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Notices.

SPIRIT (ALCOHOL), DUTY-FREE.

The question of concessions in regard to the use of spirit (alcohol) having become pressing, the Council would be obliged if those members who are interested in industries, in which partially or wholly duty-free spirit would be of advantage, would inform the Secretary in what way the power to use spirit duty-free for manufacturing purposes would affect their industries, giving, as far as possible, actual instances and figures :—

1. As facilitating present processes (crystallising, &c.).
2. As rendering possible the manufacture, in Great Britain, of products which the duty has hitherto prevented.
3. As affecting the position of British manufactures in regard to foreign competition.
4. As to the branches of industry which the duty on alcohol has crippled or destroyed.

THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information at as early a date as possible, the Journal is now issued twice a month, and contains abstracts of French and American, as well as British, patents.

MEMBERS AND THEIR CONTRIBUTIONS.

Every Candidate for admission as a Member of the Society must be proposed according to the form set out in Rule 26. He must be proposed by one or more Members to whom he is known personally. The proposal form must be sent duly signed to the General Secretary, who shall lay the same before the Council at its next Meeting. If the majority of the Members of Council present are in favour of his election, the Candidate shall be declared duly elected, and his name shall be entered in the Register of the Society. At whatever period of the year a new Member may be elected, he shall be required (unless the Council shall determine otherwise) to pay his subscription for that year; having done which he shall be entitled to receive all the numbers of the Society's Journal for that year.

The Nomination Paper must take the following form, and may be obtained from the General Secretary, or from any of the Secretaries of Local Sections :—

THE SOCIETY OF CHEMICAL INDUSTRY.

We, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) ....
as a fit and proper person to become a Member of the Society.

For Names only of Members recommending the Candidate. } ....
....

And I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.

Signature of Candidate....................................

Address to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. } ....
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Profession or Business Occupation ....

Date....................................

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

Each Member shall pay an annual subscription of Twenty-five Shillings, due on the First of January in each year; except that any Member may pay a life composition fee of Twenty Pounds in lieu of an annual subscription. He shall also pay, on receipt of notice of election, an entrance fee of One Guinea in addition to his first year's subscription; except that should a Member who has paid an entrance fee resign and subsequently seek re-election the Council may dispense with a further entrance fee.

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.

The Joint Committees of the Societies of Chemical Industry and Public Analysts have now submitted their report, prescribing a method for dealing with the various substances which might contain Arsenic, and the report has been accepted by the Council.

Copies of this, together with the papers, discussions, and abstracts which appeared in the Journal in 1901, and other extracts, may be obtained from Messrs. Eyre and Spottiswoode, price 1*s.* per copy, or 1*s.* 1½*d.* post free.

LIST OF SECTIONAL COMMITTEES.

In future, the list of Sectional Committees will appear once a month only, in the second number.

ANNUAL GENERAL MEETING.

The Annual General Meeting will be held on July 9th, 10th, and 11th next in Liverpool. Full particulars will appear in a subsequent issue.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

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Death.

Cotterill, Thos., The Poplars, West Bromwich. March 23.

Canadian Section.

Meeting held on Thursday, March 6th, 1902.

PROF. W. R. LANG IN THE CHAIR.

ELECTROLYTIC MANUFACTURE OF CAUSTIC SODA AND BLEACHING POWDER AT SAULT STE. MARIE, ONTARIO.

BY B. E. F. RHODIN.

The water power developed at Sault Ste. Marie, where the St. Mary's river has a fall of 19 ft., is at the present moment being used in connection with the operation of a great many industries, of which the electrolytic manufacture of caustic soda and bleaching powder, although at present the smallest one actually in operation at Sault Ste. Marie, is destined to become an important factor amongst the industries of Canada.

As is well known, the electrolytic manufacture of caustic soda and bleaching powder is carried out by the decomposition of common salt by means of the electric current. A great many different processes and forms of apparatus are, at the present moment, in use, and it seems almost certain that the electrolytic production of these commodities will in time supersede the chemical manufacture of them, at least in countries where water power exists and can be developed cheaply.

The process employed at Sault Ste. Marie is what is known as a mercury cathode process. The electrolytic cell itself is a circular vessel of vitrified earthenware, of a peculiar design. The bottom surface of this cell has a number of depending openings, and the top surface also has openings corresponding to those on the bottom surface. The appearance of the cell resembles that of a wheel, the openings above referred to corresponding to the spaces between the spokes. With a view of strengthening the resemblance mentioned, it will have to be supposed that the width of the spokes of a wheel be equal to the distance between them. The anodes consist of carbon blocks, which fit into the openings of the top surface of the electrolytic cell. Into these carbon blocks there are fitted, by means of a screw thread combination, a number of carbon rods, which hang downwards into the openings of the bottom surface of the cell. It will be understood that, when these anodes are placed in position, the top surface of the cell is closed and, of course, made tight by means of a special cement. Now this electrolytic cell is suspended inside a shallow cast-iron dish, the diameter of which is 5 ft. The bottom of this cast-iron vessel is covered with a layer of mercury, which layer of mercury seals the interior of the electrolytic cell from the annular space of the cast-iron vessel surrounding the cell itself. The cell is suspended by means of a vitrified earthenware pipe, which is bolted to a circular flange, of the same diameter as the pipe, in the centre of the top surface of the cell. When the electrolytic cell is in operation it is, of course, filled with brine, whilst the annular space of the cast-iron vessel is filled with water. It will be understood that the mercury on the bottom of the cast-iron vessel forms a seal between the brine and the water, and prevents communication between these liquids. The carbon anodes are connected up to a metallic ring contact, which is connected to the positive pole of a dynamo, whilst the cast-iron vessel is connected to the negative pole of the dynamo. When the current is on, the electrolytic cell itself is being rotated inside the cast-iron vessel, the brine is being decomposed, the chlorine going off at the surface of the brine through the pipe by means of which the cell is suspended, and the sodium depositing on the mercury inside each opening of the bottom surface of the cell. The mercury, through the rotation of the cell, and through the depending flanges dipping into it, is being put into motion towards the periphery of the cast-iron vessel, which motion is greatly accelerated by radial ribs placed on the bottom of the cast-iron dish. It will consequently be seen that the mercury, after having received a certain quantity of sodium, and having amalgamated with it inside the openings of the electrolytic cell above referred to, is being continuously thrown out into the annular space of the cast-iron dish which contains water, with which the sodium contained in the mercury amalgam reacts into sodium hydrate and hydrogen. The very essence of a mercury cathode cell is to remove the mercury amalgam from the actual field of decomposition as soon as it is formed, afterwards to extract the sodium from the amalgam, and again to have the mercury ready to amalgamate with more sodium.

The above description of the cell in use at Sault Ste. Marie clearly shows how the mercury at first is amalgamated with the sodium, and is afterwards put in motion towards the combining space, where the sodium hydrate is formed. When the mercury amalgam leaves the openings of the electrolytic cell, fresh mercury is always ready to enter the actual field of decomposition. The mercury amalgam, on its journey towards the annular space, is somewhat lighter than pure mercury, on account of its contents of sodium, and consequently remains on the surface of the total body of mercury in the annular space. As the sodium is being extracted from the amalgam, the mercury becomes pure and sinks to the bottom, whilst fresh amalgam is continuously being supplied on the surface. The mercury, just relieved of its contents of sodium owing to the motion imparted to same, travels towards the centre of the cast-iron vessel, between the ribs of the bottom of the vessel, and, after a little while, it is again amalgamated with sodium in the actual field of decomposition, which, in this case, is constituted by the openings of the bottom surface of the electrolytic cell.

This brief description is intended to illustrate the mercury's capacity as the amalgam conveyer in the cell, *i.e.*, its continuous amalgamation with sodium, its continuous giving up of sodium, and its continuous readiness to be again amalgamated with sodium.

With a view of making the operation of the cell continuous, there must be a constant supply of brine into the actual field of decomposition, and also a continuous drawing off of the sodium hydrate solution formed. The latter factor is a very simple matter. At the surface of the water in the annular space of the cast-iron vessel there is a draw-off pipe. When the sodium hydrate solution reaches a desired strength, the draw-off pipe is opened, and the sodium hydrate solution runs out, whilst a corresponding quantity of water is being fed in through a supply pipe. A constant supply of strong brine is a very difficult matter, and of utmost importance to the successful working of an electrolytic process. In the cell employed at Sault Ste. Marie, there is, in the centre of same, provided a cup or receptacle, which receives the incoming electrolyte (concentrated brine), and from this cup the electrolyte is conveyed, by means of suitably arranged ducts, to the bottom of the openings of the electrolytic cell, which are in the actual field of decomposition. The cup is placed above the level of the brine in the electrolytic cell. In use, the electrolyte flows into the cup, and thence, by means of the ducts above referred to, into the actual field of decomposition, which is the region between the carbon rods and the mercury surface. In this region, the salt in the electrolyte is broken up into its elements, chlorine and sodium. The electrolyte gets weaker and flows upwards and out of the electrolytic cell through a pipe placed underneath the cup above referred to. It will consequently be understood how strong brine is constantly being fed into the actual field of decomposition, whilst the brine, weakened by decomposition, is being continuously taken away from the cell to be strengthened and afterwards used again.

In connection with the decomposition of salt for the production of caustic soda and bleaching powder by electrolysis, the following factors are of extreme importance:—

1. The cell must be made of material that resists the action of free chlorine and sodium hydrate solution.

2. Power consumption must be reduced to a minimum.

3. High current density is essential with a view of reducing working costs and initial outlay to a minimum.

4. Recombination of final products or secondary reactions must be prevented as much as possible.

In the electrolytic cell in use at Sault Ste. Marie, carbon and vitrified earthenware are exposed to the action of free chlorine, and vitrified earthenware, mercury, and iron to the action of sodium hydrate solution. These materials are the very best for their respective purposes, and the apparatus is consequently lasting. In connection with the manufacture of chemicals in general, the depreciation of the apparatus employed is a very serious item, and commercial success can only be obtained by paying the utmost attention to the quality of the material employed.

The theoretical potential difference in connection with the decomposition of a concentrated solution of common salt (sp. gr. 1·20078) is 2·30 volts. Electrolytic mercury cathode cells at present in use are operated with a potential difference of from 4 to 5 volts. At Sault Ste. Marie, owing to the very high current density employed, a potential difference of 5 volts is required. Power costs there, under the above conditions, 0·136 cent per pound of product made. This item could be reduced by 0·027 cent per pound of product made by diminishing the current density, and consequent utilisation of a lower potential difference.

However, the use of a high current density is advantageous, as, by having a very large output per cell, the working cost and the initial outlay are reduced to a degree which, from a commercial point of view, exceeds the above mentioned possible reduction of the cost of power. A current of from 800—1,000 ampères per cell is used at Sault Ste. Marie, and the passing of this enormous current through a cell that is only 3 ft. in diameter has only been made possible by the discovery of the Acheson graphitised carbon electrode, the conductivity of which is four times as great as that of ordinary carbon, and also by the system of the circulation of the electrolyte employed, whereby a concentrated solution of salt always is present in the actual field of decomposition.

When a solution of sodium chloride is being electrolysed the following chemical changes take place:—

$$2NaCl = \underset{\text{(cathode)}}{2Na} + \underset{\text{(anode).}}{2Cl}$$

If the mercury amalgam were not immediately removed from the actual field of decomposition, as above described, a recombination of final products or secondary reactions would take place as follows:—

$$2Na + 2H_2O = 2NaOH + H_2.$$
$$2NaOH + 2Cl = NaClO + NaCl + H_2O.$$

If a heated electrolyte be used, chlorate is formed. Apart from losses, which would be caused by such secondary reactions, there would be great danger owing to the explosive nature of a mixture of chlorine and hydrogen. It is, of course, impossible to prevent secondary reactions altogether, but the mercury in the cell employed at Sault Ste. Marie does its work so well, that during the year 1901, the quantity of hydrogen produced by secondary reactions amounted to less than 3 per cent. of the total quantity of chlorine made.

The factory, erected at Sault Ste. Marie, Ontario, by The Canadian Electro-Chemical Co. Ltd., has a power installation of 660 kilowatts, consisting of three 220 kilowatt dynamos, each driven by a separate water wheel. The electrolytic installation consists of 120 cells such as above described. The evaporation plant consists of stock tanks, weak liquor evaporation apparatus, and six finishing kettles. The bleach plant consists of 10 bleach chambers, each of the following dimensions, length 55 ft. 6 ins., width 17 ft., and height 6 ft. 6 ins. The chambers are made of No. 6 sheet lead, and are provided with a 2-in. tile floor. The lime plant consists of disintegrator and dressing machinery for a daily output of 14 tons of slaked lime.

During the first year of its existence, only part of the factory was operated, with a daily output of 4 tons 800 lb. of bleaching powder and 2 tons of caustic soda. The products made were liked by the consumers in Canada, and as soon as commercial conditions permit, the factory will be worked to its full capacity, as will be referred to later.

An electrolytic alkali factory requires very careful analytical superintendence. The analytical work can be divided into three classes, viz., testing of raw materials, factory control, and testing of finished products. Raw materials, which are lime and salt, must be of very pure quality, and each lot supplied at the works has to be subjected to complete analysis before being utilised. The factory control comprises frequent determinations of caustic liquor and chlorine gas produced. In connection with finished products, determinations of free chlorine in the bleaching powder and total contents of sodium oxide in the caustic soda are the only ones really necessary.

The composition of an average sample of the burned lime used for the manufacture of bleaching powder at Sault Ste. Marie is as follows:—

	Per Cent.
Silica	0·51
Ferric oxide and alumina	0·41
Lime	94·01
Magnesia	1·03
Carbonic acid	trace
Water	3·39

The composition of an average sample of the salt used is as follows:—

	Per Cent.
Insoluble in water	0·013
Calcium sulphate	0·330
Magnesium sulphate	trace
Sodium sulphate	0·113
„ chloride (by diff.)	99·535

The composition of an average sample of the bleaching powder produced at Sault Ste. Marie, during 1901, would be 37 to 38 per cent. of free chlorine. The composition of an average sample of the caustic soda produced at Sault Ste. Marie, during 1901, would be 74 to 76 per cent. of sodium oxide.

It is often held up against a mercury cathode process for the decomposition of brine, that there must be a loss of mercury, and that such loss must be a very serious matter, owing to the great value of the mercury. As may be deduced from the description of the electrolytic cell given above, the chance of the mechanical loss of mercury is very slight owing to the construction of the cell. The mercury is covered with a liquid throughout, and the hydrogen, given off in the combining chamber, is not given off from the mercury surface, so that the hydrogen going into the atmosphere in the cell room carries no mercury. Regarding the solubility of the mercury in the sodium hydrate solution, it might be interesting to know that it has been found, as a result of careful research work on the subject, that one pound of mercury is dissolved by the alkali solution for every 27,500 lb. of caustic soda produced. The electrolyte, on account of its contents of free chlorine, always carries mercury to the extent of 5/100ths of 1 per cent. of its contents of salt. The electrolyte in the circulation system is changed once every four to six weeks. The loss of mercury resulting thereby amounts to approximately 20 lb. in the period of time stated. It will thus be seen that the loss of mercury, in connection with the electrolytic manufacture of caustic soda and bleaching powder by means of a workable mercury cathode process, is entirely negligible from a commercial point of view.

As already stated, as soon as commercial conditions permit, the total plant at Sault Ste. Marie, consisting of 120 cells, will be operated at its full capacity, each cell utilising a current of 1,000 ampères, at a potential difference of five volts, and with an A.H. efficiency of 90 per cent.; the total output would then be, per working day, 9 tons 241 lb. of bleaching powder, and 4 tons 565 lb. of caustic soda.

This output would meet the total demand for bleaching powder in Canada, and to a great extent the present demand for caustic soda.

(See also this Journal, 1897, 745; and 1900, 417.)

A number of photographs were exhibited showing the interior of the works, and Prof. W. H. Ellis explained the attached diagrams by means of lantern slides.

DISCUSSION.

Prof. W. **LASH MILLER** showed an experiment illustrating the production of alkali by electrolysis with a mercury cathode, and congratulated the Society on the nature of their first paper. The hearty support which the manufacturers had given to the proposed American Electro-Chemical Society, and the frankness with which Mr. Rhodin described the processes in use at the Sault, showed that the policy of obscurantism in electro-chemical industry had been abandoned.

Dr. W. H. **ELLIS** congratulated the Canadian Section of the Society of Chemical Industry on the character of the first paper read before it, and thought that the fact that a gentleman like Mr. Rhodin had been willing to came forward and give an account of this new development of a new industry augured well for the future of the branch. The Rhodin process, like the Castner-Kellner process, which had been for several years in successful operation at Niagara Falls, was based upon the use of mercury as a cathode. It would appear that electrolytic cells of this type were proving more satisfactory than those with a porous diaphragm. There was a third type of cell in which the anode products were separated from the cathode products by the specific gravities of the solutions operated on. In such a cell, saturated brine was fed continually into the anode compartment and caustic soda solution overflowed at an equal rate from the cathode compartment. By Mr. Rhodin's arrangement of a distributing cup and ducts and an overflow pipe, some of the advantages of these gravity cells were combined with the use of the mercury cathode. One great advantage of the latter was the purity of the solution of sodium hydroxide obtained. How far this, and its other good points, would enable the mercury cell to compete successfully with the greater simplicity of the gravity cell, it must be a matter for experience to decide.

Prof. **ROSEBRUGH** drew attention to the importance of the potential difference at which the process was carried on as one of the factors which determined the amount of power required for a given daily output. The author gave 2·3 volts as being "theoretically" required, presumably referring to the formula :—

$E = 0{\cdot}004298\ H$, where—
E = Electromotive force in volts,
H = Heat of reaction in 100-grm.-degree units.

Taking this expression, which embodied Thomson's Law (thus omitting the term introduced by von Helmholtz), there resulted for the reaction—

$$\mathrm{NaCl,Aq} + \mathrm{Hg_6} = \mathrm{NaHg_6} + \mathrm{Cl} + \mathrm{Aq}.$$
$$964 \qquad - 21 = 943$$
$$\text{Now } 943 \times 0{\cdot}004298 = 4{\cdot}06 \text{ volts,}$$
$$\text{whilst, for } \mathrm{NaCl,Aq} + \mathrm{H_2O} = \mathrm{NaOHAq} + \mathrm{H} + \mathrm{Cl}.$$
$$964 + 684 - 1118 = 530,$$
$$\text{and } 530 \times 0{\cdot}004298 = 2{\cdot}28 \text{ volts.}$$

The latter equation, though representing the final result of the process, was clearly inapplicable even to an approximate calculation of the E.M.F., as the second part of the process, namely, the recovery of the sodium from the mercury as hydrate, does not occur within the "cell," strictly speaking. From the agreement of the latter calculated value with that given by the author, it would appear that this was the source of the error. Confirmation of the former value, 4·06 volts, might be found in the values given recently by Prof. Dr. W. Nernst for electrode potentials, namely :—

	Volts.
Na	+ 2·82
Cl	− 1·42
Difference	4·24

These values also agreed very well with the author's statement that, in practice, a pressure of 4 to 5 volts was required. The author had drawn attention to the great practical importance of the choice of current density in determining capital outlay and cost of working. Assuming for simplicity that the excess above 4 volts was due to and proportional to the current density; then if 4½ volts be used, this would correspond to one half the output per cell obtainable at 5 volts, and therefore for the same output, would require twice as many cells, with corresponding increase in floor and roof area, piping, and attendance; whilst, to offset this large increase in expense, there was only the reduction of 10 per cent. in the power, the amount by which 4½ was less than 5.

Mr. **BAIN** said that he had recently had the pleasure of listening to some lectures on electrolytical processes by a famous authority on the manufacture of soda, Dr. Lunge, of Zurich. The latter pointed out that these methods could hardly be expected to supplant the old processes for at least some time, because a simple calculation showed that about 2·4 tons of bleaching powder was produced per ton of caustic soda, and that there was no market for such an enormous quantity of chlorine as would be obtained were electrolytic processes only used for the manufacture of soda.

The **CHAIRMAN** compared the three processes of alkali making, and indicated the cost of soda twenty years ago and now. There was little danger, he said, of the electrolytic process ousting the Leblanc or Solvay processes from their present position, on account of the output of bleaching powder being so great in comparison with that of alkali. In this he endorsed the former speaker's remarks, adding that, when coal and common salt were to be had cheaper than water-power, the older processes would continue to be employed. The thanks of the meeting were accorded to Mr. Rhodin for his paper, and also to Prof. Ellis and Prof. Miller for their demonstrations.

New York Section.

ERRATUM.

THE COMPOSITION OF PAINTS AND PIGMENTS.

BY MAXIMILIAN TOCH.

In the Journal for Jan. 31st, 1902, p. 103, col. 1, under "*Zinc Oxide,*" it is stated that "the difference in whiteness is *soon* apparent", whereas it should be "the difference in whiteness is *not* apparent in a very short time between the two oxides."

Nottingham Section.

Meeting held on Wednesday, March 26th, 1902.

MR. L. ARCHBUTT IN THE CHAIR.

THE RÔLE OF ALUMINA IN BLAST FURNACE SLAGS.

BY G. J. WARD.

Several papers* have appeared lately dealing with the constitution of slags, and the author thought that the following series of analyses, together with the specimens from which they were made, might be of interest to the Section, especially as the amount of alumina present is abnormally high in most of them, higher than is shown in any printed analyses which he has hitherto seen.

Mark.	1. SiO_2.	2. Al_2O_3.	3. FeO.	4. CaO.	5. MgO.	6. O in acid / O in base.	7. O in SiO_2 / O in CaO.MgO and FeO.	8. Order of basicity.	9. O in SiO_2 and Al_2O_3 / O in CaO.MgO and FeO.	10. Order of basicity.
A	27·55	29·25	0·73	13·20	18·31	0·587	1·30	1	2·53	3
B	30·17	33·23	0·65	32·48	0·66	0·635	1·66	7	3·15	8
C	29·94	27·61	0·85	37·87	1·81	0·650	1·36	3	2·45	2
D	33·52	44·87	0·92	18·85	1·19	0·657	2·94	17	6·40	18
E	31·81	38·87	0·97	27·06	0·87	0·662	2·04	13	4·25	14
F	31·27	27·93	0·52	39·51	0·98	0·668	1·41	4	2·53	3
G	31·64	31·68	0·78	35·10	0·33	0·668	1·63	6	3·07	7
H	31·63	25·72	1·21	43·78	0·57	0·669	1·30	1	2·23	1
I	30·45	28·52	..	34·54	1·28	0·682	1·56	5	2·85	5
J	32·67	32·61	0·84	32·70	1·09	0·688	1·75	10	·29	10
K	34·31	36·53	0·70	28·86	0·92	0·706	2·10	14	4·00	13
L	32·10	30·99	0·52	31·93	0·72	0·710	1·71	8	3·34	11
M	32·75	29·71	0·94	32·85	1·57	0·720	1·71	8	3·01	6
N	33·36	30·64	0·31	33·17	1·25	0·727	1·77	11	3·26	9
O	34·81	30·44	0·31	32·25	0·25	0·783	1·98	12	3·50	12
P	36·96	33·62	1·32	25·96	1·03	0·822	2·48	15	4·46	15
Q	38·14	40·48	1·19	15·48	1·82	0·828	3·74	19	7·29	19
R	36·56	34·21	0·74	20·70	2·02	0·848	2·83	16	5·18	17
S	44·01	27·74	1·96	21·13	0·91	1·180	3·43	18	4·95	16

The following table of silicate from Jonstorff's paper should be borne in mind:—

Oxygen Ratio. Acid / Base.	Metallurgical Description.	Molecular Formulæ.	
		Monoxide Basis.	Sesqui-oxide Basis.
1 : 1½	Sub-silicate……	R''_3SiO_5	R'''_2SiO_5
1 : 1	Mono-silicate….	R''_2SiO_4	$R'''_4Si_3O_{12}$
1½ : 1	Sesqui-silicate…	$R''_4Si_3O_{10}$	$R'''_8Si_9O_{20}$
2 : 1	Bi-silicate…….	$R''SiO_3$	$R'''_2Si_3O_9$
3 : 1	Tri-silicate…….	$R''Si_3O_8$	$R'''_4Si_9O_{24}$

Gehlenite = $(3R''O.Al_2O_3)(SiO_2)_2$.
i.e., R''_3SiO_5,Al_2SiO_5.
Spinel = $RO.Al_2O_3$.

*Ledebur gives two methods for calculating the proportion of furnace charges to give slags of a desired acidity.

In the first—that of Mrazek—the oxygen present in the SiO_2 is divided by that in the Al_2O_3, MnO, CaO, MgO, and FeO, and the result is called the oxygen ratio.

The second—Platz's—is the simpler; the percentage quantity of SiO_2 and Al_2O_3 are added together and the sum divided by the sum of the percentages of the monoxide bases, and the proportions of the charge are arranged to give a fraction of $\frac{51}{49}$. This sounds very rough and ready, but the error introduced by not taking the oxygen contents is not very serious. For, whilst a molecular quantity of alumina amounts to 34 per atom of oxygen, silica is 30 (thus $Al_2O_3\ \frac{102}{3} = 34\ SiO_2\ \frac{60}{2} = 30$), and usually the quantity of the other bases is small compared to that of the CaO.

In short, Mrazek considers Al_2O_3 to be a base, Platz calls it an acid, whilst Blum, in his recent paper, suggests that it is neutral.

In the table, the analyses are given in the order of their basicity, reckoning the Al_2O_3 as a base, and column 6 gives their oxygen ratios.

Column 7 gives the oxygen ratio on the assumption that the Al_2O_3 is neutral, and the corresponding order is shown in column 3.

In 9 is given the ratio calling Al_2O_3 an acid, and in 10 the order on that basis.

The MnO was not determined, but is known to be very low.

Sample A was a piece of slag which fell to dust on cooling; assuming the Al_2O_3 to be basic, it shows a much lower oxygen ratio than any of the others.

If the Al_2O_3 be neutral, it must be bracketed first with H; if acid, then it comes third on the list.

The sample was taken whilst still warm, and kept in a stoppered bottle. A weighed portion was well washed with

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* Handbuch der Eisenhüttenkunde, II., p. 536.

* The Constitution of Slags and the part they play in the Metallurgy of Iron, by Baron Jüptner von Jonstorff, Journ. Iron and Steel Inst., 1900, II., p. 276; Composition of Blast Furnace Slags, L. Blum. Abstracted, Journ. Soc. Chem. Ind., 1902, p. 118.

hot water, and the washings titrated with standard acid solution showed an alkalinity equivalent to 1·56 per cent. of CaO. Whether the unusual quantity of MgO (magnesian limestone was being used as a flux at the time) has anything to do with the falling it is hard to say, but this does not seem probable, and it has been impossible to obtain another sample of a "fallen" slag.

