needles melt at 115° — 116°C ., but when powdered and dried, the m.p. falls to 112° — 113°C . The sulphate of this base was obtained by crystallisation from a mixture of absolute alcohol and acetone. This pure salt, when dry, melted in the Roth apparatus at 183° — 184.5°C ., but in a capillary tube suspended in H_2SO_4 , as prescribed for taking melting points in the official work, it melted at 156° — 160°C . Dried afresh over H_2SO_4 and heated as prescribed in the pharmacopœia, it melted at 187° — 188° , whereas the salt tested immediately afterwards in a Roth's apparatus melted at 160° — 161°C . It is evident that the melting point is lowered by the presence of the merest trace of moisture; for this reason the determination under such condition, cannot be recommended as a standard test for true alkaloid.

The use of the gold double salt for the melting point test is not open to objection since hyoscyamine must be present in fairly large quantity to raise the melting point in any marked degree; but fractional precipitation with gold chloride is not a test to be recommended for pharmaceutical employment. The author advocates, if it be essential that



atropine should be free from hyoscyamine, that the optical test should be relied on, and the melting point methods abandoned. He considers it to be an open question if this chemically pure atropine is requisite for medicinal use.

—J. O. B.

Alkaloid; New —, from Elder Bark. F. Malméjac. J. Pharm. Chim. 14, [1], 17—19.

THE bark was extracted by means of alcohol acidulated with tartaric acid, by digestion at 75° C. After evaporating the solvent, the acid residual extract was washed with ether, made alkaline with sodium bicarbonate and again extracted with the same solvent. The second ethereal extract, on evaporation, gave a crop of small, long, very hygroscopic crystals, which rapidly deliquesced on exposure to the air to a colourless oily liquid, which, however, recrystallised on being placed in a desiccator over H₂SO₄. The aqueous solutions of this body gave marked precipitates with all the general reagents for alkaloids. It is, therefore, considered to be one of them, and has been named *sambucine*.—J. O. B.

Phenacylphenacetin. C. Goldschmidt. Chem.-Zeit. 1901, 25, [59], 628.

THE formula is (C₆H₅O)C₆H₄N(COCH₃)(CH₂COC₆H₅) forms a non-poisonous, hyponotic antipyretic. It is prepared in a similar manner to methylphenacetin. A solution of phenacetin in xylene is heated to boiling, sodium added, and the separated phenacetin-sodium treated with an equivalent quantity of bromacetophenone. After filtering from sodium bromide, the liquid is evaporated, and the residue, crude phenacylphenacetin, crystallised from alcohol. The compound is soluble in alcohol and glycerin, insoluble in water, and melts at 87° C.

The author has also prepared the guaiacol sulphonic acid salt of triphenylguanidine. Pure barium guaiacol sulphonate is treated hot with the necessary quantity of pure triphenylguanidine sulphate. The compound forms thin plates melting at 50° C., soluble in ether and alcohol, and somewhat poisonous. It acts as a local anæsthetic.—A. S.

Hydrastin (Resinoid). L. Ough. Chem. and Druggist, 1901, 59, [1122], 152.

THE rhizome of *Hydrastis canadensis* Linn. contains berberine and hydrastine in combination with an unknown "vegetable acid," a fluorescent substance (probably identical with æsculin), a green fixed oil of disagreeable smell and taste, a small quantity of volatile oil to which the odour of the root is due, sugar, albumin, starch, and about 10 per cent. of mineral matter. For the preparation of the resinoid hydrastin, the coarsely powdered rhizome is thoroughly damped with alcohol (sp. gr. 0.828), the mixture allowed to macerate in a percolator for about 48 hours, and then the root slowly extracted with more alcohol till completely exhausted; about 2 galls. of alcohol are required for each pound of root. The greater part of the alcohol is removed from the extract by distillation, and the residue is evaporated to dryness at a low temperature. The resinoid thus obtained (yield, 11 per cent.) is of a darkish-brown colour, and can be readily reduced to a fine powder in a dry, warm atmosphere.—A. S.

Hamamelins of Commerce. T. S. Barrie. Pharm. J. 1901, 67, 231—233.

HAMAMELIN is the name given to preparations obtained from *Hamamelis virginiana*, the witch-hazel. The commercial hamamelins are dry extracts of (1) the leaves and (2) the bark. The extracts of group (1) are green in colour, they appear (judging from the analytical data) to be made with strong alcohol, the alcoholic solution being mixed with powdered leaves and the whole evaporated to dryness. The extracts of group (2) are brown in colour, they seem to be made from the bark by means of dilute alcohol. Owing to the presence of hygroscopic substances, they do not keep well; in all the samples examined, mineral matter had been added to overcome the hygroscopicity. They contain more tannin than the green extracts. The organic matter of one brown sample was completely soluble in absolute alcohol and almost completely soluble in boiling

water; on exposure to air it remained pulverulent. These properties, taken in conjunction with the high percentage (26.0) of tannic acid, indicate a specially treated extract of witch-hazel, or that the extract was not prepared from that bark at all. Barks normally contain more tannic acid than leaves, thus the two groups of extracts should not be compared on the basis of their acid-contents alone.—A. C. W.

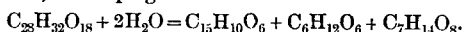
Lotus arabicus; Nature and Origin of the Poison of —. W. R. Dunstan and T. A. Henry. Proc. Roy. Soc. 1901, 374—378.

A CONTINUATION of the work described in this Journal, 1900, 1140.

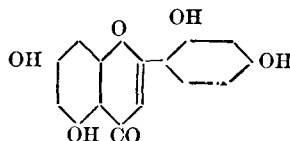
Lotusin can be separated from an alcoholic extract of the plant by a tedious process, which gives the small yield of 0.025 per cent. It is a yellow crystalline glucoside, more soluble in alcohol than in water. On heating it gradually decomposes without exhibiting a definite melting point. On hydrolysis it is decomposed into dextrose, hydrocyanic acid, and *lotoflavin*—



The hydrolysis is readily effected by hydrochloric acid, slowly by sulphuric acid. When heated with aqueous alkalis, ammonia and *lotusinic acid*, C₂₈H₃₂O₁₈ are formed. *Lotusinic acid* is a monobasic acid which yields yellow crystalline salts; it is readily hydrolysed into *lotoflavin*, dextrose, and heptogluconic acid—



Lotoflavin, C₁₅H₁₀O₆, is a yellow crystalline colouring matter, isomeric with luteolin and fisetin, readily soluble in alcohol, hot glacial acetic acid, and aqueous alkalis. Morin appears to be hydroxylotoflavin. *Lotoflavin* forms a tetra-acetyl derivative and two mutually convertible trimethyl ethers, which yield the same acetyltrimethyl-lotoflavin. Fused caustic potash converts *lotoflavin* into phloroglucinol and β-resoreylic acid; its formula is thus probably—



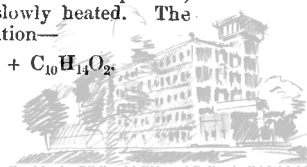
The o-position of one of the hydroxyl groups with reference to a carbonyl group explains the production of only a trimethyl ether. *Lotusin* is assigned the formula of a *lotoflavin ether* of maltose cyanhydrin. Mandelic nitrile, levulose cyanhydrin, and penta-acetyl gluconitrile, in which the cyanogen group occupies a similar position to that assumed in *lotusin*, are readily hydrolysed by dilute hydrochloric acid into hydrocyanic acid and the corresponding aldehyde or ketons.

Mature plants bearing seed-pods gave 0.345 per cent. of hydrocyanic acid, calculated on the air-dried material. Younger plants gave less, and old plants, from which the seeds had fallen, hardly any. *Lotusin* disappears during the ripening of the seeds.

Lotase is much more readily injured than emulsin; its hydrolytic power is rapidly destroyed by heat, and gradually by contact with alcohol and glycerin. *Lotase* acts very feebly on amygdalin, and emulsin attacks *lotusin* very slowly. The plant also contains an amylolytic and a proteolytic enzyme.—A. C. W.

Carvone; Auto-oxidation of —. C. Harries. Ber. 1901, 34, [10], 2105—2106. (See also this Journal, 1900, 682, 697.)

WHEN carvone is shaken with barium hydrate, water, and a little methyl alcohol, barium peroxide separates and the ketone goes into solution. The latter is completely oxidised if the operation be performed in an atmosphere of oxygen. After filtering, extracting the filtrate with ether, evaporating *in vacuo* and acidifying, a diketone separates, which melts at 185°—187° C. when slowly heated. The reaction proceeds according to the equation—



The diketone is identical with the final product of the oxidation of oxaminocarvoxime (Ber. 31, 1812), which must possess the constitution of 1-methyl-4-propenyl dihydroresorcinol. Small quantities of a substance with a pleasant odour of strawberries are also formed in the auto-oxidation of carvone.—A. C. W.

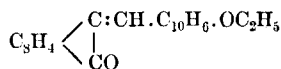
Thujylamine into Thujene; Transformation of —
L. Tschugaeff. Ber. 1901, 34, [11], 2276—2281.

THUJENE was originally obtained from thujone (this Journal, 1901, 65). The author has now endeavoured to convert thujylamine into thujene; dry distillation of the hydrochloride of the base gives, however, isothujene.

Thujone was carefully fractionated, and then converted into the oxime, which on reduction with sodium in absolute alcohol gives the amine. Pure thujylamine, regenerated from the hydrochloride and dried over barium oxide and sodium, is a colourless liquid, boiling at 195° C., with an odour similar to coniine, and readily absorbing carbon dioxide from the air; sp. gr. at 20° C., compared with water at 4° C. = 0.8712, $[\alpha]_D = +101.00^\circ$. The base was completely methylated in one operation by means of aqueous potash and methyl iodide. The resulting crystalline mass of trimethylthujylammonium iodide, after standing overnight, was filtered and crystallised from hot water. The free trimethylthujylammonium hydroxide was obtained by digestion with silver oxide and water, as an alkaline liquid, which was evaporated to a syrup on the water-bath, and then *in vacuo* over phosphorus pentoxide. The resulting crystalline mass, chiefly composed of carbonate of the ammonium base, was subjected to dry distillation. The distillate was washed with dilute hydrochloric acid, then with water, dried over calcium chloride, and distilled over sodium. The product is identical with thujene and quite distinct from Wallach and Semmler's isothujene; thujene from thujylamine has, however, a greater laevo-rotation than thujene obtained by the xanthogenic acid method. If the dry distillation of thujylxanthogenic methyl ester be interrupted when the temperature in the flask has reached 190° C., and the fraction distilling at 190°—215° C. collected separately, this fraction is found to possess all the properties of ordinary thujene, except that it is dextro-rotatory; for 100 mm. $[\alpha]_D = +21.83$. The dry distillation of the xanthogenic ester thus appears to produce two thujenes.—A. C. W.

Camphor; Compound of — with β -oxy- α -Naphthoic Aldehyde. A. Helbronner. Comptes Rend. 133, [1], 43—45.

By reacting with the sodium-derivative of camphor on the ethyl ether of the oxynaphthoic aldehyde, brilliant white crystals were obtained, which melt at 100° C. and dissolve readily in most organic solvents. The formula of the substance is—



and the author calls it "ethoxynaphthal camphor." It yields by reduction the corresponding hydrogenated compound, which melts at 112° C., and has a specific rotation lower than that of the naphthal camphor from which it was prepared. The analogous methoxy-compounds were also prepared.—J. T. D.

Jasmine Flowers; Essential Oil of —. E. Erdmann. Ber. 1901, 34, [11], 2281—2283. (See also this Journal, 1899, 296, 396, 513, 1153; 1900, 770; 1901, 275.)

THE author made the first announcement of the discovery of methyl anthranilate in jasmine oil. (See Verhandl. Ges. d. Naturforscher-vers. in München, 1899, 1, 139; Ger. Pat. 122,290 of May 28, 1898). This patent also contains the first announcement of the presence of benzyl alcohol, benzyl acetate, and linalool in jasmine oil. These results were obtained by working with a preparation made in Grasse by extraction of the flowers with a volatile solvent, and of guaranteed purity. Hesse's statement that methyl anthra-

nilate is formed during *enfleurage* is, accordingly, not confirmed. Also Hesse's conclusion, that jasmine blossoms develop nine times as much essential oil during the 24 hours' *enfleurage* as they contained when plucked, does not appear to be warranted. Animal and vegetable fats are good solvents for perfumes, but the petroleum spirit used to extract the blossoms in Southern France has little solvent power, e.g., it does not mix in all proportions with benzyl alcohol. The blossoms contain sap and the perfumes are enclosed in cells, thus the extraction by petroleum spirit cannot well be exhaustive. Loss of perfume also occurs in driving off the solvent. Comparative experiments with similar material by *enfleurage* and by maceration with the same fat would be required to decide the question. Although Charabot has shown that simple changes occur in the essential oils of flowers during blooming—loss of water with formation of esters and terpenes, oxidations of alcohols to aldehydes and ketones, formation of indole pyrrol from a derivative—there is nothing yet to justify the statement that a large formation of perfume from indifferent materials takes place within such a brief period. (Compare also Walbaum, this Journal, 1900, 1036, and von Soden and Rojahn, 1901, 65.) —A. C. W.

Oil of Rue; Algerian —. H. v. Soden and K. Henle. Pharm. Zeit. 46, 277. Pharm. J. 1901, 67, [1619], 1.

THE oil distilled from Algerian rue differs considerably in character and constituents from the ordinary oil of rue described by Thoms (this Journal, 1901, 606). The Algerian oil consists principally of normal methylheptyl-ketone, together with small quantities of methylnonyl-ketone; it also contains the ester of an unknown alcohol. It has the sp. gr. 0.842 at 15° C.; optical rotation, -5° ; and it does not solidify at -15° C.—A. S.

Monarda Oil. J. W. Brandel and E. Kremers. Pharm. Review, 19, 241.

THE authors have identified a new constituent, hydrothymoquinone, in the phenolic portion of the oil of *Monarda fistulosa*. The hydrothymoquinone was recognised by means of its melting point, and by giving with thymoquinone the violet-blue thymoquinhydrone. It is suggested that other coloured oils which contain phenols may owe their tints to the interaction of two similar bodies producing coloured quinhydrone—A. S.

Citronella Oil. E. J. Parry. Chem. and Druggist, 1901, 59, [1122], 142.

WHEN subjected to the so-called "Schimmel's test," pure citronella oils of commerce give somewhat different results, some being completely soluble in 80 per cent. alcohol, whilst others, although quite soluble in 3 or 4 volumes of the alcohol, become slightly turbid when 10 volumes of the solvent have been added. The author finds that in general, the oils of low sp. gr. give a perfectly clear solution, whilst those of high sp. gr. often give the slight turbidity referred to. In cases where doubt can arise as to the limit this turbidity may assume, the author recommends the use of alcohol of slightly higher strength. With pure citronella oils, the turbidity almost, if not quite, disappears when alcohol of 81—83 per cent. strength is used, whilst if even very small quantities of petroleum are present, there is practically no change if the strength of the alcohol be increased to 85 per cent. The lower solubility in alcohol of the oils of high sp. gr. is probably due to the greater proportion of sesqui-terpene in such oils.—A. S.

Mercury and Bismuth Salts; Determination of —. T. Tyrer and C. T. Tyrer.

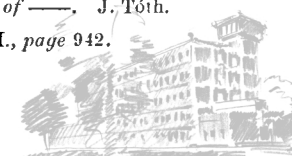
See under XXIII., page 937.

Tartar; Commercial Determination of —. H. Quantin.

See under XXIII., page 941.

Nicotine in Tobacco and in Aqueous Extracts of Tobacco Leaves; Determination of —. J. Tóth.

See under XXIII., page 942.



Alkaloids; Action of the Vegetable —, on certain Indicators. A. Astruc.

See under XXIII., page 941.

Santonin; The B.P. Test for —. E. M. Marshall.

See under XXIII., page 938.

Hydrastine and its Determination, &c. T. Mabon.

See under XXIII., page 942.

Morphine; The Lloyd Reaction for —. J. L. Mayer.

See under XXIII., page 938.

Spanish for Common Broom; Dangerous Substitution of —. E. Perrot.

See under XXIV., page 944.

Phenol when mixed with Resinous Substances; Determination of —. J. C. Thresh.

See under XXIII., page 939.

Menthol; Action of Benzaldehyde on the Sodium Compound of —; and New Methods of preparing Benzylidenementhone. C. Martine.

See under XXIV., page 944.

Peppermint Oil; Co'our Reaction of —. P. Welmans.

See under XXIII., page 938.

PATENTS.

Air; Improved Process for Treating —, for obtaining a Gas or a Liquid rich in Oxygen therefrom. W. P. Thompson, London. From E. A. Le Sueur, Ottawa, Canada. Eng. Pat. 10,722, June 12, 1900.

ACCORDING to the third claim, this process of treating air in order to produce from it a fluid rich in oxygen, "consists in chilling it at a suitable pressure until a partial liquefaction of said air occurs, whereby a liquid richer in oxygen than is air, is precipitated; in transferring said liquid to a chamber, in which it exists under a lower pressure than that under which it was precipitated, and in contact with one side of a pipe to the other side of which is applied the temperature of the incoming air in process of partial liquefaction, whereby the oxygen strength of the liquid is further raised, and in utilising the chilling effects residing in the said liquid, the gaseous mixture off from it, and the unliquefied gaseous residue from the original liquefying operation to chill fresh incoming air on its way to being split up."—E. S.

Oxygen Gas; Preparation of —. G. F. Jaubert, Paris. Eng. Pat. 11,466, June 4, 1901.

A MIXTURE of 200 parts of chloride of lime with 78 parts of sodium dioxide is strongly compressed into pastilles or cartridges in the manner described in Eng. Pat. 17,461, 1900 (this Journal, 1901, 43). When the compressed material is placed in water, oxygen is evolved, and may be applied generally, and in particular, to oxidise the impurities in acetylene. The claims include the use of alkali or alkaline earth peroxides mixed with alkali or alkaline earth hypochlorites.—E. S.

Diacyldiamidouracil; Manufacture of —. G. W. Johnson, London. From C. F. Boehringer und Söhne, Waldhof, Mannheim, Germany. Eng. Pat. 12,985, July 25, 1901.

THE process for the manufacture of 4·5-diacetyl diamidouracil is claimed, which consists in heating uric acid with acetic anhydride (with or without a condensing agent—

pyridine, quinoline, or dimethylaniline) until an ammoniacal silver solution is not reduced on heating for a short time with the product of the reaction. The diacetyl compound is then separated, by boiling with water, from the slightly soluble 8-methylxanthine (compare Eng. Pat. 526, 1901, this Journal, 1901, 833). A triacetyl compound formed at the same time is decomposed by boiling with water.

—A. C. W.

Lactic Acid; Manufacture of Purified —, from crude Solutions. C. N. Waite, Cranford, New Jersey, U.S.A. Eng. Pat. 13,403, July 1, 1901.

THE process claimed for the production of purified lactic acid consists in repeatedly washing the crude acid with amyl alcohol and distilling off the solvent from the alcoholic solution of lactic acid, or washing this solution with water and concentrating the aqueous solution.—A. C. W.

XXI.—PHOTOGRAPHY.

Photographic Image; Variation of Gradation of a Developed — when impressed by Monochromatic Light of different Wave-lengths. Sir W. de W. Abney. Proc. Roy. Soc. 1901, 68, [447], 300—321.

SOME two years ago the author indicated that in a given photographic plate there was a variation in gradation according to the colour of the light with which the exposure was made; he has now carried out a series of experiments, under different conditions, which show (at least with pure silver salts in gelatin) that the least steep gradation is produced by that monochromatic light to which the plate is most sensitive, and that the gradation becomes steeper the further in either direction along the spectrum the light for exposure is taken.

If then, a photograph of a graduated scale of greys be taken through red, green, and blue glasses, the gradation or contrasts of greys in the negative would be most pronounced in the case of the red image, and would produce a difficulty in three colour photographic printing, which is certainly the case.—J. W. H.

Hydrocyanic Acid; Action of —, upon finely divided Silver. A. Haddon. Photography, 1901, 13, 396; Chem.-Zeit. Rep. 1901, 25, [58], 216.

HENDERSON has shown that "green-fog" can be removed, or an overdense negative "reduced" by placing it in the wet state, film downwards, over a bath of potassium cyanide solution for several hours. The action is due to the gradual decomposition of the cyanide by the carbon dioxide of the atmosphere, which liberates hydrocyanic acid gas; the latter being very soluble in water, dissolves on the damp film, and attacks the superfluous metal in the gelatin. Henderson stated that the plate must not fit the dish closely, as free admission of air was necessary. The author finds that presence of air is not required to effect solution of the silver; that the silver remains in the film; that the substance produced by the reaction between the hydrocyanic acid and the silver can be removed from the gelatin even if it has been allowed to dry; that if it dries on glass, the substance is decomposed; and that it is probably the same substance as is formed when hydrocyanic acid acts directly upon metallic silver.—F. H. L.

Chromium Family; Compounds of the —; Sensitive to Light. T. T. Baker. Brit. Jour. Phot. 1900, 48, [2148], 428.

POTASSIUM di-tungstate, di-molybdate, and di-uranate may be used in place of potassium bichromate for sensitising gelatin. A molybdenum printing-paper may be obtained by soaking gelatin in a diluted solution of molybdenum in aqua regia and applying the mixture to paper; weak acetic acid may be used as a fixing agent. Tellurium chloride is very sensitive to light and gives an invisible image capable of being developed by potassium ferricyanide; it is also a useful toning agent.—J. W. H.



Toning Baths for Gelatin-Chloride Prints. M. Wilson. Brit. Jour. Phot. 1901, 48, [2149], 442.

THE author gives an account of further tests of toning baths. Potassium molybdate in the usual chloride of gold bath was not a success on account of the objectionable colour of the resulting prints. Sodium malate gave very good results, the toning action was rapid and there was no tendency to produce double tones. A combined sodium malate and sulphocyanide bath was found to be very liable to stain; sodium benzoate (60 grains), sodium phosphate (75 grains), ammonium sulphocyanide (38 grains), chloride of gold (1 grain), and water (15 fluid ounces), formed the best bath tested; each constituent seemed to bring about its own change independently; the gradation was perfect and the colour effects pleasing. Sodium benzoate and phosphate together also gave excellent results. Red-brown tones were given by a combined bath of sodium benzoate and tungstate, but patches of different colour were produced. Sodium tungstate and phosphate gave good results, without any tendency to double tones or stain. Sodium oxalate was a failure as a toning agent when used alone, but with the addition of sodium phosphate very satisfactory prints were obtained.—J. W. H.

PATENTS.

Photographic Chemicals or other Materials; Receptacles for holding Small Quantities of —. J. J. Griffin and Sons, Ltd., and F. H. Ibbetson, London. Eng. Pat. 14,047, Aug. 4, 1900.

CLAIMS are made for modifications in the construction of the glass tubes described in Eng. Pat. 12,337 of 1899. The tube and transverse dividing partition may be made of transparent or opaque xylonite, celluloid, viscose, porcelain, stoneware, or other non-vitreous chemically inert material impervious to air; material not naturally impervious may be coated or impregnated with a suitable air-excluding substance. The tube may be composed of a narrow and a wide tube joined co-axially end to end, or of two parallel tubes of equal diameter joined together to form a double tube. A longitudinal partition may be used, forming two semi-cylindrical compartments, or three or more compartments may be obtained by joining together three or more tubes parallel to each other, or by providing a cylindrical tube with two or more longitudinal partitions. The different compartments may be distinguished by giving different colours to the material. The ends of the tube may be closed with caps secured by means of a suitable adhesive or binding substance; if the tube and caps are of celluloid or xylonite, it is preferred to secure the cap by means of acetone or other suitable solvent.—T. H. P.

Photographic Plates, Films, and Papers; Process of Drying —. A. Edwards and E. M. Nelson, Warwick. Eng. Pat. 14,625, Aug. 15, 1900.

CLAIM is made for a process of drying photographic plates, films, and paper, consisting in heating the air in the drying chamber by means of hot water pipes or other heaters and in removing the moisture from the heated air as a deposit of frost or snow on pipes into which ammonia is allowed to expand, or on pipes filled with cold brine and glycerin, or on any other suitable containers holding a refrigerating medium.—

T. H. P.

XXII.—EXPLOSIVES, MATCHES, Etc.

Explosives; New Method of preparing —. Bonnet. Rev. Prod. Chim. 4, [6], 83—84.

THE "nitro derivatives and nitro-picrate derivatives" being soluble in free fatty acids, the author has succeeded in preparing in this way explosives of higher fusing point than those from oils and fats containing the fatty acids in combination with glycerin. The fatty acids, or fatty acid esters of bases other than glycerin, are melted, alone or with fatty substances, and employed to dissolve the nitro derivatives, &c., after which the mass is incorporated with potassium (or ammonium) chlorate or perchlorate, and left to cool.

The following typical examples of these explosives are given:—

Prepared from Fatty Acids alone.—Free (stearic) acid, 12 parts; dinitrobenzene, 8 parts; potassium chlorate, 80 parts.

Mixed Fatty Acid and Fat.—Palmitic acid, 6 parts; oil or fat, 2 parts; nitronaphthalene, 10 parts; picric acid, two parts; ammonium perchlorate, 80 parts.

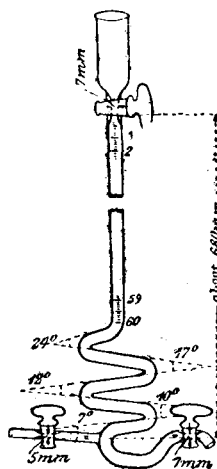
Mixed Fatty Acid and Fatty Acid Ester.—Margoric acid, 7 parts; methyl stearate, 3 parts; dinitrotoluene, 15 parts; potassium perchlorate, 75 parts.

Fatty Acid and Dissolved Nitro Derivatives.—Stearic acid, 6 parts; mononitro-naphthalene, 12 parts; dinitrotoluene, 2 parts; potassium chlorate, 80 parts.—C. S.

Nitrocellulose; Researches on the Stability of —. W. Will. Zeits. angew. Chem. 1901, 14, [31], 783.

SINCE the conclusion of his research on this subject (this Journal, 1901, 609—617), the author has made a series of experiments which have led him to adopt the following modifications in his methods.

(1) The guncotton is introduced into the apparatus in the moist condition in which it leaves the centrifugal machine; (2) A copper U-tube is used as the reduction vessel; and (3) A special apparatus is used for measuring the gas (see figure). This consists of an ordinary gas-burette with its lower end fused to a tube bent in zig-zag fashion. A fairly rapid current of carbon dioxide can be passed through this apparatus without fear of any of it escaping absorption.—C. A. M.



PATENTS.

Picric Acid; Process for the Manufacture of —. L. Wenghöffer, Berlin. Eng. Pat. 16,371, Sept. 14, 1900.

ONE hundred kilos. of crude sulphanilic acid are stirred to a thin paste with water, and mixed with a dilute solution of 40 kilos. of sodium nitrite, so that the whole passes into solution with the exception of impurities, which must be filtered off. The filtrate is mixed with 28 kilos. of sulphuric acid, forming diazobenzene sulphonic acid, which crystallises out. After filtering, the yellowish porous mass of crystals, containing about 20 per cent. of water, is introduced into nitric acid of such strength that, after the admixture, the acid has a density of 40° B. The mixture is slowly heated until the generation of nitrogen gas commences, and the supply of heat is stopped when this gas is no longer evolved. Then, after standing for about 36 hours, the whole of the picric acid will have formed a deposit. Or, 100 kilos. of the sulphanilic acid are slowly added to 40 of the nitrite in 40 of water, with constant stirring, the resulting yellow paste is then introduced into sufficient nitric acid of such density as to produce 320 kilos. of acid of 40° B. By this process 50 kilos. of aniline have yielded 110 kilos. of picric acid, or 90 per cent. of the theoretical yield. The object of the invention is to substitute for phenol a raw material less liable to fluctuations in market value, as the basis for the manufacture of the picric acid.—W. G. M.

Gunpowders; Smokeless —. E. Edwards, London. From W. Kent, Chicago, Ill., U.S.A. Eng. Pat. 11,400, June 4, 1901.

FIFTY parts of picrate of ammonia and 50 of barium nitrate are well ground and mixed in a wheel mill with the aid of a little water; the resulting paste is granulated by

reducing the pressure of the wheels, and the grains are separated by means of a sieve, and dried. To give durability to the powder, which without the addition is efficient for some purposes, about 15 parts of picric acid are added to 100 parts of the composition specified, either before granulation or by melting and mixing it with the granulated powder. This powder aims at being smokeless, and without tendency to deteriorate with age, whilst it gives a high muzzle-velocity to the projectile without undue pressure in the gun-barrel on firing.—W. G. M.

Priming [Explosive] Compositions. H. Ziegler, Thun, Switzerland. Eng. Pat. 14,583, Aug. 14, 1900.

CARBONATES of the alkaline earths may be added to fulminate of mercury priming compositions to prevent the decomposition of the fulminate by other constituents. Barium nitrate (with barium carbonate) is substituted for potassium chlorate, as the products of explosion of the powder containing it are less liable than those of chlorate charges, to lead to the rusting of the gun-barrel. The stability of the baryta composition is also greater than that of other mixtures commonly used, both in the presence of damp and at 40°–50° C.; also any explosions occurring during manufacture are less violent than those of chlorate mixtures. The following is a typical example of a composition recommended, fulminate of mercury, 30 per cent.; barium nitrate, 35; antimony trisulphide, 25; barium carbonate, 6; powdered glass, 4 per cent.—W. G. M.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Extraction Apparatus with Arrangement for Distilling off the Solvent. A. Chatelan. Chem.-Zeit. 1901, 25, [57], 612.