There is then an excess of lime or magnesia proved to be present, and only by taking the Al_2O_3 as a base can this sample be considered more basic than some of the other more stable slags.

Samples B to N are average working slags obtained under ordinary conditions; experienced men are constantly watching the furnaces and regulating the amount of limestone added to the charge, with the object of obtaining a slag of as constant a composition as possible. The regularity of the figures in column 6 as compared with those in 7 and 8 is therefore remarkable. The last five samples were taken at exceptional times, such as on blowing out a furnace, and do not throw much light on the subject.

Looking down columns 8 and 10, the most striking alterations in the order are B, D, E, and H. In fact the whole question may be summarised—Are D and E to be considered as of practically the same basicity as H, or are they several times more acid?

An examination of the samples themselves and of their history seems to point to the conclusion that they must be considered as equally basic; in other words, Al_2O_3 and CaO can replace one another as bases.

In appearance, D and E have none of the glassy structure so characteristic of Q and R, and they were produced from a furnace making Nos. 2 and 3 foundry iron. If the slag were of an acid character, the sulphur in the burden would go into the iron and make it hard, but the reverse was the case.

Turning to individual specimens, F will be noticed to be highly crystalline, and it was chosen for analysis on this account; the oxygen ratio shows it to be a nearly pure sub-silicate $(3R''O . Al_2O_3) (SiO_2)_2$.

Specimen Q is also curious, as it shows numerous basic crystals formed in a glassy matrix.

Jonstorff, in the paper quoted above, gives a method for calculating the proportion of sub-silicate and mono-silicate in a slag. Take for instance K.

$$\text{The } \frac{\text{Oxygen in acid}}{\text{Oxygen in base}} = \frac{18.30}{25·88} = 0·707.$$

Assume the composition to be—

$$x\ (RO)_3SiO_2 + y\ (RO)_2SiO_2.$$

If s be the oxygen in the silica and b the oxygen in the bases—

$$2\,x + 2\,y = s.$$
$$3\,x + 2\,y = b.$$
$$\therefore x = b - s = 25·88 - 18·30 = 7·58$$
$$\text{and } y = \frac{3s}{2} - b = 27·45 - 25·88 = 1·57$$

and the slag is $7·58\ (RO)_3SiO_2 + 1·57\ (RO)_2SiO_2$.

Samples D, E, F, G, and H are almost pure sub-silicates, and are similar chemically to gehlenite—

$$(3CaO.Al_2O_3)\ (SiO_2)_2,$$

in which lime and alumina replace one another as base.

By a very similar method given by Jonstorff, sample A can be calculated out to consist of—

$$10(3RO.Al_2O_3)\ (SiO_2)_2 + RO.Al_2O_3,$$

or 10 parts of gehlenite and one of spinel, but as in this particular case there is apparently present free lime (or magnesia), this formula must be incorrect.

Some attempts made by the author to separate the various minerals in the slags by solution in weak acids and alkalis gave no definite results.

*Akerman has worked out a series of curves showing the total heat of formation of various silicates. Taking samples B to H, and considering them as sub-silicates, which is approximately correct, we have—

Mark.	$\frac{\text{Oxygen in } Al_2O_3}{\text{Oxygen in CaO.}}$	Total Heat of Formation.	Melting Point.
		Cal.	° C.
B	1·6	375	1210
C	1·1	355	1183
D	3·6	465	1409
E	2·3	410	1280
F	1·1	355	1183
G	1·4	363	1171
H	0·95	372	1240

and for S, if we call it a mono-silicate.

S	2·0	430	1344

The high melting points of D and E are more or less confirmed by the fact that they were taken for analysis because it was found difficult to separate properly the iron from the slag, as some of the metal was carried away with the slag in a "shotty" condition. In sample D, and also in B, some of these small shot-corns may be seen. They were of course removed by a magnet before analysis.

Finally, I may say that my firm opinion is that in a blast-furnace making grey foundry iron from a burden rich in alumina, this substance is found in the slag as a base replacing an equivalent quantity of lime.

Of course it is quite possible that in furnaces working under entirely different conditions, such as a furnace making white iron for conversion into steel, the results may be that the Al_2O_3 is present as an acid. Other people think so, at any rate.

My thanks are due to Mr. A. H. Longden, who has made the greater part of the analyses, and to the Stanton Iron Works Co., for their kind permission to publish the results of these analyses.

Discussion.

Mr. F. J. R. **Carulla** said Mr. Ward had made reference to some tables on alumina, &c., that had appeared in the *Iron and Steel Institute Journal*, and which were embodied in a paper by Baron Juptner von Jonstorff, and were prepared by Paul Gredr. He was extremely interested and surprised at the results, and some of the points brought out in that table, in which it was shown that, whilst the lime was replaced by the alumina, the slag remained the same all the time. The melting-point curve fell considerably as the alumina replaced the lime, but when it reached a certain point, the curves began to rise with rapidity. From the table, it might easily be seen how curves rose. In view of that result, could the author explain why alumina seemed to be so desirable in blast-furnace slags, whilst the melting point of slags containing much alumina was so extremely high? A small quantity of alumina was present in slags which were extremely fused; but he understood that blast furnaces wore out very fast; yet, with slags which were comparatively infusible, blast furnaces seemed to last very much longer. His experience had been entirely in connection with steel-making furnaces.

Mr. R. M. Caven said Mr. Ward had made reference to a neutral alumina. He should like to know if it existed in any combination, or what it meant exactly.

Mr. Wood inquired how the temperatures or melting points were measured.

Mr. Ward: They are calculated.

Mr. Ward said, in reply, with regard to Mr. Carulla's question about the melting curve, which was higher at either end than at the middle, that that was practically the case with most alloys. The melting point of the alloy was less in nearly every case, he thought he was correct in saying, than that of either of the two metals themselves, and there was some point in it, the minimum in which often appeared to have reference to some definite chemical composition. As far as the practice was concerned, they did not want to waste fuel on an infusible slag, and, therefore, they tried to get a slag which would melt at

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* Ledebur, Eisenhüttenkunde, I., p. 185; Wedding, Eisenhüttenkunde, I., p. 1033.

the lowest temperature. If they got too much alumina, there was no doubt that the melting point would go up. Mr. Carulla seemed to think that he suggested that the alumina was desirable, but he did not think that he suggested it. The real point was, they had certain stones to work, and some of those stones contained alumina. It was there, and they could not get it out. It had to go into the furnace. His own impression was that alumina did replace lime, and that, with aluminous ironstones, they could get slag of a definite composition by leaving out lime. It was not so much the proportion of alumina and lime, as the proportion of silica. If they got a large amount of silica, they got a slag which had a tendency to eat itself into the joints of the furnace, and that was bad for the furnace. Mr. Caven asked what he meant by neutral alumina. It was the word employed by the gentleman who wrote a paper. He took it that the alumina was present in solution. He did not see why the alumina should be dissolved in a silicate, though some people seemed to think that that was the most likely way the alumina was present. Practical experience with the furnace seemed to show that the variations in the fusing point were correct. He took it that the figures given were taken from actual experiments, and the actual working in the furnace seemed to agree perfectly with the curves made.

Yorkshire Section.

Meeting held on Monday, March 24th, 1902.

MR. G. WARD IN THE CHAIR.

A COMPARISON OF METHODS USED TO DETERMINE THE IODINE VALUES OF OILS.

BY F. W. HUNT, B.SC.

(Contribution from the Leather Industries Department, Yorkshire College.)

The object of the series of experiments, which is set forth in this paper, was not to add anything of a theoretical nature to the literature bearing upon the iodine values of oils, but was an endeavour to find out how far the two methods of Wijs and Hanus agreed with the Hübl method, and if this latter could be replaced by either of the two former, especially as regards marine oils.

Solutions of the various types were made up as follows:—

Hübl.—12·5 grms. of iodine dissolved in 250 c.c. of absolute alcohol were mixed with a solution of 15 grms. of mercuric chloride in a like quantity of the same solvent. This was allowed to stand 24 hours before using.

Wijs.—The method of making this solution was not strictly that of the original paper by Wijs (Ber., 1898, p. 752), but was on the lines of a suggestion by Lewkowitsch in a discussion on a paper by Marshall (Journ. Soc. Chem. Ind., 1900, 213). This suggestion, it may be said, has been taken up by Wijs himself, who now makes his solution in this manner, as he states in a private letter to a student of the Leather Industries Department.

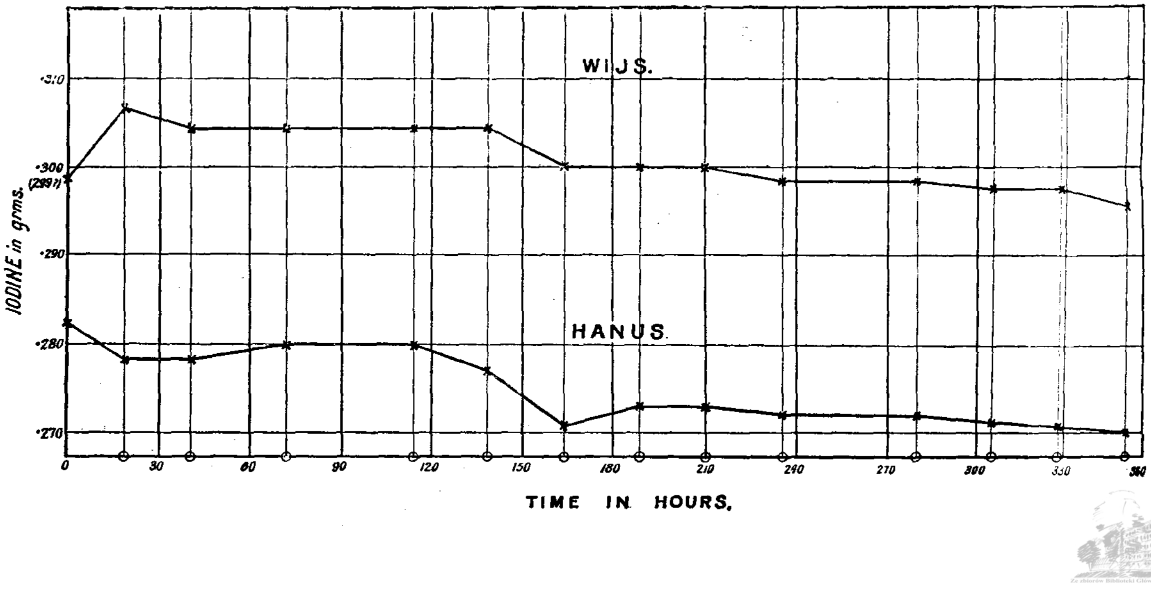
Five grms. of iodine trichloride were weighed out and dissolved in 500 c.c. of glacial acetic acid, 5·4 grms. of iodine were added, and the whole dissolved to a clear port wine coloured solution. Several of these solutions were used, and the results did not appear to be affected by the order of solution.

Hanus.—This was also modified. Hanus (Zeits. Untersuch. Nahr. Genuss., 1901, **4**, 913) recommends making iodine bromide by dropping bromine on to iodine kept at a temperature of 5° C. and constantly stirred, but the solution adopted was made by dissolving 6·6 grms. of iodine in glacial acetic acid, either in the cold or by gentle warming over the water bath (in the latter case the solution is cooled), and adding 1·5 c.c. of bromine, finally making up to 500 c.c. Bellier (Chem. Centr., 1900, 1109) used an analogous method, but added mercuric chloride to the solution.

The Wijs and Hanus solutions were both subjected to tests in regard to keeping qualities. Two solutions were made up on March 5th, and 10 c.c. were withdrawn each day and run into a stoppered bottle; 4 c.c. of 10 per cent. potassium iodide solution were added, and distilled water to make up to about 300 c.c. The iodine was titrated with $N/10\ Na_2S_2O_3$. The results as shown on the two curves are almost constant, but have a downward tendency.

Solutions were also placed in various conditions of light with but little effect. The method used to determine the iodine value was as follows:—

A weight of oil was taken which was so arranged that excess of free iodine would remain at the end of the reaction. This weight varied as the iodine value was known to be large or small, and also as the titre of the solution used. In some cases it would be about 0·1 grm., whereas in others 0·4 grm. was used. The oil thus weighed off into a stoppered bottle was first dissolved in 10 c.c. of pure chloroform, and then 25 c.c. of the iodine solution were run in, accurately measured from a burette. The whole was allowed to rest in a cupboard for periods, five hours for the Hübl method and one hour each for Wijs and Hanus methods. These periods were chosen from experiments made in the Leather Industries Department by Messrs. Blockey and Borghstijn, and were found to give the best results. In the case of the Wijs solution, the following are



the periods which Wijs himself states, in the private letter above referred to, to be the best:—For non-drying oils and fats, 15 mins.; for half-drying oils, ½ hour; for drying oils, 1 hour. In this series, however, 1 hour was adopted for all oils.

When the period of standing was over, 10 c.c. of 10 per cent. potassium iodide solution were added to the Wijs and Hanus solutions, but 20 c.c. to the Hübl solution. They were then titrated for the iodine by N/10 $Na_2S_2O_3$.

Starch must be added near the end of the titration, and the whole well shaken after each addition of thiosulphate. When the colour of the starch disappears, the end of the reaction is reached. The blue colour returns, however, after even a few seconds, which may be due to oxidation. The titration should therefore be done as rapidly as possible, so that no time is allowed for this change to take place during titration, and so introduce an error.

The following oils were treated, duplicates being done in each case. Pale seal, whale, castor, olive, linseed, cottonseed, Newfoundland cod, coast cod, pale rape, arctic shark, arachis (earthnut), and dogfish liver.

The results are tabulated in Table I.

TABLE I.

Method.	Hübl.			Hanus.			Wijs.		
Name of Oil.	No. 1.	No. 2.	Mean.	No. 1.	No. 2.	Mean.	No. 1.	No. 2.	Mean.
Pale seal	117·8	117·2	117·5	120	121·5	120·7	125·2	124·5	124·8
Whale	120	120·3	120·2	120·5	120·7	120·6	123·2	124·2	123·7
Olive	81·7	82·8	82·3	81·7	82·1	81·9	83·1	83·8	83·4
Castor (cold-drawn)	83·5	81·7	82·6	85·4	83·5	84·4	85·6	85·6	85·6
Dogfish liver	135	134·5	134·7	140·9	141·4	141·2	144·3	142·2	143·2
Arachis (earthnut)	92	91·6	91·8	91·8	91·4	91·6	93·4	93·4	93·4
Arctic shark	89·8	88·2	89	93·2	94·4	93·8	99·3	98·6	98·9
Pale rape	103	103	103	102	101·8	101·9	103	101·2	102·1
Coast cod	149	148	148·5	147·8	147·2	147·5	155·3	154	154·6
Newfoundland cod	144·5	145·2	144·8	150·5	149·6	150	154	155·5	154·7
Linseed	174·8	..	174·8	174·2	174·8	174·5	177·7	177·0	177·3
Cottonseed	108·3	108·6	108·5	107	107·1	107	110·1	109·8	110

Considering these results, it will be seen that in every case but one, *i.e.*, pale rape, the Wijs solution gave results which are high as compared with the Hübl solution, and which vary from the figures given by the latter, the greatest variations being in the fish oils, the least in the seed oils.

The Hanus solution gave figures which are higher than the Hübl figures in the case of the fish oils, but which are not so high as the Wijs. With the seed oils, this method gave results closely approximate to the Hübl.

All the solutions gave duplicates in close agreement, and thus, so long as one method is retained, the results will be comparable. The Hübl solution is the method which might be described as official, but it has serious disadvantages. On account of the use of absolute alcohol, the making of the solution is very costly. It reacts very slowly, and owing to the mercury present, requires twice as much potassium iodide as the other two methods.

Compared with this, the Wijs solution gives higher results, but is cheaper, more constant, and the reaction is rapid. But even this has disadvantages. Iodine trichloride is difficult to obtain and is not very cheap, whilst the method involving the passing of chlorine into a solution of iodine in acetic acid is not very easy to work in actual practice.

The Hanus method compares favourably with both the Hübl and Wijs methods. The solution is by far the cheapest, and is equally as constant and rapid in reaction as the Wijs. It is very easy to make up, and the materials required, glacial acetic acid, bromine, and iodine are readily obtained, if not actually at hand. The solution made up, either according to Hanus' recommendation, or according to the modification herein contained, acts equally well.

The results it gives are more nearly comparable to the older Hübl figures than are the Wijs results, and this is a point in its favour.

The result of this series, therefore, shows that the Hübl method can be replaced by either of the other solutions, but, in the opinion of the author, the Hanus method is to be preferred. Of course, in making comparisons of iodine values, one method must be observed throughout.

Experiments were also made using, in place of acetic acid, commercial carbon tetrachloride. Two solutions were made up as follows:—

No. 1.—3·3 grms. of iodine were dissolved in CCl_4 and 0·75 c.c. of bromine added. The whole was made up to 250 c.c.

No. 2.—2·5 grms. of iodine trichloride were dissolved in CCl_4 and 2·8 grms. of iodine added.

Marshall (Journ. Soc. Chem. Ind., 1900, 213) found that a solution of ICl_3 in CCl_4 acted well, whilst the iodine-bromine solution would not react to a sufficient extent. In these experiments, however, the reverse seems the case, for whilst No. 1 gave satisfactory results (see Table II.), No. 2 solution would not give a clearly defined endpoint. That this is the case may be due to the fact that, whereas Marshall used a pure and dry CCl_4, the solvent in this case was the ordinary commercial CCl_4. Another point is that whilst Marshall only allowed 10 minutes, the writer allowed a full hour.

TABLE II.

Name of Oil.	Iodine Value.	Substitution.	Corrected Iodine Value.
Olive oil	81·2	..	..
"	82·5	..	..
"	82·3	..	..
Coast cod oil	153·6	..	..
"	154·2	..	..
Linseed oil	178·8	0·7	177·4
"	180·6	1·16	178·3
Arachis oil	90·4	0·6	89·2
"	91·3	0·76	89·8
Pale seal oil	125·4	0·45	124·5

The experiments were carried out exactly as before, except that no chloroform was used. In three cases the amount of substitution was calculated by adding 10 c.c. of KIO_3 solution after the first titration was over. Substitution was found to have taken place to a small extent, and if really due to reaction with the oil, would constitute an error in the direction of too high a result. The real iodine value is thus the total iodine value less twice the amount of substitution. This is shown in Table II.

The results, as shown, closely approximate to the Hübl figures with olive and arachis oils, but in the case of the two fish oils and linseed oil, the value comes nearer the Wijs.

Carbon tetrachloride is not, however, to be preferred to acetic acid as a solvent, for not only is it more difficult to obtain, but the endpoint is not so easy to determine as with acetic acid, since the last traces of iodine are difficult to withdraw from the carbon tetrachloride.

Discussion.

The **Chairman** (Mr. Ward) referred to the difficulty of deciding as to the relative merits of the different solutions, and emphasised the desirability of adhering to one particular solution throughout a series of experiments in order to secure comparable results.

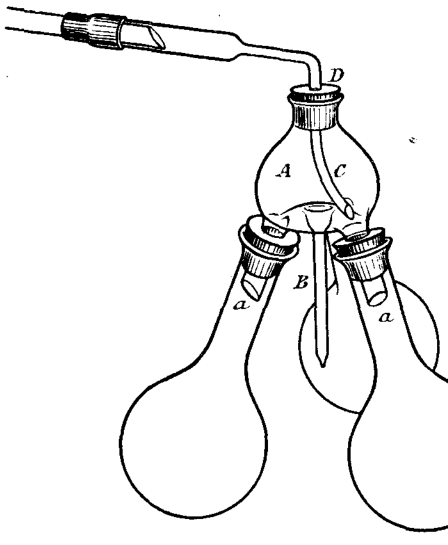
Mr. **Fairley** said that he gladly welcomed a substitute for the unstable Hübl solution, and thought that its adoption would lead to results of great comparative value.

MODIFIED FORMS OF THERMO-REGULATOR AND ADAPTOR FOR VACUUM DISTILLATION.

BY T. S. PATTERSON, PH.D.

A Simple Form of Adaptor for Vacuum Distillation.—The accompanying sketch shows a form of adaptor for vacuum distillation which is very simple in action. It is made by blowing on the end of a fairly wide and thick piece of soft glass tubing (20 mm. diam.) a bulb, A, about 55 mm. in diameter. A small portion of the end of the bulb is then carefully heated and sucked gently inwards. The glass just in the centre of this depression is then heated with a small flame and blown out again, and the narrow glass tube, B (7 mm. diam.), sealed on. This gives a bulb with a circular channel surrounding the small central tube, and on to this channel are then sealed the tubes, *a*, *a* (10 mm. diam.), of which there may be any desired number, three or four being most convenient. The thick tube is then cut so as to leave a short neck for the insertion of the rubber cork, D, through which passes the tube connecting the apparatus to the condenser or distilling flask. To the tubes, *a*, *a*, are fitted round-bottomed flasks, and the whole apparatus is evacuated through the tube B. In use, when a sufficient fraction has been collected in one flask, the next is brought under the end of the tube C by rotating A round C, the india-rubber tube to the pump, which hangs vertically downwards from B, not interfering with this motion in any way.

Fig. 1.

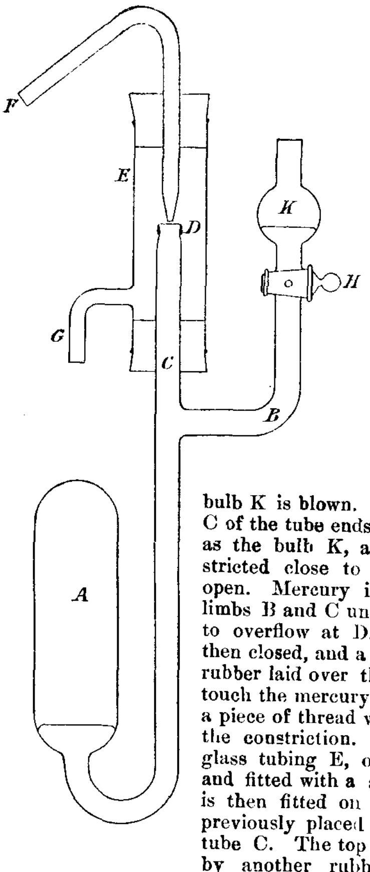


This adaptor may be recommended on account of its simple construction and the ease with which it may be taken to pieces and cleaned.

An Adjustable Thermo-regulator.—Most of the simpler forms of thermo-regulators are constructed in such a way that they can only be used at or near some particular temperature. An attempt to remedy this defect may be made by the addition of a movable side-piece, by which the level of the mercury in the tube may be raised or lowered as desired; but this is usually unsatisfactory, owing to the readiness with which the surface of the mercury fouls. A thermo-regulator which can be used between 20°—60°, and can easily be adjusted to any intermediate temperature, is of considerable value for many purposes, for instance, in determining the density of a solution at several temperatures; in which case, as in other similar ones, it is only necessary to be able to bring the thermostat to three or four different temperatures, and to keep it constant at each for a short time.

The subjoined diagrammatic sketch shows a form of thermo-regulator which has proved useful to the author for this purpose. The principle of the instrument was originally suggested by D'Arsonval, but his design, according to Ostwald (Physico-Chemical Measurements, English edition, p. 61), did not prove satisfactory.

Fig. 2.



The bulb A is made from an ordinary test tube 6 × $\frac{3}{4}$ in., and is filled, as in the ordinary forms, with toluene (air would probably do as well for most purposes), which is shut into the tube by mercury as usual. Some inches above the top of the bulb A the side tube B is fixed. This tube is sent vertically upwards, and is fitted with a stopcock H, just above which a bulb K is blown. The other portion C of the tube ends at the same level as the bulb K, and is slightly constricted close to the end which is open. Mercury is filled into both limbs B and C until it just threatens to overflow at D. The stopcock is then closed, and a piece of thin sheet rubber laid over the end D so as to touch the mercury, and then tied with a piece of thread wound firmly round the constriction. A wide piece of glass tubing E, open at both ends, and fitted with a short side tube G, is then fitted on to a rubber cork, previously placed in position on the tube C. The top end of E is closed by another rubber cork through which passes the gas inlet tube F. This latter is tapered as shown in the figure, and the end cut off with a very slight slant. The tapered end of the tube is pushed through the upper cork until it reaches to within about half a millimetre or less of the rubber membrane. The regulator is then ready for use. The gas pipe is connected with F, and that to the burner with G. A small hole may be blown in F to act as a bye-pass, or an external bye-pass may be arranged if preferred. The apparatus is then fitted into its proper position in the thermostat, the stopcock H being left open, as should always be the case when the regulator is not in use.

If now a temperature of about 30° for instance be desired, the burner is lit under the bath, and the heating allowed to proceed until the thermometer marks 29·7° or thereabouts. During this time, the expansion of the toluene in A has caused the expulsion of mercury through the cock H into the bulb K. The stopcock H is then shut, and the further heating of the bath by the flame produces an expansion of the toluene in A, which, however, is only allowed for by a bulging of the membrane at D, which shuts off the supply of gas slowly and very regularly. The temperature will soon settle down in the neighbourhood of 30°, and if the bath contain a stirrer, and the ordinary simple precautions are taken, it should not vary more than $\frac{1}{100}$° in an hour. A more exact setting to a desired temperature may be obtained by carefully opening H and allowing a very small quantity of mercury to pass into K. This slightly releases the pressure in A and causes a slight increase in the size of the flame. Temperatures may thus be easily adjusted to within $\frac{1}{10}$° of any desired value and kept constant there.

The apparatus once fitted up will last for a long time, this depending to some extent upon the quality of the rubber used for covering D. The flame increases or diminishes very regularly, and entirely without the sudden jumps so difficult to avoid when the contact is between mercury and glass only. Finally, the apparatus is one which may very easily be constructed; it is perhaps a little more complicated than the simplest form of regulator, but is still well within the powers of any amateur glass worker.

Discussion.

The Chairman (Mr. Ward) considered the thermo-regulator to be very ingeniously constructed. He referred to the somewhat unreliable character of rubber membranes, especially when they were brought into contact with coal-gas, and imagined that the membrane would be liable to rupture after prolonged use.

Mr. Fairley referred to the very general utility of thermo-regulators. He thought that a more suitable membrane than rubber might be devised. The deleterious action of coal-gas upon rubber was to be ascribed mainly to the action of hydrocarbon vapours, and he imagined that benzol enriched gas would be specially destructive.

Mr. Murphy enquired whether the instrument had been used in a cold room for maintaining temperatures as low as 15° C.

Dr. Turnbull (in the absence of Dr. Patterson) stated, in answer to Mr. Murphy's question, that he had no doubt that the instrument could be used at as low a temperature as 15° C., but that it had not been so used by Dr. Patterson.

Obituary.

ROBERT IRVINE,

A Vice-President of the Society of Chemical Industry.

Mr. Robert Irvine died rather suddenly on Thursday, March 20, at his residence at Royston, near Edinburgh.

Mr. Irvine was born in Edinburgh, in 1839. During his school days, he developed a great fondness for chemistry, and on leaving school, became a pupil and assistant of the late Prof. George Wilson, Professor of Technology in the University of Edinburgh. He afterwards held the post of chemist in the paper mills of Messrs. Cowan, at Penicuick, and later on, he was chemist to Messrs. Wm. Taylor and Co., of Leith, at their Magdalen Bridge Works. About 30 years ago, he became associated with the firm of Messrs. A. B. Fleming and Co., printing ink manufacturers. This association was maintained till the time of his death. When the works of Messrs. Fleming were transferred from Leith to Caroline Park, near Granton, Mr. Irvine went to reside at the old house of Royston, on that estate. Under his fostering care, as resident director, the works grew and prospered, and became, in many respects, a model of all that a chemical works and its workpeople may become under enlightened and sympathetic management.

Whilst making his home in the very midst of his daily occupation, Mr. Irvine did not allow this fact to narrow or limit his interests and sympathies. The proximity of the Granton Marine Biological Station, in which, from the first, he took a keen and active interest, kept him in touch with a department of science very far removed from that involved in his daily avocations, and his occasional communications to the Royal Society of Edinburgh showed that the tendency of his scientific thought had been largely influenced by his association with the naturalists and others who were engaged in working up the results of the *Challenger* Expedition at the Marine Station.

It is understood that Mr. Irvine's interest in the study of bacteriology led him to devote a considerable sum to the founding of a professorship of bacteriology in the University of Edinburgh.

Mr. Irvine was a Fellow, and, for some time, a Member of Council of the Royal Society of Edinburgh, took an active interest in its affairs, and contributed various papers to its Transactions.

Mr. Irvine's connection with the Society of Chemical Industry dates from its foundation, and he took a leading part in the establishment of the Scottish Section, in 1884. In 1894, he was elected Chairman of that Section, and in that capacity, he acted as host to the Society during its reception in Edinburgh, in July of that year. In 1901, he was elected a Vice-President of the Society.

From his earliest connection with the Society up to the time of his death, he was its warm friend and a faithful upholder of its best interests. Whilst he from time to time published papers in the Journal, it was always a matter of dissatisfaction to him that the interests of his business connections compelled him to withhold his best technical work from publication; but, to those who had the privilege of knowing him personally, it was quite obvious that his skill and ability as a technical chemist were of a very high order. His published papers, including his address as Chairman of the Scottish Section, show how thoroughly he was alive to the need which exists for constant watchfulness on the part of the chemical manufacturer, in order that the latest results in pure science may be immediately utilised. In this respect, his career ought to provide a most valuable object-lesson to the younger generation of chemists.

He was a loyal friend, and a most kindly, cultured gentleman, who, through a long, and sometimes trying, business life, preserved a stainless record for honour and probity. Such a man cannot drop out of the ranks without leaving a serious blank, and it is good that this should be so, and that we who are left should feel to the full the loss we have sustained by his death.

Journal and Patent Literature.

English Patent Specifications may be obtained by post by remitting 8*d.* each—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS AND MACHINERY.

English Patents.

Liquid under Pressure; Machinery for the Production of ——. A. Vogt and M. von Recklinghausen, both of London. Eng. Pat. 21,565, Nov. 28, 1900.

The working liquid is forced, under considerable pressure, from a low-pressure chamber into a compression and explosion chamber, thereby compressing a previously introduced mixture of air and combustible matter. By the pressure due to the ignition of the latter, the working liquid is forced into a high-pressure chamber, whence it is led to the motor or place of consumption where it does work, the liquid then being led back to the low-pressure chamber for re-use. After each explosion, a sweeping out charge of air is forced through the explosion chamber, in order to clear it of burnt gases.—R. S.

Liquid in a Closed or Inaccessible Vessel; Method of Ascertaining, Exhibiting, or Recording the Depth of a ——. J. G. Childs, London. Eng. Pat. 4096, Feb. 26, 1901.

An inverted bell jar is placed in the vessel, the depth of liquid in which it is desired to know; the pressure of the air in the bell jar is indicated by a manometer or Bourdon gauge, which communicates with the jar by a tube; from the readings of the gauge, the level of the liquid can be ascertained.—J. W. H.

Liquids from Solids; Apparatus for Separating ——. H. Duncan, R. R. Sherriff, and The Gold Recovery from Slimes Syndicate, Ltd., all of Glasgow. Eng. Pat. 26,667, Dec. 31, 1901.

The material to be filtered is fed on to the upper side of an endless revolving band of filtering cloth, which, in course of its progress, passes over a vacuum chamber, into which the liquid is drawn by suction, leaving the solid material to be removed automatically at the point at which the band of cloth passes downwards over a roller at the far end of the apparatus. The edges of the cloth band are gripped by means of a special device to facilitate the action of the vacuum box, and whilst passing over this chamber, the cloth is supported by the upper side of an endless belt of wire gauze, which is caused to travel over rollers, at the same speed, and in the same direction, as the cloth band. The solid material from the filter is passed into a mixing tank, where it may be treated with water or any required solution, and the mixture from this chamber is then fed on to a filtering arrangement, similar to the first.—W. G. M.

Filters. C. E. Chamberlain, Paris. Eng. Pat. 25,606, Dec. 14, 1901.

A series of filtering cylinders are placed with their closed ends downwards in a container, which receives the water to be filtered; the open ends of the cylinders are flanged, packing being inserted to form a joint with the container and with the cover, which is placed on the top, and serves as the outlet. The whole is held together by means of set screws, &c.—J. W. H.

Filters. E. M. Knight and J. Hawkridge, London. Eng. Pat. 464, Jan. 7, 1902.

The invention relates to the construction of frames for carrying the woven material which forms the filtering medium; the skeleton frame has a groove into which the edges of the filtering medium are packed; between the inner walls of the frame a perforated plate is supported, also carrying filtering medium.—J. W. H.

Refrigeration; Process of and Apparatus for Artificial ——. P. M. Justice, London. From The Dry Air Refrigerator Company, New York. Eng. Pat. 3495, Feb. 18, 1901.

The invention relates to that system of refrigeration in which "aqua ammonia" is distilled under pressure, allowed to expand into the cooling coils, and reabsorbed by weak liquor from a previous distillation. A series of vessels is used, so that as one vessel ceases to absorb, the pressure rises and brings the next into action by the opening of a check valve, and so on. To begin with, the vessels are rendered vacuous by distillation, the ammonia in an anhydrous form being collected in a receiver at a pressure of 120 lb.; then the vessels in turn absorb the ammonia after it has expanded into the refrigerator coils.—J. W. H.

Drying Apparatus; Vacuum ——. E. Passburg, Berlin. Eng. Pat. 4126, Feb. 26, 1901.

Usually, in vacuum drying apparatus, the heating shelves or pipes have separate inlets and outlets passing through the walls of the chamber; in the improved system, "vacuum drying apparatus is fitted within with heating shelves, pipes, or other heating elements placed one above the other, characterised by an arrangement of chambers near the door of the dryer to receive within the vacuum vessel, near the door, the heat service pipes to be connected with the heating elements, by means of heat-distribution pipes for the sake of avoiding the piercing of the shell of the vacuum drying apparatus." For the same purpose "pockets are fitted on the door casting of the vacuum drying apparatus in combination with heat-distribution pipes fitted to the said pockets."—J. W. H.

Heat; Apparatus for Effecting Exchange of ——, between Liquids or Fluids. C. W. Ramstedt, Kungsangen, Sweden. Eng. Pat. 25,183, Dec. 10, 1901.

The apparatus consists of a rotating conical vessel or partition, with stationary vessels or walls located on each side of it, a jacket for containing heating or cooling fluid, and inlets and outlets for the liquid under treatment situated on opposite sides of the rotating partition. Several different arrangements of the apparatus are described, one having several vessels rotating between stationary ones. In all forms, the heated liquid serves to heat the freshly-supplied liquid, and thus becomes cooled.—R. A.

Filter Presses. K. Enzinger, Worms-on-the-Rhine, Germany. Eng. Pat. 7063, April 3, 1901.

In filter presses in which "the inlet and outlet tubes are formed by the coincidence of openings in the separate plates and frames," the connections between these tubes and the interior of the plates are made by removing the projecting edges round the particular openings in the plates forming the tubes. These openings are made unsymmetrical in shape, to increase their sectional area.—J. W. H.

UNITED STATES PATENTS.

Liquids; Apparatus for Concentrating ——. W. Venuleth, Darmstadt, Germany. U.S. Pat. 691,210, Jan. 14, 1902.

A STEAM-heated roller is made to rotate in the liquid to be concentrated by evaporation, a fixed scraper continually removing the material which may adhere to its surface.
—J. W. H.

Filter Press [Rotary]. E. Wernecke, Gerstewitz, Germany. U.S. Pat. 691,030, Jan. 14, 1902.

THE invention consists of an automatic rotary filter press. A series of chambers, provided with pistons and outer covers, rotate on a central hollow shaft, by which the liquor to be filtered is admitted to the several chambers in turn. The operations gone through during one revolution of the chambers consist of admission of liquor, compressing of the precipitate by the advance of the pistons, release of outer covers, discharge of cake of separated solids, and refixing of covers.—J. W. H.

Kiln; Dry ——. J. J. Curran, Chicago, U.S.A. U.S. Pat. 691,606, Jan. 21, 1902.

ABOVE the drying chamber of a drying kiln, an "exhaust compartment" is provided, which automatically communicates with the drying chamber, as long as moisture is being given off. This automatic action is obtained by balanced doors covered with absorbent material, the moisture taken up by them being sufficient to upset the balance and cause them to open. Automatic ventilators are fixed to the exhaust compartment.—J. W. H.

II.—FUEL, GAS, AND LIGHT.

Fuels; Fusibility of the Ashes of ——. H. Le Chatelier and Chantepie. Bull. de la Soc. d'Encouragement, 1902, **102**, [2], 223—229.

THE authors have determined the composition and fusing points of the ashes of different coals, &c. The Seger cone method proved to be a very simple one to carry out in this connection, the ground ash being mixed with water containing an organic binding substance, which is destroyed by the fire, leaving no ash, and the pasty mass moulded to the shape required. With rare exceptions, the fusing points of the ashes of coals lie between 1,100° C. and 1,500° C. Coals, even from the same pit, vary greatly in regard to the fusing points of their ashes.—J. W. H.

Peat; Calorific Power of ——. Andersson and Dillner. Oesterr.-Zeits. Berg- u. Hüttenw., 1902, **50**, 103.

THE calorific power of peat samples, even from the same moor, may range from 6,140 to 4,490 cals. Moor peat, the most recent deposit, which occurs in large tracts in Sweden, shows a range of calorific power between 3,740 and 4,480 cals., whilst the percentage of ash lies between 1·98 and 7·48, or more usually between 2 and 4. Eleven tests of reed grass (*carex*) peat showed a variation of from 2·23 to 10·95 (mostly from 2·3 to 4) per cent. of ash, whilst the calorific power was from 4,140 to 5,460 (average 5,000) cals. Mud peat is formed by the deposition of organic matter from water by the agency of iron- or lime-salts; its calorific power was from 4,360 to 4,560 cals., and the percentage of ash from 13·77 to 30·5. The calorific power of the lower layers of a peat-bog is usually higher than that of the top portion. The Laxa moor is one of the largest and best in Sweden; the value per hectare is as follows:—Mosjö moor, 3,930 kronen; Mossäng, 3,310 kronen; and Askeröd, 3,730 kronen.—W. G. M.

Gas Retorts; Comparison between Inclined and Horizontal ——. E. Drory. J. für Gasbeleucht., **45**, [12], 201—204.

THE author discusses the economy in retort-house wages effected by the use of inclined retorts, as shown by five different systems of gas-making in use at the four Berlin gasworks of the Imperial Continental Gas Association. The comparison is based on the treatment of 10,000 tons of coal in a period of 17½ days, and the economy of the inclined retort system is shown by the following table:—

System.	Men employed per 24 hours.	Total Retort-House Wages	
		Per 10,000 Tons treated.	Per Ton treated.
		Marks.	Marks.
1. Inclined retorts, with mechanical conveyors for coal and coke..................	78	7,280	0·728
2. Inclined retorts, without mechanical conveyors for coal and coke	100	9,010	0·901
3. Horizontal retorts, with Hasse-Didier regenerative settings and Arrol-Foulis charging machines	166	13,080	1·308
4. Horizontal retorts; Hasse-Didier regenerative settings; hand charging... .	226	20,485	2·0485
5. Horizontal retorts; ordinary 7-retort ovens, with hand charging	267	25,025	2·5025

The use of inclined retorts involves no heavy muscular work and calls for no special manual dexterity, and the area occupied by the retort house is less than in the case of horizontal retorts. The first system mentioned in the table is in use in the new Mariendorf works, where the retort house was specially designed, with improved ventilation, &c., for this system; and this, in conjunction with the De Brouwer conveyor for hot coke, renders the work so much more comfortable for the workmen, that 22 men less per day are required than at the works using the second system referred to.—H. B.

Potassium Ferrocyanide in Spent Gas-Purification Material; Determination of ——. O. Bernheimer and F. Schiff.

See under XXIII., *page* 500.

ENGLISH PATENTS.

Fuel [Block Fuel]; Artificial ——. A. E. Tucker, Birmingham, and C. Cory, Swansea. Eng. Pat. 4830, March 7, 1901.

FINELY-divided solid fuel is caused to adhere together by an agglutinant consisting of sago flour, or the medullary matter of sago-yielding plants, in a gelatinised condition.
—R. S.

Fuel; Treatment of Bituminous ——. P. Naef, New York, U.S.A. Eng. Pat. 5235, March 12, 1901.

THE objects of this invention are to obtain from bituminous fuel, a gas free from tar and ammonia, the plant being intended to be of very large capacity. Former patents are referred to (see this Journal, 1901, 235 and 349). The fuel is passed through a shaft, in the upper part of which it is treated for the production of by-products, by conducting hot gases through the same and by introducing steam. The gases thus obtained are separately withdrawn and treated for the recovery of the by-products. In the lower part of the shaft, the fuel is consumed and converted into gas, which is conducted away for direct use. There are 14 modifications of the apparatus used and 103 claims.
—R. S.

Coal Blocks; Smokeless ——. S. Pergeline, Nantes, France. Eng. Pat. 384, Jan. 6, 1902.

COAL is mixed with from 15 to 30 per cent. of rosin or coal tar, or of a mixture of the two, and, if desired, with 1 to 5 per cent. of carbonate or nitrate of soda. The blocks are heated in a closed vessel, the volatile bodies being driven off and burned. The blocks are finally allowed to cool out of contact with the air.—R. S.

Furnaces and the like; Apparatus for Increasing the Combustion in Boiler ——. J. Apsey, London. Eng. Pat. 4571, March 4, 1901.

The invention consists in introducing a secondary air-supply, by means of steam injectors, above the fuel, so as to consume the smoke. In rectangular furnaces, two or more perforated iron tubes are longitudinally fitted to or built in the side walls, so as to have their perforations facing inwards, and at about 2 ins. above the working top of the fire. Steam injectors cause air to pass through these tubes and perforations into the furnace. In cylindrical furnaces, one or more tubes are fixed so that their closed ends project through the front into the furnace. Centrally fixed within each tube is a smaller tube having an open end near the closed end of the first tube, while its other end is bent round so as to enter the furnace above the working top of the fire, and is provided with a steam injector. By this arrangement, the supply of air has to pass through the outer tube to reach the tube connected with the injector, and is thereby heated.—R. S.

Furnace Gases and the Abatement of Smoke; Apparatus for the more Complete Combustion of ——. H. B. Phillips and H. L. Godden, London. Eng. Pat. 7117, April 4, 1901.

An air passage is made through the bottom of the fire-bridge, either by an opening in the bridge wall or by a tube passing through the base of the fire-bridge. This opening leads to a space behind the fire-bridge, the space being formed by a perforated bent plate. Through the perforations therein, heated air passes to the partially-burnt gaseous products coming over the fire-bridge to complete their combustion. This plate also supports a series of hollow fireclay or like cones or polyhedra, which serve to break up and distribute over the flue area the gases passing over the bridge.—R. S.

Furnaces or Apparatus for Burning Refuse Matter or other Material. H. Heenan, Manchester. Eng. Pat. 7041, April 3, 1901.

In a twin-cell destructor, the gases are caused to always pass in the same direction. For this purpose, an arch is formed over both the cells, with an opening at one end leading to the flue. A secondary arch hangs down a short distance from the first arch, between the two cells. When the cell near the outlet has been clinkered and refilled, the hot gases from the other cell are directed by the cross, or secondary, arch on to it, whereby the cooler gases of the first-mentioned cell are entirely burned. When the cells are reversed, the cool gases from the other cell are directed on to the hot cell, whereby they are completely burned. —R. S.

Carburetting Apparatus for Internal Combustion Engines. F. C. Blake, London. Eng. Pat. 7731, April 15, 1901.

This invention consists in devices for feeding the oil to the chamber where it is mixed with air. The oil is fed to a closed chamber, the top of which is a flexible diaphragm, having a central nozzle projecting into the chamber above. The upper chamber is provided with adjustable air inlets, and is connected with the engine. The lower end of the nozzle is normally closed by a valve. When the piston makes its suction stroke, the resulting vacuum causes the diaphragm to rise, and a quantity of the oil from the chamber below is sprayed into the upper chamber by the nozzle.—R. S.

Carburetting Apparatus and Burner for Liquid Hydrocarbons. G. Machlet, jun., New Jersey. Eng. Pat. 15,760, Aug. 3, 1901.

Through the centre of the bottom of an upright cylindrical casing, there passes an inlet jet for compressed air, and over the jet is arranged the vaporising burner, up through which the compressed air can blow. An open helical channel passes round the exterior of the burner, and receives at its upper end, from a pipe which enters through the outer cylindrical casing, a supply of the oil to be vaporised. The vaporising burner is open at its lower end, and has a number of outlet passages at its upper end. Above the burner is an annular retort, supplied with oil from a pipe which enters through the casing. An air blast from an injector nozzle directed horizontally across the upper part of the casing, carries off the vaporised hydrocarbons through an outlet pipe on the opposite side of the casing. When the generator is to be used, light hydrocarbon from an auxiliary reservoir is admitted into the helical channel, down which it flows, meeting at the foot a blast of compressed air entering at the central inlet jet. The carburetted air produced passes up through the burner and is ignited at the burner top, heating up the annular retort. The passages at the burner top are so arranged that part of the hot gas passes down round the burner, vaporising the light hydrocarbon and carrying it to the base of the burner, up through which it is then blown by the air-blast. When the burner is sufficiently heated, the light hydrocarbon is turned off and petroleum is admitted simultaneously to the vaporising burner and the retort, the action of the burner continuing as before.—H. B.

Furnaces of Steam Boilers; Consumption of Smoke and the Production of Forced Draught in ——. H. Hamilton, Port Glasgow. From J. Hamilton, Cape Town. Eng. Pat. 610, Jan. 9, 1902.

The smoke generated by combustion of the fuel in the furnaces, or any desired proportion of such smoke, is withdrawn from the uptake funnel, and is forced by a jet of steam or other gaseous fluid into the ash-box or lower part of the furnace.—R. S.

Electric Furnaces for Heating or Re-heating Objects to a Predetermined Degree. A. Grobet, Vallorbe, Switzerland. Eng. Pat. 9350, May 6, 1901.

The furnace consists of one or more retorts of refractory material of any suitable form, and of a suitable resistance, connected to a source of electricity, both retort and resistance being coated by a heat-insulating material. Where several retorts are arranged in the same casing, each is provided with a resistance connected to a suitable rheostat intended to control the heating of the corresponding retort. —G. H. R.

Furnaces for Heating Annealing Boxes, Glass-melting Pots, and other Articles. W. S. McKenna and H. Whiteley, U.S.A. Eng. Pat. 15,611, Aug. 1, 1901.

To enable annealing boxes, muffles, pots, and the like to be quickly moved into and out of a furnace, without injury to the mechanism necessary for carrying on these actions, the furnace is formed with a recess extending along its hearth. The recess is provided with a track, and with a ledge along each side, below the level of the hearth. A truck is constructed to run along this track, and the truck carries a movable furnace bottom, which is vertically adjustable thereon, and is provided with seats or projections for engagement with the ledges of the furnace recess. A power-driven sprocket- or driving-wheel is journalled at one end of the track, and a pulley at the other. Motion is communicated from the driving wheel to the truck by means of an endless chain or rope.—R. S.

Gas Producers. L. Mond, London. Eng. Pat. 8449, April 24, 1901.

This is an improvement upon the producer described in Eng. Pat. 12,440, 1893 (this Journal, 1894, 938), designed to yield a gas freer from tarry condensable matters when certain classes of fuel are being employed. Downwards through the centre of the producer already figured extends a hollow shaft, capable of being revolved, carrying agitating arms, and having a steam injector inside, so arranged that gases and vapours are aspirated from the top of the producer just by the charging hopper and delivered again into the producer at its base immediately above the fire-bars. By this device the tarry matters distilled off from the fuel in the charging hopper are compelled to pass through the body of the incandescent coal, thus being almost entirely converted into permanent gases.—F. H. L.

Gas from Petroleum or Paraffin Oil, and Means for Consuming same for Heating Purposes; Generators of ——. O. H. Bayldon and H. E. Morriss, London. Eng. Pat. 51, Jan. 1, 1902.

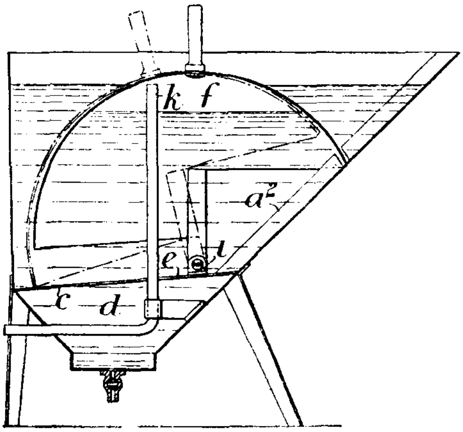
The inventors claim, as regards the generator, the use of a coil situated in the usual delivery tube between the oil tank and the main burner, which coil is heated over a suitable oil burner for the purpose of vaporising the oil therein. In connection with the mixing chamber and burner, the claim is for the employment of one or more jets of steam, the rush of which carries with them the requisite quantity of air into the mixing chamber; and the employment of one or more separate jets of air under pressure, for supplying air to the mixing chamber; also the use of an improved automatic valve for controlling the admission of steam or air to the mixing chamber, which valve consists of an outer case, with inlet and outlet, and is provided with a sliding plunger having a central bore and side outlet with sloping slot or groove, in addition to which there are supplementary outlets leading into a space between the plunger and the valve case, in which space the steam or air can collect and thrust forward the plunger, and so limit or stop the supply of steam that is passing from the bore in the plunger to the outlet in the valve case.—C. S.

Calcium Carbide or the like, or for Melting Steel, Brass, or other Metals or Alloys; Furnace for the Manufacture of ——. J. Ward and Internat. Oil Furnace Co., Ltd., Newcastle-on-Tyne. Eng. Pat. 4231, Feb. 27, 1901.

Crude or refined petroleum, paraffin, or other suitable mineral oil, is placed in trays on a vehicular framing, such as is described in Eng. Pats. 5319 (this Journal, 1901, 344) and 23,428, 1900, and the vehicles are run into a vaporising chamber, from which the vapour passes through one or more openings to a mixing chamber, where the vapour is ignited, air for the purpose being admitted through flues passing along the two sides of the furnace and entering on either side of the mixing chamber. The flames pass through openings to one or to a series of melting chambers, one or more openings being provided in the dividing wall. If there are several melting chambers, the communicating openings are alternately near the top and near the bottom of the dividing walls.—R. S.

Acetylene Gas; Apparatus for Generating ——. H. de Thiersant and W. A. Coulson, London. Eng. Pat. 6904, April 2, 1901.

This is a hand-fed, carbide-to-water apparatus. A semi-cylindrical displacement holder, *f*, oscillates on a horizontal axis, *l*, inside a water-tank, and is so constructed that when in the position of the full lines shown in the diagram, it covers, but when moved into that represented by the dotted lines, it exposes a hole, *e*, in the partition, *c*, through which carbide, dropped on to the sloping side of the generator, falls into the decomposing space, *d*. *k* leads to the burners.—F. H. L.



Acetylene Gas Generators. G. V. Foster and E. F. Mackusick, New York City, U.S.A. Eng. Pat. 2851, Feb. 4, 1902.

This is a mechanically-fed carbide-to-water generator, the carbide being made up into cubes wrapped round with pasted paper and muslin, and inserted into perforated hemispherical vessels which are screwed together so as to form balls. These are stored on a spiral platform and are collected one at a time by mechanism attached to the rising holder bell of the generator in such fashion that they fall through a water-sealed shoot at the side of the apparatus, and finally enter a space beneath the holder, where the water softens the paste and attacks the carbide. After decomposition, the shells drop into a sump containing a bucket by means of which they can be lifted out ready for recharging. An alternative arrangement suitable for hand-charging is also described.—F. H. L.

Incandescent Gas Mantles. W. K.-L. Dickson, London. Eng. Pat. 4707, March 5, 1901.

The top and bottom edges of mantles are strengthened "by means of refractory material, locally applied, having a coefficient of expansion so near to that of the material of the mantle as not to cause rupture of the mantle in use." A cream composed of ground fireclay and a 10 per cent. solution of silicate of soda may be used as the strengthening material. One or more vent holes are punched in the upper part of the collodionised mantle, the holes having their edges strengthened by refractory material.—H. B.

Incandescent Gas Lighting; Mantles for ——. W. K.-L. Dickson, London. Eng. Pat. 9733, May 10, 1901.

Ordinary mantles are to be strengthened by means of silicate of soda or potash, uniformly distributed, and forming from 0·5 to 5 per cent. of their weight. According to the preferred method of treating the mantles, the latter, in the collodionised condition as purchased, are sprayed with a 1 per cent. solution of silicate of soda in methylated spirit, the solution being coloured in order that the amount on the mantle may be judged by the depth of tint produced. The best result is obtained when the mantle contains 1 per cent. of silicate. To prevent the development of pressure within the mantle on ignition, the upper parts may be punched with vent holes, or the opening at the top of the mantle may have a "frog mouth" shape, instead of the usual circular form. The lower edge of the mantle and the edges of the vents are strengthened locally by painting them with a preparation of pipeclay or fireclay and silicate of soda solution.—H. B.

Incandescent Lighting; Machines for the Manufacture of Mantles employed in ——. J. L. Müller and J. Bonnet, Paris. Eng. Pat. 24,218, Nov. 28, 1901.