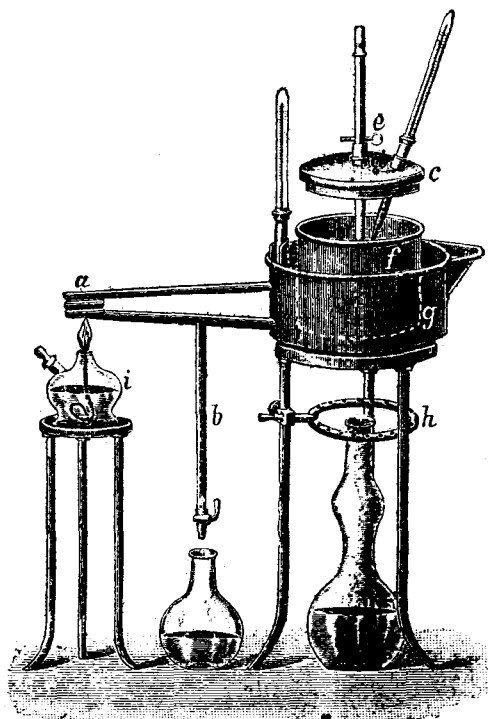
As the figure shows, the lower end of the condenser tube is bent to the side, so that it delivers the condensed solvent over the material during the extraction, or into the collecting spoon connected with the tap during the distillation. The material to be extracted is contained in a removable portion with siphon tube and ground-in stopper, which may thus also be used as a weighing bottle. In case the whole capacity of this cylinder is required, a small Soxhlet filter may be placed in the part of the extractor which lies in the neck of the flask. If the collecting spoon should be broken, it may be replaced by a cork during extraction, and by a bent tube with the end widened out during distillation.

—A. C. W.

Viscosimeter; The Engler-Ragosine. A. Ragosine. Chem.-Zeit. 1901, 25, [59], 628.

In using Engler's viscosimeter, if the temperature of the water be maintained exactly at 50° C., that of the oil sinks, towards the end of the operation, to 49° or 48° C., or even further in the case of very thick oils. The oil may be kept at 50° C. throughout, by raising the water at first to 51.5° or 52° C., and not allowing it to sink below 50° C. Both these methods are in use; the former will naturally give a higher viscosity than the latter. The modification of the apparatus here described enables both oil and water to be

maintained at 50° C. throughout. Loss of heat from the oil is prevented by covering the lid with a non-conducting layer, c, 5–8 mm. thick. The water-bath is kept at a



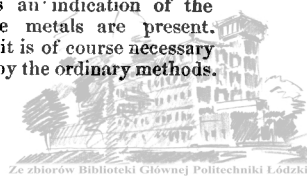
constant temperature by means of the copper tube a, 7–8 mm. in diameter, which is bent at the end into a spiral, heated by a small spirit lamp, i. The tube a is provided with a draw-off cock, b, to be used in case cold water has to be added. The cover is provided with an air-opening, d. The rod is perforated, and may be supported during the experiment by a pin, e. It is found that the temperature of the water is readily kept at 50° C., and that the temperature of the oil does not sink more than 0.1°–0.3° C. This improved apparatus naturally gives somewhat lower viscosities, which are, however, more exact.—A. C. W.

Thermometer Glass at Higher Temperatures. W. McClellan. See under VIII., page 899.

INORGANIC CHEMISTRY.—QUALITATIVE.

Potassium; Detection of—, in presence of the other Alkali Metals, Thallium and Ammonia, by means of Sodium Picrate. C. Reichard. Zeits. anal. Chem. 1901, 40, [6], 377–384.

THE author has determined, for solutions of various salts of the alkali metals, of thallium and of ammonium, the minimum concentrations with which a cold saturated solution of sodium picrate produces a precipitate. The results show that in the case of potassium salts containing less than 50 per cent. of the metal, a 2 per cent. solution is precipitated by the saturated sodium picrate, whilst this occurs with a 1 per cent. potassium chloride solution. Ammonium salts must be removed by ignition before testing for potassium in this way, since 2 per cent. solutions of ammonium salts are also precipitated. Lithium and sodium salts do not interfere with the reaction, excepting sodium carbonate, which must be previously converted into the chloride, care being taken to add but a slight excess of acid. As caesium and rubidium picrates are less soluble than the potassium salt, the formation of a precipitate with sodium picrate solution cannot be used as an indication of the presence of potassium when these metals are present. Before testing for the alkali metals, it is of course necessary to remove any other metals present by the ordinary methods.



Thallium, which resembles the alkali metals in some respects, also forms a sparingly soluble picrate, the minimum percentage of thallium nitrate in a solution giving a precipitate with saturated sodium picrate, being about 0.5.—T. H. P.

Indium; Detection of [micro-chemically] —. P. Kley. Chem.-Zeit. 1901, 25, [53], 563.

INDIUM is best detected (micro-chemically) by means of the double chloride of indium and rubidium. A small fragment of rubidium chloride is added to the solution of indium hydroxide in strong hydrochloric acid; the crystals which separate are colourless octahedra, which polarise light strongly and show themselves to be complex rhombic crystals, measuring from 10 to 70 μ . The limit of the reaction lies at 0.00024 mgrm. In. The delicacy of the reaction can be increased by using caesium instead of rubidium, the limit being then 0.00002 mgrm., but the crystals are then so small that they are only recognised with difficulty. The separation of indium from other metals is readily effected by converting it into hydroxide; when precipitated by means of ammonia, the hydroxide clings to the object glass, and can here be washed, first with ammonia and then with water. In this way most of the zinc and cadmium are removed. Aluminium and zinc are not, however, prejudicial to the reaction; even when 50 per cent. of zinc is present, the separation with ammonia need not be made. But when traces of indium are accompanied by large quantities of trivalent metals, the separation by means of ammonia is followed by treatment with ammonium carbonate, in which indium is soluble, and from which it is afterwards precipitated by oxalic acid. But with very small quantities of indium, the reaction is not satisfactory, and the rubidium process is preferable. Ammonia and ammonium chloride should be expelled as far as possible, as they tend to reduce the size of the crystals. Ammonium chloride gives double salts with indium chloride, soluble in hydrochloric acid. The remainder of the article is taken up with a criticism of Huyssse's work (see this Journal, 1900, 19, 930).

—W. G. M.

INORGANIC CHEMISTRY.— QUANTITATIVE.

Chromium Oxide in Chrome Mordants; Volumetric Determination of —. R. Hartmann. Chem.-Zeit. 1901, 25, [53], 564.

ABOUT 1 grm. of chromium acetate (of 21° B.; for more concentrated mordants, less would be used) is diluted with 10–15 c.c. of water, and mixed with a few drops of strong caustic soda solution, until the precipitate formed has redissolved. The solution is heated on the water-bath, and sodium peroxide added until it has a pure yellow colour. The solution is then completely evaporated, in order to decompose any Na_2O_2 or H_2O_2 , redissolved in 500 c.c. of water, and acidified with dilute sulphuric acid. 50 c.c. of a decinormal solution of Mohr's salt are then added, and, after dilution to 1 litre, the excess of the latter is titrated back with decinormal permanganate solution until the liquid has a dirty violet colour. Chromium acetates produced by reduction from bichromate are freed from the reducing substances by nitric acid or by hydrochloric acid and chlorate, as for gravimetric determinations, and after conversion into sulphate are titrated as above. Certain pyrolygneous substances in the acetate cause a somewhat excessive use of permanganate, and therefore lead to correspondingly low results; but as the difference rarely exceeds 0.02–0.09 per cent., it is negligible.—W. G. M.

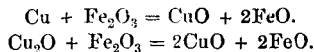
Sulphur; Influence of Aluminium Salts in the Determination of —. E. Noaillon. Bull. Assoc. Belge des Chim. 15, [2], 90–93.

THE author finds that the influence of aluminium chloride on the results obtained in determining sulphur as barium sulphate, is the opposite to that exerted by iron salts, the results coming out higher than the truth. For example, a potassium sulphate solution that furnished 0.10035 grm. of sulphur in the absence of alumina, gave 0.10164–0.10180 grm. in presence of 2 grms. of that substance, whereas in the case of iron salts, the results come out below the truth.

The high results are probably due to the presence of alumina, in the state of chloride, in the precipitate, since, if present as sulphate, the results would come out too low. It is found advantageous to make the sulphur determinations in a solution containing 5 per cent. of hydrochloric acid, the slight error resulting therefrom being negligible, whilst the operation is facilitated by the improved condition of the precipitate.—C. S.

Copper Oxide, Commercial; Determination of Cuprous Oxide in —. D. Miklosich. Zeits. angew. Chem. 1901, 14, [30], 753.

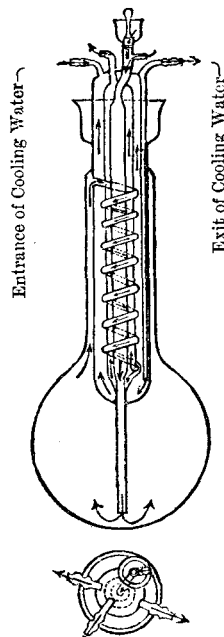
P. DRAWE's method for estimating Cu_2O in commercial CuO (this Journal, 1901, 809) is liable to error, owing to the solubility of metallic copper in copper sulphate solutions. A method, however, based on the second of the following two equations, gives good results:—



One gram of ferrous ammonium sulphate is weighed carefully, and, after adding 10 c.c. of dilute sulphuric acid, is titrated with permanganate. When just peroxidised, a further addition of 10 c.c. of the dilute acid is made, and 0.5 grm. of the copper oxide to be tested is added. The mixture is warmed in an Erlenmeyer flask, provided with a Bunsen valve (to prevent access of air), until the copper oxide is dissolved; after cooling, the contents of the flask are quickly poured into 1 litre of air-free water in a porcelain dish, and titrated back with permanganate. In this way a known quantity of standardised ferric salt is mixed with the copper oxide, and any reduction to the ferrous condition that may occur should be due to cuprous oxide, the amount of which is therefore found by simple calculation.—W. G. M.

Steel and Iron; Carbon Determination in —. Schmitz. Chem.-Zeit. 1901, 25, [65], 684.

A SLIGHT modification of the method for determining carbon in iron and steel gives good results, and can be carried out in 1–2 hours. 5 grms. of iron or 3 grms. of steel are dis-



solved in the flask shown in the figure (which may also prove useful for other purposes), in a mixture of chromic acid, cupric sulphate, and sulphuric acid, and the hydrocarbons formed being passed, together with air over a platinum spiral maintained at a bright-red heat, and are thus burned to carbon dioxide. The quantities employed are, 25 c.c. of chromic acid (500 grms. in 250 c.c. of water), 150 c.c. of copper sulphate (200 grms. per litre), and 200 c.c. of sulphuric acid (2,100 grms. of concentrated sulphuric acid to 1 litre of water). The apparatus is arranged as follows:—Flask, platinum spiral, small wash-bottle with sulphuric acid, U-tube with phosphoric anhydride, two U-tubes with soda lime and phosphoric anhydride, U-tube with phosphoric anhydride and finally a wash-bottle with sulphuric acid. In the ordinary method, in spite of the copper sulphate, the loss in hydrocarbons, according to the hardness of the steel, is frequently considerably more than $\frac{1}{50}$ th of the total carbon. This

error is avoided by the use of the platinum spiral. With two sets of apparatus as described, eight determinations can be readily carried out in one day.—T. A. L.

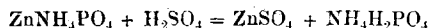


Zinc in Spathic Iron Ores; Estimation of Small Quantities of —. J. Flath. Chem.-Zeit. 1901, 25, [53], 564–565.

THE usual method of estimating zinc in these ores is tedious and liable to errors, which the author describes. The process recommended is as follows: 3–5 grms. of the ore are dissolved in hydrochloric acid, with gentle heating, requiring about a quarter of an hour. The liquid is diluted with about 150–200 c.c. of water, a slight excess of ammonia is added, the resulting precipitate at once redissolved, without filtering, in acetic acid (15 c.c. of the 96 per cent. acid being used), and the metals Zn, Pb, Cu, and about 2–4 per cent. Fe precipitated by passing H_2S . If the beaker be kept covered with a clock glass, to exclude air as far as possible, the precipitate may be filtered in from 5 to 10 minutes. It deposits quickly and completely, and the supernatant liquid has never been found to contain more than a trace of Zn. The precipitate is washed twice with hydrogen sulphide water, any milkiness of the filtrate being disregarded as due to sulphur. The precipitate is then dissolved in *aqua regia*, evaporated with 10 c.c. of dilute (1:1) sulphuric acid, diluted with 100 c.c. of water, and boiled. The copper is precipitated with sodium thiosulphate and filtered off. The excess of thiosulphate and any iron that may be present are oxidised by adding 5 c.c. of nitric acid, and boiling. Bromine water is added, and the iron is precipitated by ammonia. The zinc is estimated volumetrically in the filtrate. By this process the zinc is rapidly freed from the bulk of the iron. Figures quoted go to show that results are accurate, but somewhat higher than those obtained by the older method.—W. G. M.

Zinc; Volumetric Determination of —. P. H. Walker. J. Amer. Chem. Soc. 1901, 23, [7], 468–470.

THE process given by the author is a modification of that devised by Stolba for the determination of magnesium, and is carried out as follows:—To the zinc solution, which should contain ammonium chloride, a large excess of ammonia is added, then a large excess of sodium phosphate solution. Hydrochloric acid is now gradually added until, after stirring, the solution remains milky, when the liquid is heated to about 75°C ., and the gradual addition of acid continued, with constant stirring, until nearly complete neutralisation is attained. By this means the precipitate becomes crystalline, and after five minutes' standing it should be filtered off and washed with cold water until the washings show only a faint trace of chlorine. The filter paper and precipitate are now returned to the beaker in which the precipitation was carried out, an excess of standard acid added, and the exact point of neutrality determined by means of standard alkali, using methyl orange as indicator. From the equation—



it is seen that 1 c.c. of normal acid corresponds with 32.7 mgrms. of zinc. The method gives good results. Since the zinc ammonium phosphate is not precipitated in presence of a large excess of ammonia, any magnesium present, which will be precipitated, may be removed by filtration, and the filtrate neutralised to throw down the zinc. Fairly good results are obtained by this method also in the presence of iron, calcium, and magnesium, but any manganese must be previously separated, best by means of nitric acid and potassium chlorate.—T. H. P.

Zinc; Determination of —, by means of Iodine Solution. P. Knaps. Chem.-Zeit. 1901, 25, [51], 539–540.

ZINC sulphide, in the acetic acid solution in which it is ordinarily precipitated, is converted by iodine into zinc iodide and sulphur. If, however, more than 0.05 grm. of zinc sulphide to 200 c.c. of water be present, the separated sulphur protects particles of it from the action of the iodine. This can be prevented by forming a precipitate, such as barium sulphate, in the liquid prior to the introduction of the hydrogen sulphide. Thus, from 10 to 20 c.c. of a solution of 150 grms. of barium chloride in a litre, and the same quantity of sodium sulphate solution (200 grms. per litre), are introduced, the zinc precipitated, and the excess of hydrogen sulphide removed by boiling. An excess

of standard iodine solution is then added, the liquid shaken for 1–2 minutes, and the excess of iodine titrated with standard thiosulphate. Ammonium salts do not interfere, and the author shows by test experiments that the results are accurate even in the presence of considerable quantities of manganese salts.—C. A. M.

Arsenic Acid; Acidimetry of —. A. Astruc and J. Tarbouriech. Comptes Rend. 133, [1], 36–38.

WITH Methyl Orange, arsenic acid is neutral when soda, potash, ammonia, baryta, strontia, or lime has been added in quantity sufficient to form the salt RH_2AsO_4 , where R represents a monad radicle; this is true in cold or hot solutions.

With phenolphthalein, neutralisation occurs in the case of the alkalis with the formation of R_2HAsO_4 , whether in cold or hot solutions. The phenomenon is the same with the alkaline earths in the cold; but, when boiled, neutrality is shown only on the formation of R_3AsO_4 .

If to arsenic acid in the presence of a chloride of an alkaline earth metal, there be added excess of alkali, a gelatinous precipitate of tribasic arseniate falls. If now phenolphthalein be added, and acid just to the permanent disappearance of the red colour, it is found that the precipitate dissolves, and that at the neutral point there is exact formation of R_2HAsO_4 ; but if, before titration with acid, the liquid be boiled, the gelatinous precipitate becomes crystalline, and this crystalline tribasic arseniate remains undissolved on titrating.—J. T. D.

Cyanides; Isopurpuric Acid Test for —. C. Reichard. Chem.-Zeit. 1901, 25, [51], 537–538, and [52], 555–556.

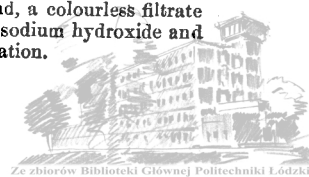
IF 10 c.c. of a 1 per cent. solution of potassium cyanide be mixed with a few c.c. of a cold saturated solution of sodium picrate, there results in a few moments a dark coloration, which gradually deepens, until after 15 minutes, the liquid has become purple-red and opaque. A solution containing 0.25 per cent. of potassium cyanide, when similarly treated, at first remains clear for some time, but after 30 to 45 minutes it, too, becomes dark, and finally, after about two hours, completely opaque. If the cyanide solution contain only 1 part in 1,600, it remains unchanged for about an hour, but after 10–12 hours there is a perceptible coloration, which, however, does not deepen in intensity on standing, as in the case of the stronger solutions. Even in dilutions of 1:2,000 or 3,000, a perceptible darkening occurs, but in the author's opinion the limits of the test cannot be fixed at more than 1:2,000.

If the solutions be boiled, the reaction is considerably accelerated, but in order to obtain an approximate idea of their strength by the velocity of the changes, it is necessary to make the test in the cold.

As the simplicity of the test is frequently complicated by the presence of other salts, the author has studied the behaviour of insoluble cyanides towards picric acid.

The presence of cyanogen in silver cyanide cannot be detected by the isopurpuric reaction.

Copper Cyanide, when freshly precipitated and exposed in a moist condition to the atmosphere, soon absorbs oxygen and becomes light blue. If freshly precipitated copper cyanide be suspended in water and treated with barium peroxide, oxygen is soon liberated, and the colour of the cyanide changes to light blue. The substance formed dissolves in solutions of ammonium hydroxide or sodium hydroxide, yielding dark blue liquids, which are so stable that they can be boiled without change. Like this blue compound, copper cyanide which has been treated with sodium picrate yields a blue solution on treatment with ammonium hydroxide, but this solution is decomposed on warming with sodium hydroxide, yielding a colourless liquid and a black powder, probably copper oxide. By treating copper cyanide with sodium hydroxide solution, a similar blue solution is obtained, but no purple coloration results on the addition of sodium picrate. On the other hand, by warming the copper cyanide with barium peroxide and water until all evolution of oxygen has ceased, and then filtering from the blue compound, a colourless filtrate is obtained, which, when treated with sodium hydroxide and sodium picrate, gives the purple coloration.



Lead Cyanide suspended in water and heated with sodium picrate remains unaltered. No purple coloration is obtained on adding sodium picrate after treatment with barium peroxide, as in the case of copper cyanide.

Zinc Cyanide is readily soluble in sodium hydroxide solution, yielding a colourless liquid, which becomes dark reddish-yellow on the addition of sodium picrate. Ammonium hydroxide also dissolves zinc cyanide, and on heating the solution with sodium picrate, a purple coloration is obtained, whilst ammonium picrate is precipitated. The filtrate from the barium peroxide treatment gives the coloration, even without the addition of alkali.

Cadmium Cyanide gives a coloration with sodium picrate and sodium hydroxide, but not with ammonium hydroxide. Barium peroxide gives a filtrate which does not show the reaction without the addition of ammonium or sodium hydroxide.

Nickel Cyanide is a light green powder which does not alter when heated with sodium picrate solution alone, but on heating the mixture with concentrated sodium hydroxide solution, a purple shade is produced.

From his experiments the author concludes that the isopurpuric acid reaction can only be used advantageously with the simple cyanides of the alkali metals.—C. A. M.

Soap; Effect of Sodium Chloride in the Estimation of Free Alkali Hydrate and Carbonate in —. F. B. Robertson. *J. Soc. Dyers and Colourists*, 1901, 17, [7], 171—172.

In estimating the free alkali in soap, an error is caused by the presence of the sodium chloride used in "salting out" the soap. The process employed was to salt out, filter, and in the filtrate estimate free NaOH and Na_2CO_3 by titrating with N/10 acid until neutral to phenolphthalein, then adding Methyl Orange and continuing the titration until again neutral. The first titration should give the caustic soda plus half the carbonate; the second neutralises the remainder of the carbonate. When salt is present it affects both indicators, but in an opposite manner, reacting "acid towards phenolphthalein, but alkaline towards Methyl Orange." The two errors thus both tend to reduce the apparent amount of caustic and increase the apparent amount of carbonate.

This effect is not due to the use of impure commercial salt, since the most carefully purified samples gave practically identical figures. It is, however, worthy of note that some samples of salt sold as "chemically pure" are distinctly alkaline, even to phenolphthalein.

Corrections: Estimation of Total Free Alkali.—In estimating the total free alkali with Methyl Orange indicator, a deduction must be made of 0.0114 c.c. of N/10 H_2SO_4 for each grm. of salt used, or, without sensible error, 0.004 c.c. of N/10 H_2SO_4 for each 1 c.c. of a saturated solution of salt.

Separate Titration of NaOH and Na_2CO_3 .—Sufficiently concordant results were obtained on working with samples of known alkalinity by adding to the acid figure obtained in the phenolphthalein titration, 0.024 c.c. of N/10 H_2SO_4 for each 1 c.c. of saturated salt solution, and deducting 0.0285 c.c. of N/10 H_2SO_4 for each 1 c.c. of saturated salt solution when titrating with Methyl Orange; but no absolute figure has been arrived at in this case, because the necessary correction varies with each proportion of NaOH and Na_2CO_3 . The correction given, applies when the two are present in approximately equal amounts. "If the NaOH is in excess the correction is less; if the Na_2CO_3 is in excess, the correction must be greater; and this fact renders an explanation of the action of the salt more obscure." (See also Wright and Thompson, this Journal, 1885, 625.)—R. B. B.

Paris Green; Determination of Arsenious Oxide in —. S. Avery and H. T. Beans. *J. Amer. Chem. Soc.* 1901, 23, [7], 485—486.

The following procedure affords a rapid and accurate means of determining the arsenious oxide content of Paris green. 0.2—0.3 grm. of the pulverised sample is weighed out into a beaker of about 300 c.c. capacity, water being added and then concentrated hydrochloric acid, drop by

drop, until solution is just effected; from 6 to 10 drops are usually sufficient. Sodium carbonate solution is then added until a slight permanent precipitate is formed, at which point a solution of 2 to 3 grms. of sodium potassium tartrate is run in; by this means the precipitated copper is dissolved and further precipitation during the subsequent titration prevented. After diluting the liquid to about 200 c.c., solid sodium bicarbonate and starch solution are added, and titration with iodine carried out in the usual way. The end reaction is sharp, and the determination can be completed in about 10 minutes, while the method gives concordant results. The presence of copper sulphate has no influence on the titration, which, however, does not give accurate results if cuprous salts are present; such salts have not been observed in the samples of Paris green examined.—T. H. P.

Phosphoric Acid; Determination of — in Superphosphates, Compound Manures, and precipitated Phosphates, by Cold Precipitation as Ammonium Phosphomolybdate. L. Ledoux. *Bull. Assoc. Belge des Chim.* 15, [8], 125—129.

The reagent employed consists of 100 c.c. of a solution prepared by dissolving 150 grms. of molybdic acid in 600 c.c. of ammonia (sp. gr. 0.96), and pouring the solution into 1,070 c.c. of nitric acid (sp. gr. 1.22), obtained by mixing 500 c.c. of concentrated acid with 570 c.c. of water.

Three essential conditions affect the reliability of the method: the presence of a considerable quantity of ammonium nitrate; the conversion of the phosphoric acid into the ortho form; and the presence of sufficient of the molybdic reagent to saturate the total citric and phosphoric acid.

In carrying out the method, 2 grms. of superphosphate or 4 grms. of compound manure are extracted by water and by citrate solution in the usual manner, each of the extracts being made up to 250 c.c. and mixed in equal proportions (59 c.c.). In the case of precipitated phosphates, a quantity of the citric extract corresponding to 0.2 grm. of substance is taken.

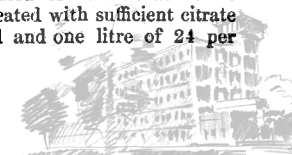
The solution is boiled for five minutes with 15 c.c. of nitric acid (sp. gr. 1.40), cooled, and treated with 15 c.c. of ammonia (sp. gr. 0.92); 100 c.c. of molybdic reagent are then added to the solution, which should be slightly acid, and the mixture agitated briskly for half an hour at a temperature not exceeding 16° C. The resulting precipitate is perfectly pure, and may be estimated by the Pemberton titration method or by weighing as magnesium pyrophosphate.—C. S.

Superphosphates; Determination of Water-soluble Phosphoric Acid in —. L. v. Széll. *Landw. Vers.-Stat.* 55, 325—346. *Chem. Centr.* 1901, 2, [5], 374.

The author finds that with pure solutions of sodium phosphate, the molybdate method gives good results, but with solutions containing other salts, the precipitates are contaminated by SiO_2 , Fe_2O_3 , Al_2O_3 , and traces of MoO_3 , and consequently give higher results than the ordinary citrate method. The latter method gives too low results, owing to the slight solubility of magnesium-ammonium phosphate in ammonium nitrate solution. The author modified the molybdate method (repeated evaporation of the solution with hydrochloric acid, and then with nitric acid and double precipitation of the phosphomolybdate) and also the citrate method (use of only a little more citrate solution than is required for dissolving the precipitate which forms at first), and then obtained results that agreed very satisfactorily. The modified molybdate method gave, with pure sodium phosphate solutions, results absolutely identical with those obtained by the usual methods.

The water-soluble phosphoric acid is determined in the following manner:—

The superphosphate is ground, passed through a 3 mm. sieve, and 20 grms. triturated with water to a thick paste. This is diluted, decanted, rinsed into a litre flask, made nearly up to the mark, and agitated or rotated as usual. 50 c.c. of the clear solution are treated with sufficient citrate solution (300 grms. of citric acid and one litre of 24 per



cent. ammonia, made up to 3 litres) to dissolve the precipitate formed, then $\frac{1}{10}$ th of the previous quantity of citrate solution is further added, and the mixture treated, with agitation, with magnesia mixture (25 c.c. are sufficient in most cases). The subsequent operations are the same as usual.—A. S.

Natural Waters; Determination of Nitric and Nitrous Acid in —. L. W. Winkler. Chem.-Zeit. 1901, 25, [55], 586—587.

The author gives the following improved methods for the rapid determination of ammonia, nitric and nitrous acids in natural waters.

Nitric Acid.—10 c.c. of the water to be examined and of distilled water are mixed separately in 50 c.c. flasks with 1 c.c. of a 2 per cent. solution of brucine sulphate and 20 c.c. of concentrated sulphuric acid. The distilled water solution is then made hot, and potassium nitrate solution (1 c.c. = 0.1 mgrm. of N_2O_5) added to it drop by drop until it assumes a yellow tint identical with that of the other solution. Instead of the ordinary flasks, it is more convenient to use long-necked cylindrical flasks with a bulb about 3 cm. in width, as with these the tints can be more readily compared; it is best also to look downwards through the flasks at a milk-glass plate, using a black screen with holes to stop the white light. If the red colour produced by the nitrate is slow in changing to yellow, the solution is too cold and must be reheated. Since brucine sulphate solution does not remain clear for more than a few days, it will sometimes be found convenient to add to the water 2—3 centigrams of pure brucine and then 1—2 drops of concentrated sulphuric acid, the remainder of the latter being added after the brucine has dissolved. The best results are obtained with waters containing from 1 to 10 mgrms. of nitric acid (N_2O_5), per litre; waters containing more than this quantity should be suitably diluted. The results yielded by this method are not vitiated by the presence of organic matter in the water.

Nitrous Acid.—100 c.c. of the water are mixed in a 200 c.c. flask with 20 c.c. of 10 per cent. hydrochloric acid and 2—3 c.c. starch solution, and to the mixture is added 5 grms. of potassium bicarbonate and, after about a minute's gas evolution, 0.1—0.2 gm. of potassium iodide; after standing for five minutes longer, the iodine separated is titrated with a sodium thiosulphate solution, 1 c.c. of which corresponds with 0.1 mgrm. of N_2O_5 . If the potassium bicarbonate is in small crystals, it must be shaken into the liquid a gram or so at a time, the potassium iodide being added with the last of the carbonate. For preserving the starch solution the author considers it best not to add anything to it, but to sterilise it and keep it sterile. 1 gm. of starch is boiled with 500 c.c. of water, the clear liquid filtered after 24 hours' standing, and the filtrate introduced into small (50 c.c.) medicine bottles, which are then fitted with cotton-wool plugs and heated for half an hour at 100° C.

The methods described are found to give good results.

—T. H. P.

Carbonic Acid in Water; Determination of —. J. W. Ellms and J. C. Beneker. J. Amer. Chem. Soc. 1901, 23, [6], 405—431.