Relates to improvements in the apparatus for making incandescent mantles, described in Eng. Pat. 83 of 1901, in which the mantles were suspended in series of any suitable number, 10 for example, upon rods which passed through the machine and stopped at various positions in succession, where the operations of burning off, calcining, immersion in collodion, and drying were effected. A stoppage is now provided for, during which the mantles are trimmed to the desired length by means of horizontal knife blades, and the speed of output from the machine is increased by limiting the periods of stoppage to one minute each. Thus, instead of a four-minute stoppage over a single calcining burner (limiting the feed to one rod in four minutes), the mantles stop for one-minute periods over four successive calcining burners, the rate of feed being one rod per minute.—H. B.

Incandescent Electric Lamps. Sir H. C. Mance and Nernst Electric Light, Ltd., London. Eng. Pat. 5038, March 9, 1901.

Two or more separate contacts are provided at each end of the Nernst filament, between the conducting wire and the filament. "Thus one wire is twisted or wound round the rod and carried away sideways. A little further along a second wire is attached in the same way. The two wires are twisted together at a small distance from the rod."

—H. B.

Incandescent Electric Lamps; Nernst ——. C. C. Garrard and Nernst Electric Light, Ltd., London. Eng. Pat. 5040, March 9, 1901.

The glow bodies and heaters of Nernst lamps are usually supported by the conducting wires, and troubles arise owing to the softening of the wires at the high temperature. The patentees form the filaments and heaters with an extension at each end, beyond the platinum contact, to such a distance that the end is cool. The end is then attached to a support so as to take the strain off the conducting wires.—H. B.

Glowers for Pyro-electric Lamps, and Process of making the same. British Thomson-Houston Co., Ltd., London. From C. P. Steinmetz, Schenectady, U.S.A. Eng. Pat. 26,133 of 1901, Jan. 20, 1902, under Section 2 of Act of 1888.

In lamps of the pyro-electric (Nernst) type, the glow-body usually has fine platinum leading-in wires wrapped round its ends, and, as the ends of the glower waste away during use, the winding becomes loose. The patentees sprinkle powdered magnetite (Fe_3O_4) on to the wire-wound ends, and then fuse the magnetite, preferably by heating the ends for a moment in a small electric arc between carbon points. The bead of magnetite improves the contact and increases the conductivity at these parts, tending to keep them cool and preventing the wearing away of the stick.—H. B.

Arc-Lamps, and Electrodes therefor. British Thomson-Houston Co., Ltd., London. From W. T. Dean, Schenectady, U.S.A. Eng. Pat. 26,139 of 1901, Jan. 20, 1902, under Section 2 of Act of 1888.

Each electrode consists of a rod of refractory material (such as magnesia or zirconia), which only becomes a good conductor when heated to incandescence, surrounded by a loose tube or sleeve of carbon. The carbon sleeve of the upper electrode is provided with clutch mechanism, operated by a regulating coil, which serves to raise the sleeve and strike an arc between it and the lower electrode when the circuit is closed. The top of the upper refractory core is enlarged so as to form a shoulder, the arrangement being such that when its carbon sleeve has been lifted a short distance and an arc has been struck, the top of the sleeve engages the shoulder and the core is also lifted.

When no current is flowing, the upper sleeve and core rest on those of the lower electrode. On closing the circuit, an arc is struck between the carbon sleeves, and then the upper core is raised. Both cores are heated so highly in the arc, that their resistance becomes less than that of the carbons, whereupon the arc forms between the cores, the increased current lengthening the arc and raising the candle-power of the lamp.—H. B.

United States Patents.

Hydrocarbon Oils; Apparatus for the Vaporisation, Combustion, and Utilisation of ——. T. Tomlinson, Bray, Ireland. U.S. Pat. 690,486, Jan. 7, 1902.

See Eng. Pat. 25,629, 1899; this Journal, 1899, 1005.
—A. S.

Oil Burner. B. G. Devoe and C. W. Dailey, Lima, Ohio, U.S.A. U.S. Pat. 693,502, Feb. 18, 1902.

The invention, the object of which is to provide a cheap, durable, and efficient oil burner, which may be conveniently applied to an ordinary stove or furnace without materially changing the construction thereof, is characterised by the combination of an oil chamber having an upwardly projecting and concentrically-arranged tubular flange projecting from its bottom to form an air inlet, with ribs arranged on the outer walls of said flange, a bell-shaped wick-support carried thereby and resting on the ribs, means for supplying oil to the wicks, and an adjustable hood arranged above the support and surrounding the same.—A. S.

Regulator; Automatic Oil and Air —— [*for Oil-burning Furnaces*]. F. W. Parfitt, Louisville. U.S. Pat. 694,886, March 4, 1902.

Within the reservoir, in which it is desired to keep the oil and compressed air at a certain level, is placed a ball-float cock, the end of which is pivoted upon the plugs of two cocks, so arranged that when the float sinks, one of the cocks is opened to let compressed air escape from the reservoir, and when the float rises, the other cock is opened, admitting air to the injection pump, whereupon air is pumped into the reservoir. While the oil is at the proper level in the reservoir, neither of the cocks is open. The speed of the injection pump is controlled by the pressure inside the reservoir.—H. B.

Portable [*Oil*] *Furnace.* J. Ward, Delaval, Northumberland. U.S. Pat. 695,015, March 11, 1902.

The furnace, which is carried upon wheels or rollers, consists of two chambers, one behind the other, communicating through a flue at the bottom of the partition between them. The oil is fed into one or more shallow troughs, mounted on a frame, which is run upon wheels into the front chamber, the troughs being provided with sliding tops for regulating the vaporisation of the oil. A flue at the end of the back chamber conducts the vaporised oil to the boiler or other object to be heated. In the side walls of the furnace are tortuous passages, through which air, entering through slides in the front of the furnace, flows, the heated air passing out by a flue at the end of the back chamber, and mingling with the vaporised oil in the combustion chambers of the boiler, &c.—H. B.

Vaporiser for Hydrocarbon Engines [*for Motor Vehicles, &c.*]. A. Krastin, Cleveland, Ohio. U.S. Pat. 695,060, March 11, 1902.

The casing, through which air is drawn into the explosion cylinder, is covered with wire gauze at its open end, and is provided with a cock for controlling the air admission, and an inlet for the liquid fuel, which is controlled by a needle valve. A relief valve is attached to the head of the cylinder. The operating arms of the cock and valves are connected to a single oscillating rod, by means of which all three are operated simultaneously, the cock and valves being so set that the movement of the rod opens and closes them in proper sequence.—H. B.

Liquid Fuel and Air Burner. A. J. Fowler, London, Canada. U.S. Pat. 689,954, Dec. 31, 1901.

The burner comprises the following features:—A vaporising chamber; a superheating chamber in which a central opening is formed; a coiled pipe, extending from the vaporising chamber to and around the superheating chamber; a burner-pipe fitted with a burner-tip, and communicating with the coiled pipe, from which burner-pipe the vapour is discharged; in combination with an annular air-chamber, in which perforations are formed, and which is located below and extends around the opening in the superheating chamber; a superheating air-chamber communicating with said annular air-chamber; a high-pressure air-reservoir communicating with said superheating air-chamber; and an air-pressure regulator on the pipe which extends from and communicates with the high-pressure air-chamber and the superheating air-chamber.
—C. S.

Crude-Oil [*Petroleum*] *Burner.* G. E. Witt, Fresno, Cal. U.S. Pat. 693,938, Feb. 25, 1902.

The inventor claims, in a crude-oil burner, the combination of an inlet chamber, an oil-feed pipe communicating therewith, a steam pipe having an injector nozzle extending into said inlet chamber, a perforated tubular mixing chamber extending from the inlet chamber, an atomising chamber inclosing the mixing chamber, and a plug in the outer end of the latter, to centre the same in the atomising chamber, which plug is channelled for the discharge of commingled steam and atomised oil from the atomising chamber.—C. S.

Burner; Combination Illuminating and Heating ——. V. K. Coffill, Brooklyn. U.S. Pat. 690,700, Jan. 7, 1902.

A vertical burner tube, fitted at the top with an illuminating burner tip, is surrounded by a Bunsen or outer tube which can slide up and down, its motion being guided by a vertical slot, which engages a pin or stud fastened rigidly to the burner tube. Lateral slots extending from the vertical slot enable the Bunsen tube to be fixed at any desired height. When the burner is to be used for illuminating purposes, the outer tube is lowered till its upper edge is below the burner-tip; when used for heating purposes, the Bunsen tube is raised until a sufficient area of the slots is uncovered to admit the proper proportion of air to the gas to produce a non-luminous flame. A lever, pivoted on the outer tube and fitted with a handle, facilitates the adjustment of the outer tube.—H. B.

Bunsen Burner. C. W. Taylor, Sioux City. U.S. Pat. 690,792, Jan. 7, 1902.

In a Bunsen burner of ordinary construction, the usual gas-inlet nipple is replaced by a horizontal perforated diaphragm. An annular collar is arranged on the interior of the burner tube a little above the diaphragm, pressing upon the outer edge of a metal disc which rests upon the diaphragm. A handle attached to the disc projects through a horizontal segmental slot in one side of the burner tube, enabling the disc to be partially rotated in a horizontal plane. A central perforation in the diaphragm, and a similar one in the disc, always coincide, whatever the position of the disc handle may be. Other perforations in the diaphragm are eccentrically disposed in relation to apertures in the disc, so that, by rotating the disc, a greater or smaller volume of gas can be admitted as desired, the central perforations always permitting some gas to pass.—H. B.

Bunsen Gas Burner. B. M. Hanna, Pittsburg. U.S. Pat. 694,746, March 4, 1902.

The burner is adapted to be regulated for either high-pressure or low-pressure gas. The gas-inlet orifice, which is arranged at the foot of the mixing tube, consists of a central perforation in a metal plug, which may be screwed up or down slightly in the tubular base attached to the gas-pipe. Inside the metal plug is a fixed needle valve, the point of which projects upwards into the central perforation, any rotation of the plug opening or closing the orifice as the case may be. A pin attached to the plug projects laterally through a slot in the outer burner tube, to facilitate the adjustment of the plug.—H. B.

Separator; Gas and Water ——. I. L. Neely, Fairmont, Indiana, U.S.A. U.S. Pat. 690,986, Jan. 14, 1902.

A vertical cylindrical reservoir has a water inlet near its middle and a gas outlet in its top cover; a valve in the water outlet below is controlled by means of a float, to which it is attached by a spiral spring. Normally the valve is closed, but on the level of the water in the reservoir rising, the float, stretching the spring, finally lifts the valve, and allows the water to escape, when the valve again closes.—J. W. H.

Carburetter. J. G. Clark and G. Cothran, Indiana, U.S.A. U.S. Pat. 689,460, Dec. 24, 1901.

The carburetter consists of a vertical cylindrical vessel, heated by a burner beneath, through which passes vertically downwards a blast pipe, ending in radiating perforated branches near the bottom of the vessel. The vessel is charged with the carburetting liquid. Two valved eduction pipes are connected to the vessel, one passing to near the bottom, the other only passing a short distance below the cover. These two unite outside the vessel, and lead to a vertical helical heating tube, enclosed in a vertical cylinder, and heated by a burner. The other end of the coil leads to the distributing pipe, which is provided with branches for supplying the two burners used in the process.—R. S.

Carburetter. J. St. C. Legge, London. U.S. Pat. 690,303, Dec. 31, 1901.

The air is forced upwards through a vertical drying cylinder, within which are holders, having perforated bottoms, containing quicklime or calcium chloride. The dried air then passes through a tube which has two branches. One branch leads to a perforated coil, which is immersed in the carburetting liquid contained in the bottom of the carburetting vessel. The other leads to a perforated coil, which is situated above a perforated diaphragm in the same vessel, and beneath a quantity of porous material. The quantities of air which pass through the respective coils can be regulated according to the weather, &c. The carburetted and uncarburetted air mix thoroughly in passing through the porous material, and the mixture passes out through an opening in the top to the distributing main. The carburetting vessel is immersed in a water tank, and a coil, which is immersed in the liquid hydrocarbon, is open at both its ends to the water in the tank. The supply of hydrocarbon is regulated by a float operating, through levers, a needle valve on the supply pipe.—R. S.

Carburetter [Oil-Gas]. O. A. Lane and H. A. Davenport U.S.A. U.S. Pat. 690,444, Jan. 7, 1902.

The oil is brought by a tube provided near its exit with a gravel filter, and at its exit with an adjustable needle valve. It then passes to a vertical tube, at the bottom of which is a quantity of wick, while, higher up, the tube is surrounded with a burner adjustable in vertical position, and arranged to heat, not only the vertical tube, but an upper horizontal retort into which the vertical tube opens. The oil vapour is "fixed" in this retort, and passes from the retort to a vertical tube having two branches, a lower one leading to a needle-valved outlet supplying gas to the burner surrounding the vaporising tube. This valve is initially heated by means of an external oil cup. The burner referred to consists of an annular casing, divided by an annular foraminiferous diaphragm into two compartments, an outer or mixing chamber and an inner combustion chamber. The upper branch of the vertical tube leads to a horizontal mixing tube supported upon the top of the retort, and the entrance to which is regulated by another needle valve.—R. S.

Carburetting Air; Apparatus for ——. P. R. van der Made, Breuleken, Netherlands. U.S. Pat. 690,681, Jan. 7, 1902.

Air is forced through a horizontal perforated pipe which is immersed in liquid hydrocarbon contained in a horizontal cylinder. A tier of these boiler-like cylinders is used, and the cylinders are employed in series, that is, the oil is supplied by a pump to the top one only, overflow pipes carrying it to the others in succession, whilst air is supplied to the bottom one only, the perforated tube in each higher vessel being connected with the vapour- and air-space in the chamber below.—R. S.

Carburetter or Mixing Valve for Explosive Engines. A. L. Kull, Camden, New Jersey, U.S.A. U.S. Pat. 690,112, Dec. 31, 1901.

The valve is adapted to thoroughly vaporise a liquid hydrocarbon, and to intimately mix the vapour thus obtained with air, at each suction stroke of the piston of the engine. The device consists of a lower part having air and oil inlets, and an upper part, forming a mixing chamber, which is separated from the lower part by a spring-controlled lift valve. The lower part has a large air inlet, and a narrow oil inlet regulated by a needle valve. The main valve is of an inverted conical shape, and its seat is a correspondingly shaped bushing fitting on the conical wall of the casing. The air enters beneath the valve; the oil is fed to an annular groove beneath the bushing. The latter is perforated to allow the oil to escape in fine jets when the valve is raised, whereby the oil mixes with the air just before the latter reaches the mixing chamber.—R. S.

Wax-burning Lamp. A. J. Pursall and H. D. Jackson, Birmingham. U.S. Pat. 689,747, Dec. 24, 1901.

The lamp consists of a body, a removable base, a reservoir divided by a perforated vertical partition into two compartments, one of which is charged with a cake of wax, whilst the other terminates below in a passage leading to the burner, which is situated below and close to the reservoir, and contains a wick that extends down to a point near the bottom of the burner receptacle.—C. S.

Gasoline Lamp. F. E. Shortt, Carthage, N.Y. U.S. Pat. 689,656, Dec. 24, 1901.

THE features in this lamp comprise the combination, with the oil-reservoir, of an air cylinder connected therewith, a spring-operated piston for forming a vacuum in the air cylinder, a handle for retracting the piston against the power of the spring, an air tube dipping below the surface of the liquid in the oil reservoir, a draught tube extending from the air cylinder into the upper part of the reservoir and fitted with a valve to prevent the outflow of the fluid from the air cylinder, a generator, an oil pipe connecting the oil reservoir with the generator, an initial heater near the generator, a valve-controlled conducting pipe connecting the air cylinder and initial heater, and a pipe for delivering gas from the generator to the lamp burner.—C. S.

Lamp; Vapour-burning Street ——. J. C. Craniger, U.S.A. U.S. Pat. 690,237, Dec. 31, 1901.

GASOLINE, contained under pressure in a reservoir situated at the base of a lamp-post, is led up a pipe to a two-way valve situated in the upper part of the lamp, the ports of the valve being so arranged that the gasoline can be supplied either to the main burner, to the auxiliary burner, or to both burners simultaneously. The vaporiser of the main burner consists of a conical coil, composed of coils of pipes $\frac{1}{2}$ in. and $\frac{1}{8}$ in. in diameter, situated above the burner, one end of the coil being connected with the two-way valve, and the other end with a vapour chamber arranged horizontally below the coils and above the burner. The auxiliary burner, which also comprises a vaporising coil connected to the two-way valve, is situated centrally within the upper part of the vaporising coil of the main burner. The vapour from the main vaporiser is led through a perforated air-mixing chamber and then down to the burner, which is surmounted by a mantle and surrounded by a chimney. The lower parts of the lamp are contained within a glass globe, and the upper parts are covered by a metal dome, the lamp being suspended from a bracket on the lamp-post. The auxiliary burner is always kept lighted when the main burner is not in use, and it thus keeps the vaporising coils of the latter hot. The two-way valve is actuated by a clockwork mechanism in such a way that, when the lamp is to be lit up, the valve is first set for a short time in that position which allows gasoline to flow into both burners, and next, when the main burner has lit, is set so as to extinguish the auxiliary burner. A metal diaphragm and cylindrical casing serve to confine the heat of the burners to the vaporising coils and protect the valve mechanism. —H. B.

Burner; Vapour ——. H. F. Smith, Philadelphia. U.S. Pat. 690,327, Dec. 31, 1901.

IN this burner device, adapted for the production of a luminous flame from gasoline or the like, the vaporised hydrocarbon enters a vapour chamber which communicates, through a vapour jet, with a mixing tube, wherein the gas mingles with air admitted in regulated quantity by a screw-threaded valve situated at the side of the mixing tube. The device is arranged horizontally, the end being turned up to receive the burner-tip; a detachable cap at the other end facilitates the cleaning of the vapour chamber and jet. —H. B.

Hydrocarbon Lamp. S. B. Morss, N.J., U.S.A. U.S. Pat. 691,068, Jan. 14, 1902.

THE inventor claims, in connection with a hydrocarbon lamp or heater, the combination of a burner having a wick tube; a tube or duct having a portion overlying the wick tube and two depending portions lying on opposite sides of the wick tube and opening downwardly; and a wick extending continuously from the wick tube to an oil container, thence up into and through the duct and depending therefrom into the oil, the overlying portion of the duct having means to permit the escape of vapour; a guide for the wick below the burner, and a shield surrounding the said means of escape and extending upwards.—C. S.

Incandescent Gas Burner. W. H. A. Sieverts and J. F. C. Juergens, Germany. U.S. Pat. 689,657, Dec. 24, 1901.

THE burner is designed to permit of the vertical adjustment of the burner top (which is covered with wire gauze and surmounted by a flame-spreader) relatively to the gas inlet at the base of the mixing tube, whilst the burner is in operation. The outer burner-tube, which carries the burner top, rests upon a nut, which may be screwed up and down upon a screw-threaded ring or sleeve resting upon the shoulder of the mixing tube.—H. B.

Incandescent Burner for Oil Lamps. J. McFarlane and E. D. Sterne, Washington. U.S. Pat. 690,117, Dec. 31, 1901.

AN oil lamp of the circular-wick type is described, in which means are provided for adjusting the air currents passing up the interior of the lamp.—H. B.

Incandescent Gas Lamp. W. Tice, New York. U.S. Pat. 694,695, March 4, 1902.

REFERENCE is made to patentee's U.S. Pat. 538,344 of 1897. The mixing tube of the burner, round which is fitted closely a slotted, rotatable sleeve for regulating the air-inlets, is provided with a bead, flange, or other external stop just above the top of the rotatable sleeve. On this stop rests the tube, carrying the burner top, gallery, &c., which is slipped over the upper end of the mixing tube. When once the rotatable sleeve has been adjusted so as to pass the proper amount of air, any accidental disturbance of it through the rotation of the upper parts of the burner is prevented by the stop.—H. B.

Incandescent Gas Burner. C. A. Bluhm, Michigan City. U.S. Pat. 694,824, March 4, 1902.

A CONICAL valve is arranged, point downwards, in the gas-inlet orifice of the burner. The point is adapted to screw upon a fixed threaded stem, which projects upwards centrally through the gas orifice. The upper end of the conical valve is attached to a stem, of angular cross-section, that engages loosely an angular perforation in a cross-plate fixed in the head of the burner. When the burner is rotated, the latter stem is caused to turn likewise, and the conical valve is raised or lowered in the gas orifice, regulating the flow of gas accordingly.—H. B.

Acetylene Gas Generator. C. E. Colomy, Virginia, U.S.A. U.S. Pat. 689,540, Dec. 24, 1901.

THIS is a mechanically-fed carbide-to-water generator. The flexible connection between a rising holder and its counterpoise runs over a wheel fastened to a shaft, at the other end of which is a clutch gear and pulley. The latter drives, by means of a belt, another pulley on a horizontal shaft, which passes through a stuffing box into the gas space of the generator. Inside, this shaft transmits its motion to a vertical shaft carrying a conical disc at the aperture of the usual carbide hopper, which serves to feed granulated carbide into the water as it moves round; while below the water level, the shaft also bears a distributing plate, which is swept clear of lime, &c., by a fixed brush. Owing to the clutch, the mechanism only works when the holder bell is travelling downwards.—F. H. L.

Acetylene Gas Generator. C. Sebelle, Vienna. U.S. Pat. 689,756, Dec. 24, 1901.

THIS is a mechanically-fed carbide-to-water generator in which the carbide hopper is fastened to, and rises with the holder-bell. The apex of the cone is formed by a pair of flaps, each connected to a counterweighted lever, which normally join together, V-fashion. When the bell falls, stops fixed to the walls of the generator trip up these horizontal levers, opening the carbide hopper to the descent of the material. In order to prevent a large lump of carbide jambing open the flaps and permitting smaller pieces to enter the water when the hopper should be closed, each flap is composed of a large number of flexible steel wires, like a brush, which engage together, and secure the opening.—F. H. L.

Acetylene Gas Generator. A. M. Dimmick, U.S.A.
U.S. Pat. 689,858, Dec. 31, 1901.

A mechanically-fed carbide-to-water apparatus. The carbide container is a separate cylindrical vessel, which is divided internally by means of two partitions into a V-shaped space for the carbide, one wall of which is vertical. At the apex of the V, in the vertical wall, there is a round hole covered by a movable box, which collects a certain charge of carbide. As the holder bell falls, mechanism comes into action which upsets this box, allowing its contents to run down an inclined plane through a layer of oil, into the water of the generator, the box afterwards assuming its normal position. The decomposing chamber has a false bottom with a central aperture in it, which is capable of being covered by a flap-valve connected to an outside lever; this hole is usually open, and the carbide falls into the space beneath; but when it is desired to remove the lime sludge, the flap can be shut and a manhole opened without permitting gas to escape. Above the decomposing chamber is a rising holder working in an annular seal. The lid of the carbide store is water-jacketed, and any quantity of material can be kept in it without wastage.—F. H. L.

Acetylene Gas Generator. J. A. Mosher and W. S. Hamm,
Chicago, U.S.A. U.S. Pat. 690,173, Dec. 31, 1901.

A generator of the drip pattern. Inside a vertical cylindrical vessel are placed superposed carbide receptacles consisting either of hemispherical basins with perforated bottoms or of wire cages. The base of each serves as the cover for the cage immediately beneath, while the topmost one has a cover of its own, also provided with a number of distributing holes. The water enters and the gas escapes at the top of the generator, and therefore it is claimed that overheating is minimised, since the action takes place between liquid water and carbide, the water-vapour passing off with the gas. Heat distribution is also assisted by making the generating cylinder large in comparison with the contracted area within which acetylene is evolved. U.S. Pat. 652,974, granted to J. A. Mosher, is referred to.
—F. H. L.

Acetylene Gas Generator. T. A. Bryan, Baltimore, U.S.A.
U.S. Pat. 690,356, Dec. 31, 1901.

A self-contained, mechanically-fed, carbide-to-water generator, with displacement-holder, the supply of carbide being governed by the pressure in the apparatus. The bottom of the carbide hopper terminates in a tube, the mouth of which enters into a movable scoop capable of being closed by a movable door. At the top of the whole apparatus is a small chamber in connection with the gas space, which contains a flexible diaphragm fastened to a lever; this lever opens or closes the door of the carbide scoop. The lower end of the carbide tube also communicates with the air by a tube pointing downwards, and closed by a screw cap, through which carbide can be removed from the storage hopper when necessary. When the generator is in action, this tube is shut off at its internal end by a movable door operated by the above-mentioned mechanism. On the main service pipe is a three-way cock, communicating either between the generator and the burners, or between the generator and the safety pipe; this cock is controlled by a hand lever, the other end of which locks over the screw cap at the top of the carbide hopper, through which the solid is fed in. Said cap, accordingly, cannot be unscrewed without disconnecting the service, and at the same time making a connection between the gas space of the generator and the escape pipe. The last-mentioned lever also locks or unlocks the main water-inlet and the sludge cock at the bottom. The apparatus works with granulated carbide.
—F. H. L.

Acetylene Gas Generator. J. J. Hendler, Missouri, U.S.A.
U.S. Pat. 690,425, Jan. 7, 1902.

This is a small apparatus of the contact type, intended to be immersed bodily in a large mass of water, such as a lake, for the illumination of parks, &c., or in the sea for buoying. It consists of a closed cylindrical vessel containing carbide, with a cock and burner mounted on top, and having an upright pipe arranged concentrically within it, closed at the top, with a side hole half-way up, and open at the bottom. Inside this tube is an inverted funnel tube, through which either water enters to attack the carbide, or the excess of gas passes down to collect in the funnel. Small tubes with returned heads also pass from below the bottom of the cylinder to near its upper part, serving also to remove surplus gas. Beneath the bottom of the cylinder is a spreading base, open at the bottom, which acts as a stand; and near the top of the cylinder is a ring-shaped float, either of cork or the like, or of rubber, which can be distended by acetylene escaping from the cylinder through a non-return valve. From underneath the base hangs a weight to maintain the whole in a vertical position when floating in water. The inverted funnel and the stand of the apparatus behave as displacement-holders.—F. H. L.

Lamp; Photographic Flash-Light ——. J. L. Zweck.
U.S. Pat. 690,508, 1902.

See under XXI., *page* 497.

Acetylene Gas Generator. J. H. Ross, Aston, England.
U.S. Pat. 690,773, Jan. 7, 1902.

This is a self-contained table lamp. See Eng. Pat. 9537, 1900; this Journal, 1901, 564.—F. H. L.

Acetylene Gas Generator. W. W. Cozins, California.
U.S. Pat. 691,357, Jan. 21, 1902.

This is an automatic drip generator with displacement-holder, the supply of decomposing water coming from the displacement chamber, and being accordingly cut off when a store of gas accumulates. The carbide is contained in a large number of small pots, arranged partly "in series" and partly "in parallel," which are slung on lengths of barrel extending horizontally from the holder, which is a rectangular tank, with a purifying vessel in its centre.
—F. H. L.

Acetylene Gas Generator. L. T. Stephenson, Trinidad,
Colorado, U.S.A. U.S. Pat. 694,587, March 4, 1902.

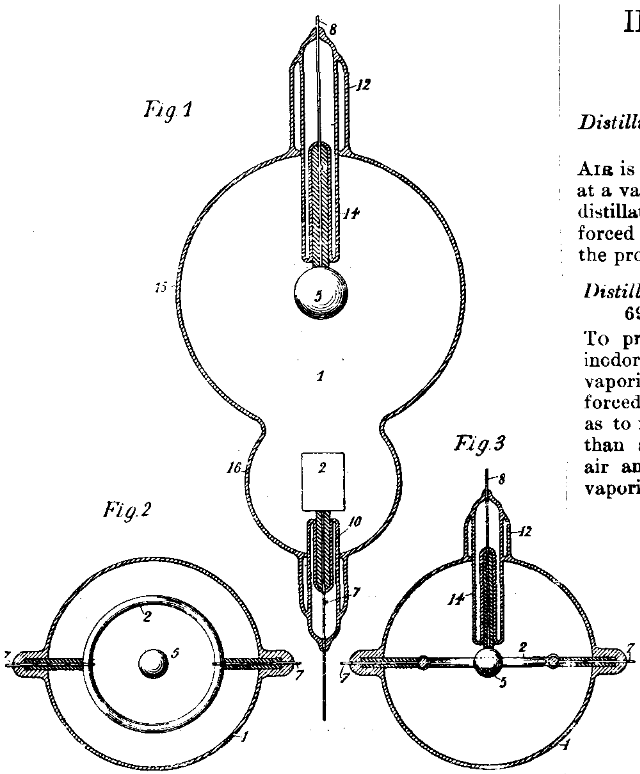
This is an automatic generator of the flooded-compartment system. The store of water for decomposing purposes is separate from that in which the holder floats, said water being admitted to the carbide by the opening of a valve each time the bell falls. Should the holder-bell rise above a certain point, it brings into operation a series of levers, which open blow-off cocks on the decomposing chamber and on the holder, thus enabling surplus gas to be removed. The carbide is contained in a number of subdivided superposed vessels, which communicate with one another in such fashion that the water, entering from beneath, attacks the carbide in each in succession.—F. H. L.

Acetylene Gas Generator. J. Harris, Cleveland, Ohio, U.S.A.
U.S. Pat. 694,916, March 4, 1902.

An apparatus of the automatic water-to-carbide type, with separate store of decomposing water, a rising holder, the falling of which opens a cock on the water inlet, and a horizontal carbide vessel of one tier only, divided radially into a number of compartments.—F. H. L.

Incandescent Electrode Vapour Electric Lamp. P. C.
Hewitt, New York. U.S. Pat. 690,952, Jan. 14, 1902.

It has been found that in lamps enclosing certain gases of proper density, and electrodes of suitable material, a current of moderate E.M.F. will cause the gas to emit light, and will raise the negative electrode to incandescence. In the lamps described, the resistances are so adjusted that the cathode emits intense light, that emitted in the gaseous path being relatively small. To prevent the current from passing round to the back of the cathode and damaging the leading wires, the latter are enclosed in tubes of glass, porcelain, or other material which will remain a non-conductor when hot. In Fig. 1, the cathode, 5, situated in the centre of the globe, is held by the porcelain tube 14, through which the leading wire 8 passes, the tube being held by the glass stem 12. The anode, 2, is seated in the glass column 10, enclosing the wire 7. The electrodes are made of iron or other conducting material, or even of light-emissive material, such as the rare earths. "Gas of the proper density is placed within the globe." "With attenuated nitrogen . . . and with iron electrodes separated a distance of about one and one-half inches, the lamp may be started with a direct current having a pressure of seven hundred and fifty volts or less," and the cathode becomes incandescent. If, while the lamp is in action, the current increases, the resistance of the gas decreases; but this is compensated for by an increase of the resistance between the gas and the cathode, so that the temperature of the cathode remains steady, and the lamp is self-governing. By correctly adjusting the gas density, the lamp may be made to start on the same current as it is designed to operate on. Figs. 2 and 3 show a modification in which the cathode is surrounded by an anode, 2, made in the form of a ring.



In this patent the claims are for the apparatus (see following abstract).—H. B.

Method of Electric Lighting. P. C. Hewitt, New York. U.S. Pat. 690,953, Jan. 14, 1902.

The text and drawings of this specification are substantially identical with those of the preceding. The claims are for the method of lighting, by rendering luminous the cathode of a lamp of the kind described above; and for the method of adapting lamps for use with currents subject to slight variations, by the compensating arrangement of the resistances. Reference is made to U.S. Pats. 682,690, 682,691, 682,692, and 682,699 of 1901.—H. B.

[*Incandescent*] *Gas Arc-Lamp.* J. K. Russell and W. F. Clausen, Sheboygan, Wisconsin. U.S. Pat. 691,001, Jan. 14, 1902.

The invention refers to a suspended incandescent gas lamp, constructed so as to resemble an arc lamp. A cluster of burners supplied with gas from a common central gas pipe, is enclosed within a globe, each burner having a draught chimney, about 20 ins. long, arranged above it, the mantle being hung from a horizontal rod held in slots at the base of the chimney. The chimneys are held in position within an outer casing by means of two perforated discs, which prevent any circulation of air outside the chimneys. The outer casing and globe resemble externally those of electric arc lamps, an exit being provided at the top of the casing for the hot waste gases. The central gas pipe is provided with a pilot jet.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

United States Patents.

Distilling Oil. J. A. Dubbs, Pittsburg, Pa. U.S. Pat. 694,621, March 4, 1902.

Air is forced through the oil while the latter is maintained at a vaporising temperature, the vapours are condensed, the distillate is heated to a vaporising temperature, and air is forced through it while in that condition. It is stated that the products will burn without smoke or smell.—C. S.

Distilling Oil. J. A. Dubbs, Pittsburg, Pa. U.S. Pat. 694,622, March 4, 1902. (See preceding abstract.)

To produce distillates that will burn with a smokeless, inodorous flame, the inventor proposes to distil the oil by vaporisation under the combined action of heat and air forced through the oil, the influx of air being so controlled as to maintain a pressure in the still substantially higher than atmospheric pressure, in consequence of which the air and oil are subjected to a temperature exceeding the vaporising temperature of the latter.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Light and Colouring Matters. H. Silbermann. Zeits. f. Farben.- u. Textil-Chem., 1902, **1**, 152—155.

The author advances the proposition that decomposition of dyestuffs by light is a process analogous to that produced by the action of the electric current; in both cases the destruction of the colouring matter may be due either to reduction or oxidation.

The formation of a dyestuff is generally an exothermic process, whilst its decomposition is due to an endothermic reaction, the latter change being brought about either by the application of light or electrical energy.—G. T. M.

Tetramethyldiaminodiphenylcarbinol; Condensation Products of ——, with Primary Amines substituted in the Para-position. A. Guyot and M. Granderye. Comptes Rend., **134**, [9], 549—551.

It was expected that this condensation would result in the attachment of the amine to the carbinol residue by a linking in a position ortho to the NH_2 group; but this was not the case with the amine derivatives tried (*p*-nitraniline, sulphanilic acid, and *p*-phenylenediamine).

p-Nitraniline yields a Phenyl-leucauramine—

$NO_2.C_6H_4.NH.CH[C_6H_4.N(CH_3)_2]_2$; $(NH : NO_2 = 1:4)$,

and on longer heating, the *p*-nitro-derivative of *p*-dimethylamidobenzylidene-aniline. Sulphanilic acid yields the sulphonic derivative of the same substituted aniline, without intermediate formation of leucauramine; with this there is a small quantity of another substance, possibly the product of the normal or expected condensation. *p*-Phenylenediamine yields, similarly, the *p*-amino derivative of the same substituted aniline.—J. T. D.

Sym-dimethyldiamino di-o-tolylketone (*Auramine G*). R. Gnehm and R. G. Wright. Ber., 1902, **35**, [4], 913—915.

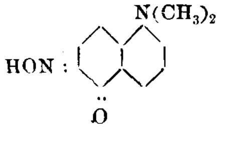
Auramine G is obtained by treating a hot mixture of *sym*-dimethyldiaminodi-*o*-tolylmethane (from methyl-*o*-toluidine and formaldehyde), sulphur, ammonium chloride, and salt with dry gaseous ammonia (U.S. Pat. 488,430). When this product is heated in aqueous solution with hydrochloric acid, it yields dimethyldiaminoditolylketone, which crystallises from acetone in faintly-yellowish needles, melting at

81° C. The base of Auramine G forms light yellow crystals, melting at 120° C. and soluble in organic solvents. The picrate crystallises from alcohol in shining orange needles, melting at 234° C.; the sulphate also forms orange needles and melts at 182° C., whilst the oxalate is a light yellow crystalline powder, melting at 210° C. The ketone, on reduction in alcoholic solution with sodium amalgam, yields colourless needles (from acetone) of the carbinol, melting at 161° C., and giving a deep bluish-violet solution with acetic acid. The carbinol condenses with *p*-aminoazobenzene (Möhlau and Heinze; this Journal, 1901, 570) to form benzene-azophenyl-leucauramine G, crystallising in thick orange plates, which melt at 170·5° C. Similarly, benzene-azo-*a*-naphthylamine yields benzene-azo-*a*-naphthylleucauramine G. Leucauramine G itself is readily obtained by treating Auramine G in aqueous solution with zinc dust and hydrochloric acid. It forms straw-yellow needles from benzene, melting at 208° C.

On treating the carbinol described above with sulphuretted hydrogen in warm alcoholic solution, it is converted into the thiocarbinol, a colourless crystalline powder, melting at 214° C. If the Auramine base be similarly treated, it yields the corresponding thioketone, which separates from alcohol in bluish-red crystals, melting at 177° C. The thioketone gives two salts with hydrochloric acid, $C_{17}H_{20}N_2S,2HCl$ and $C_{17}H_{20}N_2SHCl$, the former readily passing into the latter on exposure to air. The authors also find that the carbinol and leucauramine described give crystalline derivatives with diazonium compounds, and that the lower homologues react in the same way.—T. A. L.

a-Naphthylamine Derivatives; Some ——. V. Fussgänger.
Ber., 1902, **35**, [4], 976—984.

According to Friedländer and Wellmans (Ber., **21**, 3123), dimethyl-*a*-naphthylamine gives a sulphonic acid when warmed with sulphuric acid. The product of the reaction is now shown to be a mixture of two sulphonic acids, one of which is sparingly, and the other easily, soluble in water. The former is also obtained, and with much better yield, by methylating Laurent's 1.4′-naphthylamine sulphonic acid. The author also obtained 1.4-dimethyl-*a*-naphthylamine sulphonic acid by reacting with methyl alcohol, methyl iodide and caustic soda on naphthionic acid in a sealed tube, at about 100°—110° C. The product combines with diazo compounds, giving dyestuffs similar to those from naphthionic acid, but the combination takes place more slowly. The 1.4′-dimethyl-*a*-naphthylamine sulphonic acid, on fusion with potash, gave 1.4′-dimethylaminonaphthol, melting at 110° C., sparingly soluble in water, but readily soluble in alkalis, acids, and organic solvents. This product condenses in acetic acid solution with *p*-nitrosodimethylaniline, giving tetramethyldiaminonaphthophenoxazonium chloride. The dyestuff dissolves in concentrated sulphuric acid with a violet colour, becoming bluish-green on dilution. The presence of alkylamino groups renders the product strongly basic, and readily soluble in water. It gives pure indigo-blue shades on cotton mordanted with tannin and tartar emetic. The same dyestuff is obtained by reacting with dimethyl-*m*-aminophenol on 3′-nitrosodimethyl-1-amino-4′-naphthol, which may also exist as dimethyl-1-amino-4′.3′-naphthoquinone-oxime—

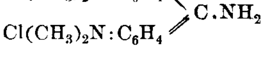


and is obtained by the action of sodium nitrite on dimethyl-1-amino-4′-naphthol hydrochloride in glacial acetic acid. When dimethyl-1-amino-4′-naphthol is condensed with *p*-nitrosodimethyl-*m*-aminophenol, it yields a blue dyestuff, which differs from dimethylated Nile Blue (New Methylene Blue GG) in possessing a hydroxyl group. The author has also prepared diethyl-1-naphthylamine-4′-sulphonic acid, which, like the methyl derivative, crystallises with one molecular proportion of water. Clève's 1.3′-naphthylamine sulphonic acid, on methylation, only yields methylnaphthylamine sulphonic acid, whilst the 1.2′- and 1.1′-naphthylamine sulphonic acids are both converted into dimethyl derivatives when treated with methyl iodide, as described above. The sodium salts of all these three last-mentioned acids crystallise with one molecular proportion of water.—T. A. L.

Aromatic Aldehydes and Amines; Condensations between ——. O. Dimroth and R. Zoeppritz. Ber., 1902, **35**, [4], 984—992.

It is generally assumed that the first stage in the condensation of aldehydes and ketones consists in an addition to the CO group, followed by elimination of water. Hitherto it has not been possible to isolate these intermediate compounds in the reaction between aldehydes and ketones, and aromatic amines. The authors, however, find that, although these products are very unstable and are readily converted into benzylidene compounds, they are capable of forming hydrochlorides which, generally, are very sparingly soluble in hydrochloric acid. Benzaldehyde and aniline do not react in aqueous solution even on warming, but, on adding in the cold a few drops of concentrated hydrochloric acid, a white precipitate of benzaldehyde-aniline hydrochloride, $C_6H_5CH(OH)NHC_6H_5HCl$, is formed, which, however, is only stable in presence of an excess of hydrochloric acid. The compound from *β*-naphthylamine and benzaldehyde is more stable, and melts at 163° C. When added to dilute sodium carbonate solution cooled to 0° C., it loses water and is converted into benzylidene-*β*-naphthylamine, melting at 103° C. Benzaldehyde and *p*-nitraniline in presence of hydrochloric acid give a light yellow precipitate, melting at 188° C. This product, when added in small quantities to dilute sodium carbonate solution at 0° C., yields the hydrate $C_6H_5CH(OH)NHC_6H_4NO_2$, which can be dried in the air, and melts at 86° C. When dried *in vacuo* over sulphuric acid it yields benzylidene-*p*-nitraniline, melting at 118° C. Corresponding derivatives have also been obtained from salicylaldehyde and *p*-hydroxybenzaldehyde, and aniline.

The same reaction has been applied to the phenylimine of benzophenone $(C_6H_5)_2C:N.C_6H_5$ (cubes from acetone, melting at 116° C.), which, on treatment with aqueous hydrochloric acid, is converted into the hydrochloride of benzophenone-aniline $(C_6H_5)_2C(OH)NHC_6H_5HCl$ (white crystals melting at 191°—194° C.), and this has a bearing on the constitution of Auramine. When Auramine base $[(CH_3)_2NC_6H_4]_2:C:NH$ is brought into contact with acids, it is converted in common with other ketonimines, into the hydrate $[(CH_3)_2N.C_6H_4]_2:C(OH)NH_2$, and this, according to the authors, corresponds to the carbinols of the other di- and triphenylmethane dyestuffs; such, for example, as Benzaldehyde Green $[(CH_3)_2N.C_6H_4]_2:C(OH)C_6H_5$. The formation of a salt from this compound leads to the quinonoid formula—

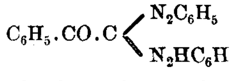


$$\left.\begin{array}{r}(CH_3)_2N.C_6H_4\diagdown\\ Cl(CH_3)_2N:C_6H_4\diagup\end{array}\right. C.NH_2$$

as the more probable one for Auramine, rather than the imino formula suggested by Graebe (this Journal, 1899, 752).—T. A. L.

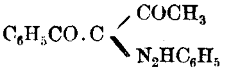
Formazylphenylketone. E. Bamberger and H. Witter.
J. prakt. Chem., 1902, **65**, [3 and 4], 139—149.

By reacting with an alkaline diazobenzene solution on benzoylacetone, a mixture of formazylphenylketone—



$$C_6H_5.CO.C\left\langle\begin{array}{l}N_2C_6H_5\\ N_2HC_6H_5\end{array}\right.$$

and of "phenylazobenzoylacetone"—

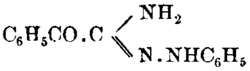


$$C_6H_5CO.C\left\langle\begin{array}{l}COCH_3\\ N_2HC_6H_5\end{array}\right.$$

is obtained, the latter remaining in the alkaline filtrate, the former separating as a scarlet precipitate, and crystallising from alcohol in red matted needles. The same product is also obtained by reacting with an alkaline diazobenzene solution on an alcoholic solution of phenylazobenzoylacetone, or else on an alkaline solution of benzoylacetic acid. In this latter case, benzoylformaldehyde hydrazone is formed as an intermediate compound and can be isolated. Formazylphenylketone crystallises from alcohol in matted red metallic needles, melting at 142° C., readily soluble in ether, benzene, chloroform, glacial acetic acid, and hot alcohol, sparingly soluble in cold. It dissolves in mineral acids with a reddish-violet colour, and gives a silver and a sodium salt. The acetyl compound separates from alcohol in orange-yellow needles, melting at 154° C. This substance, reduced with sulphuric acid and zinc dust, gives, among other products, acetanilide, showing that the acetyl group was originally attached to nitrogen. When formazylphenylketone is carefully heated with sulphuric acid, it is converted into aniline and α-phentriazylphenylketone—

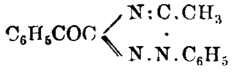
$$C_6H_4<\begin{matrix}N.N\\ \vert \quad \Vert\\ N.C.COC_6H_5\end{matrix}$$

which crystallises from water in golden-yellow silky needles, melting at 114° C. The substance is soluble in concentrated mineral acids, and is precipitated on adding water. It combines with phenylhydrazine, yielding the phenylhydrazone, melting at 185° C. On treating formazylphenylketone with ammonium sulphide, normal azo fission takes place, yielding aniline and benzoylamidrazone—



$$C_6H_5CO.C<\begin{matrix}NH_2\\ N.NHC_6H_5\end{matrix}$$

This compound separates in golden-yellow plates, melting at 152° C., or crystallises from petroleum spirit in woolly needles. On warming with acetic anhydride it yields an acetyl compound, melting, according to the rate of heating, at 143°—150° C., which dissolves with an eosine colour in concentrated sulphuric acid. On prolonged heating on the water-bath with acetic anhydride, inner condensation takes place, yielding phenylmethylbenzoyltriazol—



$$C_6H_5COC<\begin{matrix}N:C.CH_3\\ \cdot\\ N.N.C_6H_5\end{matrix}$$

which separates from benzene in silky needles, melting at 55·5° C., and gives a hydrazone with phenylhydrazine.

—T. A. L.

Carmine Blue. P. Sisley. Rev. Gén. Mat. Col., 1902, **6**, [63], 57—59.

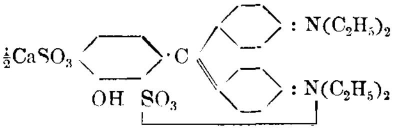
Carmine Blue, Superfine or Patent Blue (see this Journal, 1890, 53), is prepared by successively condensing *m*-nitrobenzaldehyde with diethylaniline, reducing the product, transforming the amino group of the triamine thus produced into hydroxyl by means of the diazo-reaction, sulphonating the leuco-base, and, finally, oxidising the sulphonic acid obtained, with lead peroxide and sulphuric acid. It comes into commerce in the form of the calcium salt, a dyestuff having the property of resisting the action of alkaline solutions.

Prudhomme (see this Journal, 1896, 267) assumed that this valuable property depends on the presence of the hydroxyl group in the meta position with respect to the methane carbon atom. This hypothesis is confirmed by the fact that the green acid salts of the unsulphonated dyestuff, when treated with ammona, yield a base of the same colour. Nevertheless, a colourless modification of the base may be obtained by the use of excess of alkali.

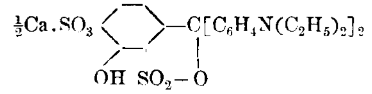
These phenomena resemble those exhibited by Ethyl Green, a dyestuff containing no hydroxyl, and the results indicate that the fastness of Carmine Blue towards alkalis is not due to its *m*-hydroxyl group.

Suais and Sandmeyer (see this Journal, 1896, 706), by synthesising ortho-sulphonated Malachite Green and Ethyl Green from *o*-sulphobenzaldehyde, have shown that this resistance to alkalis is due to the presence of the sulphonic radicle in the orthoposition with respect to the methane carbon atom. These sulphonated dyestuffs, although containing no hydroxyl groups whatever, closely resemble Carmine Blue in their behaviour towards alkalis.

The *calcium* salt, when purified from sodium and calcium sulphates by boiling with dilute alcohol containing calcium chloride, has the composition $Ca(C_{27}H_{31}N_2S_2O_7)_2$; it crystallises with 10 or 14 molecules of water, and the dried salts from the two hydrates are dissimilar, for on exposure to the atmosphere, each regains its appropriate amount of water. This salt, although containing only one atom of calcium combined with 2 mols. of the disulphonic acid, is neutral, and this property is explained by supposing, either that a linking together of the sulphonic group and one of the nitrogen atoms occurs—



or that the sulphonic and carbinol radicles condense to form an inner anhydride—

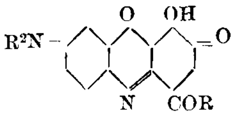


The free acid, isolated by treating an alcoholic solution of the calcium salt with sulphuric acid, crystallises in pale-yellow needles ; it dissolves in water or alcohol to a bluish-green solution, from which the coloured form of the acid is deposited ; this variety is, however, always mixed with a large proportion of the colourless modification.

The *ferrous* and *magnesium* salts, obtained by the action of the colour acid on the corresponding metallic sulphate, crystallise in indigo-blue scales.—G. T. M.

Gallocyanines. C. Vaucher. Bull. Soc. Ind. Mulhouse, 1901, 403—409.

By virtue of their quinonoid constitution—



(R^2 being CH_3, C_2H_5 &c., and R being NH_2, OH, OCH_3, &c.) the dyestuffs of the Gallocyanine group react readily with aromatic amines, phenols, sulphurous acid, and reducing agents.

Condensation with phenols is best effected in the presence of acids. The products (Phenocyanines) are leuco compounds, which are readily oxidised to dyestuffs, and are of special value in calico printing. They dissolve in concentrated sulphuric acid with a pale-brown colour, which is changed to a deep blue by the addition of a small quantity of an oxidising agent.

Sulphurous acid, in the form of sodium sulphite or bisulphite, under the influence of heat and pressure, transforms the Gallocyanines into pale-grey or greenish-coloured monosulphonic acids of leuco derivatives, along with simple leuco compounds. The latter are also formed by the action of various reducing agents. Their hydrochlorides are characterised by ready solubility, and find extensive application in the foulard style of calico printing, being padded along with a mordanting salt upon the tissue, which is then printed in pattern with a discharge mixture. Unlike the dyestuffs, the leuco compounds can be easily sulphonated by means of sulphuric acid, giving the same derivatives as are obtained by the action of sulphites upon the dyestuffs.

Alkali bisulphite compounds of the Gallocyanines, analogous to Alizarin Blue S, are readily prepared, and have long been known.

The chromium colour lakes of all of these dyestuffs are of greater importance in dyeing and printing than the lakes produced upon other mordants. The sulphonic acid derivatives dye upon chrome-mordanted wool colours which are faster to milling than those yielded by the unsulphonated Gallocyanines. The sulphonic acid dyestuffs derived from gallanilide, when applied to wool and fixed by after-mordanting with chromium fluoride, give colours which are fast to bleaching (sulphur dioxide) and carbonising.

The following is a list of the principal members of the group :—

Year of Discovery.	Name of Dyestuff.	Preparation from :—	Patentee.
1881	Gallocyanine	Nitrosodimethylaniline and gallic acid (H. Koechlin).	L. Durand, Huguenin, and Co.
1887	Prune	Nitrosodimethylaniline and gallic methyl ester.	Kern and Sandoz.
1889	Gallamine Blue	Nitrosodimethylaniline and gallaminic acid.	Geigy.
1889	Gallanilic Violets.	Nitrosodialkylanilines and gallanilide (sulphonic acids).	Industrie Chimique.
1889	Dauphin Blue	Sulphonation of the Gallocyanine-anhydride-anilide discovered by Nietzki.	Kern and Sandoz.
1890	Gallanilic Indigo P S.	(Addition to Ger. Pat. 56,991 for manufacture of Gallanilic Violets.)	L. Durand, Huguenin, and Co.
1891–2	.. ..	Action of primary and secondary alkylamines on Gallocyanine.	„
1893	Coreïne 2 R	Dialkylaminoazo-benzenes and gallaminic acid.	„
1893	Celestine Blue	Nitrosodiethylaniline and gallaminic acid.	F. Bayer and Co.
1893–4	Gallazines	Phenolsulphonic acids and Gallocyanines (oxidation products).	L. Durand, Huguenin, and Co.
1893–5	Phenocyanines	Resorcinol and Gallocyanines.	„
1894	(Sulphonated Gallocyanines.)	Dialkylaminoazo-benzenedisulphonic acids and gallic acid.	„
1895	Gallanilic Green	Nitration of Gallanilic Indigo P S.	„
1895	Coreïne A B	Anilidation and sulphonation of Coreïne 2 R.	„
1898	(Sulphonated Gallocyanines.)	Action of sulphurous acid, free or combined, on Gallocyanines.	„
1898	(Leuco-gallocyanines.)	Reduction of Gallocyanines.	„
1900	(Sulpho-alphyl-gallocyanines.)	Action of aromatic sulphochlorides on Gallocyanine, Prune, Phenocyanine, &c.	Sandoz and Co.
1900	(Sulphonated Gallocyanines.)	Sulphonation of leuco-gallocyanines.	L. Durand, Huguenin, and Co.
1900	(Sulphonated Gallocyanines.)	Action of sulphurous acid on Gallanilic Violets, &c.	„

—E. B.

Gallocyanines. (*Observations on the preceding Article.*) E. Noelting. Bull. Soc. Ind. Mulhouse, 1901, 402—403.

The list of dyestuffs of industrial value belonging to the Gallocyanine group, has been greatly extended during recent years. They are obtained by methods depending upon the following steps :—

Reduction.— Although their existence has long been known, it has only recently been discovered that the leuco-gallocyanines are capable of advantageous industrial application. On account of their solubility, darker shades are obtained with them than with the Gallocyanines from which they are derived, especially when these are sparingly soluble.