The authors have investigated the following three volumetric methods of determining the free and half-bound carbonic acid of water:—(1) Pettenkofer's method, in which precipitation of the magnesia during titration with barium hydroxide is prevented by the addition of ammonium chloride. (2) Trillich's modification, in which precipitation of the magnesia is not prevented during titration, the amount of barium hydroxide used up by the magnesium carbonate being allowed for by means of a separate gravimetric determination of the magnesium present. (3) The Lunge-Trillich or Seyler method. The last method is recommended on account of ease and rapidity of manipulation, avoidance of difficulties arising from the presence of magnesium salts, and for its greater accuracy, the results obtained being mostly less than 1 per cent. too low, and the possible error being less than $\pm$ 3 per cent. Pettenkofer's method and Trillich's modification of it give

numbers which are on an average 5 to 10 per cent. too low. The Lunge-Trillich or Seyler method depends on the action of phenolphthalein as an indicator in the presence of free carbonic acid, and of carbonates and bicarbonates of the alkaline earth bases, the assumption—shown by the authors to be justified—being made that in the bicarbonates of these bases, there is one molecule of half-bound carbon dioxide for each molecule of fixed carbon dioxide. The free carbonic acid in the water is determined by placing 100 c.c. of the sample in a glass cylinder, with 25 to 30 drops of a neutral phenolphthalein solution, and running in N/50 or N/20 sodium carbonate solution until a faint permanent pink colour is obtained. In this operation the following precautions should be observed:—(1) The titration may be carried out in a short Nessler cylinder, with a similar vessel containing the same quantity of water to help in the determination of the end point, the stirring rod used being bent at the end into a ring, perpendicular to the length of the rod. (2) The sodium carbonate solution should be prepared from freshly ignited carbonate, and well-boiled water cooled out of contact with air; it should be exposed as little as possible, and the greater portion of it should be run in quickly. (3) With waters rich in free and half-bound carbonic acid, less than 100 c.c. should be employed, especially when N/50 carbonate is used, and shaking or vigorous stirring of the water should be avoided. The fixed carbonic acid, which gives the half-bound, is then determined according to Hehner's method, using methyl orange or lacmoid as indicator. In the absence of free carbonic acid in a water, the half-bound may equal the fixed, in which case phenolphthalein would show a neutral reaction; if, however, the water is alkaline to phenolphthalein, the half-bound acid is less in quantity than the fixed, so that part of the alkaline earthy carbonates exist in solution without the assistance of half-bound acid. In such a case, the half-bound carbonic acid is arrived at by first determining the fixed acid by titration, with lacmoid as indicator, and deducting from the result twice the amount of carbonic acid indicated by the sulphuric acid required to discharge the pink colour produced on adding phenolphthalein to the water. The existence of free carbonic acid in a solution containing free mineral acid is possible, but is seldom met with in natural waters.—T. H. P.

Mercury and Bismuth Salts; Determination of —. T. Tyrer and C. T. Tyrer. Brit. Pharm. Conference, Dublin. Chem. and Druggist, 1901, 59, [1123], 234.

Determination of Mercury.—The authors have used the hypophosphorous acid method for the determination of mercury for several years with satisfactory results. They have also tried stannous chloride, formaldehyde, and sodium arsenite as reducing agents, and give the following average results obtained:—

	Hypophosphorous Acid.	Stannous Chloride.	Formaldehyde.	Sodium Arsenite.
Hyd. ammon. chlor.	76.9	75.81	76.32	76.53
Hyd. perchlor.	73.61	72.86	73.42	72.92
Hyd. ox. rub.	91.7	91.17	91.37	91.45

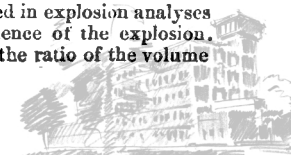
Phenylhydrazine hydrochloride, tartar emetic, and phosphorous acid did not give satisfactory results. A modification of the method proposed by Vanino and Treubert (this Journal, 1898, 379) is stated to give fair results.

Determination of Bismuth.—In the determination of bismuth by reduction, hypophosphorous acid and formaldehyde were found to work well, but neither method has any advantage over the B.P. sulphide process.—A. S.

ORGANIC CHEMISTRY.—QUALITATIVE.

Nitrogen; Oxidation of —, as a Source of Error in the Determination of Hydrogen and Methane. A. H. White. J. Amer. Chem. Soc. 1901, 23, [7], 476—482.

Oxides of nitrogen are always formed in explosion analyses in amount increasing with the violence of the explosion. The value of the explosive ratio, i.e., the ratio of the volume



of the non-explosive gases to that of the explosive gases, recommended by Bunsen, namely, 3.81—1.55, is not sufficient when working with the Hempel explosion pipette. If the explosive ratio be kept between 4 and 3, however, the error is negligible in the technical analysis of gases consisting almost entirely of hydrogen. The presence of small amounts of methane increases the error, and when large quantities of this gas are mixed with the hydrogen, the error may easily amount to 1 per cent. or even more; in this case also the explosive ratio should be kept between 4 and 3. The method of Dennis and Hopkins, according to which the gas, in contact with a glowing platinum spiral, burns quietly in a current of oxygen and air, tends to give high results, and the errors may become of importance if care is not taken to avoid prolonged and excessive heating of the spiral.—T. H. P.

Beer Yeast in Pressed Yeast; Detection of —, by Bau's Method. S. Küttner and C. Ulrich.

See under XVII., page 919.

Beer Yeast in Pressed Yeast; Detection of —.

H. Herzfeld.

See under XVII., page 919.

Salicylic Acid in Wines; Sensitiveness of the different Methods of detecting —. A. J. Ferreira da Silva. Bull. Soc. Chim. 1901, 25, [14], 726—731.

THE author has determined the smallest proportions of salicylic acid in wine which it is possible to detect by means of ferric chloride after extracting the acid by one of the various methods proposed. The German official method in which 50 c.c. of the wine are treated with a mixture of ether and light petroleum spirit, is sensitive to 1 part of salicylic acid per 200,000 of wine, whilst if the extract obtained as above be subjected to further treatment with benzene, only 1 part in 100,000 can be detected. The latter degree of sensitiveness is also possessed by the two methods proposed by Weigert and Rösler, in which 50 c.c. of the wine are extracted in the one case with carbon bisulphide, and in the other with chloroform. Extraction of 20 c.c. of the wine with ether and treatment of the ethereal liquid with benzene, which is the method of procedure adopted in the Municipal Laboratory of Paris will not detect less than 1 part of the acid in 33,000 of wine.—T. H. P.

Morphine; The Lloyd Reaction for —. J. L. Mayer. Brit. and Colonial Druggist, 1901, 40, [4], 90.

THE author recommends a new test, to be known as the Lloyd reaction for morphine, based upon the fact that a mixture of morphine and hydrastine when treated with a few drops of concentrated sulphuric acid gives a violet-blue coloration. The author has determined the effect of the reaction on various alkaloids by mixing 1 part of hydrastine with 8 parts of the other alkaloid, adding a few drops of concentrated sulphuric acid, and stirring for at least five minutes. It is important that the mixture be stirred for at least five minutes, as many alkaloids give colorations for the first few minutes, which are totally different from the end reactions. Of 20 alkaloids examined, only two, heroine and veratrine, besides morphine, gave a violet-blue colour when mixed with hydrastine and treated with concentrated sulphuric acid in the way described above. These three alkaloids, heroine, morphine, and veratrine, can readily be distinguished, as veratrine gives a characteristic cherry-red coloration with concentrated sulphuric acid; whilst when treated with nitric acid, heroine gives a yellow and morphine an orange-red colour.—A. S.

Santonin; The B.P. Test for —. P. Pain. Brit. Pharm. Conference, Dublin. E. M. Marshall. Chem. and Druggist, 1901, 59, [1123], 246.

THE author points out that many other substances will answer the B.P. test for santonin. He suggests the following test, which he claims to be more certain and sensitive. If a few crystals of santonin be warmed in a test tube, with 2 or 3 c.c. of ethyl nitrite solution, a fine rose-red colour

is produced on the subsequent addition of a few drops of potassium hydroxide solution. No colour is produced till the potash is added, a distinction from aloin and resorcinol, both of which give a red colour with ethyl nitrite solution, intensified by the addition of potash; thymol gives a dark yellow solution when submitted to this test.—A. S.

Peppermint Oil; Colour Reaction of —. P. Welmans. Pharm. Zeit. 46, 591. Chem. Zeit. Rep. 25, [26], 233.

AN excellent colour reaction can be obtained by treating 5 c.c. of peppermint oil with about 1 c.c. of mercury iodochloride (25 grms. of I, 39 grms. of HgCl_2 , made up to 1 litre with acetic acid and acetic ether), the liquid turning deep blue within a minute and exhibiting a beautiful fluorescence. The colour increases in intensity on standing and persists for a considerable time.—C. S.

Titration of Organic Acids and Alkalis of Complex Function by Coloured Indicators. Neutralisation; Studies in —. Berthelot. Comptes Rend. 132, [23], 1377—1382.

THE author has examined, using as indicators litmus, Methyl-Orange, phenolphthalein, and Poirrier's Blue, some typical compounds of complex function:—glycocoll (aminacetic acid), leucine (aminocaproic acid), the three aminobenzoic acids, hippuric acid, taurine, aspartic acid, and uric acid. *Glycocoll*: is acid to phenolphthalein, and neutrality is reached on adding a quantity of soda in the proportion $\text{NaOH} : 16.7 \text{ C}_2\text{H}_5\text{NO}_2$; it is alkaline to Methyl-Orange, and needs for neutralisation $\frac{1}{2} \text{E}_2\text{SO}_4 : 16.7 \text{ C}_2\text{H}_5\text{NO}_2$; it is acid to Poirrier's Blue, but there is no clear indication, of the neutral point on adding soda. *Leucine*: acid to phenolphthalein, needs about $\text{NaOH} : 14 \text{ C}_6\text{H}_{13}\text{NO}_2$; slightly alkaline to Methyl-Orange, about $\frac{1}{2} \text{E}_2\text{SO}_4 : 70 \text{ C}_6\text{H}_{13}\text{NO}_2$; neutral to litmus; acid to Poirrier's Blue, indication not clear, but about $\text{NaOH} : \text{C}_6\text{H}_{13}\text{NO}_2$, indicating a compound similar to the alkali alcoholates. *Aminobenzoic Acids*: no neutral point with Methyl-Orange; with the other three indicators, acid, needing $\text{NaOH} : \text{C}_7\text{H}_7\text{NO}_2$; the three acids behave alike. *Aspartic Acid*: no satisfactory indication. *Hippuric Acid*: a well defined monobasic acid with all the indicators, though the change-point is not well marked with Methyl-Orange or Poirrier's Blue. *Taurine*: neutral to litmus, phenolphthalein, and Methyl-Orange. *Uric Acid*: solution very dilute, indications not sharp; but acid to litmus, phenolphthalein, and Poirrier's Blue, alkaline to Methyl-Orange.

Mixtures in known proportions of hippuric acid and sodium phosphates were also examined with the same indicators, to discover how far there was reaction between the acid and the salt. *Hippuric acid* and NaH_2PO_4 : with Methyl-Orange, the hippuric acid is indicated as though alone; with phenolphthalein, the acidity of the acid adds itself to that of the phosphate. *Hippuric acid* and Na_2HPO_4 : faintly alkaline to Methyl-Orange, and acid ($1.01 \text{ NaOH} : \text{C}_9\text{H}_9\text{NO}_3 + \text{Na}_2\text{HPO}_4$) to phenolphthalein. The mixture behaves like sodium hippurate and NaH_2PO_4 . *Hippuric acid* and Na_3PO_4 : alkaline to Methyl-Orange, neutral to phenolphthalein; behaves like sodium hippurate and Na_2HPO_4 .

Glycocoll has no similar influence on the phosphates; the bodies behave in all cases as though each were alone.

—J. T. D.

ORGANIC CHEMISTRY.—QUANTITATIVE.

Acetylene and other Combustible Gases; Determination of Phosphorus and Sulphur in —. P. Eitner and G. Keppeler. J. für Gasbeleucht. 1901, 44, [30], 548—552.

THE authors consider Wilgerodt's method of estimating the phosphorus and sulphur compounds in acetylene by oxidation with bromine water (this Journal, 1896, 188) inconvenient, because of the enormous consumption of bromine entailed by the conversion of the acetylene to tetrabromide. The method of Lunge and Cederkreutz (this Journal, 1897, 1046), in which the acetylene is passed through a solution of sodium hypochlorite, is convenient, but Ahrens found that the acetylene, after treatment with



this solution, still contained some phosphorus, which he detected by means of potassium permanganate (this Journal, 1899, 819). The authors consider the method of oxidising the whole of the phosphorus and sulphur compounds by permanganate impracticable, because the acetylene also must be oxidised, and an enormous volume of solution of permanganate is therefore required. The determination of small quantities of phosphorus and sulphur then becomes difficult.

The authors have modified Drehschmidt's method for the determination of sulphur in coal gas by combustion, in order to make it applicable to the determination of phosphorus and sulphur in acetylene. The gas is burnt in a small blast burner fed with oxygen, so as to give a non-luminous flame, at the rate of about 10 litres per hour, and the products of the combustion, diluted with a little secondary air, which is admitted to the flame, are collected within a glass hood, from which they are aspirated through absorption bulbs. The first set of 10 bulbs contains only water, a second set contains solution of sodium hypobromite, and then follows an empty Peligot's or Volhard's absorption tube, by which any liquid sprayed forward is retained. The volume of acetylene consumed is exactly measured by means of an experimental meter, in which concentrated brine previously saturated with acetylene of similar origin is used as the confining liquid. After a suitable volume of the acetylene has been burnt—usually 20 to 25 litres serves well—the glass hood, on which phosphoric acid will have settled, is inverted and filled with hot water containing hydrochloric acid, which is left in it overnight. Its contents are then concentrated in a porcelain dish, and ammonia and ammonium carbonate added. The liquid is then filtered to remove silica, &c., and the filtrate is added to the liquid obtained from the contents and washings of the absorption apparatus after they have been boiled with hydrochloric acid to destroy the hypobromite, made ammoniacal, and filtered. After cooling, the phosphoric acid is determined by precipitation with magnesia mixture, and the sulphuric acid in the acidified filtrate from this determination by precipitation with barium chloride.

The authors found by investigation that the whole of the phosphoric acid produced by the combustion was retained in the glass hood and first set of bulbs, while the sodium hypobromite in the second set of bulbs ensured the retention of all the sulphuric acid formed. They made parallel determinations of the phosphorus in four different samples of acetylene by this method and by the Lunge and Cederkreutz method, and found that the former consistently gave higher results. They then passed acetylene through sodium hypochlorite, as directed by Lunge and Cederkreutz, collected the gas thus treated, and determined the phosphorus remaining in it by the combustion method. Four sets of analyses thus made on different samples of acetylene gave the following results:—

	1.	2.	3.	4.
	Grammes of Phosphorus per Cubic Metre of Acetylene.			
Retained by hypochlorite	0·21	0·60	0·15	0·40
Found, by combustion, in the gas passed through the hypo- chlorite.....	0·20	0·21	0·31	0·07
Total	0·41	0·81	0·46	0·47

The authors therefore consider that the method of combustion with oxygen is more exact and convenient than the earlier methods for the estimation of phosphorus compounds in acetylene. It is also applicable to other gases, such as methane (from aluminium carbide), or to combustible liquids with which air or, preferably, hydrogen may be carburetted.—J. A. B.

Phenol when Mixed with Resinous Substances; Determination of —. J. C. Thresh. British Pharm. Conference, Dublin. Chem. and Druggist, 1901, 59, [1123], 230.

In the examination of carbolised gauze on which the phenol is fixed by aid of resin, the author found that the

ordinary methods for the determination of phenol give absolutely unreliable results. He states that the following method, however, will give very concordant and accurate results in such cases. About 20 grms. of the gauze are mixed in a 700 c.c. flask with 500 c.c. of water acidulated with hydrochloric acid, and a few fragments of granulated zinc. The mixture is slowly distilled until about 300 c.c. have passed over; the distillate contains practically the whole of the phenol, which can be readily determined by the bromine process. The zinc enables the boiling to be carried on steadily, and the gas-bubbles, with a little manipulation, keep the gauze from matting together. The author has obtained the following results with the method:—

Percentage of Phenol.

Calculated.	Found.
6·0	5·88
6·0	5·64
4·0	3·75

—A. S.

Indigo containing notable Amounts of Indirubin; Analysis of Samples of —. W. M. Gardner and J. Denton. J. Soc. Dyers and Colourists, 1901, 17, [7], 170—171.

INDIRUBIN is formed in notable amount whenever an excess of alkali is used in the extraction tanks or beating vats employed in the manufacture of indigo. When present in larger amount than 1—2 per cent., indirubin interferes greatly in the permanganate method of assaying samples of indigo. Indirubin is less readily attacked than indigotin by permanganate, and the solution shows a bluish red tint when the oxidation of indigotin is complete, finally acquiring a yellow colour when the indirubin has also been oxidised. It is possible with much practice to obtain a fairly satisfactory result by taking the moment of fullest development of the red colour to represent the complete oxidation of indigotin and the moment of its final destruction as a measure of the indirubin, but the end reactions are very indefinite, and the method is not suitable for general use.

Indirubin is more easily soluble than indigotin in alcohol, and it is also soluble in ether and glacial acetic acid. Methods of analysis depending on a separation by the two latter solvents have been devised respectively by Rawson (this Journal, 1899, 251) and Koppeschaar (this Journal, 1899, 302), but in both these methods the present authors have found a difficulty in completely extracting the indirubin. They have found the most satisfactory solvent to be acetone, and have devised the following process which has proved to be accurate, rapid, and easily carried out:

Process for Assaying Indigo rich in Indirubin.—0·2 grm. of the finely powdered and dried sample is boiled in a flask with reflux condenser for half an hour with 100 c.c. of acetone. After cooling, the solution is made up to 100 c.c. with acetone and then to 200 c.c. with a 10 per cent. salt solution which precipitates the small amount of indigotin in solution and also the impurities. After shaking, the solution is allowed to stand for five minutes, filtered through an asbestos filter, and the indirubin estimated colorimetrically by comparison with a standard solution of indirubin. This standard solution must be made up with acetone and salt solution in similar proportion to that employed above, as the colour is redder in pure acetone.

Estimation of Indigotin.—Wash the precipitate on the asbestos filter with hot water until free from salt. Dry, and transfer the asbestos and precipitate to a cylindrical crucible by means of a camel's hair brush. Treat with concentrated sulphuric acid, purify the sulphindigotic acid and titrate with permanganate in the usual way. The end reaction is then quite sharp, there being an entire absence of indirubin. The quality of the acetone used is of importance.—R. B. B.

Maumené Test for Oils. C. A. Mitchell. Analyst, 1901, 26, [304], 169—177.

In the ordinary methods of applying this test it is practically impossible for different chemists to obtain



concordant results, and this is especially the case with highly unsaturated oils, like linseed oil, in which the rise of temperature is so great as to lead to charring. Maumené attempted to remedy this by mixing the linseed oil with a definite proportion of olive oil of known thermal value, whilst Ellis (this Journal, 1886, 361) employed a mineral oil for the same purpose. Both of these methods, however, only partially prevented the effects of overheating, and it was impossible for different workers to be sure of obtaining a diluent of the same thermal value.

In the method proposed by the author, carbon tetrachloride is used for the dilution, and all oils diluted alike. The test is made in the same way as Hehner and Mitchell's bromine thermal test (Analyst, 20, 146):—2 grms. of the oil are dissolved in 10 c.c. of carbon tetrachloride in a vacuum-jacketed tube, the temperature of the solution taken with a standard thermometer graduated in tenths of a degree, 2 c.c. of sulphuric acid of known strength introduced, the mixture stirred with the thermometer, and the rise of temperature noted. Shortly before the end of the reaction, which occupies about a minute, the sulphonated product rises to the surface of the carbon tetrachloride.

Fatty Acids.—Experiments were first made with the dry fatty acids of the oils in order to eliminate the heat due to hydrolysis, and in each case a parallel determination of the bromine thermal value was made with the same tube and thermometer. The iodine values were calculated from each series of figures and showed a close agreement in the majority of the oils, as is seen in the following table:—

Fatty Acid.	Rise with H_2SO_4 93·8 per Cent.	Calculated Iodine Value. Rise $\times 7$.	Bromine Thermal Rise.	Calculated Iodine Value Rise $\times 6$.
	° C.		° C.	
Oleic acid I. (old)	11·8; 11·7	82·6	14·0	84·0
" II. "	11·3; 11·4	79·8	14·3; 14·2	85·8
Almond.....	13·6; 13·8	96·6	16·1	96·6
Earthnut.....	12·5	87·5	14·2	85·2
Olive.....	11·6	81·2	14·1	84·6
Cotton.....	16·8	117·6	18·1	108·6
Maize I. (old rancid).	18·4	128·8	18·4	110·4
Maize II.	16·9	118·3	19·8	118·8
" III. (1898)	17·2	120·4	20·0	120·0
Sesamé.....	16·0	112·0	18·1	108·6
Rape.....	13·7	95·9	16·5	99·4
Poppy, 1895....	17·8	124·6	20·4	122·4
Linseed I. (4 yrs. old).	24·8	173·6	23·2	169·2
Linseed II. (Calcutta).	24·7	173·0	20·4	176·4
Linseed III. (after 3 weeks exposure).	27·6	193·2	27·9	167·4
Linseed IV. (oxidised).	21·5	150·5	21·7	130·2
Linseed (boiled 10 hrs.)	23·9	167·3	23·3	169·8
Tung.....	23·2	162·4	21·2	127·2
Castor.....	16·8	117·6	14·5	87·0
Codliver (old)...	20·5	143·5	23·4	140·4
Whale (old)....	14·0	98·0	15·3	91·8
Butter I.....	8·1	53·7	5·8	34·8
" II.....	9·4; 9·1	65·8	6·0	36·0
Mutton fat.....	9·6	67·2	8·6	51·6
Lard.....	11·5	80·5	10·9; 10·8	65·4

The Maumené figures of the maize oil acid (I.) and exposed linseed acids (II.) show that the rise of temperature with sulphuric acid is increased by oxidation, as was also found by Ballantyne (this Journal, 1891, 29). Castor oil, tung oil, butter fat, and lard fatty acids gave Maumené figures much higher proportionately than the bromine thermal figures.

Glycerides.—The oils themselves tested by this method also showed a certain agreement between the Maumené figures and the iodine value, though as a rule this was not so close, as in the case of the fatty acids. It was fairly satisfactory, however, in the case of almond, earthnut, olive, maize, sesamé, mustard husk, rape, and Japanese rape oils. The figures given by linseed oil were invariably too low, though the results obtained with 98 per cent. sulphuric acid approximated more closely to the truth than those with

acid of 94 per cent. In the case of tung oil a clot formed round the thermometer immediately, and vigorous stirring was required to break this up (cf. Jenkins, this Journal, 1898, 674). The sample of tung oil examined by Rowland Williams (this Journal 1900, 301) showed by the author's method:—Maumené figure, 26·2° C., and bromine thermal value 23·7, the respective calculated iodine values being 112·6 and 142·2.

Halogen Standard Figures.—In order to obtain uniformity in the results, the author suggests that all results should be calculated on the basis of a tube and thermometer with a bromine thermal factor of 5, and that the exact strength of sulphuric acid be given. The influence of using different apparatus is shown in the following examples:—

Oil.	Vacuum Tube I., Thermometer I., Bromine Thermal Factor = 6.		Tube II., Thermometer II., Bromine Thermal Factor = 5·52.	
	Rise with H_2SO_4 93·8 %.	Halogen Standard Figure.	Rise with H_2SO_4 93·8 %.	Halogen Standard Figure.
	° C.		° C.	
Almond.....	12·7	15·24	13·6	14·96
Cotton.....	15·3	18·36	16·3	17·33
Oleic acid.....	11·7	14·04	12·5	13·75

Influence of the Duration of the Reaction.—The rise of temperature with sulphuric acid occupies from 45 seconds to one or even two minutes with the weaker strengths of acid. A rough correction can be obtained by noting the fall of temperature from the highest point attained at intervals of 5 minutes, and dividing the total loss of temperature by the number of minutes before the mercury ceases to fall. It becomes apparently constant at 2° or 3° above the temperature of the room, which points to the establishment of an equilibrium between any substitution which occurs and the loss of heat. The loss thus determined was found to amount to approximately 0·2° C. with different tubes, strength of acids, and oils. If the rise does not last more than a minute, this correction may be neglected, but it is advisable to use acid of more than 96 per cent. strength to reduce the time error as far as possible.

Influence of Different Strengths of Acids.—Archbutt (this Journal 1886, 304) showed that the concentration of the sulphuric acid had a considerable influence on the ordinary Maumené figure, and this is also the case with the author's method, as is shown in the following results:—

Oil.	Acid. 93·8 %.	Acid. 95·1 %.	Acid. 96·3 %.	Acid. 97·8 %.
	° C.	° C.	° C.	° C.
Oleic acid.....	11·8	13·25	14·6	15·7
Almond.....	12·7	14·4	16·2	18·8
Cotton.....	15·0	18·7	20·0	22·9
Linseed.....	19·6	27·5	28·1	31·2

It will be observed that the rise with 93·8 per cent. acid was disproportionately low in the case of the linseed oil.

—C. A. M.

Hübl's Solution; Improvement of the Stability of—
M. Kitt. Chem.-Zeit. 1901, 25, [51], 540.

The instability of Hübl's solution depends upon a reaction which gradually leads to a condition of chemical equilibrium. This condition can be accelerated by boiling the Hübl solution on the water-bath under a reflux condenser.

Thus, a solution prepared in accordance with Hübl's directions contained 0·61405 gm. of iodine in 20 c.c.; but after being boiled for five hours, the amount had fallen to 0·22194 gm., at which it remained constant even after an additional 196 hours. The author then prepared a solution which, after boiling, gave a reading of about 0·5 gm. of iodine in 25 c.c. in the following manner:—30 grms. of iodine and 25 grms. of mercuric chloride were each dissolved in 500 c.c. of 98 per cent. alcohol, and the mixed

solutions boiled for an hour on the water-bath. Before boiling 25 c.c. of the solution gave a reading of 0.76756 grm. of iodine and, after boiling, 0.49321 grm.

On comparing the keeping qualities of this solution with that of ordinary freshly-prepared Hübl solution, the following results were obtained:—

Hübl Solution.		Iodine Solution.	
Time.	Decrease in Iodine Reading.	Time.	Decrease in Iodine Reading.
Days.	Per Cent.	Days.	Per Cent.
24½ hours = 1	2.12	23 hours = 1	Nil
45 " = 2	3.31	74 " = 3	Nil
355 " = 15	9.31	56 " = 4	0.75
650½ " = 27	12.75	193 " = 8	1.50
		2.9 " = 12	2.88
		500 " = 25	5.62
		910 " = 49	8.12

—C. A. M.

Oils, Fats, and Waxes; Elimination and Determination of Water in—. C. B. Davis. J. Amer. Chem. Soc. 1901, 23, [7], 487—488.

The loss due to foaming and spitting met with in the determination of water in oils, fats, or waxes, may be obviated in the following way:—Coiled-up thick filter paper is introduced into a wide mouthed, glass-stoppered, weighing bottle in quantity sufficient to half fill it, and the bottle and paper are then dried at 110° C. until of constant weight. A portion of the oil or of the solid wax or fat sufficient to just saturate the filter paper is then added, the bottle being then closed and re-weighed, and afterwards dried at 110° until no further loss in weight occurs. Samples prone to oxidation are dried in an atmosphere of hydrogen or carbon dioxide.—T. H. P.

Linseed Oil and its Adulterants [Analytical Constants, and Detection and Determination of Adulterants]. P. C. McIlhenny.

See under XII., page 909.

Sugar Canes; Valuation of—. F. N. G. Gill.

See under XVI., page 915.

Sugar in Beets; Rapid Determination of—. Hiltner and Thatcher. (This Journal, 1901, 754.) Notes on the above. E. E. Ewell.

See under XVI., page 915.

Total Acidity of Wines; New Indicator for Determining—. E. G. Runyan. J. Amer. Chem. Soc. 1901, 23, [6], 402—405.

For determining the total acidity of wines, the author recommends as indicator the Aurin-Malachite Green mixture which Lachaux proposed for the rapid measurement of the excess of alkali in beet-sugar juices. This indicator is prepared by dissolving 3.1 grms. of aurin or commercial rosolic acid in 150 c.c. of 90 per cent. alcohol, the solution, after neutralisation, being mixed with 0.5 grm. of Malachite Green dissolved in 50 c.c. of alcohol. The end reaction is sharper for the change from acidity to alkalinity of the solution than for the reverse. A number of comparative determinations of the acidity of claret, Rhine wine, and sherry using aurin-malachite green, phenolphthalein, and litmus as indicators, shows that the first-named indicator gives results which are lower than those obtained with the others. As the differences are greatest in the case of claret or red wine where, with phenolphthalein or litmus a decided excess of alkali must be run in before the change of colour can be detected, the author considers that the numbers obtained with Aurin-Malachite Green are the most accurate.—T. H. P.

Wheaten Flour; Densimeter for the Valuation of — for Bread Baking. E. Fleurent. Comptes Rend. 132, [23], 1421—1423.

The value of a flour for baking depends on the proportion of gliadine contained in its gluten. For its rapid approximate valuation, the author has devised a densimeter, graduated in two series of divisions from a common zero. The upper set serves for the preparation of the alcohol (74 per cent.) to be used as a solvent, the lower to read the density of the solution of gliadine. The solution is made by agitating a quantity of the flour containing 5 grms. of dry gluten with 150 c.c. of the 74 per cent. alcohol. The gliadine content is deduced empirically from the density, the densities of a number of such solutions being compared with the amount of gliadine gravimetrically determined in each case. The author states that variations in the gliadine from different flours, in the amount of other substances dissolved, and in the humidity of the flours, do not affect the results to an extent appreciable for the purposes of the baker.—J. T. D.

Tartar; Commercial Determination of—. H. Quantin. Ann. Chim. anal. appl. 6, 244—248. Chem. Centr. 1901, 2, [7], 503.

The French casserole test ("procédé à la casserole") consists in extraction with boiling water and subsequent separation of crystals from the liquor by cooling. This approximate determination is of good service in the factory and can be carried out by a workman. The obtainment of sufficiently large crystals to allow of their separation without appreciable loss depends entirely upon the method of carrying out the test, i.e., upon gradual cooling. The author, whilst adhering to the principle of the casserole test, proposes to avoid the drying and weighing of the crystals by titrating the solution of the sample and the mother liquor from the crystals, taking due regard to the temperature at which the crystals separated.—A. S.

Alkaloids; Action of the Vegetable—on certain Indicators. A. Astruc. Comptes Rend. 1901, 133, [2], 98—100. (See also this Journal, 1900, 781.)