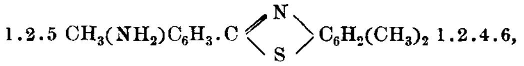
Sulphonation.—Besides their insufficient solubility, the neutral dyeing character of certain Gallocyanines has been an obstacle to their employment in wool dyeing. Both of these defects have been overcome by sulphonating them. In many cases direct sulphonation is impracticable. The leuco compounds are, however, sulphonated with ease. The leuco-sulphonic acids produced, can be applied as such, and oxidised into dyestuffs upon the fibre. This is done in the case of cotton fabrics. In wool dyeing, it is preferred first to transform the leuco compounds into dyestuffs.

Sulphonation can also be directly effected by the action upon the dyestuffs of sulphites and bisulphites under pressure.

Action of Phenols.—Phenols possess the interesting property of uniting with Gallocyanine dyestuffs, forming leuco compounds of unknown constitution. These are converted into the corresponding dyestuffs, when they are printed upon cotton fabrics and steamed. The dyestuffs of this class have gained an important place in the calico-printing industry, on account of their brightness of colour and fastness.—E. B.

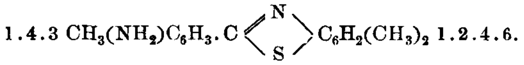
Erica Base; Some Isomerides of ——. G. Schultz and M. Tichomiroff. J. prakt. Chem., 1902, **65**, [3 and 4], 150—160.

By heating four atomic proportions of sulphur with rather more than two molecular proportions of *m*-xylidine to 185°—195°C., the chief product formed, is dehydrothioxylidine—



$$1.2.5\ CH_3(NH_2)C_6H_3.C\left\langle{}^{N}_{S}\right\rangle C_6H_2(CH_3)_2\ 1.2.4.6,$$

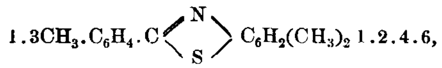
together with isodehydrothioxylidine, which has the constitution—



$$1.4.3\ CH_3(NH_2)C_6H_3.C\left\langle{}^{N}_{S}\right\rangle C_6H_2(CH_3)_2\ 1.2.4.6.$$

The former base is of technical importance, since, after diazotisation and combination with α-naphthol-ϵ-disulphonic acid, it yields the valuable pink cotton dyestuff Erica (Eng. Pat. 17,333 of 1888 ; this Journal, 1889, 980). The azo dyestuffs from the isomeric base do not dye cotton directly, and have little value as wool dyestuffs. The object of the present research was to ascertain whether it would be possible to convert the iso into the Erica base, or into a technically valuable isomeride. Isodehydrothioxylidine base, separated by means of its hydrochloride, crystallises from alcohol in yellow needles, melting at 121° C. The acetyl derivative separates from benzene in white needles, melting at 198° C. Two series of experiments were made with the iso base, the first comprising the following reactions : diazotisation of the iso base, replacement of the diazo group by hydrogen, nitration of the thio base so obtained, and reduction of this nitro compound to the corresponding amino derivative; whilst the second series consisted in nitrating the isodehydrothioxylidine, diazotisation, replacement of the diazo group by hydrogen, and reduction of the nitro group.

The diazo chloride of isodehydrothioxylidine separates from alcohol, on adding ether, in brownish-red needles melting with decomposition at 80°—90° C. When boiled with absolute alcohol, thin yellow needles, melting at 74°·5 C., of *m*-methylbenzenyl-*p*-amino-*m*-thioxylenol are obtained. This product has the constitution—



$$1.3CH_3.C_6H_4.C\left\langle{}^{N}_{S}\right\rangle C_6H_2(CH_3)_2\ 1.2.4.6,$$

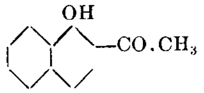
and gives on nitration two nitro compounds, one melting at 152° C., and the other at 146° C., the former being less soluble in alcohol than the latter. The nitro compound melting at 152° C. gives on reduction an amino base melting at 95° C., yielding an acetyl compound melting at 244° C. The base, after diazotisation and combination with sodium α-naphthol ϵ-disulphonate, gives a cotton dyestuff inferior in all respects to Erica. Since the amino compound gives *m*-toluylic acid and a diaminothioxylenol on fusion with potash, it follows that the nitro group enters the thioxylenol ring, either between the two methyl groups or ortho to one only.

When, according to the second series of experiments, isodehydrothioxylidine is nitrated in sulphuric acid solution, it yields a nitro product crystallising from alcohol in yellowish-red needles melting at 192° C. On diazotisation and boiling with alcohol, the product gives a nitro compound, melting at 146° C., identical with that obtained by nitrating the thio base described above, melting at 74°·5 C. The corresponding amino base is obtained by reduction with stannous chloride, and forms reddish needles melting at

89° C. Diazotised and combined with sodium α-naphthol ε-disulphonate, it gives a dyestuff very similar to that from the corresponding base melting at 95° C.—T. A. L.

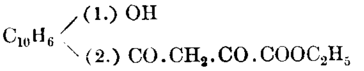
α-Naphthochromone. v. Kostanecki and G. Froemsdorff. Ber., **35**, [4], 859—861.

2-Aceto-1-naphthol—



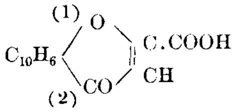
may be condensed with ethyl oxalate in the presence of metallic sodium similarly to resacetophenone mono-ethyl ether (Kostanecki, Paul, and Tambor; this Journal, 1901, 1106).

o-Hydroxy-naphthoyl-pyruvic acid ethyl ester—

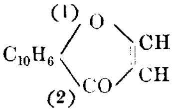


$$C_{10}H_6 \begin{cases} (1.)\ OH \\ (2.)\ CO.CH_2.CO.COOC_2H_5 \end{cases}$$

m. pt. 114°—115° C., is thus obtained, which is converted into *α-naphthochromone carboxylic acid*—



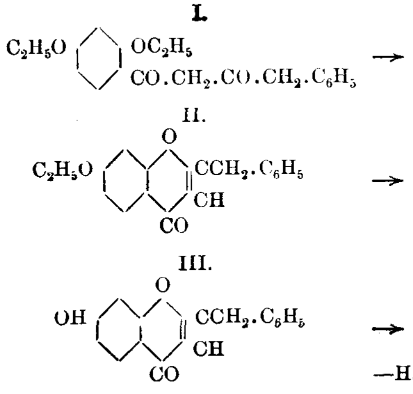
m. pt. 277°—288° C., on boiling with alcoholic hydrochloric acid. By distillation, carbon dioxide is lost and—



α-naphthochromone is obtained. This crystallises from dilute alcohol in white shining needles, which become dull and powdery when exposed to the air. It dissolves in concentrated sulphuric acid with a yellow colour, and the solution shows an intense blue-green fluorescence.—H. L.

3-Hydroxy-β-benzylchromone; Synthesis of ——. O. Hannach and v. Kostanecki. Ber. **35**, [4], 866—869.

Phenylacetic ester may be readily coupled with resacetophenone diethyl ether in the presence of metallic sodium. The β-diketone so obtained (formula I.) reacts in an analogous manner to those described above (see preceding abstracts). On boiling with hydriodic acid for a short time, it is converted into *3-ethoxy-β-benzylchromone* (formula II.), m. pt. 154° C., which crystallises in long, broad needles that fluoresce when dissolved in sulphuric acid. The ethyl group is removed on prolonged boiling with hydriodic acid, and *3-hydroxy-β-benzylchromone* (formula III.) is obtained in white prisms melting at 183° C. The solution of this substance in sulphuric acid fluoresces but faintly. These chromone derivatives are of interest, since they contain the same skeleton formation as brasilin (W. H. Perkin, jun., and Gilbody; this Journal, 1900, 40, 528).



—H. L.

Azo-Dyestuffs; Action of Sulphides, Sulphites, and Hyposulphites (Hydrosulphites) on ——. A. Rosenstiehl and E. Suais. Comptes Rend., **134**, [9], 553—554.

When glucose acts on the nitro-derivatives of azo-dyestuffs, the nitro group alone is attacked, two molecules losing three atoms of oxygen to form a derivative of the corresponding azoxyamine, and giving rise to a new series of dyestuffs, dyeing unmordanted cotton. By carrying the action farther, the azo-group also is attacked, and a series of azoamines is obtained. Other reducing agents were examined, as it was not desired to act at once on the nitro-group and the azo-group.

Sulphides give very complex products, save in the case of bisulphides, when the reaction—

$$RNO_2 + CaS_2 + H_2O = RNH_2 + CaS_2O_3$$

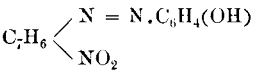
occurs sharply.

Sulphites attack the azo-group, giving nitramines in almost quantitative amounts, whether para- or meta-derivatives be acted on. With para-derivatives of azoxyamines, sulphites behave similarly, but meta-derivatives are not attacked.

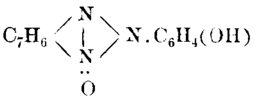
Hyposulphites act more powerfully than sulphites; from azoxyamine derivatives, whether para- or meta-, the azoxyamine is separated.—J. T. D.

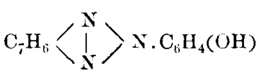
Nitrated Azo-Dyestuffs; Reduction of ——. A. Rosenstiehl and E. Suais. Comptes Rend., **134**, [10], 606—608.

The sharp reactions by which, from azo-dyestuffs derived from meta- and para-nitramines, we can obtain at will the nitramines, azoxyamines, azoamines, or dyestuffs derived from the azoxyamines or the diamines (this Journal, 1901, 570), cannot be carried out with the corresponding derivatives of the orthonitramines. The reaction of reducing agents on the substance obtained by coupling phenol with the diazo-derivative of orthonitro-paratoluidine is typical of the general reaction of such compounds. Whether the reducing agent be glucose or sodium sulphide, the colour disappears, and a compound of formula $C_{13}H_{11}N_3O_2$ is formed; further reduction by zinc-dust and caustic soda yields a substance of formula $C_{13}H_{11}N_3O$. These bodies are still phenolic; they do not contain the group – N:N –, characteristic of azo-dyestuffs, for they are colourless; and the second atom of oxygen in the earlier product is combined with nitrogen, for on its combustion in oxygen, nitrous fumes are seen. The constitution of these substances is shown in the formulæ—

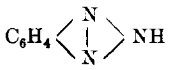


$$C_7H_6 \begin{cases} N = N.C_6H_4(OH) \\ NO_2 \end{cases}$$





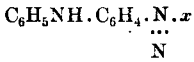
The last substance is hydroxyphenylpseudo-ortho-aziminotoluene, a derivative of Ladenburg's pseudo-aziminobenzene—



and the method is a general one for obtaining similar substances.—J. T. D.

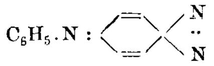
Diazo Bodies and the so-called Triazolenes; Quinoid ——. A. Hantzsch. Ber., **35**, [4], 888—896.

The diazo salts (with acids) of *p*-aminodiphenylamine possess the usual diazonium structure—

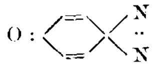


$$C_6H_5NH.C_6H_4.\underset{\underset{N}{\vdots}}{N}.x$$

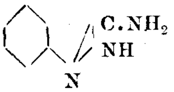
according to the author's view (see Jacobson, Annalen, 287, 131). But they differ from diazonium compounds in general in their behaviour to caustic alkalis; for they do not form diazotates, but lose a molecule of water, and are converted into an insoluble, extremely unstable, and explosive compound of the following formula :—



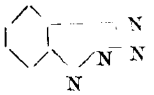
(phenylimino-quinone diazide). This substance is analogous to "diazophenol"—



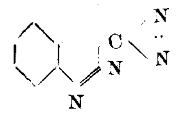
(quinone diazide) obtained similarly from the diazonium salts of *p*-aminophenol, for which the quinoïd structure seems well established (Wolff, Annalen, 312, 126). The author would range into the class of quinoïd diazo compounds the triazolenes obtained by Bamberger by diazotising amino-indazene—



replacing his formula for the simplest triazolene—



by the isomeric—



The triazolenes are well-crystallised stable substances which are volatile without decomposition in steam, and yet readily combine with phenols and amines to form azo dyestuffs. Indazol triazolene is converted into a diazonium salt by means of hydrochloric acid.—H. L.

English Patents.

Indigo; Manufacture of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 9613, May 8, 1901.

See Fr. Pat. 310,880; this Journal, 1902, 38.—T. A. L.

Colouring Matters [Anthracene Dyestuffs] of the Anthracene Series; Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin and Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 7194, April 4, 1901.

See Fr. Pat. 309,761; this Journal, 1902, 42. The specification is supplementary to Eng. Pats. 8051 and 19,531 of 1899 (this Journal, 1900, 341 and 817), and to 20,718 of 1900 (this Journal, 1902, 37).—T. A. L.

Anthracene Derivatives [Anthracene Dyestuffs]; Manufacture or Production of ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 8924, April 30, 1901.

See Fr. Pat. 310,329; this Journal, 1902, 40.—T. A. L.

Dyestuffs [Anthracene Dyestuffs] and Intermediate Products of the Anthracene Series; Manufacture of ——. O. Imray, London. From the Farbwerke Hoechst, Germany. Eng. Pat. 7541, April 12, 1901.

See Fr. Pat. 309,772; this Journal, 1902, 44.—T. A. L.

Dyestuffs [Sulphide Dyestuffs]; New Sulpho Acids and Sulphur ——. T. R. Shillito, London. From J. R. Geigy, Basle, Switzerland. Eng. Pat. 12,578, June 20, 1901.

See Fr. Pat. 310,809; this Journal, 1902, 44.—T. A. L.

Dyestuffs [Sulphide Dyestuffs] therefrom; Manufacture of p-Monoalkylamido-p-oxydiphenylamines, and ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 7919, April 17, 1901.

See Fr. Pat. 309,898; this Journal, 1902, 42.—T. A. L.

Dye [Sulphide Dyestuffs]; Manufacture of ——. Vidal Dyes Syndicate, Ltd., London. From H. R. Vidal, Paris. Eng. Pat. 569, Jan. 8, 1902.

The action of sulphur and caustic alkalis on *m*-dinitrobenzene, *m*-dinitro-toluene, and on 1.4′-dinitro-naphthalene at about 100° C. produces brownish substances, which, when heated with sodium sulphide to about 250° C., are converted into direct yellowish-browns for cotton. Subsequent treatment with potassium bichromate solution turns the shade redder.—T. A. L.

United States Patents.

Blue Sulfur Dye [Sulphide Dyestuffs], and Process of making same. A. Weinberg and R. Herz, Frankfort. Assignors to L. Cassella and Co., Frankfort-on-the-Main Germany. U.S. Pat. 693,632, Feb., 18, 1902.

See Eng. Pat. 16,247 of 1900; this Journal, 1901, 889.
—T. A. L.

Blue Sulfur Dye [Sulphide Dyestuffs]; Process of making ——. A. Weinberg and R. Herz, Frankfort. Assignors to L. Cassella and Co., Frankfort-on-the-Main, Germany. U.S. Pat. 693,633, Feb. 18, 1902.

See Fr. Pat. 303,524; this Journal, 1902, 41.—T. A. L.

Dyeing Sulfur Colors [Sulphide Dyestuffs]; Process of ——. A. Kertesz, Frankfort. Assignor to L. Cassella and Co., Frankfort-on-the-Main, Germany. U.S. Pat. 693,653, Feb. 18, 1902.

In order to prevent tendering of the fibre in goods dyed with sulphide dyestuffs, the patentee passes them finally through a bath containing a weak solution of sodium acetate (5—10 grms. per litre) after coming from an acid bath.
—T. A. L.

Disazo Wool Dye [Azo Dyestuffs], and Process of making same. K. Schirmacher, Soden. Assignor to the Farbwerke Hoechst, Germany. U.S. Pat. 693,670, Feb. 18, 1902.

See Fr. Pat. 313,748; this Journal, 1902, 169.—T. A. L.

Ferro-Chrome Color, and Process of making same. A. Haagen, Cologne, Germany. U.S. Pat. 693,703, Feb. 18, 1902.

See Eng. Pat. 7560 of 1901; this Journal, 1901, 728.
—T. A. L.

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

Strength and Stretch of Cotton Yarns; Effect of Moisture, Acids, and Alkalis on ——. G. R. Smith. J. Soc. Dyers and Colourists, 1902, 18, 55—59.

The results obtained by mercerisation depend chiefly on the alteration in the physical properties of the cotton fibre. The lustre imparted to the yarn by this process is due to the joint action of the alkaline solution and the tension; the former renders the fibres more flexible and plastic, whilst the latter causes them to lie more closely together. The result is a surface capable of reflecting more light than was the case with the fibre before treatment. American cotton is less lustrous and shorter in staple than the Egyptian and Sea Island varieties, and it is least benefited by mercerisation. Steeping and stretching in water alone slightly increase the lustre, but the full effect is obtained only in the presence of the alkali. American, Egyptian, and Sea Island cotton yarns, when steeped for eight minutes in caustic soda solution of 50° Tw., shrink to the extent of 20·9, 17·7, and 16·1 per cent. respectively. The shrinkage is greatest in the case of the American cotton, because, on account of the shortness of the fibres, a greater number is required to make up a given length of thread.

The increase in strength of dried Sea Island cotton yarns, due to mercerisation with an alkaline solution of 50° Tw., varies from 12·3 to 25·8 per cent.; this increase is due to the coalescence of the fibres in the thread, rather than to the thickening of the walls of the fibre. The mercerised yarns, when subjected to the breaking load, stretch less than the untreated material, the reduction in elongation varying from 12·3 to 25·8 per cent.

Experiments made with alkaline solutions of varying strength, show that with dilute solutions, the time of immersion does not materially affect the result, whereas, at higher concentrations, this factor becomes important. In the wet state, yarns steeped in strong alkaline solutions are weakened to a greater extent than those immersed in the more dilute solutions.

The strength and stretch of unmercerised cotton yarns increase with the amount of water present, the wet yarn being stronger than the dried material, whilst the yarn containing its normal amount of moisture occupies an intermediate position in this respect. Mercerised yarns, on the other hand, are found to be weaker in the wet state than in the dry. This is probably due to the fact that the friction between the mercerised fibres, which have been forced by tension to take up constrained positions, is greater in the dry than in the moist condition.

Acids, especially in concentrated solutions and at high temperatures, have a very weakening effect on the fibres and considerably diminish the stretch of the yarn.—G. T. M.

Silk; The Fibroïn of ——. E. Fischer and A. Skita. Zeits. Physiol. Chem., 1901, **33**, 177—192; through Zeits. Untersuchung der Nahrungs- u. Genussmittel.

Silk may be separated into two components, soluble silk glue and fibroïn, by treatment with hot water. Fibroïn is very sensitive towards alkali, so much so, that it does not even withstand prolonged heating with water in glass vessels. The material used by the authors for their experiments was therefore prepared by heating silk in a porcelain beaker in an autoclave to 117°—120° C. When heated with mineral acids, fibroïn is split up into certain amino acids, which were separated by esterification, and subsequent fractional distillation of the esters. The authors succeeded in isolating *l*-leucin and *l*-phenylalanin in addition to the decomposition products of fibroïn, previously described (tyrosin, aminopropionic acid, glycocoll). Several other amino acids were also obtained, which have as yet not been identified. The amino-propionic acid, proved to be optically active, and identical with *d*-alanine. 100 parts of fibroïn yielded 10 per cent. of *l*-tyrosin, 21 per cent. of *d*-alanine, 36 per cent. of glycocoll, about 1·5 per cent. of *l*-leucin, and about 1·5 per cent. phenylalanine.
—H. L.

Textile Fabrics; Spots on ——, *caused by Aspergillus Fumigatus.* C. Wehmer. Chem.-Zeit., 1902, **26**, [22], 241.

A number of small dull grey circular spots, each of about 1 sq. cm. area, occurring in patches, on certain dyed woollen goods, which had been stored in Singapore, were examined. The microscope detected *hyphæ*, and a few spores which, by cultivation, were shown to be those of *aspergillus fumigatus*. This fungus is known in Europe, occurring as mould on vegetable matter at its most favourable culture temperature (38°—40° C.); but in the tropics, it may be as abundant as *penicillium glaucus* is in temperate climates, and may thus occur, as in the present case, even in the midst of bales of cloth, where the conditions for its growth would appear to be most unfavourable.—W. G. M.

2.7-*Dihydroxynaphthalene; Dyeing of Artificial Silk with*——. B. Settlik. Zeits. für Farben- u. Textil-Chem., **1**, [5], 121—122.

2.7-Dihydroxynaphthalene dyes artificial silk silver grey; but if the material be previously mordanted with metallic salts, a variety of mode shades may be obtained. A fine dark brown in particular may be obtained by the addition of pyrogallol. 1—2 per cent. solutions of the required salts are taken, together with a 1 per cent. freshly prepared and faintly alkaline solution of dihydroxynaphthalene in warm water. After dyeing, which must be performed below 60° C., since all kinds of artificial silk are injuriously affected by heating above this temperature, the material is soaped, washed, and dried. The characteristic feel of natural silk is imparted by passing through a bath of dilute acetic acid. Artificial silk, as is well known, loses its gloss on drying, unless it be gently stretched during this operation.
—H. L.

Tissue Printing; Use of Formic Acid and Formates in——. A. Scheurer. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, [2], 6—7.

The comparatively high price of formic acid has hitherto prevented its employment in dyeing and printing. The acid is now being manufactured at a cost which will allow of its application, in many instances, in place of acetic acid, in these industries.

The author remembers some experiments which were made, before the year 1868, with the formates of aluminium and iron as mordants in dyeing. The results showed that these salts do not decompose so readily as the corresponding acetates, when goods treated with them are exposed to the air.

In extract printing, in view of the fact that the coefficient of affinity of formic acid is 14 times greater than that of acetic acid, and that the vapour pressures of the formates are, therefore, probably lower than those of the acetates, the latter decompose much the easier in the fixing process. This condition, unfavourable with mordants fixed by exposure of the goods to the air, can offer advantages in favour of the formic acid in other cases. Such a case occurs, for example, with mixtures containing Alizarin Orange and aluminium salts. When aluminium acetate is employed, these become unfit for use after the lapse of a few hours, owing to the combination of the dyestuff with the alumina, which takes place even in the presence of a large excess of acetic acid; with aluminium formate, however, and an addition of 100 grms. per litre of formic acid, the printing mixtures keep well.

Formic acid serves as an efficient substitute for acetic acid in the preparation of tin compounds, and of certain thickenings employed in printing. As a solvent for basic dyestuffs, *e.g.* Methylene Blue, in admixture with tannic acid, it is inferior to acetic acid.—E. B.

Paranitraniline Red; Coloured Resists under——. J. Langer. Zeits. f. Farben-für u. Textil-Chem., **1**, [5], 116—119.

Coloured resists under Paranitraniline Red are best produced by printing a paste containing a basic dyestuff and an excess of tannin (sufficient not only to fix the basic colour, but also to precipitate and therefore to reserve the diazotised paranitraniline) upon cloth prepared with β-naphthol. (1) The author gives detailed and complete recipes for producing a bright and heavy blue and an olive reserve on this principle, together with a pattern. (2) Peculiar effects difficult or impossible to produce by printing directly may be obtained by printing on a naphthol ground, a white discharge containing both potassium sulphite and also tartar emetic, and then printing over this a tannin colour, with excess of tannin. This white resists not only the red bottom, but also the overprinted tannin colour. A pattern is shown with a white resist in conjunction with blue, green, and pink, under Paranitraniline Red; and a detailed recipe for carrying out the same is given. (3) Prussian blue may be used as an alternative method for the production of a blue resist.—H. L.

Discharges with Powdered Aluminium and Magnesium. R. Weiss. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, [2], 4--6.

A CLAIM for priority in the discovery that aluminium can be employed in place of zinc in the production of discharge effects in tissue printing.

The author, in the year 1891, experimented with powdered aluminium and magnesium, in conjunction with zinc powder and sodium sulphite, and also with a mixture of aluminium powder and potassium oxalate thickened with gum, with a view to obtaining discharges upon wool dyed with the following dyestuffs:—Methyl Green 3 J (Durand and Huguenin), Green X A (Geigy), Violet 170 (Poirrier), Benzoazurin, Erika B, and Milling Yellow.—E. B.

ENGLISH PATENTS.

Decorated Fabric, and Process of Producing same. E. Roussell, France. Eng. Pat. 4304, Feb. 28, 1901.

A PROCESS of decorating stuffs is claimed, which consists in successively submitting the fabrics to:—(1) a first dyeing operation; (2) a printing operation with any design, by means of a material capable of discharging the colour; (3) a second dyeing operation, when the discharge has produced the desired decolorisation (complete or partial) of the parts to which it has been applied. These operations of dyeing and printing with the discharge may be effected by ordinary means, care being taken, of course, to employ for the first dye only dyestuffs susceptible of being attacked by the discharge which is used. The second dye matches with the first dye, and being produced on the parts affected by the discharge as well as on the body of the fabric, blends and softens the contours, so that soft designs are obtained and not designs with a hard outline as in ordinary printed fabrics. The softened or stumped outlines give to the fabric an appearance different from that of ordinary printed stuffs and prevent it being seen that the decorative effect has been obtained by printing.—H. L.

Raw Silk and Fabrics containing Raw Silk; Treatment of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 6644, March 29, 1901.

SEE Fr. Pat. 286,961; this Journal, 1902, 49.—A. S.

Textile Fabrics, Paper, &c.; Machines for Moistening ——. H. H. Lake, London. From F. B. Comins, Massachusetts, U.S.A. Eng. Pat. 22,331, Nov. 5, 1901.

THE base of the perforated mouthpiece of the nozzle of the dampening machine fits loosely in a chamber fixed on to the stand-pipe supplying the fluid to be ejected. The fixed chamber contains a vertical cleaner stem terminating in a fine acicular clearer. The pressure of the fluid passing through the nozzle forces up the movable mouthpiece so that it is held clear of the cleaner; when the pressure is reduced, however, the mouth-piece falls back by its own weight, and the clearer needle penetrates the orifice, removing any obstacle. The backward movement of the mouth-piece is also effected by external mechanism consisting of a journalled collar, with projecting cam finger and arm carried on a cam shaft. The cam arm is raised by the action of a tripper carried on the collar of another shaft, the cam finger is accordingly depressed and forces the mouth-piece on to the cleaner stem.—G. T. M.

Rust; Compounds for Removing [from Fabrics, &c.] ——, *and for Similar Purposes.* J. Hammer and N. Coleman, Washington, U.S.A. Eng. Pat. 1862, Jan. 23, 1902.

THE composition, which is for removing "rust," or more particularly for imparting a fresh, clean appearance to fabrics which have become rusty-looking, consists of a mixture of 10 parts of oxalic acid and 2 parts of borax.—A. S.

Bleaching, Dyeing, Washing, and otherwise Treating Fibres and Textile Fabrics by Means of Circulating Liquids: Apparatus for ——. O. Imray, London. From C. Roesch and Co., Mülheim-am-Rühr, Germany. Eng. Pat. 13,375, July 1, 1901.

SEE Fr. Pat. 312,424, 1901; this Journal, 1902, 342.
—G. T. M.

Fibres, Fabrics, or the like; Treating with Bleaching, Dyeing, or like Liquors: Apparatus for ——. O. Imray, London. From C. Roesch and Co., Mülheim-am-Rühr, Germany. Eng. Pat. 26,155, Dec. 21, 1901.

A ROTATING cylindrical boiler, with perforated sides, and mounted on a vertical axis, contains a perforated pipe or shaft concentrically arranged within it. The boiler is surrounded by a vessel which fits it closely, except on one side, where it is expanded into a lateral chamber connected with the conduit supplying the dyeing or bleaching liquor. On the floor of the boiler, within the area enclosed by the perforated pipe, are a number of perforations leading to an annular chamber formed between the floor of the outer vessel and a recess in the bottom of the rotating boiler; this compartment communicates in turn with the outlet pipe. The whole apparatus is closed in by a lid fitting on the upper edges of the central pipe, boiler, and enclosing vessel, and the liquid is circulated through the materials contained in the rotating boiler by means of a rotary pump.
—G. T. M.

Bleaching, Dyeing, Drying, &c. of Textile Fabrics, especially Fabrics having a Pile; Apparatus for Use in ——. J. A. Sackville, Pendleton, England. Eng. Pat. 4441, March 2, 1901.

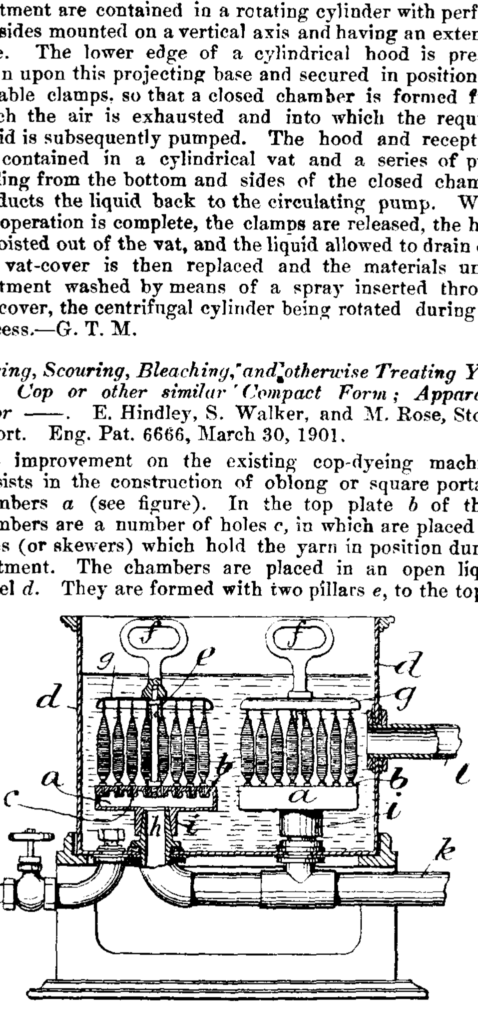
SEE U.S. Pat. 693,446, Feb. 18, 1902; see page 474.
—G. T. M.

Dyeing and otherwise Treating Fibrous Materials; Centrifugal Machines for ——. F. F. Könitzer, Zittau, Germany. Eng. Pat. 5655, March 18, 1901.

(COMPARE this Journal, 1902, 171.) The materials under treatment are contained in a rotating cylinder with perforated sides mounted on a vertical axis and having an extended base. The lower edge of a cylindrical hood is pressed down upon this projecting base and secured in position by suitable clamps, so that a closed chamber is formed from which the air is exhausted and into which the required liquid is subsequently pumped. The hood and receptacle are contained in a cylindrical vat and a series of pipes leading from the bottom and sides of the closed chamber conducts the liquid back to the circulating pump. When the operation is complete, the clamps are released, the hood is hoisted out of the vat, and the liquid allowed to drain off; the vat-cover is then replaced and the materials under treatment washed by means of a spray inserted through the cover, the centrifugal cylinder being rotated during the process.—G. T. M.

Dyeing, Scouring, Bleaching, and otherwise Treating Yarn in Cop or other similar Compact Form; Apparatus for ——. E. Hindley, S. Walker, and M. Rose, Stockport. Eng. Pat. 6666, March 30, 1901.

THE improvement on the existing cop-dyeing machines consists in the construction of oblong or square portable chambers *a* (see figure). In the top plate *b* of these chambers are a number of holes *c*, in which are placed the tubes (or skewers) which hold the yarn in position during treatment. The chambers are placed in an open liquor vessel *d*. They are formed with two pillars *e*, to the top of



which are screwed the handles *f*, whereby they can be readily placed in and taken out of the vessel *d*. A plate *g*, which is secured to the top of the pillars *e*, by the handle-shaped nuts *f*, bears against the points of the tubes or skewers. To the tube connection *h*, and to the side of the vessel *d*, are connected respectively the pipes *k* and *l*, which are connected to a pump, whereby the liquor can be forced into or drawn from the chambers *a*, through the yarn and returned into the vessel *d*. By these means, force and suction can be used at any temperature without the aid of a lid and cover as generally used, ensuring safety from accidents that occur with closed vessels.—H. L.

UNITED STATES PATENTS.

***Waterproof;** Process of Treating Materials to Render them* ——. A. H. Hipple, Nebraska. U.S. Pat. 694,859, March 4, 1902.

THE inventor claims the manufacture of compressed waterproof asbestos by incorporating oil in its fibres, vulcanising the oil and compressing. The asbestos is mixed with linseed oil and sulphur, the mass being vulcanised at a temperature of about 300° F.—J. F. B.

***Metal;** Method of Covering Textile and Porous Materials with* ——. J. A. Daly, Washington, U.S.A. U.S. Pat. 694,946, March 11, 1902.

PYROXYLIN, celluloid, or the like is dissolved in amyl acetate or rubber in benzene or chloroform, and the solution is worked up into a paste by the addition of finely-divided metal, such as bronze-powder. The fabric to be treated is then saturated with this mixture and dried, and metal is deposited upon it by electrolysis. The process is especially applicable to lace.—W. G. M.

***Mercerising;** Apparatus for* ——. A. Röner, Oberdollendorf-on-Rhine, Germany. U.S. Pat. 694,100, Feb. 25, 1902.

SEE Fr. Pat. 303,826; this Journal, 1902, 48.—G. T. M.

***Dyeing;** Apparatus for* ——. J. Rhodes, Bradford, England. U.S. Pat. 693,443, Feb. 18, 1902.

SEE Eng. Pat. 25,823, 1898; this Journal, 1900, 44.
—G. T. M.

***Dyeing;** Apparatus for* ——. J. A. Sackville, Manchester, England. U.S. Pat. 693,446, Feb. 18, 1902.

THE apparatus is intended for use in the treatment of piled fabrics; it consists of a vat *b*, *c* (see figures) fitted with a horizontal shaft *e*, carrying two wheels *j j*, having arms furnished with grooves *k*, the ends of these grooved arms being cut obliquely in the manner indicated. The inclined cradle or frame *l* contains a number of loose rods, and as the wheels rotate, the ends of each pair of grooved arms come into contact with the frame, and pick off the lowest rod which falls down the groove. The piece of cloth under treatment, which is fed into the machine between the rollers *t*, has its end looped over the first loose rod, and as the succeeding rods drop into the grooved arms, they come automatically between the several convolutions of the fabric, holding it in position and preventing it from coming into contact with the machine. A piled fabric is fed in with its pile turned away from the axis. The loose rods are furnished with enlarged ends or caps, in order that the adjacent folds of the spiral of cloth do not touch one another. As an alternative method, the fabric in batch form, with rods inserted in each lap or fold, may be held taut in a frame fixed in a rotating holder placed in a dye-vat.—G. T. M.

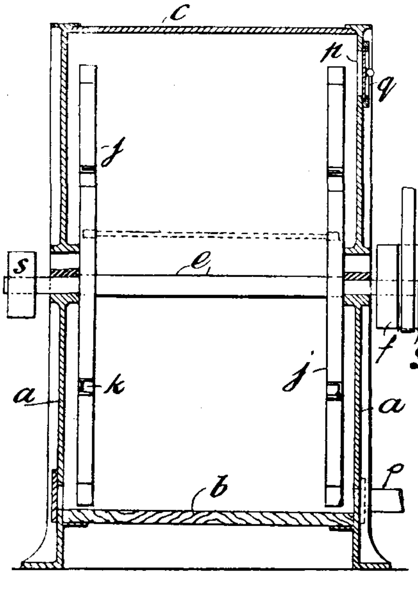
Ageing Apparatus. J. C. Hebden, Providence, R.I., U.S.A. U.S. Pat. 694,640, Dec. 20, 1901.

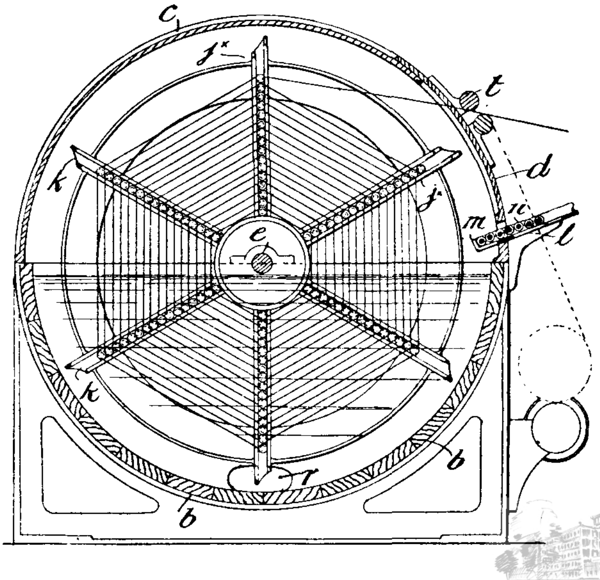
AN endless, travelling apron is arranged horizontally near the bottom of an ageing chamber. The textile materials to be treated, namely, yarns or tissues, are fed in continuously at one end of the chamber, and are withdrawn at the opposite end, after having been carried through the chamber by the apron. Steam and air are supplied to the chamber by means of air injectors. To prevent irregularity in the action upon the dyed or printed yarns or tissues, which occurs in the ageing process, the position of the latter upon the apron is frequently changed, while they are passing through the chamber, by drawing them over rollers placed at intervals above the apron, and allowing them to fall back again upon this. The apparatus is specially designed for use in ageing fabrics dyed with Sulphur dyestuffs, which are passed through it in the wet state immediately after dyeing.—E. B.

***Carpets, Mats, &c.;** Apparatus for Printing* ——. A. F. Lundeberg, Stockholm, Sweden U.S. Pat. 690,746, Nov. 1, 1900.

THE apparatus in question is designed for use in printing carpets in through-coloured patterns.

The carpets are placed between pressure blocks containing cells or depressions, corresponding with each other. The edges of these form the outlines of the pattern which is to be produced. Dye liquors, steam and hot air, are drawn as required into the cells and through the carpets, by means of a vacuum pump connected with the cells in the upper block, through supply pipes communicating with the cells in the lower block.—E. B.





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

Metals; Colouring of ——, by Rieder's Electrochemical Process. Zeits. Elektrochem., 1902, **8**, [7], 101.

See under XI. B., *page* 485.

United States Patent.

Hides; Apparatus for Colouring ——. A. Rigaud, St. Junien, France. U.S. Pat. 691,075, Oct. 25, 1900.

The hides to be dyed are secured to a platform which is moved upon rails under a spraying apparatus. When the hides are treated with different liquors, "as in carrying out different steps of a process," these are applied by means of two or more sets of the spraying apparatus, separate gutters and tanks being provided underneath the several sets, to receive for use again the excess of the liquors which drains from the hides.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid Manufacture; Comparison of Costs and Profits of ——, by the Contact Process and the Modern Chamber Process. F. Lüty and H. H. Niedenführ. Zeits. angew. Chem., **15**, [11], 242—257.

The bulk of the paper consists of an account of recent improvements in the chamber process, all having for their aim the concentration of the process into smaller space and shorter time, including modern developments of the Glover and Gay-Lussac towers, fans or blowers for increasing the draught, cooling arrangements, Meyer's tangential chambers, and the Lunge-Rohrmann plate towers. Concentrating apparatus is also discussed. The authors arrive at the following as the cost of acids of various strengths, including depreciation of plant and interest on capital:—

—	Chamber Process.		Contact Process.
	In its Old Form.	With New Improvements.	
	Marks.	Marks.	Marks.
Chamber acid (containing 100 kilos. H_2SO_4)	2·69	2·33	2·53—2·91
	Platinum Concentration.	Kessler Concentration.	
100 kilos. of acid of 93 per cent. of H_2SO_4	2·74	2·56	2·52
100 kilos. of acid of 97—98 per cent. of H_2SO_4	3·22	..	2·65

So that, for chamber acid, the old process has nothing to fear from the contact process. Even for 93 per cent. acid, if Kessler's apparatus be used for concentration, the old process is still almost on a level with the contact process; but for more concentrated acids still, the contact process is in the better position. Under present circumstances, however, a 93 per cent. acid (and perhaps 97 per cent. acid) would be most cheaply made by dissolving anhydride or fuming acid from the contact process in chamber acid from the old process; the figure for this would be 2·52 marks per 100 kilos.; and in the case of small works the author suggests the association of a number of makers by the old process in the erection and working of a contact plant, which cannot be profitably carried on on a small scale. Further improvement in the chamber process is still to be looked for, too, in the more scientific utilisation of the heat of reaction. A step in this direction has recently been taken by Zanner, whose apparatus for concentrating chamber acid by the heat of the gases from the burners as they pass to the Glover towers (this Journal, 1901, 717) has already given excellent results.—J. T. D.

Sulphuric Acid; Physical Chemistry of ——. O. Sackur. Zeits. Elektrochem., 1902, **8**, [6], 77—82.

The article summarises the work of Knietsch (see this Journal, 1902, 172—173, and 343) on the catalytic process for the manufacture of sulphuric acid. The author, however, differs from the statement that dilution with indifferent gases exerts no influence on the yield. Since

$$\frac{(SO_2)^2.O_2}{(SO_3)^2.v} = k,$$

where v = the total volume, and the expressions within brackets represent, respectively, the quantities of the substances—

$$\frac{SO_3}{SO_2} = \sqrt{\frac{O}{v.k}}$$

Hence dilution with air containing nitrogen must give rise to a diminished yield. Attention is drawn to the special characteristic properties of the 98 per cent. acid, which might be explained by assuming that it has a definite chemical formula, $nH_2SO_4 + mH_2O$, an assumption which derives support from the fact that acid of this strength, and of this strength alone, distils over unchanged. But, as it is not proved that at a different pressure, some other strength of acid might not have this property, and as the formula of such an acid would be very complex, it is probably safer to assume that the strong acids are liable to dissociation, according to the expression $2H_2SO_4 \leftrightarrows H_2SO_4.H_2O + SO_3$. It is shown how, although this is, at first sight, opposed to the work of Lidbury (Zeits. physikal Chem., **39**, [4], 464), it may not really be so; whilst it is in conformity with the observations of Gahl (Zeits. physikal Chem., **33**, 208) on the partial pressure of H_2SO_4 in 100 per cent. and slightly diluted acids; and also of Schenk (Annalen, **316**, 1; and this Journal, 1901, 577—578) and Oddo (Gaz. chim. Ital., **31**, II., 158), showing the existence of polymeric modifications of SO_3.—W. G. M.

Ozone; Formation of ——. A. de Hemptinne. Bull. Acad. roy. Belgique, 1901, 612—621. Chem. Centr., 1902, **1**, [7], 391.

The following conclusions are arrived at, as to the most favourable conditions for the formation of ozone by the electric discharge. The distance between the electrodes in the ozoniser has a considerable influence on the yield, which reaches a maximum when these are at a certain definite distance from each other. The pressure of the air has no appreciable influence, but the volume of air is of importance, although with an increase of the latter, the yield of ozone does not increase in the same ratio. A maximum amount of ozone is also produced when the bright sparks attain a definite length, but this maximum varies with the distance between the electrodes, the velocity of the current of air, and the intensity of the electric current. The use of oxygen instead of air causes an increase of the yield of ozone, but not to such an extent that it can be recommended in practice. With regard to the influence of the intensity of the electric current, it is advantageous with a definite amount of electrical energy, on the one hand, to work with low tension, in order to attain a greater strength of current, which is favourable for the formation of ozone; on the other hand, low tension necessitates a decrease of the distance between the electrodes, and this affects the yield injuriously. The conditions necessary for the attainment of the best yield must be fixed experimentally.—A. S.

Base between Two Acids; Method of Determining the Ratio of Distribution of a ——. H. M. Dawson and F. E. Grant.

See under XXIV., *page* 504.

English Patents.

Sulphuric Anhydride; Catalytic Bodies and the Manufacture of ——. J. Wetter, London. From the Firm of E. de Haen, Hanover, Germany. Eng. Pat. 8545, April 25, 1901.

Asbestos or other porous mineral matter is impregnated with solution of ammonium vanadate, or of other soluble vanadium compound, and is then dried and calcined, for application as a catalytic agent in the production of SO_3 from SO_2 and oxygen.—E. S.

Sulphuric Acid; Apparatus for Concentrating ——. A. Zanner, Brussels, Belgium. Eng. Pat. 2379, Jan. 29, 1902.

See U.S. Pat. 693,635, 1902; see below.—E. S.

Potassium Cyanide; Purification of ——. G. W. Johnson, London. From The Stassfurter Chemische Fabrik vormals Vorster und Grüneberg, Stassfurt, Germany. Eng. Pat. 8257, April 22, 1901.

Raw cyanide is heated in a funnel-shaped crucible, having near its tap-hole at the bottom, a filter of refractory material, and as the cyanide melts and flows through the filter, access of air is obstructed by continual additions of cyanide into the upper compartment of the crucible.—E. S.

Separating Fluids rich in Oxygen from Air; Process and Apparatus for ——. E. A. Le Sueur, Ottawa, Canada. Eng. Pat. 4828, March 7, 1901.

The apparatus is constructed on a counter-current system, in one passage of which the air is reduced in temperature, and a portion of it liquefied. At the low temperature end of the system, the liquefied portion is separated from the unliquefied portion, and the latter is allowed to expand through a motor to abstract heat from the system prior to its rejection from the apparatus. Preferably, the aqueous matter is discharged by a preliminary refrigeration of slight intensity. The liquefied portion of the air, with or without a preliminary treatment by fractional distillation to increase its oxygen strength, is either withdrawn as a liquid or is caused to vaporise at the expense of the latent heat of fresh incoming air. In the latter case, the product of its vaporisation travels through a passage in the counter-current system, so that it is raised to ordinary temperatures before its withdrawal.—R. A.

United States Patents.

Sulphuric Acid; Apparatus for Concentrating ——. A. Zanner, Brussels. U.S. Pat. 693,635, Feb. 18, 1902.

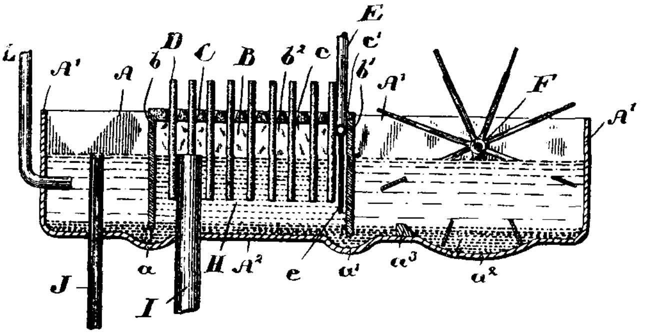
The apparatus consists of a rectangular cast-iron vessel, covered internally by earthenware plates cemented to the iron surfaces by a mixture of water-glass and asbestos, and divided into compartmentss by cross partitions of similarly protected plates, perforated alternately at opposite ends to admit of a serpentine circulation of the acid to be concentrated. The partitions are arranged to impinge upon the joints in the plates lining the sides. The cover is similarly protected. A pipe for exit of the acid distilling off is provided near the top of the vessel, and other pipes near the bottom serve as inlet and outlet passages.—E. S.

Sulphuric Anhydride; Apparatus for Cooling and Absorbing ——. G. C. Stone, Jersey City, U.S.A. U.S. Pat. 695,180, March 11, 1902.

A number of pipe sections, inclined with respect to each other, and joined by U-shaped intermediate connections, enter, both at the upper and the lower ends, into a "multiform," the upper multiform receiving the water or sulphuric acid for absorbing the SO_3, and the lower receiving the gases and vapours from the contact apparatus, which thus pass upwards against the flow of liquid. Each pipe-section is provided with a dam extending transversely across its lower end, an aperture being left for passage outwards of the absorbing liquid, which has exit by a side tube in the lower multiform. The apparatus is immersed in water, or may be otherwise cooled. The uncondensable gases escape from the upper multiform.—E. S.

Chlorine Gas and Caustic Soda from Common Salt; [Electrolytic] Machine for Producing ——. G. M. Wilson, Saulte Ste. Marie, Canada. U.S. Pat. 693,678, Feb. 18, 1902.

A rectangular metal chamber, open at the top (shown in section in the drawing), is provided with the bottomless inner cell B, having non-conducting sides, and a carbon cover C, with numerous perforations, in which perforations the carbon electrodes D are inserted, a few only of which can be shown in the section. The two wells or depressions in the bottom of the chamber, a and a^1, are immediately below the side walls of the inner cell (which rests on the bottom of the chamber, near the edges); and the third well a^2 is shaped to the paddle F. The two wires from the source of electricity are connected respectively to the cover plate C and to the metal wall of the outer cell. Water is continuously admitted through the pipe L, the overflow for the outer cell being through the pipe J. Brine passes into the inner cell through the pipe E, having branches e reaching to near the bottom, the overflow being through the pipe I, which also conveys the chlorine liberated. Mercury at the bottom of the chamber has a sufficient depth to lute the inner from the outer cell. As the paddle-wheel rotates, it sweeps the mercury from the well a^2 over the guide-wall a^3, and so into the well a^1, and under the inner cell into the opposite side of the chamber, whence it is forced by the pressure to the side walls, and returns to the well a^2, and so continuously. The sodium taken up by the mercury from the decomposition of the brine yields caustic soda to the water in the outer cell, the solution having outflow through the pipe J.—E. S.



Chlorine and Alkaline Hydrates; Production of —— *Electrolytically.* E. D. Chaplin, Winchester, and H. G. Halloran, Boston, both of Mass., U.S.A. U.S. Pat. 695,033, March 11, 1902.

The electrolytic cell is preferably, but not necessarily, circular in form, and consists of two superimposed parts. The lower is a shallow circular tray; the upper part is of stoneware, porcelain, or other impervious material, and is also circular, fitting on to the lower tray and forming a continuation of its side walls upwards. The walls of the upper vessel are turned over inwards at the top for a short distance, and then downwards again to the level of the joint with the lower tray, so that the upper portion consists of an annular vessel of ∩-section, having its outer wall resting on the wall of the tray below. Between the upper and lower divisions is stretched an asbestos-cloth or other diaphragm, held firmly in place by clamping the two parts of the apparatus together. Within the annular chamber, graphite or other carbon anodes are suspended symmetrically, passing air-tight through holes in the roof of the compartment. A ring of copper, connected with the positive pole of the generator, rests on pins attached to the projecting carbon rods, and thus makes contact with them, all outside the cell. The cathode, consisting of a horizontal spiral of copper, is supported in the inner chamber, which may be covered or left open, according as the hydrogen produced is to be collected or not. An inflow pipe for the solution of chlorides of the alkali metals is provided below the asbestos diaphragm, and a specially devised overflow pipe, for the removal of the hydroxide solution at will, is connected to the top of the inner cell. A vent for the chlorine and a manometer-tube are passed through the top of the annular cell. The asbestos diaphragm is held in place by the inner as well as the outer wall of the annular chamber, so that it effectually screens (by a porous division) the anode from the cathode compartment.—W. G. M.

Triple Salt, and Method of making same. E. Courant, Berlin. U.S. Pat. 693,378, Feb. 18, 1902.

THE patented triple salt consists of two cyanides and of a salt other than a cyanide, having an alkali or alkaline earth base. To obtain $Ag_2Cy_2BaCy_2BaCl_2$, one molecule of silver oxide is dissolved in a solution of two molecules of barium cyanide to form the soluble substance $Ag_2Cy_2BaCy_2BaO$, which is then treated with hydrochloric acid, not in excess. Or, barium hydroxide is added to a solution of silver-barium cyanide and then hydrochloric acid to form the triple salt. Other triple salts may be similarly produced, and are stated to be more stable than the corresponding double cyanides. It is proposed that in depositing copper electrolytically, a certain proportion of the copper triple salt Cu_2Cy_2, 4KCy, K_2SO_3 should be employed in the electrolyte, using a copper anode, and the zinc article to be coated as cathode.—E. S.

Alkaline Cyanides; Apparatus for Obtaining ——. G. Craig, Glasgow, N.B. U.S. Pat. 695,037, March 11, 1902.

SEE Eng. Pat. 22,482, 1900; this Journal, 1901, 809.
—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

[*Pottery*] *Biscuit Bodies.* H. Hegemann. Sprechsaal, **35**, [9], 313—314.

THE chief consideration in preparing biscuit bodies is to grind the materials exceedingly fine, to prevent discoloration —due to excessive porosity—in the muffle. This is particularly necessary in bodies containing sand, or they will not be sufficiently compact when fired. A high percentage of kaolin, and low proportion of quartz will give a fine-grained biscuit with a marble-like structure; *e.g.*, kaolin, 50; felspar, 35; quartz, 15 parts. A good body for dolls' heads is prepared from kaolin, 46¼; felspar, 38½; quartz, 15¼ parts; the firing temperature is that of Seger cone 12, and the ware is very strong.

Other bodies suitable for the same firing temperature are obtainable from: (1) Kaolin, 40; felspar, 25; quartz, 35 parts. (2) Kaolin, 46; felspar, 7; quartz, 40; lime or levigated chalk, 7 parts. (3) Kaolin, 48¼; felspar, 13¾; Martinroda sand, 36; calc-spar or chalk, 2 parts. (4) Kaolin, 44¼; felspar, 6¼; quartz, 29¾; calc-spar or chalk, 9¼; pumice, 10½ parts.—C. S.

ENGLISH PATENTS.

Glass Articles; Apparatus for Manufacturing ——. O. Imray, London. From J. A. Chambers, Pittsburg, Pa., U.S.A. Eng. Pat. 24,468, Dec. 2, 1901.