Alkaloids derived from Pyridine.—Pyridine is less basic than piperidine, thus the former does not act on phenolphthalein, whilst the latter may be estimated by means of that indicator in aqueous solution. In an indifferent solvent (benzene) pyridine does not act on rosolic acid; whilst, in presence of this substance, piperidine is neutralised by 1 mol. of hydrochloric acid. In a similar manner the alkaloids derived from piperidine (conicine, conhydrine, sparteine, &c.) are strong bases acting on Helianthin A, phenolphthalein, and rosolic acid, whilst the alkaloids derived from pyridine (nicotine, pilocarpine) do not act, under the same conditions, on phenolphthalein; in an indifferent solvent the former influence Helianthin A and rosolic acid, the latter Methyl Orange alone.

Sparteine, in aqueous solution, is made neutral to rosolic acid and phenolphthalein by 1 mol. of hydrochloric acid, and neutral to Helianthin A by 2 mols. of the same acid. In an indifferent medium, sparteine is a monovalent base towards rosolic acid.

Alkaloids derived from Tropine.—Tropine itself is a strong base and behaves towards indicators in a similar manner to piperidine. Atropine and hyoscyamine are also similar. In benzene solution, however, tropine is basic towards rosolic acid, whilst atropine and hyoscyamine are neutral. Egonine and benzoyl-egonine, which possess both acid and basic functions, are neutral to indicators in aqueous solution; dissolved in benzene, they are neutral to rosolic acid, monovalent bases towards Helianthin A, and monobasic acids towards phenolphthalein.

Alkaloids derived from Quinoline.—In aqueous solution, quinine is neutral to phenolphthalein, requires 1 mol. of hydrochloric acid to become neutral to rosolic acid and 2 mols. to become neutral towards Helianthin A. In benzene solution, quinine acts only on Methyl Orange, and then as a divalent base.



Alkaloids derived from Orazine and Isoquinoline.—Dissolved in water or dilute alcohol, codeine, morphine and thebaine may be approximately estimated by means of rosolic acid, to which papaverine, narcotine and narceine are neutral. All these alkaloids behave as monovalent bases towards Helianthine A. The benzene solutions of these alkaloids act similarly towards Methyl Orange; 1 mol. of narceine or morphine requires 0.9—1.0 mol. of potash to become neutral towards phenolphthalein.

Alkaloids which probably contain the Pyridine Nucleus in an unknown State of Condensation.—Aconitine, veratrine, strychnine and brucine are very weak bases which hardly act upon Helianthine A.

Alkaloids derived from Purine.—Crystallised caffeine is neutral to all the indicators. When dehydrated and dissolved in benzene, it turns Methyl Orange yellow, but cannot be estimated, even approximately, by this means.

—A. C. W.

Nicotine in Tobacco and in Aqueous Extracts of Tobacco Leaves; New Method for the Determination of —.
J. T6th. Chem.-Zeit. 1901, 25, [57], 610.

In titrating nicotine solutions, Iodeosin alone was found to give a sharp reaction. A strong solution of caustic soda should be used to liberate the alkaloid from the salts in which it is present in tobacco; the subsequent extraction with ether is the more incomplete the more water is present. The following method was adopted: The tobacco, dried in the air or over quicklime, was ground or pounded, 6 grms. were weighed and well triturated with 10 c.c. of 20 per cent. caustic soda. Burnt gypsum was then added in small quantities, with continuous stirring, until the whole mass fell to powder when lightly pressed. The powder was brought into a thick-walled cylinder, 25 cm. high and 5 cm. wide, and shaken with 100 c.c. of a mixture of ether and petroleum spirit 50 times at intervals during at least 1 hour. Then 25 c.c. of the clear solution were withdrawn by means of a pipette, brought into a 300—400 c.c. flask, 40—50 c.c. of water and 1 drop of Iodeosin solution added, then excess of $\frac{1}{10}$ N. acid, which was titrated back with caustic soda. A control experiment on pure nicotine gave 96.3 per cent.

The presence of ammonia in small quantities in the tobacco leaves does not affect the accuracy of the method. Keller recommends that a current of air be blown through the ether solution for one minute in order to drive off ammonia (D. pharm. Ges. Ber. 1898, 8, 145). The author did not find that the ether vapour lost its alkaline reaction after blowing air for one minute or more, and in working on pure nicotine lower results were obtained, which were doubtless due to loss of alkaloid in the ether vapour.

—A. C. W.

Hydrastine and its Determination, &c. T. Maben. Brit. Pharm. Conference, Dublin. Chem. and Druggist, 1901, 59, [1123], 234—236.

HYDRASTIN is essentially a mixture of the alkaloids occurring in the rhizome of *Hydrastis Canadensis*. The name hydrastine is now usually applied to the white, and berberine to the yellow alkaloid obtained from the plant. Both alkaloids are bitter, but they differ considerably in therapeutic properties, hydrastine being much the more powerful of the two. The rhizome contains, on the average, about 2.18 per cent. of hydrastine and about 3.3 per cent. of berberine, but the percentage of both alkaloids varies very greatly. The following method has proved most satisfactory for the assay of hydrastis:—10 grms. of the finely ground drug are exhausted with hot alcohol, and the percolate cooled and made up to 100 c.c. with alcohol.

Determination of Berberine (Yellow Alkaloid).—25 c.c. of the percolate are treated with $1\frac{1}{2}$ c.c. of hydrochloric acid (32 per cent.), $\frac{1}{2}$ c.c. of concentrated sulphuric acid, and 125 c.c. of sulphuric ether; the mixture is cooled, well agitated, and allowed to stand for 24 hours in a refrigerator. The separated berberine hydrochloride is filtered through a tared filter, washed free from acid with a mixture of equal volumes of alcohol and ether, dried at 105° C., and weighed. The weight multiplied by 0.9017 gives the weight of berberine.

Determination of Hydrastine (White Alkaloid).—The combined filtrate and washings from the berberine hydrochloride are rendered almost neutral, evaporated nearly to dryness on the steam bath, and the residue treated with hot water in small quantities. The hot aqueous solution is filtered into a separating funnel, and the treatment is continued until the washings from the residue cease to give an alkaloidal reaction with the ordinary test reagents. The extraction of the alkaloid from the resinous mass may be somewhat expedited by the addition of a few drops of alcohol at each extraction with water, evaporating off the alcohol each time before pouring off the aqueous washing. The aqueous extract is made alkaline with ammonia water and the hydrastine removed by continued extraction with ether. The ethereal extract is evaporated, the hydrastine dissolved out from the residue by treatment with successive quantities of 5 per cent. sulphuric acid, the solution made alkaline with ammonia, and the alkaloid again extracted with ether. The ethereal extract is evaporated to dryness, the residue dissolved in excess of $N/_{50}$ acid, and the solution titrated back with $N/_{100}$ alkali, using cochineal as indicator. The result multiplied by 0.00383 gives the weight of hydrastine.

In assaying the "concentration" or extract, the above process may be used, or the following shorter method:— $\frac{1}{2}$ gm. of the "concentration" or extract is treated in a beaker with sufficient 60 per cent. alcohol to dissolve the greater portion of it. The alcoholic solution is distributed upon about 2 ozs. of well-washed sawdust or other inert material contained in a dish, the beaker being rinsed out with successive small portions of 60 per cent. alcohol, and the washings also transferred to the sawdust. The dish is allowed to stand in a warm place until the alcohol has practically all evaporated, the residual powder is treated in an 8-oz. flask with 150 c.c. of sulphuric ether and sufficient water to moisten the mass, the whole made alkaline with ammonia, and the flask corked tightly, and shaken at intervals during five hours. After settling, 75 c.c. of the clear ethereal solution are withdrawn, the hydrastine extracted by successive quantities of 2 per cent. hydrochloric acid, the acid solution made alkaline with ammonia, and the hydrastine again extracted with ether. The ethereal solution is evaporated to dryness, the hydrastine dissolved in $N/_{10}$ acid, and the solution titrated back with $N/_{100}$ alkali.

The author then criticises the B.P.C. formulary process for the preparation of the extract by aid of 60 per cent. alcohol. He states that not only will the dry extract contain less than 10 per cent. of "white alkaloid," but, owing to the weak alcoholic menstruum, it will be hygroscopic, and, unless care be taken to guard against atmospheric influences, it will, in time, form a sticky, semi-solid, gum-resinous mass. He recommends that in the next issue of the Formulary the name of the extract be changed to "*extractum hydrastis siccum*"; that a stronger alcoholic menstruum be employed; and that the extract be standardised to contain 10 per cent. of hydrastine (white alkaloid). The following were the results obtained on examining six samples of commercial hydrastine, of which four were American, one was B.P.C., and one was from an unknown source:—

	Hydrastine.	Berberine.
I.	15.2	23.56
II.	8.7	9.67
III.	trace	26.9
IV.	"	16.53
V.	"	trace
VI. (B.P.C.)	"	"

One sample was said to contain 20 per cent. of hydrastine; another "the combined alkaloids from golden seal in the same proportion as they exist in the drug, but in ten times the concentration"; and no claim was made for any of the others. In appearance three of the samples were of a bright yellow colour, in fine powder, and perfectly non-hygroscopic. Two, including the B.P.C. sample, were in coarser powder, hygroscopic, and darker. One was darker in colour, and non-hygroscopic.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Arsenical Poisoning. Eng. and Mining J. 1901, 72, [4], 102.

HAVING regard to the comparative immunity from illness of men who work in mines containing arsenical ores and in reduction works where such ores are treated, it is certain that arsenic is not a cumulative poison like lead, but quickly disappears from the vital organs of the body, and it is also probable that men working continually with arsenical materials undergo a kind of inoculation. Brouardel has stated that arsenic could be administered as a slow poison and death might occur six weeks after it had ceased to be taken. While the person subject to arsenical poisoning is living, arsenic is readily detected in the urine or linen and especially in the hair. At Havre, France, the hair of a lady who was poisoned was analysed: 100 grms. yielded 1 mgrm. of arsenic. Pouchet has shown that long after all trace of arsenic had disappeared in the viscera, it could easily be detected in the spongy tissue of the bones. Especially the arsenic given in small doses appears to become located in the bones.—A. S.

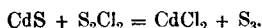
Blue (or Green) Wöhler's Sulphur; New Case of the Formation of —. N. A. Orlow, J. russ. phys.-chem. Ges. 33, 397—399. Chem. Centr. 1901, 2, [8], 522.

IF dry bismuth sulphide, Bi_2S_3 , be agitated with a solution of sulphur monochloride in benzene, and the solution, after decanting from some greenish-black lumps, be heated to 70°C ., a green powder is formed, which does not alter in benzene, but which becomes yellow to white on drying or moistening with alcohol. It consists of almost pure sulphur (about 5 per cent. of ash). Zinc sulphide and cadmium sulphide act in a similar manner. The product prepared by means of cadmium sulphide also contained blue grains, and this led the author to identify the green variety of sulphur with Wöhler's modification. It is suggested that the blue sulphur stands in the same relation to ordinary sulphur as ozone does to oxygen. It is possible that the ash found in all the products (BiCl_3 in that from Bi_2S_3) acts the part of a condensing agent.

—A. S.

Green Modification of Sulphur; Reaction of the Formation of the —. N. A. Orlow. J. russ. phys.-chem. Ges. 33, 400—403. Chem. Centr. 1901, 2, [8], 522. (See preceding abstract.)

THE formation of the green sulphur will take place in presence of carbon bisulphide or toluene instead of benzene. The reaction proceeds according to the equation:—



A compound CdCl_2S_3 must be excluded, since analyses of the precisely analogous bismuth product, showed that the precipitate formed in that case is of extremely variable composition (0.90 per cent. BiCl_3).—A. S.

Copper Sulphate under the Influence of Water and Temperature; Dissociation of —. C. Hensgen. J. prakt. Chem. 1901, 63, [10 & 11], 554—562.

A PRELIMINARY communication on the dissociation of copper sulphate in water in different concentrations and at different temperatures, the author finding that the proportion of metal to acid determined as Cu_2S and BaSO_4 , differs from the relative amounts present in the solid salt according to the varying conditions, details of which are given in a number of tables.—T. A. L.

Cadmium Oxide; Natural —. B. Neumann and E. Wittich. Chem.-Zeit. 1901, 25, [53], 561—562.

IT has usually been accepted that cadmium is always present in zinc minerals, even in zinc carbonate, in the form of sulphide. The authors have now, however, found that a brown-black deposit, partly amorphous, partly crystalline, on some fragments of calamine from Monte Pone in Sardinia, consisted of "chemically pure cadmium oxide." Between the covering of crystals and the ground mass was

an extremely thin citron yellow layer which contained much cadmium; the ground mass itself contained no trace of cadmium. Similar crystals can be produced artificially by the distillation of cadmium. The natural crystals belonged to the regular system, and had a hardness of about 3, and a sp. gr. of 6.15. No measurements could be made as the largest crystal measured only $\frac{1}{2}$ m.m. along one side. W. G. M.

Stannous Chloride and Oxygen; Reaction between —. S. W. Young. J. Amer. Chem. Soc. 1901, 23, [7], 450—456.

IN order to get a clue to the course taken by the reaction between stannous chloride and oxygen, the author has prepared solutions of the chloride in hydrochloric acid, these being then oxidised as quickly as possible, transferred to a thermostat and measurements of the electrical conductivity made from time to time. The oxidation was effected by means of free oxygen (aided by small quantities of hydrogen sulphide), potassium permanganate, ferric chloride, hydrogen peroxide or sodium hypochlorite. In all cases, the freshly oxidised stannous chloride solutions show electrical conductivities which increase with time, the increase being in general greater for solutions more concentrated in hydrochloric acid than for those containing less acid. These results show that the first stage in the oxidation of stannous chloride is the formation of stannic chloride, and that hydrochloric acid is necessary for this change, which takes place according to the equation: $\text{SnCl}_2 + \text{O} + 2\text{HCl} = \text{SnCl}_4 + \text{H}_2\text{O}$. The stannic chloride thus formed is then acted upon by water, the resulting products being stannic hydroxide and hydrochloric acid. $\text{SnCl}_4 + 4\text{H}_2\text{O} = \text{Sn}(\text{OH})_4 + 4\text{HCl}$; it is this second reaction to which the increasing conductivity of the oxidised solutions is due. The oxidation of stannous chloride hence follows the Ostwald rule, which states that wherever an intermediate product can be formed during a reaction, such product is formed.—T. H. P.

Chlorine and Ammonia; Reaction between —. W. A. Noyes and A. C. Lyon. J. Amer. Chem. Soc. 1901, 23, [7], 460—463.

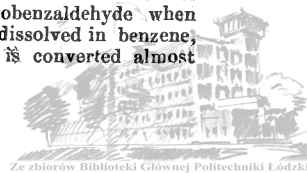
BY the action of an excess of concentrated ammonia solution on chlorine, the volume of the nitrogen evolved approaches but never reaches one-third that of the chlorine used, whilst if a 0.5 per cent. ammonia solution be taken in such quantity as to leave the liquid faintly acid, the volume of the nitrogen is very nearly one-sixth of that of the chlorine. If a 2 per cent. ammonium chloride solution be used in place of ammonia, the chlorine is almost completely absorbed, while the volume of the nitrogen may be as low as only 1—2 per cent. of that of the chlorine. The normal reaction between chlorine and ammonia is expressed by the equation: $12\text{NH}_3 + 6\text{Cl}_2 = \text{N}_2 + \text{NCl}_3 + 9\text{NH}_4\text{Cl}$; this, however, only takes place when nearly the proper proportions of the two compounds are taken. In presence of excess of ammonia, the nitrogen chloride reacts thus: $\text{NCl}_3 + 4\text{NH}_3 = \text{N}_2 + 3\text{NH}_4\text{Cl}$, and $\text{NCl}_3 + 2\text{NH}_4\text{OH} + \text{H}_2\text{O} = 3\text{NH}_4\text{ClO}$.—T. H. P.

Cupric Hydroxide; Action of —, on Solutions of Metallic Salts. A. Mailhe. Comptes Rend. 133, [4], 226—228.

TETRACUPRIC hydroxide, $\text{Cu}_4\text{O}_3(\text{OH})_2$, with solutions of metallic chlorides or bromides, gives a series of mixed basic salts, of the general formula $\text{MR}_x\text{CuO}_y\text{H}_2\text{O}$, where x is usually 2 or 3. The action is slow in the cold but much more rapid in hot solutions. The hydroxide $\text{Cu}(\text{OH})_2$, and in some cases the oxide CuO , furnish the same compounds.—J. T. D.

Light; Chemical Action of —. II. G. Ciamician and P. Silber. Ber. 1901, 34, [10], 2040—2036. (See this Journal, 1901, 844.)

CONTINUING their researches on the chemical action of light, the authors find that *o*-nitrobenzaldehyde when exposed to light in a thin layer or dissolved in benzene, ether, acetone, or isopropyl alcohol is converted almost



completely into *o*-nitrosobenzoic acid. Thus a solution of *o*-nitrobenzaldehyde in benzene contained in a sealed tube and exposed for half an hour to light, deposits a white crystalline precipitate of *o*-nitrosobenzoic acid. This product already obtained by E. Fischer, by the oxidation of phenylloxindole (Ber. 29, 2064) blackens at 180° C., and melts at 205°–210° C. A solution of *o*-nitrobenzaldehyde (1 grm.) in absolute ethyl alcohol (20 c.c.) is converted after a few hours exposure to light into *o*-nitrosobenzoic ethyl ester (0.7 grm.). This substance forms colorless crystals which fuse at 121° C. to an emerald green melt. The methyl ester obtained similarly from methyl alcohol crystallises in rhombic plates (occasionally 2 c.m. long) and melts at 153° C. No similar reactions to the above were observed in the case of the *m*- and *p*-isomerides.

—T. A. L.

Saccharification, by Seminase under the Influence of Sodium Fluoride, of the Carbohydrates of the Horny Albumin of Leguminous Seeds. H. Hérissay. Comptes Rend. 133, [1], 49–52.

THE author has previously shown that seminase is present not only during the germination of these seeds, but in the seeds when at rest, by keeping the moist seeds at 25° C., in presence of chloroform, when formation of mannose and galactose occurs through the action of the ferment. He now employs sodium fluoride as an antiseptic instead of chloroform, and finds that the action is carried farther and is much more rapid (eight or nine days in place of two or three months), so that it can even be utilised as a practical mode of preparation of mannose. The fluorides of potassium and of ammonium, as well as the double fluoride of potassium and sodium, were tried in place of sodium fluoride, but none gave satisfactory results.—J. T. D.

Propyl Glycol; Oxidation of —, by Mycoderma Aceti. A. Kling. Comptes Rend. 133, [4], 231–233.

A 5 per cent. solution of propyl glycol was sown with pure cultures of *mycoderma aceti*, and fermented at 30° C. for some days. Examination of the hydrazone, osazone, and oxime of the product showed them to be identical with the corresponding derivatives of acetol. This ferment, then, like the sorbose bacterium, converts propyl glycol into acetol: $\text{CH}_3\text{CH(OH).CH}_2\text{OH} + \text{O} = \text{CH}_3\text{CO.CH}_2\text{OH} + \text{H}_2\text{O}$. *Mycoderma* seems to be rather more active than the sorbose bacterium. The acidity diminishes slightly as the fermentation proceeds, and an acidity of 2 per cent. of acetic acid greatly retards it.—J. T. D.

Acetone; Action of Hypophosphorous Acid on —. C. Marie. Comptes Rend. 133, [4], 219–221.

WHEN hypophosphorous acid (250 grms.) is treated with acetone (400 grms.), simple solution occurs in the first place. But on boiling for 60–70 hours, the boiling-point rises, and on cooling, crystals separate, which, after purification, melt at 180°–181° C., and have the composition expressed by $2\text{H}_3\text{PO}_3 + 2\text{C}_3\text{H}_6\text{O}$. The substance is a monobasic acid, which decomposes carbonates, forming crystallisable salts. The mother liquor, after distilling off the acetone, and treating with lead carbonate, yields a soluble and an insoluble portion. The former, after separating the lead, yields a crystallisable substance, extremely soluble in water or alcohol, melting at 40°–41° C., and functioning as a monobasic acid; its formula, from the analyses of the substance itself and its lead salt, appears to be $\text{H}_3\text{PO}_3 + \text{C}_3\text{H}_6\text{O}$. The insoluble lead compound is the salt of a dibasic acid of formula $\text{H}_3\text{PO}_3 + \text{C}_3\text{H}_6\text{O}$; on decomposing the lead salt by hydrogen sulphide, the acid is obtained in crystals melting at 169°–170° C.

—J. T. D.

Menthol; Action of Benzaldehyde on the Sodium Compound of —; and new Methods of preparing Benzylidenementhone. C. Martine. Comptes Rend. 133, [1], 41–43.

WHEN the sodium-compound of menthol is treated with benzaldehyde, reaction according to Claisen's equation occurs in part, but in part the menthol compound reacts

in the same manner as the corresponding borneol compound, and yields benzylidene-menthone. The same benzylidene-menthone is obtained by the action of benzaldehyde on the sodium compound of menthone.

—J. T. D.

Spanish for Common Broom; Dangerous Substitution of —. E. Perrot. J. Pharm. Chim. 14, [1], 19–21.

It is stated that, on the Continent, the flowers of the Spanish broom, *Spartium junceum*, are frequently substituted for those of the common broom, *Sarothamnus scoparius*, in commercial specimens of the drug. That this substitution is dangerous has recently been shown by several serious cases of poisoning which followed the taking of a herb tea, compounded with dried herbs, in which broom flowers were an ingredient, and which were those of *Spartium* and not the official *Sarothamnus*. Although 1 litre of the herb tea prepared from the ingredients would only represent 4 to 6 grms. of these flowers, yet a dose was sufficient to produce alarming toxic symptoms such as purging and vomiting. It has been stated that the Spanish broom is 6 or 7 times as powerful in its medicinal action as the common broom, but no definite chemical investigation of the active principles has been made. The following characters distinguish the two flowers:—*Sarothamnus scoparius*: Calyx small, bell shaped with two unequal lobes, the upper bidentate, the lower with three small teeth. Style, always rolled in a circle. *Spartium junceum*: Calyx deeply cleft on one side to the base. Style, merely curved, not rolled.

—J. O. B.

Prizes.

SOCIÉTÉ INDUSTRIELLE DE MULHOUSE.

The programme of subjects, for which prizes will be awarded by the Société Industrielle de Mulhouse next year, has been issued, and copies can be obtained upon application to the secretary of that society. In general, chemistry, medals will be awarded for the best memoirs on works on the theory and manufacture of alizarin reds; the synthesis of the colouring matters of cochineal; theoretical and practical study of the carmine of cochineal, criticising the methods indicated in books and commercial methods, as well as giving a process rivaling those at present in use, as to brilliancy of shade, price, &c., explaining the theory of the process; study of the colouring matter of cotton; its isolation and identity or otherwise with the substance which acts as a mordant in the fibres of unbleached or insufficiently bleached cotton; the composition of aniline blacks; work on the physical and chemical modifications which occur when cotton fibre is converted into oxycellulose, and explaining the deterioration resulting when an alkaline bath in boiling water acts on the oxidised fibre; the influence of chlorine and its oxygen compounds upon wool; the constitution of colouring matters employed on linen fibres, and hitherto incompletely studied; synthesis of one of the natural colouring matters employed in industries; theory of the natural formation of some substance of organic origin and its synthetic reproduction.

In connection with dyeing, medals will be awarded for memoirs and studies on the following subjects:—A new mordant capable of practical application; metallic solutions which yield their base to the immersed fibres, and the conditions under which they are most effective; the iron mordants, and the part they play in dyeing, dependent on their state of oxidation and hydration; a solid Aniline Black which will not deteriorate, or cause other colours to deteriorate, with especial reference to albumin; a soluble black, which shall be equal, as regards the action of light and soap, to Aniline Black; a blue which shall be cheap, and which will dye wools and resist the action of boiling and light; a blue analogous to ultramarine in shade and fixity, capable of being chemically fixed on cotton; a pure yellow capable of being fixed like alizarin, and having equal properties; a lake red equal, in colour and resistance to light, at least to that of vatted Indigo blue; a purple giving with cotton a shade equal to that of Magenta on wool; a dyestuff capable of replacing logwood in its various

applications; an assistant applicable to wool, and prepared from salts other than tin salts, thiosulphates, sulphites, and bisulphites; a new method of fixing aniline colours, equal to that of the tartar emetic process, and as resistant to a light as these are after the sulphate of copper bath; means of making dyestuffs resist the action of boiling soap solutions, and the prolonged action of water; method for producing the sheen of gold and silver metallic powders, capable of resisting the operations of cleaning, and the action of colours printed at the same time; a manual containing a series of tables showing the specific gravity, and solubility at various temperatures of as many inorganic and organic compounds as possible, especially as regards substances used in bleaching, dyeing, and printing; synthesis of a cheap substance having the essential properties of Senegal gum; a substitute for egg albumin in linen dyeing capable of causing the fixed colours to withstand the various operations, and as resistant to friction as those fixed with albumin; a method for rendering blood albumin equal to egg albumin for industrial applications; a manual dealing with the analysis of compounds used in printing and dyeing; an indelible ink for cotton and similar fabrics; a method for cheaply removing grease spots from fabrics; the use of resins in bleaching cotton fibre, indicating the part that resin takes in the lye-washing of fibres, as well as the quantities of resin most suitable; on the part that different varieties of cotton play in bleaching and dyeing of fibres, indicating the relative solidity of various cottons, and bleaching action on them; the bleaching of wool; the bleaching of silk; the preparations and applications of hydrogen peroxide in bleaching textile fibres; in the bleaching of cotton, wool, silk, hemp, and other fibres.

Medals are also offered for various methods of fabric printing; an alloy or other substance having the elasticity and durability of steel, and the property of not causing chemical action in the presence of acid dyestuffs and colours containing metallic salts; a new cylinder machine capable of printing eight colours at once; and an application of electricity to bleaching, dyeing, or textile printing; the application of some new method of electrolytic bleaching, dyeing, or textile printing; the discovery or introduction of a useful process for the manufacture of printed calicoes. Medals are also offered for memoirs and improvements in connection with steam generation, power production, spinning machines, weaving appliances, electric lighting, comparison of costs of electricity, gas, acetylene, and water-gas for lighting factories. Money prizes are awarded in some of the subjects; all competitions are open to everyone, irrespective of nationality. Memoirs, designs, and models must be sent to the President of the Société Industrielle de Mulhouse before Feb. 15, 1902.—C. T. T.

MINERAL PHOSPHATES IN WESTERN AUSTRALIA.

Bd. of Trade J., Aug. 22, 1901.

The *Government Gazette* of Western Australia of the 12th ult. publishes an official notification that the following rewards are offered for the discovery of mineral phosphates within the State of Western Australia, viz., 500*l.* if discovered upon Crown lands, 250*l.* if discovered upon private lands.

The conditions under which the rewards will be paid may be seen at the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, S.W.

New Books.

THE MINERAL INDUSTRY: ITS STATISTICS, TECHNOLOGY, AND TRADE IN THE UNITED STATES AND OTHER COUNTRIES TO THE END OF 1900. Founded and edited by RICHARD P. ROTHWELL, late Editor of the *Engineering and Mining Journal*; Ex-President American Institute of Mining Engineers, &c.; and completed by JOSEPH STRUTHERS, Ph.D., Columbia University, New York City. Volume IX. Supplementary Volumes I. to VIII. The Scientific Publishing Company, New York and London. 1901. Price 1*l.* 10*s.*

LARGE 8vo volume containing table of contents, introduction, 884 pages of subject-matter, and a copious alphabetical

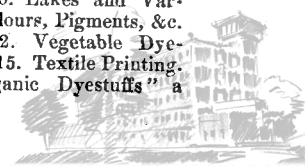
index. The subjects in this work are treated exhaustively, geographical and geological occurrence, commercial values, modes of treatment, chemical composition, and statistics being given. In the Introduction are given:—I. The Total Value of the Mineral and Metal Production of the United States. Statistical Tables of the Production of Ores and Minerals, Production of Metals, &c. Summary of the Mineral Industry of the United States in 1900, &c. II. Aluminium and Alum. III. Ammonia and Ammonium Sulphate. IV. Antimony. V. Arsenic. VI. Asbestos. VII. Asphaltum. VIII. Barytes. IX. Bismuth. X. Borax. XI. Bromine. XII. Calcium Carbide and Acetylene. XIII. Cement. XIV. Chromium and Chrome Ore. XV. Clay. XVI. Coal and Coke. XVII. Copper. XVIII. Copperas. XIX. Felspar. XX. Fluorspar. XXI. Fullers' Earth. XXII. Garnet. XXIII. Gems and Precious Stones. XXIV. Glass. XXV. Gold and Silver. XXVI. Graphite. XXVII. Gypsum. XXVIII. Iron and Steel. XXIX. Lead. XXX. Magnesium and Magnesite. XXXI. Manganese. XXXII. Mica. XXXIII. Molybdenum. XXXIV. Nickel and Cobalt. XXXV. Ochre and Iron Oxide Pigments. XXXVI. Petroleum. XXXVII. Phosphate Rock. XXXVIII. Platinum and Iridium. XXXIX. Potash and Potassium. XL. Mercury. XLI. Rare Elements. XLII. Salt. XLIII. Silica. XLIV. Slate. XLV. Soda and Sodium. XLVI. Stone. XLVII. Sulphur and Pyrites. XLVIII. Tale and Soapstone. XLIX. Tin. L. Tungsten. LI. Zinc and Cadmium. LII. Pyritic Smelting. LIII. Progress of Metallography in 1900. LIV. Manufacture of Titanium and its Alloys. LV. Review of the Literature on Ore Dressing in 1900. LVI. Concentration of the Broken Hill (N.S.W.) Sulphide Ores. LVII. Recent Contributions to the Science of Ore Deposits. LVIII. Notes on Electro-Chemistry, 1900; On the Concentration of Finely Crushed Ores, &c. LIX. The Mining Stock Exchanges in 1900. LX. General Summary of Import Duties and Mineral Statistics of Foreign Countries, &c.

SUBJECT LIST OF WORKS ON CHEMISTRY AND CHEMICAL TECHNOLOGY IN THE LIBRARY OF THE PATENT OFFICE. [Patent Office Library Series: No. 6. Bibliographical Series: No. 3.] Darling and Son, Ltd., 34—40, Bacon Street, London, E. Printed for His Majesty's Stationery Office. Published at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. 1901. Price 6*d.*

KEY TO THE CLASSIFICATION OF THE PATENT SPECIFICATIONS OF GERMANY, AUSTRIA, DENMARK, AND NORWAY, IN THE LIBRARY OF THE PATENT OFFICE. [Patent Office Library Series, No. 5.] Darling and Son, Ltd., 34—40, Bacon Street, London, E. Printed for His Majesty's Stationery Office. Published at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. 1901. Price 6*d.*

ZUR GESCHICHTE DER ENTSTEHUNG UND ENTWICKLUNG DER CHEMISCHEN INDUSTRIEN IN DER SCHWEIZ. Zusammengestellt im Auftrage der schweizerischen Gesellschaft für chemische Industrie, auf Grund von Mitteilungen seitens Mitgliedern der Gesellschaft. Von Dr. GEORG LUNGE, Professor am eidgen. Polytechnikum in Zürich. Druck und Verlag: Art. Inst. Orell Füssli, Zürich. 1901. Price M. 1.

SMALL 8vo volume, bound as pamphlet, containing preface, 70 pages of subject-matter, and a table of contents. In the preface Prof. Lunge acknowledges the assistance and co-operation of various Swiss manufacturers and chemists, representing the several industries on which reports are given. These branches are as follows:—1. Acids, Alkalis, and Salts. 2. Manure Manufacture. 3. Wood Distillation. 4. Explosives and Match Industries. 5. Electro-chemical Industry. 6. Pharmaceutical and Photographic Preparations. 7. Soap Manufacture and Allied Industries. 8. Starch and Dextrin. 9. Glue. 10. Lakes and Varnishes; Book- and Stone-Printing Colours, Pigments, &c. 11. Artificial Organic Dyestuffs. 12. Vegetable Dyestuffs. 13. Bleaching. 14. Dyeing. 15. Textile Printing. Under the head of "Artificial Organic Dyestuffs" a



remarkable achievement is recorded for Switzerland, in that whereas the production of these dyestuffs reckoned as to value, in millions of francs, for the countries England, France, and Switzerland is respectively, 9, 7, and 7, during the year 1875, on the arrival of the year 1896 these figures have changed as follows: 8—9 (England); 3—10 (France); and 16 (Switzerland). The figures for Germany are: 1875, 30½ millions; and 1896, 90 millions.

TWENTIETH CENTURY INVENTIONS: A Forecast. By GEORGE SUTHERLAND, M.A. Longmans, Green, and Co., 39, Paternoster Row, London; New York and Bombay. 1901. Price 4s. 6d.

8vo volume, containing preface, table of contents, and 286 pages of subject-matter. The general drift of the work may be gathered from the following chapter headings:—I. Inventive Progress. II. Natural Power. III. Storage of Power. IV. Artificial Power. V. Road and Rail. VI. Ships. VII. Agriculture. VIII. Mining. IX. Domestic. X. Electric Messages. XI. Warfare. XII. Music. XIII. Art and News. XIV. Invention and Collectivism.

CHEMISCH-TECHNISCHES REPERTORIUM. Uebersichtlicher Bericht über die neuesten Erfindungen, Fortschritte und Verbesserungen auf dem Gebiete der technischen und industriellen Chemie, mit Hinweis auf Maschinen, Apparate und Literatur. Herausgegeben von Dr. EMIL JACOBSEN. 39. Jahrgang. 1900. Zweites Halbjahr. Zweite Hälfte. R. Gaertner's Verlagsbuchhandlung, Hermann Heyfelder, Schönebergerstr. 26, Berlin, S.W. 1901.

This is the number of the "Repertorium" for the second half of the second half-year of 1900, and it treats of the following subjects of chemical technology:—I. Foodstuffs. II. Paper. III. Photography. IV. Residues, Manures, Disinfection, and Sanitation. V. Soaps. VI. Explosives and Matches. VII. Preparation and Purification of Chemicals. VIII. Fine Chemicals, &c. IX. Chemical Analysis. X. Apparatus, Machinery, Electro-technology and Thermo-technology. XI. Appendix, &c. XII. New Books. Alphabetical index of subject-matter.

A MANUAL OF LABORATORY PHYSICS. By H. M. TORY, M.A., and F. H. PITCHER, M.Sc. John Wiley and Sons, New York. 1901. Price 8s. 6d. Messrs. Chapman and Hall, Ltd., London.

8vo volume containing preface, table of contents, 284 pages of subject-matter, and the alphabetical index. The text is illustrated with 63 engravings, and the subjects practically treated of are Sound, Light, Heat, Magnetism, and Electricity.

THE CHEMICAL ESSAYS OF CHARLES WILLIAM SCHEELÉ. Translated from the Transactions of the Academy of Sciences at Stockholm, with Additions. First published in English by J. Murray, 32, Fleet Street, London, in 1786. With a sketch of the Life of Karl Wilhelm Scheele. By JOHN GEDDES M'INTOSH. Scott, Greenwood, and Co., 19, Ludgate Hill, London, E.C. 1901. Price 5s.

8vo volume containing dedication, preface, table of contents, 290 pages of subject-matter, and an alphabetical index. The subjects of the essays are: Fluor Mineral and its Acid. Manganese, Manganesium, or Magnesia Vitriariorum. Arsenic and its Acid. Salt of Benzoin, Silix, Clay, and Alum. Preparation of Mercurius Dulcis via humida. Cheaper and more convenient method of preparing the Pulvis Algarothi. Experiments on Molybdena; Plumbago; Ether; Colouring Matter in Berlin or Prussian Blue. Preparing a New Green Colour. Decomposing Neutral Salts by unslaked Lime and Iron. Quantity of pure Air daily present in our Atmosphere. Milk and its Acid. Acid of Saccharum lactis. Constituent parts of Tungsten. Method of preserving Vinegar. Inflammable principle of Crude Calcareous Earth. Incidental remarks on the Affinity of Bodies. Crystallisation of the Acid of Lemons. Dissertation on Prussian Blue.

Trade Report.

TARIFF CHANGES AND CUSTOMS REGULATIONS.

GOVERNMENT LABORATORY; REPORT FOR THE YEAR ENDED MARCH 1901.

I.—Customs.

The chemical work of the Customs Branch of the Government Laboratory, during the past year, may be conveniently divided into four principal classes:—

(1) Tea examined under the Sale of Food and Drugs Act, and denatured tea.

(2) Tobacco, snuff, and nicotine.

(3) Articles containing spirit, ether, or other dutiable substances.

(4) Spirits, wine, and beer.

(i) Under the first class, 2,600 samples were examined, against 2,353 during the previous year. Of these, 1,924 were samples sent by the tea inspectors for chemical and microscopical examination.

Of the samples submitted, 252, representing 2,662 packages, were refused admission for home consumption, on the ground that they contained exhausted leaves, were unsound, or were mixed with sand or other substances within the meaning of the Act.

Tea which is refused admission for home consumption, can be used for the manufacture of caffeine, after it has been denatured in bond, by the admixture of a certain quantity of asafetida and lime; 676 samples of such denatured tea were examined at this Laboratory, for the purpose of testing the completeness of the denaturing process, before the tea could be delivered from bond.

(ii) The second class comprises the examination of samples of leaf and manufactured tobacco, for proportion of moisture, and of tobacco suspected to contain prohibited ingredients.

Samples of snuff are tested for genuineness, before being accepted on deposit for drawback, the assessment of drawback value being determined at the Laboratory.

A considerable proportion of the waste snuff, deposited on drawback, is used for the production of nicotine, and samples of nicotine in various stages of manufacture, as well as imported nicotine, are examined at the Customs Laboratory, to see if they conform to the standard of purity sanctioned by the Treasury, viz., 90 per cent. of nicotine, and 10 per cent. of solids. Several samples of so-called nicotine were refused admission, as they were found to consist of tobacco extract, and were not sufficiently pure to meet the requirements of the standard.

(iii) The third class includes a miscellaneous list of articles. Drugs, soaps, confectionery, patent medicines, toilet requisites, varnishes, paints, yeast, perfumery, essences, jellies, &c., are examined for proportion of spirit present; soaps, fats, and some drugs for cocoa-butter; confectionery for proportion of chocolate and for presence of spirit; cider to see that it is fermented apple juice only.

Ethers, as sulphuric, acetic, butyric; chloral hydrate, chloroform, and substances suspected to contain these articles, are examined on importation.

Methyl alcohol is examined for potability. If sufficiently purified to be potable, it is liable to the same duty as ethyl alcohol of similar strength, whilst the crude article is free of duty.

Roasted cereals, intended as coffee substitutes, are examined on importation, as the presence of either coffee or chicory renders such articles liable to duty.

Coffee, roasted and ground, when exported or shipped for stores, is allowed a drawback; samples of such are examined, to see that it is pure coffee before drawback is paid.

(iv) The fourth class consists of wines, spirits, and beer; wines and spirits being tested for quantity of spirit present, and beers for original gravity.

II.—Excise.

Medicinal Tinctures, &c.—The exportation of medicinal tinctures, flavouring essences, and perfumes on drawback, under the special regulations sanctioned by the Treasury,



continues to extend. In the past year 10,640 samples, representing 95,542 galls. of proof spirit, have been examined, as compared with 9,540 samples and 80,726 galls, respectively, in the previous year.

During the last two years, it has been observed that an improper advantage was occasionally being taken of these special regulations, to send out preparations almost devoid of medicinal or flavouring properties.

In certain British colonies, and possibly in other countries also, the rate of duty on the spirit present in medicinal tinctures, &c. is very small, as compared with that on spirit intended or capable of being used for potable or other purposes, and to avoid payment of this higher rate of duty, orders are occasionally sent from abroad, to include in the consignment of ordinary medicinal tinctures, &c., considerable quantities of alcohol, under names appertaining to such medicinal tinctures, &c., but so slightly coloured or flavoured, as to be available for other purposes. The explanation given by the exporters is, that the preparations in question were so ordered by their customers abroad, and they pleaded that, if their exportation were interfered with, they would be obtained from the Continent, and so the trade would be lost to this country. It may be pointed out, however, that such preparations can be legitimately exported, under the regulations applicable to British compound spirits.

The Board of Inland Revenue, after first cautioning the exporters, refused to allow drawback on such preparations under the medicinal tinctures regulations, and this action has materially, if not yet quite completely, checked this practice.

Wood Naphtha.—886 samples of wood naphtha, intended for methylating purposes, and representing 373,804 galls., have been examined. Of these, 52 samples, representing 22,865 galls., could not be approved as suitable for the purpose. Owing probably to the exceptionally large increase in the total quantity of wood naphtha required for methylating purposes in the year ending 31st March 1899, the number of samples of this abnormal character, which had to be rejected in that year, and especially in the latter portion of the year, was greater than at any former period. In the last quarter of 1899, about one-third of the samples submitted contained less than the minimum quantity of 72 per cent. of methyl alcohol. The deficiency, in a very large proportion of these samples, was excessive, amounting in many cases to 10, 15, or 20 per cent., and in one or two instances to 30 per cent. and upwards. The percentage of "acetone" and "esters" in such samples was, of course, correspondingly high. In the corresponding quarter of 1900, six months after the issue of the new instructions, the number of samples with less than the minimum percentage of methyl alcohol had fallen to one-sixth of the total number submitted, and of these, considerably more than half contained between 70 and 72 per cent., and only in a single sample did the deficiency amount to more than 10 per cent. In the last quarter of the year just ended, only 10 samples out of the 242 submitted were deficient in methyl alcohol, and all of them contained over 70 per cent. The number of samples containing an excess of "acetone" and "esters" was six and one, respectively, in the same period.

A no less satisfactory improvement has taken place in the "purity" character of wood naphtha. In 1888-9 many samples, as measured by the "bromine" and "methyl orange alkalinity" tests laid down (see this Journal, 21, 11, 1034), and also by their taste and smell, were much too pure to be suitable for methylating, whilst others were unnecessarily impure. Samples of this exceptional character are now rarely submitted. During the final quarter of last year, only two samples were rejected solely on the ground of being "too pure," and none of those examined were exceptionally impure.

Miscellaneous.—The samples not included in the foregoing branches of work comprise 3,197 of compounds, liqueurs, and wines for the estimation of their spirit value; 24 of spirits for the determination of amount of obscuration; 936 of yeast pressings and wash, for the determination of original gravity; and 1,839 of a general nature, including acids, cider, cordials, chocolate liqueur beans, essences,

fusel oil, finish, grogged spirits, lees, liniments, methylated spirit, patent medicines, pigments, wines (British, foreign, and medicated), vinegar, yeast, &c.

Tobacco.—Another important matter connected with the manufacture of tobacco has been dealt with in the year under review. Past experience has shown that there is always a tendency, on the part of a certain number of manufacturers, to add to their tobacco or snuff as much as possible of any ingredients which may be legally added, thus really adulterating tobacco with impunity, and the abuse has on each occasion required legislation for its rectification.

As a specific instance, may be mentioned the restriction of the use of lime-water and alkaline salts to certain definite proportions, in the manufacture of snuff.

In manufacturing roll tobacco, in addition to water, a small quantity of some kind of oil is necessary, but prior to 1879, there was no restriction either as to the quantity or the kind of oil which might be used. In 1879, at the instance of some of the larger manufacturers, an Act was passed in which olive oil was specially named as the only oil to be used in the spinning of roll tobacco. Therefore, from and after 1879, the only foreign substances which could be added to tobacco in the process of manufacture were water and olive oil for spinning, and essential oils for flavouring, roll tobacco, no restriction, however, being placed on the quantity of water or oil. In 1887, it was found desirable, in the interests of the revenue and of the consumer, to restrict the amount of moisture, and by the Act of 50 & 51 Vict. c. 15, s. 4, the extreme amount of moisture which might exist in any portion of manufactured tobacco was fixed at 35 per cent. By the Finance Act, 1898, this limit was further reduced to 30 per cent., and soon afterwards, an important movement on the part of certain manufacturers began. It was observed that occasionally some specimens of roll and cake tobacco, which from a physical examination seemed to contain moisture in excess of the legal limit, actually contained moisture considerably below that limit. An investigation of this apparent anomaly led to the conclusion that the physical appearance of such tobacco was due, not to excess of moisture, but of oil.

A process for the estimation of the amount of oil in tobacco was therefore devised, and specimens of roll tobacco from every factory in the three kingdoms were examined.

The results obtained pointed to the following conclusions:—

- (1) That the actual necessities of manufacture did not require the use of a very large quantity of oil.
- (2) That the roll and cake tobaccos from certain factories contained an excessive quantity of oil.
- (3) That manufacturers in the habit of using oil liberally were gradually increasing the amount.
- (4) That some manufacturers who had formerly been using the oil in normal quantity were also beginning to use it more freely, being, no doubt, compelled to do so by trade competition.

As this state of things was a source of grave danger to the revenue, the Oil in Tobacco Act, 1900, limiting the amount of oil to 4 per cent., was passed, and received the Royal Assent on the 6th August, 1900. Manufacturers were allowed till the 20th September to dispose of any tobacco which, having been manufactured prior to the 6th August, might contain oil in excess of the now legal limit.

III.—Board of Trade.

The lime and lemon juice submitted for approval during the year has been again generally good in quality. Out of 441 samples representing 57,200 galls., it has only been necessary to reject 14 samples, referring to 1,859 galls. The causes of rejection were lowness of quality, excess of pulpy matter, or contamination with iron or salt. Thirty samples of spirits for fortifying the juice were all of suitable character, and 13 samples of fortified juice, which had been fortified for at least two years, were all found fit to be re-issued.



IV.—Home Office.

Fifty-one samples were examined for the Factory Department of the Home Office and the Dangerous Trades Committee. The examination of these samples was mainly directed to the determination of the amount of lead, arsenic, or mercury present in various substances, and the samples included pigments used by boot finishers and wall-paper manufacturers, polishing powders from electro-plate works, enamels and colours employed in the enamelling of copper letters and iron-work, dust from the drying-room of calico printing works and yarn-drying establishments using lead and copper compounds, paper flock, slag powder, and rabbit pel't.

V.—India Office.

The samples examined for the India Office were of the usual wide range. Gold-leaf is required to contain not less than 97 per cent. of pure gold, but in one instance, a sample contained 5 per cent. of silver and only 91 per cent. of gold. Type-metal should consist of 65 parts of lead, 30 parts of antimony, and 5 parts of tin, and yet, in eight samples received together, the lead varied between 65 and 82 per cent., the antimony between 15 and 29, and the tin between 0.6 and 5.5, per cent. Antimony is required to contain less than 3 per cent. of impurities, but of five samples, two contained 4.76 and 4.15 per cent. of impurity, respectively.

—C. T. T.

UNITED KINGDOM.

Sugar Import Duties.

In view of the provisions of the "Finance Act, 1901," the Commissioners of Customs have issued a series of regulations for the guidance of Customs officers, with reference to the duties imposed on sugar and articles of cognate description imported into the United Kingdom.

The following extracts contain the principal provisions of these regulations, and give detailed information as to the rates of duty imposed on the various articles mentioned:—

Import duties on sugar, &c., are to be charged on and after 19th April, 1901, viz.:—

Sugar of a polarisation exceeding 95°	the cwt.	s. d.
not exceeding 76°	"	4 2
And "intermediate" duties varying between 4s. 2d. and 2s. on sugar of a polarisation not exceeding 98° but exceeding 76°, in accordance with table annexed. (See this Journal, 1901, 515.)	"	2 0
Molasses (except when cleared for use by a licensed distiller in the manufacture of spirits), and invert sugar and all other sugar and extracts from sugar which cannot be completely tested by the polariscope and on which duty is not specially charged—		
If containing 70 per cent. or more of sweetening matter.	the cwt.	2 9
If containing less than 70 per cent., and more than 50 per cent. of sweetening matter.	"	2 0
If containing not more than 50 per cent. of sweetening matter.	"	1 0
Glucose—		
Solid	"	2 9
Liquid	"	2 0
Saccharin (including substances of a like nature or use).	the oz.	1 3
Sugar candy will be dealt with as sugar polarising over 98°.		

Plums (including greengages) preserved in sugar or otherwise are to be charged at 7s. per cwt.*

Samples of sugar and molasses and of all goods in which sugar is an ingredient, except those specified in the schedule below, are to be taken for analysis, and duty will be charged on such goods according to the rating shown on the testing form. Delivery may be allowed to proceed at once,

* Tinned and bottled apricots, in syrup or water, and apricot pulp, are not liable to duty as preserved plums. Duty, however, must be charged on any added sugar. Dried apricots are to be charged 7s. per cwt.

The duty of 7s. per cwt. on figs is equally applicable to tinned figs and fig pulp, and is to be levied accordingly.

on the importer's depositing a sufficient sum to cover the duty. With the permission of the Customs Commissioners, merchants may clear sugar on payment of duty on an estimated polarisation, as well as syrups and molasses, at an estimated percentage, on entering into a bond in a sufficient amount to cover any short payment, arising either from the weight or rating having been understated. If importers elect to pay the maximum duty leviable, sampling may be dispensed with.

Sugar will be tested at the following ports, viz.:—London, Liverpool, Glasgow, Bristol, Hull, Leith, Southampton, Greenock, and Grangemouth: but where local arrangements have not yet been completed, samples of sugar are to be forwarded to the Laboratory, Custom House, London.

Until further orders, samples of goods containing sugar (including molasses and glucose), or goods in the manufacture or preservation of which sugar is used—except such goods as are mentioned in the schedule below—are to be forwarded to the Laboratory, Custom House, London.

The duty on sugar, &c., is chargeable according to the account taken on the landing thereof, subject to the usual regulations as regards accidental damage while in warehouse, or during removal under bond.

Sugar may be coloured in a bonded warehouse for exportation. Sugar may also be delivered from warehouse, for the purpose of breaking or crushing for exportation, upon bond being entered into, in the penalty of double the duty payable upon the goods, for the return of the sugar to the warehouse.

Sugar may be removed under bond to a bonded warehouse, for the purpose of sweetening spirits under the standing regulations, and also to a bonded Cavendish factory for sweetening tobacco.

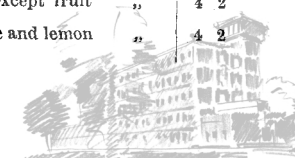
Molasses may be removed under bond direct from the ship's side or from warehouse to distillers' premises, free of duty, for use in the manufacture of spirits.

Honey (pure) and milk sugar or lactose are not liable to the sugar duty.

For table showing percentage of duty chargeable on sugar of a polarisation not exceeding 98° and exceeding 76°, see Journal, 1901, 515.

Schedule of fixed rates on the under mentioned goods:—

Blacking, solid, containing sugar or any other sweetening matter.	the cwt.	s. d.
Candied and drained peel	"	1 0
Caramel, solid	"	3 0
" liquid	"	4 2
Cattle foods containing molasses or other sweetening matter.	"	3 0
Cherries, drained, imported in bulk	"	1 0
Chutney	"	2 3
Cocoa-nut, sugared	"	2 0
Confectionery containing chocolate, viz.:—		
When the chocolate exceeds 50 per cent. of the total net weight.	the lb.	0 2
When the chocolate does not exceed 50 per cent. of the total net weight.	"	0 1½
Confectionery made from sugar and containing no other ingredients except flavouring.	the cwt.	4 2
Confectionery, hard, such as—		
Sugared almonds	"	4 2
Caraway seeds, &c.	"	4 2
Confectionery, soft, such as—		
A. B. gums imported in bulk in barrels or cases, on the entry for which the importer has declared that duty on the combined quantity of sugar and glucose used in the manufacture of the goods did not exceed the rate of 2s. the cwt.	"	2 0
Other A. B. gums	"	2 0
Caramels	"	2 0
Chewing gums	"	3 0
Jelly beans	"	3 0
Turkish delight, &c.	"	3 0
Flowers, as violets and rose petals, &c., in crystallised sugar, as crystallised fruit.	"	4 2
Fruit, canned and bottled, other than fruit liable to duty as such, preserved in thin syrup.	"	1 0
Fruit, canned and bottled, other than fruit liable to duty as such, preserved in thick syrup.	"	3 0
Fruit, crystallised, glacé, and metz, except fruit liable to duty as such.	"	4 2
Fruits, imitation, crystallised (orange and lemon slices, &c.).	"	4 2



	<i>s</i>	<i>d.</i>
Fruit, except currants, liable to duty as such, the cwt. preserved in sugar, or otherwise, whether mixed with other fruits or not.	7	0
Fruit pulp, excepting fruit pulp liable to duty as such, preserved in thin syrup.	1	0
Fruit pulp, excepting fruit pulp liable to duty as such, preserved in thick syrup, as jam.	3	0
Ginger, preserved in syrup or sugar.	3	0
Marmalades and jams, and fruit jellies, if not made from fruit liable to duty as such.	3	0
Sweetened spirits tested for strength, additional to the spirit duty, in respect of the sugar used therein.	0	2
Murzipan..... the cwt.	2	6
Milk, condensed, sweetened, whole.	1	8
Milk, condensed, sweetened, separated, or skimmed.	2	0
Nestle's milk food.	1	3
Soy, when containing molasses or other sweetening matter.	2	0
Tamarinds preserved in syrup.	1	0
NOTE.—An additional $\frac{1}{2}$ d. a lb. is chargeable in respect of any of the before-mentioned articles in which spirit has been used in the manufacture.		
Blacking, liquid, containing sugar or any other sweetening matter.	1	0
(Together with the duty on any spirit contained therein.)		

Saccharin.—Saccharin must not be imported into Great Britain or Ireland except into ports approved by the Commissioners of Customs. These ports are, at present, London, Harwich, Dover, Folkestone, Newhaven, and Southampton. Imported saccharin must be warehoused. Saccharin manufactured in Great Britain must be charged with duty in the custody or possession of the maker. It must not be imported otherwise than in packages containing not less than 11 lb.

The Board of Customs have further issued amended regulations, with regard to the drawback to be allowed on sugar and cognate goods exported, deposited, or shipped for use as ships' stores, or removed to the Isle of Man. Until the new arrangements are in full working order, the existing form of shipping bill, whether presented at the custom house or at the export station, may be used in all cases where the special form required by the amended regulations will hereafter be applicable (see this Journal, 1901, 629).

BRITISH INDIA.

Sugar imported from Italy; Countervailing Duties on—.

The Board of Trade have received a notification, dated 1st August, 1901, to the effect that additional duties are imposed, from 15th August, 1901, on bounty-fed sugars imported from Italy into British India, as follows:—

Country.	Kind of Sugar.	Bounty Bestowed.	Additional Duty to be Levied.
		Per 100 Kilos.	Per Cwt. R. A. P.
Italy.....	Sugar below No. 20 Dutch standard.	5'60 francs	1 11 0
	Sugar, No. 20 Dutch standard and above.	6'13 "	1 13 7

The above additional duty is levied upon all sugar imported into British India from Italy, whether directly or indirectly, and whether in the same condition as when exported from the country of production, or changed in condition by manufacture or otherwise.

Sugar from the Argentine Republic.

The Board of Trade have received a copy of a Customs Circular which, by order of the Governor-General in Council, revises the rate of "additional duty" on all kinds of sugar imported into British India, whether directly or otherwise, from the Argentine Republic. These "additional duties" are therefore revised as follows, with effect from 1st July, 1901:—

Kinds of Sugar.	Additional Duty to be levied.
<i>New Rate.</i>	Per Cwt. Rs. a. p.
All kinds (except sugar exported from the Argentine Republic without payment of internal revenue tax).	15 3 10
<i>Old Rate.</i>	
All kinds	9 2 0

EGYPT.

Valuation Tariff.

The Board of Trade are in receipt of a copy of a valuation tariff, used by the Egyptian Customs Authorities, to come into force on the 22nd July, and to remain in operation for three months, or until denunciation. It affects the undermentioned articles:—

Articles.	Valuation per Kilo.
	Mill.
Zinc white (1st quality), including <i>Vielle Montagne</i> .	22
Zinc white (2nd quality), including <i>Nouvelle Montagne</i> and other kinds.	13
Red lead.....	16
Linseed oil, crude.....	32
" " boiled.....	33
Cotton-seed oil.....	21
" " refined (double).....	23
Cochineal.....	90

WESTERN AUSTRALIA.

Customs Decisions.

The Board of Trade have received a copy of the following Customs decisions relative to the tariff of Western Australia:—

Articles, and how Classified.	Rate of Duty.
Aluminium powder— As articles not otherwise enumerated	15 % <i>ad valorem</i> .
Boiler fluid (solid).....	Free.

NEW ZEALAND.

Customs Decisions.

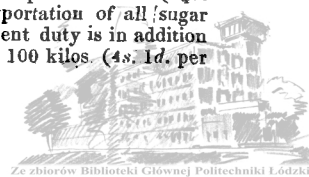
The Department of Trade and Customs of New Zealand has issued the following decisions, dated 3rd July, 1901, relating to the classification of the following articles under the Customs Tariff of the Colony:—

Articles, and how Classified.	Rate of Duty.
Carbolic acid or phenol, liquid or in crystals, in bottles of $\frac{1}{2}$ lb. or over— As carbolic acid in bulk.....	Free.
Carbolic acid or phenol, liquid or in crystals, in bottles of less than $\frac{1}{2}$ lb.— As drugs and druggists' sundries, not otherwise enumerated.	15 % <i>ad valorem</i> .
"Vinette" used with aniline dyes in colouring leather— As articles suited and intended only for use in manufactures within the Colony.	Free.

MAURITIUS.

Sugar Export Duty.

The Board of Trade have received a copy of an Ordinance which came into force on the 28th June last, and which repeals Ordinance No. 14 of 1889. It enacts that an additional duty of 2 cents of a rupee per 100 kilos. ($3\frac{1}{2}$ d. per ton) shall be levied on the exportation of all sugar produced in the Colony. The present duty is in addition to the export duty of 30 cents per 100 kilos. (4s. 1d. per



ton), leviable under the "Customs Consolidated Tariff Ordinance, 1895," a notice with regard to which was published in the *Board of Trade Journal* for 15th March, 1900.

UNITED STATES.

Customs Decisions.

The following decisions have recently been issued by the Treasury Department at Washington:—

Vienna Lime.—Vienna lime or "Putz kalk" is dutiable at the rate of 5 cents per 100 lb., under paragraph 90 of the Tariff, and not under paragraph 97, as an earthy or mineral substance, not decorated.

Asphaltum.—Asphaltum, "sun-dried in the bed," is dutiable at the rate of 3 dols. per ton, as dried, crude asphaltum, under paragraph 93 of the Tariff.

Carriage of Explosives on Steamers.—According to a recent decision of the Treasury Department, the only explosive powder which it has authority to permit to be carried on passenger steamers is the powder designated, in section 4422 of the Revised Statutes, as "gunpowder."

Magnesium Sulphate.

The Treasury Department has promulgated the decision of the United States Circuit Court of Appeals, settling the issue concerning the dutiability of sulphate of magnesia, or Epsom salts, which has been pending since the passage of the Wilson Tariff Act, in 1894, and very considerable refunds will now result, as this article has been declared to be free of duty.

FRANCE.

Sugar Bounties.

The following French Presidential Decree, published in the *Journal Officiel* of the 24th ult., fixes the rates of the direct bounties to be allowed, from the 1st inst., on sugar, the produce of France and the French Colonies, declared for exportation:—

The bounties which will be granted to French native or colonial sugars declared for exportation to foreign countries and to the French Colonies not subject to the Metropolitan Customs Tariff, are, from the 1st Sept., 1901, fixed as follows:—

	Frs.	Cts.
Raw sugar in grains or small crystals testing at least 98 per cent. for beetroot sugars, or 97 per cent., at least, for colonial sugars, the testing being made before allowance for waste in refining:—Per 100 kilos. of refined sugar.	1	78
(Sugars of this class, liable to duty and exported abroad directly by the manufacturer, when they polarise 99.75 per cent., at least, shall be considered as refined sugar, without any deduction on account of drawback in favour of the manufacturer.)		
Raw sugar testing from 65 to 98 per cent. for beetroot sugar, or from 65 to 97 per cent. for French colonial sugar:—Per 100 kilos. of refined sugar.	1	56
Sugar candies, calculated at their legal co-efficient: refined sugar in lumps or pieces, perfectly pure, hard and dry:—Per 100 kilos.	2	00
"Vergeoises":—Per 100 kilos. of refined sugar.....	2	00
Refined sugar in grains or crystals testing at least 98 per cent.:—Per 100 kilos. of refined sugar.	1	78
(If the sugars of this last-named class polarise at least 99.75 per cent., they shall be considered as pure refined sugars, and the export certificates thereon shall be accepted as discharge of temporary admission bonds for their total weight, without any deduction.)		

RUSSIA.

Tanning Materials.

A decision of the Russian Imperial Council has been recently published, in virtue of which, mimosa bark (except in the form of ground powder) may, for the future, be imported into Russia duty free, under the provisions of the note to par. 1 of section 124 of the Customs Tariff; also, that mimosa extract in any form is to be admitted on the same footing as chestnut, hemlock, and other tanning extracts, under par. 3 of section 124 of the Tariff, at the rate of 45 copecks per pound (= 36 lb.).

NETHERLANDS.

Salt as Cattle Food or Manure.

A Dutch Royal Decree, dated the 26th June last, provides, with reference to the exemption from duty of salt required for cattle food or for manuring land, that "exemption is only allowed on raw salt in which there are no pieces of a larger size than one centimetre in the case of sea salt, and one-half centimetre in the case of rock or mine salt."

ITALY.

Photographic Plates and Vegetable Tallow.

The Italian *Bollettino di Notizie Commerciali* for August contains a Decree, dated the 16th July last, effecting alterations in the tariff classification of the undermentioned articles, as stated:—

	Tariff No.	Duty.
Prepared plates for photography—		Lire Ct.
(a.) Of crystal or glass	273 per 100 kilos.	40 00
(b.) Of any other material.	352(a) " "	80 00
Former classification—		
Prepared plates for photography, of metal, glass, celluloid, or any other material.	352(a) " "	80 00
Vegetable tallow	309(b)	Free.
Former classification—		
Vegetable tallow	307 per 100 kilos.	4 00

PORTUGAL.

Customs Decisions.

The Portuguese *Diário do Governo* for the 24th July last contains a Royal Decree, dated the 19th July, providing that iron wire-gauze embedded in common glass is to be dutiable, on importation into Portugal, at the rate of 60 reis per kilo. (13s. 9d. per cwt.).

PORTUGAL—MOZAMBIQUE.

Sesamum and other Oleaginous Seeds.

The Portuguese *Diário do Governo*, for the 24th ult., contains a Royal Decree dated the 17th ult., providing that sesamum, "*manobi*" (? mandobi, or ground nut), and other oleaginous seeds and substances shall pay duty, on exportation from the province of Mozambique, at the rate of 2 per cent. *ad valorem*, when destined for Portuguese ports, and of 4 per cent. *ad valorem*, when destined for foreign ports.

SPAIN.

Covered Copper Wire.

The Spanish *Gaceta de Madrid*, for the 24th July last, contains a Royal Decree, dated the 12th July, modifying the tariff classification of covered copper wire imported into Spain.

Copper wire covered with cotton, silk, or other textile fibres, with or without india-rubber or other insulating materials, is to be dutiable under No. 81 of the Spanish Customs Tariff, at the rate of 1 peseta 25 cents per kilo. (2l. 10s. 10d. per cwt.).

Copper wire for electric conductors in public streets, covered with various insulating materials, is to be dutiable under No. 305 of the Tariff, at the conventional rate of 18 pesetas 50 cents per 100 kilos. (7s. 6d. per cwt.).

The second paragraph of the note to No. 305 of the Tariff, providing that copper wire covered with cotton or silk, &c. is to be subject to duty under No. 78, at the rate of 40 pesetas per 100 kilos. (16s. 3d. per cwt.), has now been suppressed.

CHINA.

New Tariff.

The Board of Trade have received notification, to the effect that the Protocol, recording the Agreement arrived at between the Powers and the Chinese Government, in



settlement of the disturbances which took place in China last year, was signed on the 7th Sept. Article VI. of the Protocol stipulates that, in return for certain concessions, the Powers have consented to the assessment of Customs duties on goods imported into China by sea, on the basis of an effective 5 per cent. of the value of such goods, including articles hitherto admitted free of duty. The duties will be levied *ad valorem*, pending their conversion, so far as feasible, into specific rates, which is to be effected with the least possible delay.

The new tariff will come into force two months after the signature of the Protocol, and only such merchandise as is *en route* 10 days, at latest, after the date of signature, will be exempted from the provisions of the new tariff, and admitted into China on the basis of that now in force.

ARGENTINE REPUBLIC.

Salt for Preservation of Hides for Export.

The Board of Trade have received information to the effect that an Argentine Presidential Decree of the 30th April last provides that salt, intended for use in the preservation of salted hides for export, is to be exempt from import duty.

SAN DOMINGO.

Import Duties; Modifications in —.

A decree, dated the 28th June last, makes the following alterations in the rates of Customs duties leviable upon certain articles imported into San Domingo.

Olive oil.....	{	Present duties less 50 per cent. Free.
Salts of quinine; cod liver oil and preparations thereof.		

(NOTE.—The above rates are exclusive of the various surtaxes which have been imposed from time to time.)

I.—GENERAL.

ASSOCIATION OF CHAMBERS OF COMMERCE OF THE UNITED KINGDOM.

Bd. of Trade J., Sept. 12, 1901.

A meeting of the Association of Chambers of Commerce of the United Kingdom was held at the Mechanics' Institution, Nottingham, on Tuesday and Wednesday, the 3rd and 4th September, the chair being taken each day by Lord Avebury.

Among others, the following resolutions were passed:—

German Tariff.

"That this Association views with alarm the proposed increase of the German Tariff, and strongly protests against the same, believing that it will be injurious to the trade of this country."

Patent Law Amendment.

"That this Association approves of, and adopts, the following resolutions upon Patent Law Reform, passed by a Conference of Chambers, held at Manchester on 25th June, in pursuance of a recommendation of this Association, on 13th March last.

"1. 'That this Conference heartily approves of the Report of Sir Edward Fry's Committee on the first question submitted to it, and of the separate notes relating thereto of Sir Edward Fry and Mr. Herbert Hughes, and of Sir Edward Fry respectively, and recommends the Association of Chambers of Commerce to request the President of the Board of Trade to bring in a Bill next Session to give effect thereto.'

"2. 'That, in the opinion of this Conference, no amendment of Section 22 will be satisfactory which does not provide for the granting of compulsory licences, in default of the *bonâ fide* manufacture of the patented article in the United Kingdom, and, therefore, this Conference disagrees with the conclusions of Sir Edward Fry's Committee on the second question submitted to it.'

"3. 'That this Conference approves of the findings of Sir Edward Fry's Committee on the third question submitted to it.'

"4. 'That in the opinion of this Conference, no patent right, which has previously been granted elsewhere, should be valid in this country for a longer period than in the country of origin.'

"5. 'That all patented articles, or the packages in which they are contained, should be marked with the word "Patent," and with the registered number of the patent and the date of registration.'

"That the Council be requested to urge upon the President of the Board of Trade the importance of giving legislative effect to the foregoing resolutions."

Trade Marks.

"That this Association supports the action of the London Chamber of Commerce in introducing a Bill to amend the existing Acts relating to Trade Marks, and further resolves that the Board of Trade be requested to grant facilities for a full inquiry into the unsatisfactory working of the present law, with a view to adequate legislation thereon."

Cheap Coal Supplies.

"That any investigation into the coal resources of this country should include an inquiry into the economic effect of railway and municipal charges, rates, taxes, and dock dues, with a view of providing for the re-adjustment of these burdens upon industry, before the most valuable cheap coal supplies are exhausted.

ONTARIO GOVERNMENT ASSAY OFFICE.

Eng. and Mining J., Canadian Supplement, Aug. 24, 1901.

The Assay Office is preparing a list of factories, chemical and metallurgical works, dealers, &c., in the United States, Great Britain, Germany, and France, which use ores and minerals known to occur in Ontario.

The list will also include uses and approximate market values of minerals at present commercially valuable.

Letters asking for information coming under this head will receive attention.

DRUG IMPORTS IN NATAL.

Chem. and Druggist, Aug. 31, 1901.

During the six months ended June 30, 1901, the imports into the colony included the following:—Apothecary ware, 28,994*l.*; acetic acid (368 galls.), 92*l.*; medicinal preparations, 31,582*l.*; drugs (free), 8,090*l.* (the total combined value of the aforesaid articles in the six months of 1900 was 52,291*l.*); extracts and essences, 15,388*l.*; perfumery, 5,116*l.*; photo ware, 7,938*l.*; saccharin, 1,086*l.*; saltpetre (137 cwt.), 137*l.*; sheep-dip, 4,211*l.*; toilet soap, 4,540*l.*; soap, other than toilet (4,775,866 lb.), 40,064*l.*; perfumed spirits (1,351 galls.), 2,989*l.*; spirits of wine (41 galls.), 70*l.*

MINERALS AND PHOSPHATE IN PALESTINE.

Comm. Intelligence, Sept. 7, 1901.

Valuable mineral deposits have been discovered in Palestine, on both sides of the Jordan and the Dead Sea. The waters hold magnesium chlorides, bromides, and potash salts. There are also the bituminous chalk springs of Nebi Musa, which contain from 30 to 40 per cent. of asphaltum.

The most important of all the deposits is phosphate, the immense fields of which to the east and west of the Jordan need only better means of communication in order to ensure their development.

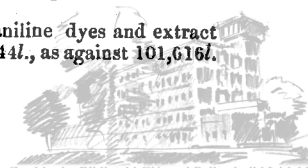
TRADE OF MEXICO IN 1900.

Foreign Office Annual Series, No. 2693.

Imports.

The value of chemical products imported into Mexico, during the year 1900, was 525,805*l.*, as against 455,300*l.* in 1899.

Paints and varnishes, including aniline dyes and extract from dyewoods, are valued at 112,544*l.*, as against 101,616*l.* in 1899.



Drugs, patent medicines, &c., were imported to the value of 94,835*l.*, as against 92,303*l.* in 1899.

The value of imports of sulphate of copper and of iron decreased from 79,005*l.* to 55,636*l.*

Caustic soda and potash, much used in cotton factories, were valued at 66,665*l.*, in the year 1900.

27,296 tons of cement and hydraulic lime, valued at 50,049*l.*, were imported during the year 1900, as against 23,563 tons, valued at 46,362*l.*, in 1899. This increase is due to the large amount of cement required for the relaying of the pavements in the city of Mexico, after the drainage has been finished. No data are obtainable as to how much cement or hydraulic lime of home production has been used in the same period.

The firebrick imported represents a value of 11,023*l.*

The greater quantity of imported cement came from the United Kingdom, but clay pipes and firebrick were of American origin.

The value of imported glassware in 1900 was 244,795*l.*, as against 184,568*l.* in 1899, principally from the United States and Germany.

France and Germany supply the greater part of the earthenware and china imported into this country, which, in 1900, amounted to 71,334*l.*, as against 65,802*l.*, in 1899.

Imports of earthenware, china, and glass from the United Kingdom are very small.

Ammunition and dynamite come from the United States.

Paper and its manufactures were imported to the value of 450,878*l.*, as against 407,056*l.*, in 1899. Cigarette paper comes from Spain, and unsized paper from the United States. The new paper factory at Mexico city, equipped with all modern appliances, is producing fair qualities of wrapping and other papers.

Exports.

Dyewoods consisted of 39,435 tons of logwood, valued at 139,945*l.*, and 5,750 tons of fustic, valued at 13,060*l.*, as against a total value, in 1899, of 85,141*l.*

Lead, in 1900, amounted to 1,484,418 cwts., valued at 429,003*l.*, as against 1,327,508 cwts., valued at 386,568*l.*, in 1899.

Rubber, in 1900, amounted to 517,000 lb., valued at 48,938*l.*, as against 489,280 lb., valued at 40,170*l.*, in 1899.

Among industrial products, may be mentioned *sugar*, principally unrefined, valued at 1,460*l.*, as against 3,851*l.* in 1899. This decrease is chiefly due to the extra local demand, either in the making of cane spirits, or in the preserving of fruits in syrup, an industry that has rapidly increased of late in the State of Vera Cruz, the towns of Jalapa, Cordoba, and Orizaba being the principal centres, on account of the quantity and diversity of fruits grown in the neighbourhood.

The export of *vanilla* decreased considerably both in quantity and value, frosts and rains in the early part of the year, and the want of the latter at the proper season, spoilt the plants, and the crop was lost. The quantity exported, in 1900, was 60,921 lb., as against 133,676 lb., in 1899, and the values were, respectively, 62,565*l.* and 181,547*l.*

This bean is now receiving the attention of many of the American agricultural companies, the properties of which are in the State of Vera Cruz, and the exports for 1901 will probably show an increase over those for 1900.

Among medicinal herbs may be mentioned jalap, valued at 3,936*l.*; and sarsaparilla, valued at 5,996*l.*

II.—FUEL, Etc.

ALCOHOL AS FUEL IN GERMANY.

Imp. Inst. J., Sept. 1901.

Prof. Behrend has carried out experiments, at the Hohenheim Technological Institute, on the use of alcohol in motors, in place of petroleum. The motors used were of German make and of six horse-power. The first experiments were made with ordinary methylated spirits, and later, with alcohol containing varying proportions of benzene. Using methylated spirit, the cost of working was 1.43*d.* per horse power, for one hour, while admixture of benzene to the extent of 68 per cent. reduced

this amount to 1.25*d.*, for the same amount of energy. Using petroleum, the cost with the same motor amounted to 1.2*d.*, so that alcohol containing about 20 per cent. of benzene could compete successfully in Germany with petroleum, as a source of power for explosion engines. The alcohol employed for trade purposes in Germany is a potato spirit, costing about 11*d.* per gallon. (See also this Journal, 1901, 853.)

IV.—COLOURING MATTERS, Etc.

DYESTUFFS IN JAPAN.

Chamber of Com. J., Sept. 1901.

Colours and dyestuffs show a decrease in importation, being in 1898 valued at 111,265 yen, and in 1899, at 74,879 yen, all intended for ship-yards and manufacturers of textile goods. Large quantities of colours, cobalt, &c., are imported for the porcelain factories at Kiushiu.

DYESTUFF IMPORTS OF ITALY.

Chamber of Com. J., Sept. 1901.

Italy's importation of dyestuffs considerably diminished in 1900. The importation from Germany suffered most, and this importation will probably become still more reduced; as the native industry has recently developed to a greater extent. Cheap articles, which replace the dearer English and German goods, are already being manufactured in the country, and every effort must be made to compete with native Italian industry.

DYESTUFF IMPORTS OF THE CANARY ISLANDS.

Chamber of Com. J., Sept. 1901.

The importation of colours and dyestuffs into the Canary Islands materially increased last year, and doubled as compared with that of 1899. Germany, France, and Italy have attempted to import their productions, but England has maintained her dominant position as regards the supply of colours.

INDIGO IN INDIA.

Chem. Trade J., Sept. 7, 1901.

The collector of Customs at Calcutta shows that, in the three years preceding the appearance of synthetic indigo on the market, the average annual exports of indigo from Calcutta were 109,182 cwt., valued at 231 rupees per Indian maund (82½ lb.), whereas, during the last four years, the competition of artificial indigo has sent down the average exports to 70,964 cwt., valued at only 178 rupees per maund. Experience showed in 1899—1900 that the artificial indigo effectively limits the level to which prices can rise, when the output of natural indigo is deficient. With a maximum limit set upon prices, the future of the industry depends on a reduction in the cost of production. The area under indigo has been much reduced in the last two years. In Lower Bengal, the reduction is as great as 60 per cent. Russia is supplying her requirements largely from Java. One satisfactory feature of the year just closed is an advance from 33 to 40 per cent. in the proportion of the total shipments that went to non-European ports.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

POTASH FROM SHEEP'S WOOL.

Chem. and Druggist, Aug. 31, 1901.

The greater part of the potash salts contained in sheep's wool is lost in the wash-waters, and little or no attempt has been made in England to save it. On the Continent as much as 2,250,000 lb. of wool-potash is produced annually by several wool-washing works. This contains from 75 to 90 per cent. of potassium carbonate and some soda. As Great Britain is the most important centre of the wool spinning and weaving industry, attention is drawn to the waste which goes on here. Mr. W. R. B. Lockie, of Liverpool, is now trying to introduce here a wool-washing machine, which saves the potash, as well, as the wool-fat. The machine is largely used on the Continent, and consists



essentially of a battery of spray-washers, which enables the wash-water to pass from one wool compartment to another, as in repercolation. The wool is impregnated successively with liquids that lose in alkaline properties as they gain in heat, until the wool reaches the temperature of the first washing-bath. The capacity of the machine per day of 10 hours, varies from 141 to 318 cb. ft. of greasy matter, at a density of 12° Baumé, according to the kind of wool treated, and the capacity of the washing-tub. Every 35·36 cb. ft. yield about 172 lb. of wool potash, selling on the Continent at about 12s. 6d. per cwt. Some sorts of wool yield more carbonate of potash than others—for instance, Australian wool yields about 160 grms., and fine qualities of Buenos Ayres wool yield as high as 190 grms. of carbonate of potash, per kilogramme of combed wool.

MERCERISING AND MILLERAINISING TEXTILES IN GERMANY.

Foreign Office Annual Series, No. 2671.

The patent respecting the process of mercerising cotton, formerly the property of the firm of Thomas and Prevost in Crefeld, and afterwards of the Company Bemberg, has been declared by the Patent Office null and void. The Patent Office caused a thorough investigation into the matter to be made by experts. An invention for the treatment of fabrics, called "Millerainising," seems to be an improved system of hot-pressing.

VII.—ACIDS, ALKALIS, AND SALTS.

CHEMICALS IN AUSTRIA-HUNGARY.

Foreign Office Annual Series, No. 2688.

Sulphuric acid, sulphate of iron, alum, and the production of mineral colours are confined to Bohemia. In 1899, there were imported into Austria-Hungary:—

Articles.	Quantity.	Value.
	Tons.	£
Sulphuric acid.....	7,814	13,134
Alum.....	6,038	3,482
Sulphate of iron.....	475	814
Mineral colours.....	1,980	4,631

The chief imports into Austria-Hungary in 1900 were: Sulphuric acid, 10,584 tons, of which nearly all came from Germany; and sulphate of copper, 3,516 tons, of which the United Kingdom supplied 1,350 tons; Germany, 374 tons; and Italy, 316 tons.

SALTPETRE AT OPORTO.

Foreign Office Misc. Series, No. 2695.

German saltpetre, though not considered here so good as that coming from the United Kingdom, has a large consumption owing to its cheapness. German prices tend to rise, a factor which will operate favourably upon the importation of the British article.

POTASH FROM SHEEP'S WOOL.

See under V., page 952.

ACID PLANT AT ATLANTA, GA.

See under XV., page 957.

PHOSPHATE IN PALESTINE.

See under I., page 951.

VIII.—GLASS, POTTERY, AND ENAMELS.

CHINA CLAY IN BRITISH GUIANA.

Eng. and Mining J., Aug. 17, 1901.

The increasing use of kaolin in the manufacture of bricks, briquettes, molds, tiles for roofing, pottery, pavement, cement and concrete, is drawing attention to the deposits of the raw material. Investigations in British Guiana show

that a superior grade of kaolin is produced on the Corentyne River, surface outcroppings up the Berbice and Demerara Rivers indicate good clay lands. Recently a New York company took a 45 years' lease of some Corentyne deposits, agreeing to take 100,000 tons annually, shipments to be made to New York. Just now the crude methods of working make it almost impossible to produce more than 20,000 tons a year, but a modern plant will probably be erected and the output materially increased. Vessels of 14 ft. draft can navigate the Corentyne River, and the freight rate to New York on clay shipped in ballast is estimated at about 2·40 dols. per ton.

GLASS INDUSTRY OF BOHEMIA.

Foreign Office Annual Series, No. 2688.

In Gablonz the manufacture of imitation jewellery, buttons, beads, ornaments, decorated glass, &c., is largely carried on, and some 30,000 persons are employed in this branch alone; the value is about 40,000,000 kr. (1,666,666l.). About 189 export firms are engaged in this trade. Decorated and coloured glass is manufactured at Haida and Steinschönau, where from 6,000 to 7,000 people are employed. In the neighbourhood of Pilsen, window glass is manufactured. In the Eyer district, near Elbogen, the firm of Siemens has established the manufacture of wire glass.

The export in 1899 was 55,649 tons, worth 2,082,545l.; in 1900, 57,076 tons, worth 2,150,811l. 13,514 tons were sent to Germany; 11,348 tons to the United Kingdom; 2,916 tons to Italy; 2,846 tons to France; 1,977 tons to Switzerland.

The porcelain industry is carried on in the neighbourhood of Carlsbad, where the bulk of the factories in Austria are found. The export was, in 1899, 9,648 tons, worth 462,218l.; in 1900, 9,512 tons, worth 513,587l. The increase in value, in 1900, was due to a larger export in the more expensive decorated styles. The largest importers are Germany, the United Kingdom, Italy, and Switzerland.

GLASS IMPORTS OF NAGASAKI (JAPAN).

Foreign Office Annual Series, No. 2692.

There is an increase of 600l. in glass manufactures. Belgium supplies the whole of this article of import.

GLASS MANUFACTURE IN JAPAN.

Imp. Inst. J., Sept. 1901.

The manufacture of glass in Japan is still in its infancy and the greater part is imported. Japan makes electric lamps and other simple goods, but has to import window glass and other important articles from abroad. This unsatisfactory state of the Japanese glass trade is due to two causes, viz., the want of capital, which prevents the installation of first-class machinery, and the scarcity of skilled workmen. All attempts to produce plate glass have failed. The import of broken glass from Europe and America has ceased, as the Japanese can now make glass entirely from raw material in their own country.

IX.—CEMENTS, Etc.

PORTLAND CEMENT IN AMERICA AND THE WEST INDIES.

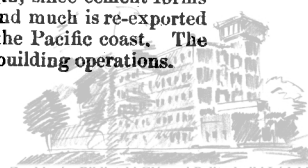
U.S. Cons. Reps., Vol. LXVI., No. 251, Aug. 1901.

CANADA.

About half the imported cement comes from Great Britain; Belgium, Germany, and the United States follow in the order named. It is suggested that other countries take unfair advantage of the preferential tariff in favour of Great Britain, by exporting cement to England for re-export to Canada as British cement.

BRITISH COLUMBIA.

Imports are chiefly of British origin, since cement forms the return freight of the salmon fleet, and much is re-exported to neighbouring American cities on the Pacific coast. The demand is increasing owing to large building operations.



NEW BRUNSWICK.

Annual imports amount to 10,000 bbls. (of 350 lb. each), of which the greater part comes from Belgium and England.

Cement imported in barrels finds the readiest sale.

ONTARIO.

Canada supplies the demand, and four new factories are in course of erection. Over production is probable.

MEXICO.

England sends nearly one half of total imports, the remainder coming from Germany, the United States, and Belgium. There is a large demand. (See "Trade of Mexico," page 951.)

BRITISH HONDURAS.

Very little cement is used here. Tariff—12½ per cent.

COSTA RICA.

The United States send one half of total import, followed by Germany and Spain.

Much of the American cement is of English or German origin.

The market is small, and cement, which should be quick-setting, should be imported in iron barrels.

Customs dues :—1 cent. (United States gold) per kilo.

GUATEMALA.

During 1900, about 4,000 100-lb. bbls. were imported, nearly all from Germany.

SALVADOR.

The principal ports of exportation are San Francisco, where cement is of Belgian origin, and Hamburg, where it is of German or Belgian origin. Annual import is 1,500 tons.

Customs dues :—Nil. Cement should be packed in iron cases.

ANTIGUA.

The market here is limited.

BAHAMAS.

Imports :—450 bbls. per annum, chiefly German.

Duty.—20 per cent. *ad valorem*.

DUTCH WEST INDIES.

A small quantity only is imported and all is German. Duty, 3 per cent.

HAYTI.

Imports :—About 2,000 bbls., chiefly from Germany, England, and France.

Duties :—25 cents per bbl., with 50 per cent., 33½ per cent. and 25 per cent. surtax.

Barrels should be strong enough to bear rough handling.

Terms :—6 months' credit.

MARTINIQUE.

Cement, known as "artificial cement," or "the half-slow process," is imported chiefly from France.

Duty.—19.5 cents per bbl. of 180 kilos.

ARGENTINE REPUBLIC.

Germany, France, and England control the market by giving credit.

CHILE.

Terms.—Wholesale, for 50 bbls. and upwards, 8 per cent. discount for cash on delivery, 6 per cent., payable in 30 days, and net at six months. A barrel weighs (gross) 400 lb.

Germany tends to control the market.

Customs Valuation.—\$4 (Chilean) per 100 kilos, gross weight, with an *ad valorem* duty of 15 per cent., payable in Chilean gold.

ECUADOR.

Demand very slight. Germany and Belgium are the principal exporters.

Weight (gross) of a barrel is 180 kilos. (397 lb.).

Duties.—1 per cent. per kilo., plus 100 per cent. per bbl.

BRITISH GUIANA.

Annual import is 13,660 bbls., all from England. Duty 25 cents per bbl.

DUTCH GUIANA.

Annual imports amount to 2,500 bbls. Customs duties nil.

FRENCH GUIANA.

Annual imports are about 2,500 bbls., and come mostly from France, but English cement is preferred.

PARAGUAY.

Annual importation is 3,000 bbls., each weighing 120 kilos., coming chiefly from Belgium. There is a small demand.

Duty.—30 cents gold per barrel.

URUGUAY.

The importation of 4,500,000 kilos. comes chiefly from England, Belgium, France, and Germany; and English brands are preferred.

Duty.—50 cents per bbl.

BAUXITE IN NEW SOUTH WALES.

Eng. and Mining J., Aug. 17, 1901.

The occurrence of bauxite in New South Wales was not known until 1899, when the geological surveyor recognised it at Wingello, in the county of Camden, where it occupies considerable areas. Extensive deposits were also discovered in the Inverell and Emmaville districts. The locations of the bauxite deposits are as follows : (1) Wingello, 105 miles from Sydney, on the railway, near Uringella Creek; (2) Inverell, 468 miles north of Sydney (nearest railroad 40 miles); (3) Emmaville, 463 miles north of Sydney (nearest railroad 18 miles).

X.—METALLURGY.

ALUMINIUM SOLDERING FLUX.

Engineer, 1901.

Aluminium soldering flux consists of about 90 per cent. of lard oil, with 10 per cent. paraffin wax. Almost any oil will solder aluminium, but animal oils are best. All that is necessary in using lard oil for soldering aluminium is to take the greatest care as regards cleanliness. Grit, or the slightest trace of dirt on the tinning of the copper bit, are quite fatal, and the process is rather slow. A strip of aluminium, 6 ins. long and ½ in. wide, takes about one minute to tin, but after tinning it may be soldered to another similarly tinned strip as readily as tinplate. Mixtures of stearic and oleic acids have been patented for this purpose. Hydrocarbon oils will answer, but not so well as animal oils. (See also this Journal, 1901, 47.)

MOLYBDENITE IN ONTARIO.

Eng. and Mining J. (Canadian Supplement), Aug. 24, 1901.

Molybdenite, or sulphide of molybdenum, having the composition MoS₂, and containing about 56 per cent. of molybdenum when pure, is at present of commercial value. It is found in numerous localities in Eastern Ontario associated with sulphides, such as pyrites and pyrrhotite, and also occurs as small segregations in syenite. It is steel gray in colour, soft and greasy, marking on paper; it is generally found in flakes or scale. It resembles graphite, but is heavier, lighter in colour, and gives a sulphur reaction with silver coin after fusing with sodium carbonate.



ANTIMONY MINING IN BOHEMIA.

Foreign Office Annual Series, No. 2688.

A British company has recently commenced mining operations in Bohemia for antimony. The antimony ore mined in Bohemia in 1899 was 399 tons, worth 3,128*l*. The amount of antimony produced was 271 tons, worth 7,036*l*.

IRON DEPOSITS IN NORWAY.

Bd. of Trade J., Sept. 12, 1901.

With regard to the reported purchase of the Dunderland iron deposits, in the north of Norway, by a British company, for a moderate sum, the contract has been completed with the Norwegian Government. In two years' time, the company expects to get to work with Edison's patent "Magnetic Separators," which, in successive sets, are to extract from the very low-grade ore, when crushed, the iron particles. The shipping facilities from the property are exceptional, and these fields will afford a valuable new supply of ore to the British iron industries. In Sweden the ironmasters are somewhat sceptical as to the actual working results of this new enterprise, and do not view the new company's extensive undertaking with any apprehension, at present. The new process, if entirely successful, will effect a considerable revolution in the iron industry.

COPPER MINING IN MEXICO.

Foreign Office Annual Series, No. 2693.

Copper mining in Mexico is increasing. In 1899 the number of mining properties in existence was 258, while on December 31, 1900, 352 were returned as paying the Government tax on mining properties.

The greatest increase was in the State of Sonora and in Lower California, the number in the former having increased from 32 to 69, and in the latter from 15 to 42; most of these belong to the Boleo Company, the principal centre of operations of which is near Santa Rosalia, on the Gulf of Lower California, whence the ores are shipped to Guaymas, on the mainland, for transmission overland, through the Custom-house of Nogales, to the United States.

The quantity of copper exported in 1900 was 27,483 tons, valued at 949,523*l*., as against 25,103 tons, valued at 792,516*l*., in 1899.

The export of copper ore was 402 tons, as against 209 tons, in 1899; the remainder was exported in the form of copper regulus, or copper matte, but does not include the amount of argentiferous copper, as that is classified as a precious metal.

Nearly all this ore, or refined metal, found its way to the United States, which acts as a great distributing centre. The only other country that supplies the United States with copper, either in ore, bullion, or matte, is British Columbia, and if the output from the Mexican mines or smelters increases, exports will increase, and that Colony will have to give up the first place to Mexico.

XII.—OILS, *Etc.*

COCOANUT OIL AND VEGETABLE TALLOW IN THE STRAITS SETTLEMENTS.

Chem. Trade J., Sept. 7, 1901.

Cocoanut Oil.—There was imported, during 1900, 10,105,733 lb., the import value of which was 1,011,679 dols. Mexican (76,320*l*.). About 97 per cent. of the oil came from Ceylon. During 1900, cocoanut oil was exported to the amount of 14,740,533 lb., the export value of which was 1,500,910 dols. Mexican (140,885*l*.). There went to Siam, 30 per cent.; to Sumatra, 15 per cent.; to Penang, 7 per cent.; to Selangor, 6 per cent.; to Dutch Borneo, 5 per cent.; to Perak, 4 per cent.; and to Java, 4 per cent.

Vegetable Tallow.—Imports during the year 1900 amounted to 52,533 lb., valued at 7,034 dols. Mexican (670*l*.), while exports amounted to 91,900 lb., valued at 37,948 dols. Mexican (3,611*l*.). About 60 per cent. of these imports came from Japan, and the remainder from Burma; all was exported to Great Britain.

MAFOUREIRA NUTS IN EAST AFRICA.

Foreign Office Annual Series, No. 2630.

There is a large trade in "mafoureira," a nut containing a large percentage of fat. Lubricants, soap, and candles can be made from "mafoureira." The supply is practically unlimited; the tree bearing the nut grows wild all over the country, and the nut itself can be bought for about a $\frac{1}{4}$ d. per kilo. It sells in Marseilles, where it is much used, for 8*l*. per ton. Freight on this produce to Marseilles comes to 50*s*. per ton, a rate which, owing to want of competition, is excessive.

CANDLES AND GREASE IN EGYPT.

Chamber of Com. J., Sept. 1901.

The import of candles from the United Kingdom has rapidly declined until it has almost ceased to exist, £E354 worth having been imported in 1899, as against £E5,919 in 1895. Belgium and France have driven the British trade in this article quite out of the field. The import of grease increased from £E9,227, in 1895, to £E21,732, in 1899, the United Kingdom possessing the practical monopoly of this branch of trade.

LUBRICATING OIL IN NAGASAKI.

Foreign Office Annual Series, No. 2692.

An item of 6,544*l*. appears in the list of imports for lubricating oil. The United States have practically a monopoly of this trade.

OIL TRADE OF GOTHENBURG (SWEDEN).

*See under XV., page 957.*XIII. A.—PIGMENTS, PAINTS, *Etc.*

ACETYLENE BLACK IN GERMANY.

Comm. Intelligence, Oct. 7, 1901.

The soot produced by the combustion of acetylene is superior in fineness and purity to any other form of carbon, particularly for pigments or ink. It would be well adapted for the preparation of black writing ink or printing ink. The soot contains 99.8 of pure carbon. Its colour is a pronounced black with a very faint touch of blue. (See also this Journal, 1899, 284.)

PAINT IMPORTS OF NAGASAKI.

Foreign Office Annual Series, No. 2692.

The import of dyes and paints, in 1900, was nearly double that of 1899. The principal items were paints in oil, value 3,580*l*., and paint for ships' bottoms, value 6,515*l*., both from the United Kingdom.

XIII. C.—INDIA-RUBBER, *Etc.*

ARTIFICIAL GUTTA-PERCHA.

Bd. of Trade J., Aug. 29, 1901.

The Imperial German Postal Authorities have agreed to give a trial to the "artificial gutta-percha," invented by A. Gentzsch (this Journal, 1899, 927). A further process by the same inventor for raising the fusion point of resins, waxes, and such like substances, which is employed in the manufacture of the above, was described in this Journal, 1899, 502. Mr. Gentzsch desires to sell his patent in the United Kingdom, and has forwarded to the Foreign Office, through the Commercial Attaché to His Majesty's Embassy at Vienna, specimens of his "artificial gutta-percha" in blocks and in the form of cable, which may be seen by those interested, on application to the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, S.W.

RUBBER COLLECTION IN EAST AFRICA.

Bd. of Trade J., Aug. 22, 1901.

H.M. Commissioner for the East Africa Protectorate states that, though information as to the india-rubber forests is limited, a quantity of the article is even now exported.



It is collected by natives, who cut the plants so that they often die after a single tapping. To prevent this destruction, responsible British firms should undertake the collection of the rubber, which they would find a paying business. At present the india-rubber industry is in a backward condition.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

DISINFECTION OF IMPORTED HIDES IN U.S.A.

Bd. of Trade J., Aug. 29, 1901.

A Circular, issued by the Treasury Department at Washington to United States Customs officials, contains the following instructions, regarding the disinfection of the hides of neat cattle shipped to United States ports:—

"It having been stated that hides of neat cattle are shipped to the United States without proper disinfection, officers of the Customs are hereby directed, with a view to prevent the introduction and spread of contagious or infectious diseases among the cattle of the United States, to treat the same as prohibited importations, and to refuse entry for warehousing or consumption of all hides of neat cattle, including calf skins, hide-cuttings or parings, and glue stock, the product of neat cattle, shipped from, or the product of, the countries of Europe, Asia, Africa, Australia, and South America, except hides, parings, cuttings, and such glue stock which have been dry salted or arsenic-cured, or lime dried after a soaking for 40 days in a strong solution of lime, and except abattoir hides the product of Sweden, Norway, and Great Britain, in all cases where the invoices are not accompanied by proper certificates of disinfection. As Consular officers have been instructed by the Secretary of State to refuse authentication of invoices of hides not properly disinfected, the disinfection in this country, or storage of such hides in 'general order warehouse' will not be permitted, as the passage of diseased hides through the country or storage with other goods, would tend to the dissemination of cattle disease in the United States."

HIDES AND LEATHER IMPORTS OF EGYPT.

Chamber of Com. J., Sept. 1901.

British trade in hides increased steadily and considerably up to 1898, but declined again, in 1899, to the extent of £E12,000, partly due to a reduction in the import of hides, which fell from £E20,756 in 1898 to £E8,794 in 1899.

TANNING MATERIALS AT FIUME (AUSTRIA) IN 1900.

Foreign Office Annual Series, No. 2694.

Imports comprised:—

	Tons.
Valonia	6,000
Sumac	300
Other extract	500
Resin	6,000
Asphaltum	2,200

and 16,000 tons of extract of oak were exported.

HIDE AND SKIN INDUSTRY OF MEXICO.

Foreign Office Annual Series, No. 2693.

The preparation of hides and skins has increased very much of late years, chiefly in the Northern States of the Republic, where tanneries fitted with modern appliances have been erected for the preparation of hides and skins, for home consumption or for export. Formerly only ox hides, sheep skins, and goat skins were salted, and were sent abroad for finishing, but now they are properly prepared, and sometimes tanned, and the preparation is being extended to other skins, especially those of the "lagarto," a species of lizard. Skins of the javali, or wild boar, the native fox, native lion or puma, and mountain cat are also exported.

The preparation of goat skins is carried on in the States of Puebla and Oaxaca.

The quantity of hides and skins of the three principal varieties exported during the past five years will be seen in the following table:—

	Quantity.				
	1896.	1897.	1898.	1899.	1900.
	Lb.	Lb.	Lb.	Lb.	Lb.
Goat skins ...	2,920,434	4,124,141	4,192,329	4,525,693	4,478,123
Ox hides	7,313,154	10,822,963	9,620,235	7,982,962	8,019,634
Deer skins ...	507,626	421,966	408,958	442,683	618,323

The export of the lagarto skins in 1900 amounted to 601,421 lb., valued at 9,359l.

XV.—MANURES.

FERTILISERS IN SOUTH AUSTRALIA.

Bd. of Trade J., Aug. 29, 1901.

The official *Journal of Agriculture and Industry of South Australia*, for July, publishes information, from which it appears that the use of fertilisers is practically in its infancy, as, prior to 1897, only a few hundred tons were annually used by the farmers. Since then, their use has rapidly increased. In 1899, about 12,500 tons of imported and 4,000 tons of locally manufactured fertilisers, or a total of 16,500 tons, were used for manuring the South Australian wheat crop. In 1900, the figures were:—Imported, 21,200 tons; local, 3,400 tons; total, 24,600 tons. This year (1901) the amounts are estimated as follows:—Imported manures, 26,400 tons; local, 5,000 tons; total, 31,400 tons.

The following figures may be taken as a fairly accurate statement of the quantities of fertilisers used for the 1901 wheat crop:—

	Tons.	Value.
Imported fertilisers	26,400	£ 108,000
Local fertilisers	5,000	22,000
Total	31,400	130,000

This total of 31,400 tons is made up approximately as follows:—

	Tons.
Mineral super-phosphate	25,500
Bone and guano supers	2,700
Thomas phosphate	1,600
Bone-dust and other fertilisers	1,600

Of imported fertilisers, Great Britain supplies about 21,500 tons; Germany, 2,500 tons; New South Wales, 1,300 tons; and Victoria, 500 tons. Except in bone and bone manures, the South Australian does not apply nitrogen to his crops, the soil and climatic conditions being responsible for this reversing of European practice. Phosphatic manures only have given a profit, and the great demand is for soluble phosphate.

At the close of 1900, the South Australian Parliament passed a new Fertilisers Act to regulate dealings in commercial fertilisers, and this has had a very satisfactory result in many ways. Fifty-seven brands of fertilisers were registered in accordance with the Act, and several low grades of bone-dust were withdrawn from the market.

PHOSPHATES IN CAPE YORK PENINSULA, SOUTH AUSTRALIA (NORTHERN TERRITORY).

Bd. of Trade J., Sept. 5, 1901.

Considerable interest is being taken in the recent discovery of extensive and valuable deposits of phosphates on the north-eastern portion of Cape York Peninsula. Four deep strata, varying in width from 2 ft. to 3 ft. 6 ins., have been traced to a considerable depth, in one instance to fully 40 ft., the phosphates improving as the depth increased. Between these strata there are layers of powders which appear to be pure phosphates. The largest deposits were

found to be lying in projections between two rises, and these indications have been traced for over a mile and a quarter along the coast, wherever similar formations occur. The deposit is within four miles of Port Clinton, and is only about 30 miles distant from the present phosphate works at Wallaroo.

The following report has been received from the School of Mines' analyst on specimens of phosphatic rock from the above find:—"The sample was found to consist of rock phosphate, and contained phosphoric acid, 34.56 per cent., equivalent to 75.44 per cent. tricalcic phosphate."

NEW FERTILISER AND ACID PLANT AT ATLANTA, GA.

Chem. and Druggist, Aug. 24, 1901.

Messrs. Armour and Co., of Chicago and London, are erecting a large plant for the production of chemical fertilisers, at Atlanta, Ga., at a cost of about 500,000 dols. The buildings will comprise a sulphuric acid plant capable of producing 60 tons of acid per day, and a plant for manipulating the materials used in the manufacture of commercial fertilisers. (See also this Journal, May 1901, 521.)

GUANO AND OIL TRADE OF GOTHENBURG (SWEDEN).

Foreign Office Annual Series, No. 2690.

Of the 24 guano and oil mills on this coast, only five were at work, for a short period, owing to the high price and scarcity of fish, the total production consisting of about 1,000 tons of guano and 150 barrels of oil.

The supply of rape-seed oil was very small and prices were high.

The price of train oil has been higher, and the supply very inadequate, in fact the article has scarcely been obtainable at times.

XVI.—SUGAR, STARCH, Etc.

SUGAR IMPORT DUTIES IN GREAT BRITAIN.

See under Tariff Changes, p. 948.

SUGAR PRODUCTION IN GERMANY DURING 1900-1 CAMPAIGN.

Bd. of Trade J., Aug. 22, 1901.

The *Reichs-Anzeiger* of the 13th August publishes statistics of the production of sugar in Germany during the month of July last, and during the 1900-1 sugar campaign. During July last, 10,048 metric tons of raw sugar and 91,096 metric tons of refined sugar were produced in German factories and refineries. In July, 1900, the production of raw sugar was 3,847 metric tons, and that of refined, 89,179 tons. During the 1900-1 sugar campaign 1,739,303 metric tons of raw and 1,289,999 metric tons of refined sugar were produced, or a total of crystallised sugar in terms of raw equal to 1,974,786 metric tons, as compared with 1,573,008 tons of raw and 1,215,204 tons of refined, during the 1899-1900 campaign, or 1,791,252 metric tons of crystallised sugar, in terms of raw.

SUGAR INDUSTRY OF BOHEMIA.

Foreign Office Annual Series, No. 2688.

The effect of the sugar duty levied by the United Kingdom is closely watched by the industry here, and the "Bohemian Sugar Industrial Society" expresses the opinion that the tax will be an undoubted benefit to British refiners, and that the duty on raw sugar may favour the cultivation of the sugar beet in the United Kingdom and create a sugar industry in the British Isles, thus dealing a heavy blow to the export trade of Bohemia.

Most of the large refineries are fitted with machinery for crystallising sugar expressly for the British market.

The existing agreement between the refiners and raw sugar producers comes to an end next year, and the latter wish the refiners to guarantee a minimum price of 32 kr. (1l. 6s. 8d.), in lieu of the present 30 kr. (1l. 5s.) per 100 kilos., on its being renewed. The term of the trust was for five years.

The raw sugar produced, in 1899-1900, in Bohemia was 551,338 tons; refined, 426,416 tons, the production being 50.3 per cent. of the total in Austria-Hungary.

The export was 76,746 tons of raw and 292,028 tons of refined sugar, or 56.7 per cent. of the total exported from the Dual Monarchy.

SUGAR TRADE OF NAGASAKI IN 1900.

Foreign Office Annual Series, No. 2692.

The import of sugar, during 1900, shows an increase of 62,706 cwt. in quantity, and 40,523l. in value, as compared with 1899. This increase does not denote greater demand; the quantity imported in 1899 was exceptionally small, owing to the large stocks carried over from 1898.

The absence of refineries in Kiushiu has necessitated the importation of a higher grade of sugar into Nagasaki than into Kobe or Yokohama. The lowest grade recognised by the Customs—below No. 14 Dutch standard in colour—includes not only raw but also partially refined and refined sugar of low quality. The sugar imported is composed of low refined grades from Hong Kong, though appearing in the category which includes raws. The bulk of the sugar imported consists of granulated white grades of the highest quality, the demand steadily increasing in this direction.

The greater part of the trade with Nagasaki is in the hands of the Hong Kong refineries, which supply a sugar refined from the best qualities of Java and Philippines cane. Beet sugar from Germany and Austria-Hungary is also imported, but its failure to stand the long voyage and its unsatisfactory condition after a few weeks' storage has militated against its success in the local market. Small quantities of Formosan and South China raws are occasionally brought in, but the demand for low grades is declining, and where still existing is amply supplied from the Goto and other islands in the south of Kiushiu.

XIX.—PAPER, PASTEBOARD, Etc.

PAPER INDUSTRY OF BOHEMIA.

Foreign Office Annual Series, No. 2688.

The paper industry of Austria is chiefly carried on in Bohemia.

In the Riesengebirge, in the valley of the Upper Elbe, and in the Aupa districts, there are no fewer than 17 paper mills and 18 cellulose factories, and there are also minor establishments at Gablonz, Reichenberg, and Friedland.

In the southern districts there are a large number of wood-pulp and cellulose factories and paper mills. Cigarette, parchment, and writing papers, playing cards, &c. are manufactured. Papier-maché articles come from Reichenau, near Gablonz.

In Böhmisches Kannitz a paper mill was recently built, and steam is used here, for the first time in Austria, in the production of paper. The engine is of 1,200 horse-power, and also works the electrical plant.

There are 42 paper mills in the Empire, 29 being in Bohemia. In 1899, the export was 102,419 tons, worth 1,650,218l., and in 1900, 126,486 tons, worth 1,955,947l. 25,068 tons were exported to Germany, 20,511 tons to Italy, and 8,071 tons to the United Kingdom.

PAPER IN ROUMANIA.

Chamber of Com. J., Sept. 1901.

In Roumania there exist four paper factories, viz., a paper factory at Letea; a cardboard factory at Busteni; a paper factory at Campulung; and a paper and cardboard factory at Saceni. In addition, there are a wood-pulp factory at Cheia, and two cardboard factories, one at Cosmeneschti, the other at Grozeschti. The capital engaged in these factories amounts to 7,468,000 lei, of which 3,637,000 lei are appropriated for the land, buildings, and canals, and 3,831,000 lei for machinery and installation of the works. The working capital amounts, approximately, to 2,350,000 lei.* The productions of the paper and cardboard factories amounted, in the year 1899, to 6,697,000

* A lei is nearly equivalent to 1 franc.



kilos., in 1900 to 7,050,000 kilos., the value of these productions being 3,910,000 lei in 1899, and 4,160,000 lei in 1900. The entire quantity was used in the country itself. In 1899 there were sold 5,956,000 kilos., of the value of 3,541,000 lei. By the law of Feb. 13th, 1898, the public authorities are bound to procure the paper they require from the four factories in the country. Thus, in the year 1899, the authorities used 1,454,000 kilos., of the value of 1,220,500 lei. The total consumption of paper and cardboard, in the year 1899, reached 7,833,000 kilos., 2,456,000 kilos. of which remained in the country, whilst 1,877,000 were exported.

WOOD-PULP IN GOTHENBURG (SWEDEN).

Foreign Office Annual Series, No. 2690.

Chemical wood-pulp, both sulphite and sulphate, occupied a firm position throughout the year, the greater part of the output being disposed of during the early part of the season, and this industry has been attended with a good result.

The prospects of 1901 are also very satisfactory, notwithstanding the increase in production and the new mills. Contrary to there being an over-production, the demand appears to be increasing steadily.

Quotations for good brands of sulphite and sulphate have been about 8*l.* 6*s.* 8*d.* to 8*l.* 17*s.* 3*d.* per ton, f.o.b. at Swedish port of shipment.

Mechanical wood-pulp, which was affected by the severe drought during the autumn of 1899, met with a favourable market, and the manufacturers of this article have had a good season.

Prices were, for dry pulp, 5*l.* to 6*l.* 13*s.* 4*d.*, and for moist pulp, 2*l.* 10*s.* to 3*l.* 6*s.* 8*d.* per ton, f.o.b. at Swedish port of shipment, depending on quality and time of delivery.

XX.—FINE CHEMICALS, Etc.

QUININE IN COREA.

Foreign Office Annual Series, No. 2687.

Quinine continues to be an important item in the import trade. Last year, the quantity imported was 120 cases of 100 1-oz. bottles each, valued at about 8,000*l.* The business is in the hands of a German firm.

PERUVIAN BARK FROM A COMMERCIAL STANDPOINT.

J. H. Stallman, N.Y. J. of Pharmacology, July 1901.

Mr. Stallman calls attention to the increase in the consumption of cinchona of late years. The annual production of bark in all countries twenty years ago, he says, was about 6,000,000 lb.; in 1890, the production had increased to over 18,000,000 lb. In 1900, the production was not over 14,000,000 lb., but of a high test, while the accumulated stocks in Europe had become reduced.

It appears that consumption has at last overtaken production, and increased shipments from Java will be required to supply manufacturers, and make up for the expected deficiency from British East India and Ceylon. In any case, the days of quinine selling below 1*s.* per oz. are numbered, and the average value of the unit during the next three years will be above the average of 1896-98. The present state of the cinchona and quinine markets do not now seem to favour this view, especially if the increased shipments from Java (which already show an excess of 1,710,000 Amsterdam lb. over 1901) continue.

XXII.—EXPLOSIVES, Etc.

MATCH TRADE OF INDIA.

Comm. Intelligence, Sept. 7, 1901.

No matches are manufactured in India; all are imported. Japan has, for the past six years or more, headed the list, with the Straits Settlements a close second, and Belgium and Sweden follow in the order named. The value of the match trade in India, last year, was nearly 40 lakhs of rupees (say 265,000*l.*), of which these four countries supplied about four-fifths. The remainder was furnished by ourselves, Germany, Norway, and other countries.

In the following table are given the imports by countries during the last three years, and the total furnished by all countries each year:—

Matches Imported into India.

Country.	1899-1900.	1900-1901.
	Rupees.	Rupees.
Belgium	481,744	696,712
Sweden	346,444	433,865
Japan	830,376	1,021,037
Straits Settlements	806,247	996,939
Other countries	1,011,127	835,020
Total	3,475,938	3,983,573

The great bulk of these matches are of the "safety" variety. Twelve boxes, wrapped in a blue paper-covered package, retail in the bazaars of Bombay at 1 anna 6 pies (about 1½*d.*) per package.

BOARD OF TRADE RETURNS.

SUMMARY OF IMPORTS.

Articles.	Month ending 31st August	
	1900.	1901.
	£	£
Metals	2,753,097	2,787,644
Chemicals and dyestuffs	589,960	441,130
Oils	1,000,893	886,222
Raw materials for non-textile industries	7,288,367	6,078,292
Total value of all imports	11,442,313	10,193,288

SUMMARY OF EXPORTS.

Articles.	Month ending 31st August	
	1900.	1901.
	£	£
Metals (other than machinery)	4,112,122	3,692,679
Chemicals and medicines	711,962	665,947
Miscellaneous articles	3,063,918	2,934,621
Total value of all exports ...	7,888,002	7,293,147

IMPORTS OF RAW MATERIAL FOR NON-TEXTILE INDUSTRIES FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Bark, Peruvian .. Cwt.	1,658	4,009	3,791	14,029
Caoutchouc	37,531	35,673	440,817	417,048
Gum:—				
Arabic	8,901	7,608	24,167	16,975
Lac, &c.	8,557	8,823	27,071	26,250
Gutta-percha	13,115	8,032	154,358	125,705
Hides, raw:—				
Dry	73,498	27,985	180,317	77,559
Wet	45,334	59,862	106,828	137,023
Ivory	614	566	27,585	28,114
Manure:—				
Guano	3,628	3,537	20,885	13,701
Bones	7,202	3,314	31,077	12,380
Paraffin	69,735	56,705	99,310	68,846
Linen rags	1,167	1,121	12,504	9,944
Esparto	17,961	14,943	68,572	63,041
Pulp of wood	42,212	34,343	232,270	162,650
Rosin	164,005	183,524	42,253	44,410
Tallow and stearin ..	262,953	125,852	339,951	161,371
Skins:—				
Goat	1,048,434	1,974,505	101,658	192,296
Sheep	1,687,797	1,066,497	175,061	92,981
Nitrate of soda ... Tons	3,246	11,576	26,321	99,461
Phosphate of lime ..	24,362	35,886	37,976	57,372

IMPORTS OF METALS FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Copper:—			£	£
Ore..... Tons	6,082	9,307	73,825	119,240
Regulus..... "	5,680	7,740	242,302	304,646
Unwrought..... "	6,303	6,239	460,441	435,035
Lead, pig and sheet..... "	17,558	18,853	309,099	280,984
Pyrites..... "	56,102	66,193	96,121	115,578
Quicksilver..... Lb.	67,604	50,867	8,540	6,435
Silver ore..... Value £	..	..	55,403	115,521
Tin..... Cwt.	57,369	71,069	398,841	415,604
Zinc..... Tons	4,584	5,643	91,912	106,435

IMPORTS OF CHEMICALS AND DYE STUFFS FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Bleaching materials Cwt.	30,309	16,770	16,537	5,812
Soda compounds..... "	..	29,713	..	8,969
Borax, &c..... "	9,297	17,234	14,483	8,932
Brimstone..... "	12,228	64,678	3,587	14,638
Nitrate of potash..... "	3,965	14,003	12,593	12,952
Chemicals, other Value £	..	..	131,357	140,117
Cutch and gambier. Tons	1,244	1,280	22,899	27,253
Dyes:—				
Alizarin..... Value £	..	..	12,322	19,140
Aniline and other..... "	..	..	37,691	45,631
Indigo..... Cwt.	163	984	2,650	14,063
Bark..... Tons	32,869	52,030	14,100	17,268
Valonia..... Tons	2,314	2,904	23,599	29,841

IMPORTS OF OILS FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Cocoa-nut..... Cwt.	38,968	36,981	46,729	45,465
Olive..... Tons	953	1,208	37,034	47,783
Palm..... Cwt.	83,403	133,554	91,945	148,936
Petroleum:—				
Illuminating... Gall.	21,386,930	15,273,146	420,774	268,374
Lubricating..... "	2,675,129	2,722,503	87,394	86,885
Seed..... Tons	3,660	1,800	94,742	46,507
Train, &c..... Tons	4,429	4,202	72,923	81,225
Turpentine..... Cwt.	47,388	71,936	66,851	93,508

IMPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Cement..... Tons	9,080	22,782	13,588	41,098
China and earthenware.	29,045	31,375	76,294	88,455
Drugs..... Value £	..	..	98,399	74,539
Glass:—				
Sheet..... Cwt.	110,817	111,144	62,704	61,369
Plate..... "	9,171	36,923	10,766	40,999
Flint..... "	41,354	51,842	73,861	88,164
Bottles..... Gross	127,658	179,807	56,626	53,741
Other..... Cwt.	31,255	25,398	56,065	52,215
Glue and gelatin..... "	15,275	17,764	33,659	37,263
Leather, unmanufactured.	108,920	98,482	700,741	627,071
Oil-seed cake..... Tons	28,235	23,726	186,879	162,373
Paints and pigments.	..	..	113,288	107,195
Paper, pasteboard Cwt.	574,476	486,397	390,640	342,552
Scientific instruments.	..	..	45,040	59,948
Soap and soap powder.	15,475	21,173	19,668	22,773
Zinc manufactures.	35,891	42,201	45,798	48,063

EXPORTS OF METALS (OTHER THAN MACHINERY) FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Brass..... Cwt.	9,887	8,214	54,108	42,456
Copper..... "	60,331	77,110	233,925	291,002
Lead..... Tons	3,982	2,668	75,057	38,522
Plated wares... Value £	..	..	38,373	44,957
Tin..... Cwt.	7,594	10,035	57,532	61,217
Zinc..... "	12,375	12,371	12,326	19,963

EXPORTS OF DRUGS AND CHEMICALS FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Alkali..... Cwt.	261,673	..	83,579	..
Bleaching materials..... "	84,739	62,418	24,485	20,887
Copper sulphate... Tons	412	307	9,777	7,004
Chemical manures..... "	48,212	63,950	225,344	234,832
Medicines..... Value £	..	..	109,421	91,699
Soda compounds:—				
Ash..... Cwt.	..	97,392	..	21,339
Caustic..... "	..	80,824	..	41,004
Bicarbonate..... "	..	22,189	..	7,672
Crystals..... "	..	17,508	..	2,995
Sulphate..... "	..	56,751	..	4,267
Other sorts..... "	..	25,492	..	11,075

EXPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Gunpowder.... Lb.	389,300	Cwt. 7,083	7,463	16,755
Candles..... "	1,518,600	1,674,200	27,018	29,032
Caoutchouc..... Value £	..	..	120,159	80,990
Cement..... Tons	23,776	23,272	54,139	44,326
Products of coal. Value £	..	..	114,367	62,267
Earthenware..... "	..	..	184,171	153,342
Stoneware..... "	..	..	18,222	17,943
Glass:—				
Plate..... Sq. Ft.	172,739	Cwt. 4,048	11,665	7,086
Flint..... Cwt.	11,289	8,171	23,573	20,035
Bottles..... "	68,086	62,021	34,367	31,265
Other kinds..... "	16,397	20,477	17,423	28,806
Leather:—				
Unwrought..... "	11,773	10,047	126,227	98,277
Wrought..... Value £	..	..	47,940	47,650
Seed oil..... Tons	2,475	2,627	72,171	75,764
Floorcloth..... Sq. Yds.	2,362,600	2,062,800	122,030	100,352
Painters' materials Val. £	..	..	177,933	155,535
Paper..... Cwt.	91,069	72,783	140,443	117,960
Rags..... Tons	4,075	5,823	24,232	34,234
Soap..... Cwt.	61,917	66,200	71,148	79,746

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

APPLICATIONS.

16,597. J. Critchlow. Improvements in apparatus for sifting potters' slips and other semi-liquids and dry materials. Aug. 19.



16,691. W. Fairweather.—From H. R. Wolff, Java. Improvements in centrifugal machines. Aug. 20.

16,734. A. Pulbrook and E. H. Pulbrook. Improvements in or connected with the separation from one another of substances having different specific gravities. Aug. 20.

16,943. L. J. Bizet. Improvements in the manufacture of receptacles for liquids or gas under pressure. Complete Specification. Aug. 23.

17,075. J. Ross and A. W. Mackenzie. Improvements in bungs or stoppers for casks and other storage receptacles for liquids generating or giving off gases or waste vapours. Aug. 26.

17,131. J. T. Pearson. Improvements in and relating to the cooling of condensing-water and other liquids. Aug. 27.

17,358. M. M. Waite and E. K. Storey. A new or improved apparatus for mixing and stirring. Complete Specification. Aug. 29.

17,364. O. M. Hillig and W. Müller. Improvements in vacuum drying apparatus for continuous working. Complete Specification. Aug. 29.

17,432. R. Simon. Improvements in evaporating apparatus. Aug. 30.

17,478. J. W. Macfarlane and A. R. Robertson of the firm of Watson, Laidlaw, and Co. Improvements in centrifugal machines. Aug. 31.

17,555. O. Francke. An improved non-conducting material for coating steam pipes or the like. Complete Specification. Sept. 2.

17,581. J. Lowe. Improvements in and relating to separating apparatus. Sept. 3.

17,624. F. C. Crean. Improvements in apparatus for disintegrating and drying pulp. Complete Specification. Sept. 3.

17,670. W. Wyatt. Controlling the flow of liquids into vessels or chambers, or from one vessel or chamber into another. Sept. 4.

17,671. J. J. Royle and Royle, Ltd. Improvements in or applicable to sterilising apparatus. Sept. 4.

17,726. M. M. Brophy. Apparatus for regulating the flow of, and separating mechanical impurities from, water, steam, and other fluids. Complete Specification. Sept. 4.

17,584. V. Schwaninger. Improvements in apparatus for raising fluids. Complete Specification. Sept. 6.

17,977. W. P. Thompson. Improvements in and apparatus for evaporating brine or other liquids, and in separating the resulting vapour and solid matter. Sept. 9.

18,085. H. S. Marsh. Improvements in and relating to refrigerating apparatus. Sept. 10.

18,174. F. Olai and C. Brown. Improvements in and relating to carburettors. Sept. 11.

18,183. E. Shaw. Improvements in the method of and apparatus for evaporating water from solutions. Sept. 11.

18,233. J. R. Greenhalgh. Improvements in distilling apparatus. Sept. 12.

18,335. P. Naef. Improvements in and relating to the treatment of liquids, for the precipitation of solids, for evaporating or for distilling them. Filed Sept. 13. Date applied for Feb. 13, 1901, being date of application in the United States.

18,373. J. Wilson and the Wilson Filter Syndicate, Ltd. Improvements in filter presses. Sept. 14.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

9508. R. Thomson. Improvements in kilns. Aug. 28.

9575. J. O. O'Brien.—From A. G. Enock and D. Enock, Natal. Pumps or apparatus for the compression of gas or air, applicable to compressors for refrigerators, mining, and other purposes. Aug. 28.

15,969. J. Westaway. Apparatus for compressing peat, pulp, powder, or other material into blocks or other forms. Sept. 11.

18,645. A. Parker. Electric furnaces. Sept. 11.

1901.

14,389. F. Strickeisen. Evaporating apparatus. Sept. 18.

14,403. P. M. Knopp. Apparatus for filtering or purifying liquids. Aug. 21.

14,989. C. Friesleben. Centrifugal separators. Aug. 28.

II.—FUEL, GAS, AND LIGHT.

APPLICATIONS.

16,661. S. Hersey. Improvements in apparatus for washing or scrubbing gas. Aug. 19.

16,662. S. Hersey. Improvements in apparatus for washing or scrubbing gas. Aug. 19.

16,659. G. Westinghouse.—From W. J. Knox, United States. Improvements in or relating to a process and apparatus for the manufacture of gas. Aug. 20.

16,700. G. Westinghouse.—From W. J. Knox, United States. Improvements relating to the supply of heat to receptacles, such as coking ovens, annealing ovens, and the like. Aug. 20.

16,702. G. G. Smith. Improvements in acetylene gas generators. Aug. 20.

16,737. J. G. L. Bormann. Improvements relating to the combustion of fuel in furnaces. Aug. 20.

16,777. A. J. Gabriel, M. Lindahl, and E. G. Svensson. Improvements in acetylene gas generators. Aug. 21.

16,895. C. Cory. Improvements in artificial fuels and their manufacture. Aug. 22.

16,969. H. J. Haddan.—From J. B. de Lery, United States. Improvements in mantles for incandescent lighting. Aug. 22.

17,171. E. B. Cornell and W. C. Alderson. Process and apparatus for making a fixed gas for lighting, heating, or any other purpose. Complete Specification. Aug. 27.

17,219. P. R. de Fauchaux D'Humy. An improved apparatus for the manufacture of fuel. Aug. 28.

17,292. T. H. Oswald and F. E. Bowman. Improvements in gas-producing plant. Aug. 29.

17,329. A. A. Masters. A combustible fluid for lighting and heating purposes. Aug. 29.

17,455. W. Doman and S. W. Bullas. Improvements in acetylene apparatus. Aug. 31.

17,494. F. W. C. Schniewind. Improvements relating to the manufacture of gas. Complete Specification. Aug. 31.

17,597. C. Scott-Snell. An improved pressure system for incandescent gas lighting. Aug. 31.

17,510. F. W. C. Schniewind. Improvements in apparatus for the manufacture of gas. Complete Specification. Aug. 31.

17,517. F. J. C. Jones. Improved method of making combustible gas. Sept. 2.

17,524. W. H. Davis. Improvements relating to incandescent gas burners. Sept. 2.

17,566. G. Belin. Apparatus for generating acetylene. Complete Specification. Sept. 2.

17,637. H. Wolf. Improved process and apparatus for incinerating, shaping, and hardening incandescence mantles. Sept. 3.

17,852. S. F. Pierce. See Class X.



17,863. F. Chailly. Improvements in the manufacture of fuel briquettes, blocks, or pieces. Complete Specification. Sept. 6.

17,893. W. Doman and S. W. Bullas. Improvements in acetylene gas apparatus. Sept. 7.

17,968. J. M. Tavernor and H. Wheatcroft. A generator for generating and supplying acetylene (principally) and other gas for illuminating and motive purposes. Sept. 9.

17,975. J. O. O'Brien.—From M. Wagner, France. Improvements in acetylene lamps and generators. Complete Specification. Sept. 9.

18,012. G. C. Marks. Improvements in burners for incandescent gas lighting. Sept. 9.

18,285. A. Anderson. Improvements in acetylene gas generators. Sept. 13.

18,347. A. Henke. Improvements in and relating to an arrangement for the purification of smoke, soot, and dust, and the prevention of sparks. Complete Specification. Sept. 13.

18,361. J. F. Hearne and T. Ashton. Improved petroleum. Sept. 14.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

15,700. T. Macalpine. Manufacture of improved fuel. Sept. 11.

16,780. H. Howell. High-pressure accumulator for incandescent gas lighting. Sept. 4.

17,004. W. H. Bennett. Apparatus for generating and burning mineral oil gas for heating purposes. Sept. 11.

18,527. Sir C. S. Forbes, Bart. Carburetter. Sept. 11.

18,674. D. C. Beggs and W. Fielding. Apparatus for the generation of acetylene gas. Aug. 28.

18,703. A. Granang. Filling vessels with liquefied gases, and apparatus therefor. Aug. 28.

18,913. E. C. Thrupp. Apparatus for liquefying air and separating oxygen therefrom. Sept. 11.

19,061. W. T. Sugg. Incandescent gas burners. Aug. 28.

19,143. E. Stauber. Coke oven. Sept. 18.

19,398. C. E. Watts and C. J. Watts. Machine for the agglomeration of fuel and other substances. Sept. 11.

19,853. S. Csáky, J. Sárkány, and S. Centián. Acetylene gas generator. July 26.

19,859. G. Mayer. Incandescent bodies for lighting purposes. Sept. 18.

20,369. H. de Thiersant and W. A. Coulson. Acetylene gas generators. Sept. 4.

22,129. K. Gossweiler. Process or apparatus for the preliminary heating of gas generators. Sept. 18.

1901.

3215. P. Jensen.—From G. Heine, Norway. Treating peat. Sept. 18.

8129. C. H. Schill and W. G. Primrose. Apparatus for the manufacture of gas. Sept. 11.

10,024. L. Breittmayer. Apparatus for extracting the naphthalene contained in illuminating and heating gases. Sept. 18.

15,646. E. J. Duff. Gas producers. Sept. 11.

16,134. J. W. Mason. Process for purifying hydrocarbon oils and rendering them non-explosive. Sept. 18.

IV.—COLOURING MATTERS AND DYESTUFFS.

APPLICATIONS.

16,811. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture of azo-colouring matters, and the production of new matter for use therein. Aug. 21.

16,875. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of indoxyl and its homologues. Aug. 22.

16,876. A. G. Bloxam.—From Chemische Fabrik Brugg A. G. vormals Zimmermann and Co., Switzerland. Manufacture of greenish-black sulphurised directly dyeing dyestuffs for cotton. Complete Specification. Aug. 22.

16,945. A. Rak. Improvements in batteries for the diffusion process by which certain juices, saps, essences, pigments, and the like are obtained from certain consistent matters, as beet-root, can, odorous plants, colour woods, tannics, and the like. Complete Specification. Aug. 23.

16,957. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of disazo dyestuffs for wool, and an intermediate product. Aug. 23.

17,094. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of orange-yellow to red mordant dyestuffs. Aug. 26.

17,273. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new substantive colouring matters containing sulphur, and intermediate products relating thereto. Aug. 28.

17,356. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new azo-colouring matters and materials for use therein. Aug. 29.

17,564. C. D. Abel.—From Actiengesellschaft für Anilin Fabrikation, Germany. Manufacture of colouring matters directly dyeing cotton. Sept. 2.

17,635. Sadler and Co., Ltd., and A. Driedger. Improvements in the manufacture of pure anthraquinone. Sept. 3.

17,807. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. The manufacture or production of new colouring matters, and of intermediate products therefor. Sept. 5.

17,809. H. J. H. Fenton. The preparation of an oxidation product of tartaric acid applicable to the manufacture of dyes. Sept. 5.

18,333. H. H. Lake.—From Chuit, Naef, et Cie., Switzerland. An improved process for the preparation of alpa-ionone. Sept. 13.

18,389. I. Levinstein, C. Mensching, and Levinstein, Ltd. Manufacture of black, sulphur-colouring matters, directly dyeing cotton. Sept. 14.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

18,533. H. H. Lake.—From Chemical Works, formerly Sandoz, Switzerland. Manufacture of sulphur dyes, and materials for use therein. Sept. 4.

18,726. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture of derivatives of aromatic amines, including new colouring matters. Aug. 28.

18,756. I. Levinstein, C. Mensching, and Levinstein, Ltd. Production of new azo-colouring matters and of dyestuffs therefrom. Sept. 18.

18,939. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new azo-colouring matters, and of new intermediate products for use therein. Sept. 11.

19,062. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture and production of new azo dyestuffs, and of new intermediate products for use therein. Aug. 28.



19,125. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new derivatives of the stilbene series. Aug. 28.

19,689. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. Production of indigo powder. Aug. 28.

23,231. The British Oil and Cake Mills, Ltd., and A. G. Wass. Manufacture of printing ink. Sept. 4.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

APPLICATIONS.

16,765. R. Mellor. Improvements in means to be employed in dyeing yarns of woollen, worsted, silk, or other like fibres. Aug. 21.

16,772. H. O. Brandt. Improvements in treating fabrics with dyes and other liquids, and apparatus therefor. Aug. 21.

16,785. The Commercial Trading Syndicate, Ltd., and C. J. Dear. A machine and process for the treatment of fibres and fibrous substances. Aug. 21.

16,901. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the printing of vegetable fibre with colouring matters. Aug. 22.

16,919. C. O. Weber and I. Frankenburg. Improvements in the recovery of volatile solvents used in the treatment of textile fabrics, and apparatus therefor. Aug. 23.

17,129. A. Barraclough and H. Barraclough. A new or improved manufacture of yarn. Aug. 27.

17,965. H. Davies. A new or improved method of roller for dyeing, mercerising, and other purposes similar. Sept. 9.

17,974. R. Bridge and B. Helm. Improvements in the construction of rollers and bowls applicable for use in dyeing and bleaching machines, and for other purposes. Sept. 9.

18,196. H. Jowett, J. Jowett, and A. E. Walworth. A new or improved machine for dyeing and washing textile materials. Sept. 12.

18,412. C. Pelham, Jun. Improvements in waterproofing materials. Sept. 14.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

11,077. W. H. Crompton and W. Horrocks. Machines for mercerising and the like, treating yarn in hank form. Aug. 28.

18,853. G. W. Johnson.—From Kalle and Co., Germany. Production of discharge effects on dyed goods. Sept. 11.

19,668. O. Imray. — From The Farbwerte vormals Meister, Lucius und Brüning, Germany. Process for rendering wool incapable of absorbing dyestuffs. Sept. 18.

19,670. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. Process for printing cotton with the aid of dyestuffs containing sulphur. Sept. 18.

20,332. W. Coventry. Machines for dyeing or otherwise treating yarn in the form of cops, bobbins, or the like. Sept. 18.

21,130. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. Process for producing on wool blue shades fast to light. Sept. 18.

1901.

11,858. A. J. Boulton.—From C. Masse and La Société Française de Ramie, France. Treatment of ramie, china grass, and other fibrous materials. Aug. 28.

VII.—ACIDS, ALKALIS, AND SALTS.

APPLICATIONS.

16,750. R. Pearson and O. March. Process of producing ammonia. Aug. 20.

16,751. R. Pearson and O. March. Method of producing ammonia. Aug. 20.

16,752. R. Pearson and O. March. Process of producing nitrogen oxides. Aug. 20.

16,761. G. T. Beilby. Treatment of gases for the recovery of nitrogen compounds. Aug. 21.

16,849. H. Spence and P. Spence and Sons, Ltd. Improvements in the manufacture of compounds of alumina. Aug. 22.

17,875. A. Descamps. See Class XV.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

11,912. G. Craig and R. M. Paterson. Obtainment of alkaline cyanides from crude materials containing cyanogen. July 10.

15,873. C. Hoepfner. Manufacture of alkali salts and by-products therefrom. Sept. 11.

17,953. F. Stahlschmidt. Process for the production of solutions of saccharate of iron. Aug. 28.

18,218. A. Shearer. Manufacture of compounds of chromic acid. Sept. 4.

18,852. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. Means for rendering solid hydro-sulphites stable upon keeping. Sept. 11.

21,819. G. W. Johnson.—From Deutsche Gold- und Silber-Scheide-Anstalt vormals Rössler, Germany. Manufacture or preparation of cyanamide and its compounds. Sept. 18.

21,820. G. W. Johnson.—From Deutsche Gold- und Silber-Scheide-Anstalt vormals Rössler, Germany. Manufacture or preparation of alkali cyanides. Sept. 18.

1901.

2039. E. C. Paramore. Method of and apparatus for generating, treating, and utilising chlorine gas. Sept. 11.

3530. C. A. Flanagan. Apparatus for concentrating sulphuric acid. Sept. 18.

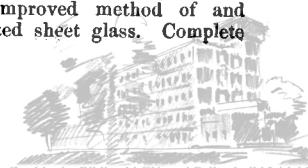
11,919. E. Teisler. Processes for preventing the escape of silicon fluoride in the decomposition of phosphates. Aug. 28.

VIII.—GLASS, POTTERY, AND ENAMELS.

APPLICATIONS.

17,161. P. M. Justice.—From The Mississippi Glass Company, United States. Improvements in machines for rolling configured wire glass. Complete Specification. Aug. 27.

17,162. P. M. Justice.—From The Mississippi Glass Company, United States. Improved method of and apparatus for making corrugated sheet glass. Complete Specification. Aug. 27.



17,656. C. G. Redfern.—From Société Anonyme de l'Industrie Verrière et ses Derives, Belgium. Improvements in the manufacture of glass by electricity. Sept. 3.

17,708. H. H. Bridgwater and J. Haley. Apparatus for charging an annealing oven with glasses or like articles. Sept. 4.

17,920. T. Shore. Improvements in or applicable to potters' jiggers for making dishes of circular, oval, or other forms. Sept. 7.

18,345. A. Aufort. Improvements in tunnel kilns for burning ceramic articles. Sept. 13.

18,364. F. J. Bourne. "Asbestos Sagger Marl" for making saggars, saggars' bats, kiln bats, kiln bricks, cranks, and setters for pottery use. Sept. 14.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

10,907. L. Grote. Machines for manufacturing glass bottles or the like. Sept. 18.

18,152. G. Leuchs and K. Leuchs. Process for producing coloured glasses and enamels by burnt titan acid. Aug. 28.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

APPLICATIONS.

16,640. O. Hertwig and E. Liebaug. Improvements in or relating to the manufacture of artificial marble and the like. Complete Specification. Aug. 19.

17,431. W. Wood and H. Bartlett. Improvements in the manufacture of woodite. Complete Specification. Aug. 30.

17,438. W. Schwarz. An improvement in the manufacture of refractory calcareous sandstone. Aug. 30.

17,540. H. W. C. K. Dyson. Improvements in red aggregates for the manufacture of artificial stones, pavings, slabs, cements, and plasters; applicable also to brick-making for decorative sanded surfaces, and for use in hour-glasses, toys, and the like. Sept. 2.

17,661. P. A. Newton.—From The New Jersey Wire Cloth Company, United States. Improvements in fire-proof constructions, and method of making the same. Complete Specification. Sept. 3.

17,886. A. J. Boulton.—From Devise Frères, France. Improved pressing mould for the production of artificial stone. Complete Specification. Sept. 6.

17,982. P. Preston. Improvements in or relating to the manufacture of concrete, and to means therefor, partly applicable for other purposes. Sept. 9.

18,008. S. Höyer-Ellefsen. Improvements in fireproof floors. Complete Specification. Sept. 9.

18,077. J. Steinbach and F. Duderstadt. Improvements in the composition of a mixture of asphalt and other substances in the formation of blocks or slabs. Sept. 10.

18,163. W. Schwarz. Machine for preparing materials for the manufacture of artificial stone. Sept. 11.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

18,374. W. L. Wise.—From The Salubratapetenfabrik, Basle, Switzerland. Wall coverings, and in the method of manufacturing thereof. Sept. 4.

18,698. R. J. Friswell. Manufacture of refractory materials for building and other purposes. Sept. 11.

1901.

11,715. C. Lorene. Manufacture or production of mortar and the treatment of stone, and the construction therewith of masonry work. Sept. 4.

12,073. S. Sborowitz. Process for producing imitation marble. Sept. 4.

15,316. C. A. Allison.—From C. S. Lawrence and F. McCornick, United States. Preserving wood. Sept. 4.

X.—METALLURGY.

APPLICATIONS.

16,758. S. Cowper-Coles and Co., Ltd., and S. Cowper-Coles. Improvements in the application of vanadium to iron and steel. Aug. 21.

16,864. C. P. Sörensen. A process for preparing aluminium for soldering. Complete Specification. Aug. 22.

16,926. J. Nicholas. Improvements in the recovery of metals from sulphide ores and other material, and in the plant employed therein. Aug. 23.

17,244. F. M. David. An improvement for the recovery of gold. Aug. 28.

17,323. A. J. Boulton.—From J. Miskolczy, United States. Improvements in densifying and solidifying metals. Aug. 29.

17,415. L. Braunfels. Method for the reduction of zinc ores. Complete Specification. Aug. 30.

17,580. A. J. Boulton.—From A. D. Carmichael, New South Wales. Improved process for desulphurising sulphide ores. Sept. 2.

17,639. F. C. Crean. Improvements in the manufacture of iron or iron alloys. Complete Specification. Sept. 3.

17,752. H. R. S. Coleman. An improved process for reclaiming tin or zinc from tinned or zinc scrap. Sept. 5.

17,779. C. F. Eckert, jun. Improved manufacture of chrome iron. Sept. 5.

17,852. S. F. Pierce. Improvements in heat-producing devices for the smelting of ores and the fusing of minerals in furnaces. Complete Specification. Sept. 6.

17,898. H. R. S. Coleman. An improved process for reclaiming tin or zinc from tinned or zinc scrap. Sept. 7.

18,149. D. Laird. An improved furnace for the cupellation of precious metals, and for oxidising and reducing ores. Complete Specification. Sept. 11.

18,150. D. Laird. Improvements in or connected with smelting furnaces. Complete Specification. Sept. 11.

18,162. J. Baxeres de Alzugaray. Improvements in obtaining oxides from ores and the like. Sept. 11.

18,230. H. H. Lake.—From W. R. Bennett, United States. Improvements relating to the hardening and tempering of steel. Complete Specification. Sept. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

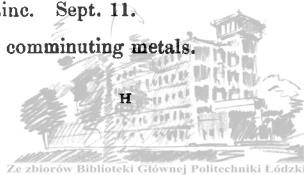
1900.

17,243. L. Sterne and S. Cowper-Coles. Process for rendering silver surfaces untarnishable. Sept. 4.

19,316. J. R. Hatmaker.—From C. T. Hennig, United States. Alloy and process for making same. Sept. 4.

19,659. J. Szirmay and L. von Kollerich. Process of coating metal goods and articles with zinc. Sept. 11.

21,357. F. W. Bühne. Process for comminuting metals. Sept. 4.



1901.

5166. J. Kennedy. Apparatus for charging blast furnaces. Sept. 4.

8333. A. D. Elbers. Process of treating molten blast furnace slag. Sept. 18.

8376. H. Brandenburg and A. Weyland. Process for extracting tin from ores or slags. Aug. 28.

15,831. E. Ferraris. Zinc or other distillation furnaces. Sept. 11.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

APPLICATIONS.

16,651. V. Jeanty. Improvements in secondary batteries. Aug. 19.

16,677. R. Pörsche. Improvements relating to the manufacture of electrodes for galvanic batteries. Complete Specification. Aug. 20.

16,874. J. Mactear. Improvements in electrolytic apparatus for production of chlorine and alkali. Complete Specification. Aug. 22.

17,187. A. Lessing. Improvements in cells of primary batteries. Complete Specification. Aug. 27.

17,250. E. G. Scott. Improvements in the treatment of galvanisers' and like waste liquors. Aug. 28.

17,320. P. E. C. Corbin. Improvements in or relating to the electrolytic manufacture of chlorates and perchlorates. Filed Aug. 29. Date applied for March 25, 1901, being date of application in France.

17,348. E. B. Viles. Improvements in and relating to plates for secondary batteries. Aug. 29.

17,480. Siemens Bros. and Co., Ltd.—From Siemens and Halske Actiengesellschaft, Germany. An improvement in aluminium electrolytic cells. Complete Specification. Aug. 31.

17,660. The Pile-Bloc Battery Company, Ltd. Improvements in electric batteries. Filed Sept. 3. Date applied for Aug. 30, 1901, being date of application in France.

17,702. The Metals Corporation, Ltd., and S. Cowper-Coles. Improvements in the electrolytic refining of copper. Sept. 4.

18,023. L. Bristol. Improvements in electric storage batteries. Sept. 9.

18,256. M. J. B. A. Colletas. Improvements in electric accumulator batteries. Complete Specification. Filed Sept. 12. Date applied for Feb. 12, 1901, being date of application in France.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

9731. S. O. Cowper-Coles. Apparatus for use in the electro-deposition of metals. Sept. 4.

11,358. H. U. Wollaston and T. V. Sherrin. Secondary batteries. July 3.

15,470. A. J. Boulton. —From E. Andreas, Germany. Process of forming metallic electrode plates. Aug. 28.

22,388. J. Bleichrode. Method for making an incandescent pile. Sept. 11.

1901.

14,967. H. H. Lake.—From A. G. Belts, United States. Apparatus for refining metals by electrolysis. Sept. 18.

XII.—FATS, OILS, AND SOAP.

APPLICATIONS.

17,988. C. Weygang. Improvements in the treatment of oils, fats, and other saponaceous materials. Sept. 9.

18,298. G. F. Carter. Improved oil purifier. Filed Sept. 13. Date applied for Feb. 13, 1901, being date of application in United States.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

9261. E. Petersen. Means for extracting or separating oil or other substances from water. Aug. 28.

1901.

15,603. A. M. Clark.—From L. Rissmuller, United States. Bleaching whale and seal oils. Sept. 11.

16,134. J. W. Mason. See Class II.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, ETC.

APPLICATIONS.

16,930. G. Willock. Composition for removing paint. Aug. 23.

16,945. A. Rak. See Class IV.

17,555. O. Francke. See Class I.

17,668. J. W. Rowlands and O. R. Jones. Bronze antifouling paint. Sept. 4.

COMPLETE SPECIFICATION ACCEPTED.

1901.

7242. A. S. Ramage. Production of oils applicable for use in the manufacture of paints and varnishes. Sept. 4.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

APPLICATIONS.

16,797. T. H. Cobley. Improvements in the treatment of leather waste for the recovery of tannin and tannates, and the production of a special guano and nitrogenous agent for the manufacture of manures. Aug. 21.

17,012. J. F. Butterworth and C. Marter. Improvements in the manufacture of compressed and moulded articles from waste leather and animal skins. Aug. 24.

17,404. W. S. Smith. A further improved method of leather dressing. Aug. 30.

XV.—MANURES, ETC.

APPLICATIONS.

16,797. T. H. Cobley. See Class XIV.

17,875. A. Descamps. Improvements in the treatment of poor phosphates. Sept. 6.

18,326. E. Jonas. An improved fertiliser. Sept. 13.

XVI.—SUGAR, STARCH, AND GUM, ETC.

COMPLETE SPECIFICATIONS ACCEPTED.

1901.

10,741. F. Singer. Machine for turning green malt. Sept. 11.

15,853. G. Hallenscheid. Twisted auger. Sept. 11.



XVII.—BREWING, WINES, SPIRITS, Etc.

APPLICATION.

16,887. J. A. Ruckdeschel. An improved process for caramelising or colouring beer wort. Aug. 22.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

APPLICATIONS.

A.—Foods.

17,133. T. Kerfoot. Improvements in desiccated milk and products made therefrom. Aug. 27.

17,331. C. T. V. Bruun. Improved method of preserving eggs. Complete Specification. Aug. 29.

18,269. J. H. Hooker. Improvements in the manufacture of alimentary products. Sept. 12.

B.—Sanitation. Water Purification.

17,218. P. R. de Fauchaux d'Humy. Improvements in and connected with retorts for carbonising and for distilling decayed vegetable and other carbonaceous matters. Aug. 28.

17,396. C. W. Beissel. Improvements in water softening and purifying apparatus. Aug. 30.

17,649. A. Sorge, jun. Improvements in water purifying apparatus. Complete Specification. Sept. 3.

17,805. J. Harris. Improvements in and relating to the purification of air. Sept. 5.

18,366. W. J. Newton. Improvements in apparatus for sewage treatment. Sept. 14.

18,405. E. Peake. A new or improved system of sewage purification. Sept. 14.

C.—Disinfectants.

16,736. B. Sieber. A process and apparatus for the gasification of disinfecting media. Aug. 20.

17,700. J. Baxeres de Alzugaray. Improvements in and connected with the manufacture of disinfecting and antiseptic fluids and compounds. Sept. 4.

COMPLETE SPECIFICATIONS ACCEPTED.

B.—Sanitation; Water Purification.

1901.

6217. F. Breyer. Process for softening water. Aug. 28.

7388. P. D. Hahn and O. Lenz. Process for deodorising and clarifying sewage and effluents from breweries and technical establishments. Sept. 4.

C.—Disinfectants.

1900.

20,034. R. J. Yarnold. Obtainment of disinfectant and antiseptic preparations. Sept. 11.

XIX.—PAPER, PASTEBOARD, Etc.

APPLICATIONS.

16,685. D. N. Bertram and S. Milne. Improvements relating to machines used in the manufacture of paper, paper pulp, and the like. Aug. 20.

16,865. J. St. Clair Legge and S. Lambert. A process for treating paper for transfer purposes. Aug. 22.

17,006. C. H. Jackson, G. I. Levy, A. Barnett, and T. R. Marigold. An improved method for producing and applying a solution of xylonite, celluloid, and the like substances. Aug. 24.

17,624. F. C. Crean. See Class I.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

14,992. J. J. Tinker. Blotting paper and the like. Aug. 28.

1901.

249. F. Billing. Manufacture of paper. July 26.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

APPLICATIONS.

16,750. R. Pearson and O. March. See Class VII.

16,751. R. Pearson and O. March. See Class VII.

16,968. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of pharmaceutical compounds. Aug. 23.

17,081. J. Montgomery. A process for making chemically pure camphor. Aug. 26.

17,924. W. Smith. Improved process in the manufacture of cineol (eucalyptol) by the use of arsenic acid. Sept. 7.

COMPLETE SPECIFICATIONS ACCEPTED.

1901.

14,507. H. Froehling. Process and apparatus for extracting alkaloids and oils from vegetable substances. Sept. 11.

15,447. J. M. Schutz and C. G. Hawley. Coffee compound or composition, and process of producing the same. Sept. 4.

XXI.—PHOTOGRAPHY.

APPLICATIONS.

17,100. C. K. Mills. — From La Société Anonyme des Plaques et Papiers Photographiques A. Lumière et ses Fils, France. Improvements in combined toning and fixing bath for photographic purposes. Aug. 26.

17,283. H. O. Cooper, J. Reardon, and W. Beresford. Improvements in the manufacture of photographic films. Aug. 29.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

19,331. A. Watkins. Photographic actinometers. Sept. 11.

1901.

2637. W. G. Perks and H. G. M. Fletcher. Method of separating flexible photographic films, cards, and the like. Aug. 28.

XXII.—EXPLOSIVES, MATCHES, Etc.

APPLICATIONS.

16,668. J. Hübner. Ignition strips made of prepared nitrocellulose, and a process for manufacturing the same. Aug. 19.

16,693. Sir H. S. Maxim. Improvements in explosive compounds for use with armour-piercing projectiles. Aug. 20.



16,694. Sir H. S. Maxim. Improvements relating to fuses for armour-piercing projectiles. Aug 20.

17,626. H. H. Lake.—From Eastern Powder Company, United States. Improvements relating to the manufacture of explosive powder. Complete Specification. Sept. 3.

17,628. H. H. Lake.—From F. Blake, United States. Improvements relating to machines for making matches. Complete Specification. Sept. 3.

17,860. Sir W. G. Armstrong, Whitworth, and Co., Ltd., and G. Stuart. Improvements in electrical primers. Sept. 6.

18,161. F. W. Jones. A new or improved explosive, and process for the manufacture thereof. Sept. 11.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

21,068. J. Bonnet. Manufacture of explosive substances. Aug. 28.

1901.

8365. O. Imray.—From J. L. Norris, United States. Explosive. Sept. 18.

9984. J. E. Blomén. Manufacture of high explosives. Sept. 18.

14,525. J. U. Mackenzie. — From The Robin Hood Powder Company, United States. Explosives. Sept. 18.