IN this apparatus, molten glass is supplied from a tank to a trough in a heated chamber or from a front extension of the tank. The trough can be raised by a lever, and immediately over it, when raised, is a hole in the top of the chamber, surrounded by a water-cooled ring, for chilling, by radiation, the glass cylinder that is being drawn. Above the hole is a mechanism for drawing the glass, which mechanism by its movement opens a valve and automatically increases the air supply as the cylinder increases in length.—W. C. H.

Enamelled Vessels; Manufacture of ——. C. A. Allison, London. From The Dubuque Enamelling Company, Iowa, U.S.A. Eng. Pat. 23,280, Nov. 18, 1901.

THIS process of manufacturing vessels, especially army canteens, consists in assembling certain parts, and coating all the parts with enamel, which is allowed to dry and is burnt on, then adding the remaining parts, and again applying coats of enamel internally and externally, allowing them to dry, and finally heating to cause the coats to fuse and fill all cracks and crevices.—W. C. H.

Clay; Apparatus for Moulding Articles in ——. W. B. Rowley, S. H. Rowley, M. J. Adams, and T. Till, all of Swadlincote, Derby. Eng. Pat. 7030, April 3, 1901.

THE apparatus comprises a mould having externally the shape of the interior of the article to be moulded, two moulding rolls to mould the exterior of the article, a table for carrying the mould between the rolls, and a means by which the rolls are made to revolve.—W. C. H.

Annealing Boxes, Glass Melting Pots, &c.; Furnaces for Heating ——. W. S. McKenna and H. Whiteley, U.S.A. Eng. Pat. 15,611, 1901.

See under II., *page* 460.

UNITED STATES PATENTS.

Glass Articles; Manufacture of Hollow ——. P. T. Sievert, Dresden. U.S. Pat. 694,685, March 4, 1902.

MOLTEN glass, in sufficient quantity to produce the article desired, is spread on a plate, and a ring or rim pressed on to it; the plate and ring are inverted together, when the glass inside the ring sags; the plate is then removed and the glass allowed to sag either until it ceases to be plastic or until it reaches a mould placed under the ring to determine its ultimate shape. The inventor claims this method of making glass, by its own weight, mould itself into articles of definite form.—J. W. H.

Tile; Process of Glazing ——. H. C. Mueller and K. Langenbeck, Zanesville, Ohio, U.S.A. U.S. Pat. 693,420, Feb. 18, 1902.

THE tiles are spaced and fixed on a base, such as paper, which is disintegrated by the heat of the kiln; finally they are coated in any convenient manner with the glazing material, and fired.—J. W. H.

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

Building Materials; Testing of ——. M. Gary. Report of the International Association for the Testing of Trade Materials. From the third meeting, held at Budapest, 1901. Mitt. aus den königl. t. Versuchs-Anst. zu Berlin, 1901, **19**, [4], 189—211.

THE Association of German Portland Cement Manufacturers defined Portland cement as a product made by burning, at a sintering temperature, an intimate mixture of calcareous and argillaceous materials, as essential constituents, the resulting mass being afterwards ground to a fine powder. Steps were subsequently taken to prevent the admixture of foreign bodies, especially blast-furnace slag.

The report deals with the following points:—

Purity of Portland Cement.—The chief injurious admixtures are lime, magnesia, and gypsum; the proportions present can be determined with certainty only by chemical analysis. Other admixtures are, colouring matters, clay, sand, ashes, hydraulic lime, trass, blast-furnace slag, &c., which, except the last, can be detected by noting the sp. gr., loss on ignition, and action of dilute acid; the alkalinity of the aqueous solution and amount of carbon dioxide give evidence of the addition of hydraulic lime (0·5 grm. of cement require 4—6·25 c.c. of N/10 HCl, and 3 grms. of cement should not give more than 1·8 mgrms. of CO_2). For the detection of blast-furnace slag, Fresenius proposed a comparison with the following values for pure cement:—(*a*) Sp. gr. at least 3·125. (*b*) Alkalinity of aqueous extract, as above. (*c*) 1 grm. of cement, treated direct, requires 18·8—21·67 c.c. of N/10 acid. (*d*) 1 grm. of cement reduces 0·79—2·8 mgrms. of potassium permanganate. Details for carrying out the determinations are given, including sp. gr. separations by means of methyl iodide.

Rules for Cement-testing. I. *Weight.*—No values are given in the Prussian rules for the weight of a unit volume. A full cask (the size of which is not given) to be taken at 180 kilos. (400 lb. English) gross and 170 kilos. nett. For determining the weight on an experimental scale, methods in use in different places of filling the vessel are discussed, *e.g.*, spreading the powder on a surface inclined at a definite angle and allowing it to flow into the vessel. The author recommends the simple French apparatus, consisting of a funnel with a sieve bottom, described in the proposals of the sub-committee B. of the International Association for Testing Trade Materials, Dresden, Sept. 27, 1899, together with a cylindrical litre vessel in which the diameter is to the height as 3:2.

II. *Time of Hardening.*—In the Prussian rules, cements are described as slow- or quick-hardening cements, the former being those which set only after two hours or more. The method of testing cements in this particular, consists in making a thick paste, which is spread on a glass plate, the cement being considered "set" when the finger-nail no longer makes an impression on it. For more exact experiments, the paste is pressed into a shallow ring, and a "normal needle," weighing 300 grms. and having a cross section of 1 sq. mm., placed on it; the time in which this is no longer able to penetrate the paste is taken as the "beginning of setting," the "time of hardening" being the interval that elapses before the needle makes no appreciable impression. The temperature of the air, and of the water used for mixing the paste, should be 15°—18° C. The author adds some observations on these determinations, and mentions some pieces of apparatus that have been made for the purpose. The hygrometric condition of the air in the "setting room" should also be noted. Many freshly-made cements which are "slow-hardening," in time become "quick-hardening," and then again get slower. This and other points are under the consideration of committees.

III. *Constancy of Volume* (*Raumbeständigkeit*).—A cake of cement, laid under water after 24 hours, should during further observation show no crumbling or cracks; these show a tendency of the cement to "fly." The time of observation should be from 3—28 days. This is a serious objection to the method, for which quicker methods have been proposed by Michaëlis, Heinzel, Tetmajer, &c., though it is pointed out these are not absolute, and cannot replace practical trials. The author regards them as useful for control tests.

IV. *Fineness.*—According to the Prussian rules, a Portland cement should leave at the most 10 per cent. of residue on a sieve of 900 meshes to the square centimetre, the thickness of the wire being half the width of the mesh. The author points out that most German cements on the market leave less than 10 per cent. residue on such a sieve, cements with 20 per cent. residue on a sieve of 5,000 meshes per 1 sq. cm. being rare.

V. *Strength.*—1. *Composition of the Bodies.*—(*a*) *Cement-Sand Mixing:* The strength of a cement is determined on a mixture of three parts by weight of normal sand (described below) and one part by weight of the cement to be tested. The shape and cross-section of the test bodies must be equal, and the tensile and compression strengths must be determined by a uniform method. Owing to the recent advances in cement manufacture, it is desirable to obtain greater differentiation by this test, and the author suggests the addition of a number expressing the cementing limit between the cement and sand.

(*b*) *Normal Sand:* The Prussian normal sand is a pure quartz-sand from Freienwalde, from which the larger particles are separated by a sieve of 60 meshes to the square centimetre, and the finer particles by a sieve of 120 meshes. The author mentions differences in the strength tests when other normal sands are used, even when they have been prepared as directed, and gives an account of work that has been done on this subject at Charlottenburg and elsewhere.

(*c*) *Method of Mixing:* The cement and sand are mixed on a plate, with the addition of 10 per cent. of water, and thoroughly worked up. This amount of water is almost always too much, and experiments show that machine mixing is preferable to hand mixing. The following official method is described:—500 grms. of cement and 1,500 grms. of normal sand are mixed, dry, for half a minute, with a light spoon, on a dish, and after the addition of water, for a further half-minute, and then in a Steinbrück-Schmelzer machine. Of this mortar, 860 grms. are put in the blocks (of which a sketch is given; see also Mitt. aus den königl. t. Versuchs-Anst., 1896). Eight and ten per cent. of water is then added, and from the behaviour of the mass the proper amount to use is estimated; the proper amount is found when 90—110 strokes begin to force the cement paste out of the channels; the mean of three experiments is taken. The samples for the strength tests are made with the addition of water thus determined.

2. *Ramming Process* (*Rammverfahren*).—(*a*) *Normal Mortar:* This may be either by hand or with a Böhme apparatus provided with a 2-kilo. hammer, which gives 150 beats to each sample.

(*b*) *Pure Cement:* The determination of the strength of pure cement is useful for comparing Portland cements with mixed cements and other hydraulic cementing materials, apart from the influence of the admixed sand. According to the Prussian rules, 1,000 grms. of cement are worked up with 200 c.c. of water for five minutes with a pestle, and pressed into a mould with an iron spatula 5—6 cm. wide, 35 cm. long, and of about 250 grms. weight, till the cement is elastic, and when sufficiently hard is taken out and kept in a moist atmosphere. This quantity of water is often too much, but if too small, the tensile strength will diminish and not increase after a certain time.

3. *Injurious Influences on the Strength of Samples.*—(*a*) *Testing Apparatus:* That used at Charlottenburg is described in "Mitt.," 1896, p. 155 *et seq.* For mortar mixing, &c., are mentioned the Steinbrück-Schmelzer, and Böhme's with Martens' filling contrivance; for a tearing machine, the Frühling-Michaelis; and for compressing, a 32-t. Amsler-Laffon press.

(*b*) *Form of the Samples:* For breaking tests, bodies with a breaking-surface of 5 sq. cm., and for compression tests, cubes of 50 sq. cm. surface are used. The form of figure 8 is used for the tensile tests.

(*c*) *Value of Tensile and Compression Tests:* Though the relation of these in hydraulic cements is different, the latter is often taken as a measure of the value, and gives rise to erroneous conclusions. Again, the results of strength tests by 28-day tests may be equal, whereas 7-day tests may be different. The compression test is again coming to be considered the more reliable, and with it the differences between individual values and the mean value are less than is the case with tensile tests.

(*d*) *Examination of Tests:* For tensile tests the pull should amount to 100 grms. per second during the breaking, and the mean of 10 determinations taken. For compression tests the pressure is applied to the sides, and not to the bottom and upper smoothed surface. Other influences must be noted, as renewal of the water, shaking, possibility of the sample drying by evaporation or draughts during the first 24 hours, and also the temperature of the air and water.

4. *Values for Portland Cement.*—Slow-hardening cement should, by the test with 3 parts by weight of normal sand to 1 part by weight of cement after 28 days' hardening—1 day in the air, and 27 days under water—have a minimum tensile strength of 16 kilos. per sq. cm. and a minimum compression strength of 160 kilos. per sq. cm. For quick-hardening cements, the strength in general is somewhat less.—W. C. H.

Limestone; Chemical Composition of Dalmatian Bituminous

——. J. Slaus-Kantschieder. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [3] 54—55.

According to the author, Dalmatian bituminous limestone has been employed in large quantities for building purposes in Venice, especially on the islands of Brazza and Bua.

In determining the amount of bitumen, the finely-pulverised, dried material was repeatedly extracted with carbon bisulphide in a small beaker, and then with benzene, and the residue transferred, with the aid of alcohol, to an asbestos filtering tube, and dried at 90° C. until constant in weight.

The following partial analyses were made with samples of different origin:—

Origin.	Moisture.	Residue on Ignition.	Carbonic Acid.	Bitumen.	Organic Substances.
	Per Cent.	Per Cent.	Per Cent	Per Cent.	Per Cent.
Luke (Brazza)	0·248	51·28	43·05	4·97	0·45
" "	0·352	53·36	39·02	6·91	0·36
Dolac (Sinj) .	trace	73·21	..	12·01	..
Knin	1·140	49·72	38·56	9·93	0·65
Dalmatia	0·752	49·65	40·08	9·22	0·30
Sinj district..	trace	50·40	42·77	6·57	0·46

A fuller analysis of four other samples of bituminous limestone gave the following results :—

Origin.	Moisture.	Residue on Ignition.	SiO_2	$Fe_2O_3+Al_2O_3$.	CaO.	MgO.	SO_3.	Carbonic Acid.	Bitumen.	Organic Substances.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent	Per Cent.	Per Cent.
Dramotin..................	0·56	47·98	1·90	trace	45·93	trace	0	36·09	14·04	1·33
Drnis........................	0·324	53·40	4·75	0·59	48·01	0	trace	32·21	13·80	0·26
Ploce (Montenegro)	0·43	51·63	5·92	3·20	32·26	4·75	..	28·40	1·67	17·87
Sinj	0·68	40·50	..	..	..	..	..	24·42	3·58	30·81

The third sample (Ploce) also contained 5·21 per cent. of alkali chloride, expressed as sodium chloride. Both the two last samples yielded on dry distillation, a considerable proportion of dark brown viscous oil resembling crude naphtha.—C. A. M.

Slaked Lime ; Preparation of ——. W. Michaelis. Ger. Pat. 128,050, March 13, 1900.

In order to produce slaked lime of suitable moisture content for special purposes, *e.g.*, the manufacture of artificial sandstone, the inventor takes suitable proportions of colloidal calcium hydrate (pit-slaked) and dry hydrate, mixes them together, and introduces the mixture (packed in closed iron chests) into a high-pressure steamer. The dry steam in the latter cannot convert the dry calcium hydrate into the colloidal modification; but at the same time the excess water in the pit-slaked lime is prevented from evaporating, and is compelled to act upon the adjacent particles of dry hydrate, and complete the slaking of same, under the influence of the prevailing high temperature in the apparatus. The product is a fully-slaked paste suitable for mixing with sand to make artificial stone, and will not be liable to any subsequent defects caused by after-slaking.—C. S.

English Patents.

Artificial Stone, and Manufacture thereof. N. Brooke, Lightcliffe, and W. Glossop, Hipperholme, Yorks. Eng. Pat. 383, Jan. 6, 1902.

The waste obtained in quarrying York stone is ground to a powder, and the impalpable dust removed by washing. The powdered stone is mixed with Portland cement or other binding material, moistened with water, placed in porous moulds and subjected to great pressure.—W. C. H.

Artificial Stone; Machine for Preparation of Materials for ——. W. Schwarz, Zürich, Switzerland. Eng. Pat. 18,163, Sept. 11, 1901.

This machine for the manufacture of artificial stone from sand and lime consists of a mixing vessel, with a steam jacket, an appliance for introducing a regulated quantity of water or steam, with or without an appliance for exhausting the mixing vessel; and in some forms an appliance is added for leading off vapours arising from the slaking of the lime.—W. C. H.

Kilns; Rotary Burning or Roasting ——. H. H. Lake, London. From Fellner and Ziegler, Frankfort-on-the-Maine. Eng. Pat. 9369, May 6, 1901.

In rotary kilns, fired with coal-dust, a better heating effect is obtained when the fire-jet is directed slightly to one side and downwards. Consequently in these kilns, the jet is provided, on the outside of the kiln, with a cylindrical part mounted on a shaft, by which means it can be inclined at any desired angle to the axis of the kiln. The jet is also mounted in a flanged guide-ring, to be capable of taking any radial position. The nozzle is flattened, and the width of the aperture can be varied by means of movable jaws.—W. C. H.

United States Patents.

Wood; Method of Creosoting ——. C. S. Friedman, Philadelphia, U.S.A. U.S. Pat. 693,697, Feb. 15, 1902.

The mixture for creosoting wood is applied in the usual way, and consists of glue, 1 lb.; water, 2 qrts.; potassium bichromate, 3 oz.; zinc chloride, 4 oz.; creosote, 2 galls. The creosote becomes minutely diffused in the solution after the manner of an emulsion.—J. W. H.

Wood; Process of Producing Artificial ——. E. Helbing, Hamburg. U.S. Pat. 694,014, Feb. 25, 1902.

The process for producing artificial wood from turf consists in first thoroughly washing the turf, and retaining as far as possible its natural fibre, then adding a mixture of hydrate of lime and sulphate of aluminium, then pressing whilst moist for a short time and allowing it to harden in the atmospheric air. (See Eng. Pat. 13,136, 1901 ; this Journal, 1901, 991.)—J. F. B.

Wood; Process of Preserving ——. I. B. Sprague, Everett, Washington, U.S.A. U.S. Pat. 694,212, Feb. 25, 1902.

Pieces of rusty iron are driven, about 2 inches apart, into the wood, and iron borings pressed into the intervening spaces. Finally, immersion in an oxidising liquid ("a salt solution containing rust") completes the treatment, which is especially intended to prevent the destructive attacks of teredoes.—J. W. H.

Stones, Tiles, &c.; Manufacture of Artificial ——. E. Rott, Dassel, Germany. U.S. Pat. 693,906, Feb. 25, 1902.

Natural clay is mixed with cream or milk of lime, and the mass which becomes hot and finally, dry and crumbled, stored for use. This mass is made into a paste with water and formed into articles, which are hardened by steam at a pressure of not more than 25 atmospheres.—J. W. H.

Concrete Joint. E. L. Ransome, New York. U.S. Pat. 694,578, March 4, 1902.

Layers of concrete are bonded into each other by means of small pieces of honeycomb slag.—J. W. H.

Magnesia; Compound of ——. E. Rueff, New York. U.S. Pat. 694,424, March 4, 1902.

One part of powdered calcined magnesite, mixed with 20 parts of water, is agitated under a stated pressure with carbon dioxide "until the mixture has absorbed less than one part, by weight, of the gas." The mixture is then gradually heated to about 160° F., is drained, dried, and shaped into desired forms under a pressure of from 200 to 1,000 lb. per square inch. This compound, as stated in the second claim, "contains at least twice as many molecules of magnesia as of carbon dioxide, and more molecules of water than of magnesia, said compound being very finely-divided and light, forming porous lumps in presence of water, being a bad conductor of sound and heat, and possessing when pressed or moulded great tensile strength and elasticity." It is stated to be suitable for lining interior walls, for fireproofing, and for covering boilers and pipes, &c.—E. S.

Cement; Composition of Matter for ——. J. D. MacDonell, Littleriver, Florida, U.S.A. U.S. Pat. 691,397, Jan. 21, 1902.

The composition consists of three barrels of crushed calcareous rock, one barrel of calcium sulphate, one barrel of cement (any manufacture), 4 oz. of nitric acid, 4 oz. of nitro-hydrochloric acid, 1 quart of crude carbolic acid, and 10 gallons of water. The ingredients are thoroughly mixed, dried, and screened.—W. C. H.

Cement; Manufacture of ——. J. Steiger, London, England. U.S. Pat. 694,802, March 4, 1902.

Hydrated silicic acid is produced by heating powdered silicates with a solution of magnesium chloride (at 130° C. or over) until the mass stiffens; it is allowed to cool, crushed, powdered, and finally mixed with powdered calcined magnesite.

The proportions given are:—80—90 parts of a 50 per cent. solution of magnesium chloride, 20—30 parts of siliceous matter (slag or granite, say), and 150—200 parts of calcined magnesite. (See Eng. Pat. 4657, 1901; this Journal, 1902, 409.)—J. W. H.

Kiln; Lime, Cement, or like ——. I. Isserlis, Kiew, Russia. U.S. Pat. 691,145, Jan. 14, 1902.

The kiln consists of several compartments arranged in line. The compartments communicate at the bottom, and are provided with chimneys at the top. Hearths are arranged on the opposite sides of each compartment. The claims also include the arrangement of feeding doors, fire-grates, with auxiliary grates, ash-pans containing liquid, and means for supplying fuel.—W. C. H.

X.—METALLURGY.

Clay Slimes; Treatment of ——, *by the Cyanide Process, with Agitation.* A. H. Tays and F. A. Schierz. Chem.-Zeit. Rep., 1902, 72.

At San José de Garcia, Sinaloa, Mexico, the ores of the Guadeloupe mines were at first only treated by the amalgamation process, when gold to the value of 80 marks per ton remained. The tailings were then profitably treated with cyanide. Finally, the authors were confronted with the problem of treating 16,000 tons, consisting of 75 per cent. of clay slimes and 25 per cent. of sand slimes. The material contained ferric oxide, pyrites, small quantities of lead and copper sulphides and carbonates, and 52 marks of gold and 40 grms. of silver per ton. The copper amounted to 0·11 per cent. Preliminary experiments showed that 90 per cent. of the noble metals could be extracted by twice treating with cyanide and lime; by 24 hours' action, only 75 per cent. was regained. Vats provided with stirrers were then erected. The best results were obtained with a 0·15 per cent. cyanide solution, the consumption of cyanide being 7 lb. per ton; 78·56 per cent. of the gold was extracted. The slimes were mixed with 1·5 times the quantity of cyanide solution and brought into a vat containing more cyanide solution, 18 tons being used to 10 tons of slimes. The agitation lasted 5 hours; 30 minutes before the end, 5 lb. of slaked lime per ton were added. After settling for 7 hours, 70 per cent. of the solution could be drawn off quite clear; without lime, there was practically no settling. When a smaller proportion of slimes to the cyanide solution was taken, the settling was much slower. When the sand slimes were mixed with clay slimes, 80 per cent. of the solution could be drawn off. The residue was again washed with water or dilute cyanide, and then emptied out. About 0·9 lb. of zinc was used per ton of slimes. The fine particles of zinc and the slimes from the zinc boxes were taken to a filter-press, and thence to the furnace. The coarser particles of zinc were first treated with sulphuric acid. In smelting, 34 kilos. of borax, 24 kilos. of sodium bicarbonate, 5 kilos. of sand, 3 kilos. of ashes, 6 kilos. of clay, and 5 kilos. of hematite were used to 100 kilos. of the gold slimes. The cost of the treatment per ton of slimes amounted to 20 marks, composed of potassium cyanide, 8 marks; zinc, 0·80 mark; labour and management, 4 marks; taxes, 2 marks; other expenses, 5·20 marks.—A. C. W.

Gold and Silver; Detection and Determination of Small Quantities of ——. L. Wagoner.

See under XXIII., *page* 501.

Platinum Metals; Detection by the Action of Sodium Peroxide on the ——. Leidié and Quinnesseu.

See under XXIII., *page* 499.

Mercury Ores (Dalmatian), and their Determination. C. Ehrmann and J. Slaus-Kantschieder.

See under XXIII., *page* 501.

Metals; Distillation of ——. G. W. A. Kahlbaum, K. Roth, and P. Siedler. Zeits. anorg. Chem., **29**, 177—291. Chem. Centr., 1902, **1**, [9], 519.

By aid of Kahlbaum's mercury air-pump (see this Journal, 1894, 760), the authors have succeeded in distilling *in vacuo* a series of metals. The distillation apparatus was constructed of porcelain, and the course of the distillation was followed by means of Röntgen rays. The metals purified by distillation were examined as to their specific gravity, specific heat, and crystalline form. The specific gravities and specific heats of the distilled metals are shown in the following table:—

Table.	Specific Gravity at 20°/4° C.		Specific Heat.	
	Unpressed.	Pressed.	Unpressed.	Pressed.
Cu	8·93258	8·93764	0·09272	0·09266
Ag	10·4923	10·5034	0·05608	0·05623
Au	18·8840	19·2685	0·0309	0·03087
Pb	11·3415	11·3470	0·03053	0·03083
Zn	6·9225	7·12722	0·0939	0·0940
Cd	8·64819	8·64766	0·0559	0·0560
Te	6·23538	..	0·04878	..
Sb	6·61781	6·69090	0·04973	0·04957
Bi	9·78143	..	0·03055	..

—A. S.

Steel; Want of Homogeneity of Soft Basic Martin ——. A. Riemer. Stahl u. Eisen, 1902, **22**, 269.

In running ingots of low-carbon ingot-iron, platy crusts are apt to form (from 2 to 4 cm. thick), and to float on the surface. When the metal is thick-flowing, the heavier metal of high fusing point first crystallising out is liable to cling to the sand in the channel leading to the mould. This accounts for the higher percentage of silica found in these crusts. The want of homogeneity of these ingots is due entirely to physical causes.—W. G. M.

Steel; Study of the Transformations of ——, *by the Method of Expansibility.* G. Charpy and L. Grenet. Comptes Rend., **134**, [10], 598—601.

The expansion method has the advantage over the pyrometric method, that the temperature may be raised as gradually as desired, and the results of heat-absorption or evolution during transformation thus eliminated. The authors' results may be summarised as follows:—In steels and cast-irons containing but traces of elements other than iron and carbon, expansion is regular up to 700° C. Then transformation begins, evidenced by a contraction, the extent of which increases with the carbon-content up to a maximum about 0·85 per cent. of carbon, and persists during a temperature-range of from 5°—15° C. Then, as the temperature rises, expansion begins again, slowly diminishes, and is followed by a second (but very gradual) contraction, extending over 190° for a steel of 0·08 per cent. of carbon, 80° for one of 0·25 per cent., and becoming imperceptible with steel of 0·65 per cent.

The temperature of the first contraction agrees closely in all cases with the critical point α_1 (700° C.), observed pyrometrically, and that of the upper limit of the second contraction (perhaps, for steels above 0·85 per cent. of carbon a dilatation) with the point α_3 (800° to 890° C.); but these experiments show no indication of the pyrometric point α_2.

These observations agree with the hypothesis that the transformation at 700° corresponds to the resolution of the eutectic (perlite) of iron (ferrite) and iron carbide (cementite), and the gradual transformation above 700° to the solution of the ferrite in excess (with contraction) in hypo-eutectic, or the cementite in excess (with expansion) in hyper-eutectic steels.—J. T. D.

Steels; Expansion of ——, *at High Temperatures.* G. Charpy and L. Grenet. Comptes Rend., **134**, [9], 540—542.

The following figures were obtained for annealed steels over various temperature-ranges :—

Composition of Steels.					Mean Coefficients of Expansion from				
C.	Mn.	Si.	P.	S.	15° to 200° C.	200° to 500° C.	500° to 650° C.	——	
0·03	0·01	0·03	0·013	0·023	11·8 × 10^{-6}	14·3 × 10^{-6}	17·0 × 10^{-6}	24·5 × 10^{-6}	880° to 950° C.
0·25	0·04	0·05	0·010	0·010	11·5	14·5	17·5	23·3	800° to 950° C.
0·64	0·12	0·14	0·009	0·010	12·1	14·1	16·5	23·3	720° to 950° C.
0·93	0·10	0·05	0·005	0·010	11·6	14·9	16·0	27·5	" "
1·23	0·10	0·08	0·005	0·009	11·9	14·3	16·5	33·8	" "
1·50	0·04	0·09	0·010	0·010	11·5	14·9	16·5	36·7	" "
3·50	0·03	0·07	0·005	0·010	11·2	14·2	18·0	33·3	" "

Below the transformation-temperature, the coefficients are almost the same for steels containing up to 3·50 per cent. of carbon (about 50 per cent. of cementite). Even above that temperature the coefficients vary but little for steels up to 0·85 per cent. of carbon; the great variations for steels higher in carbon than this are, perhaps, partly due to the transformation in these steels extending over a considerable range of temperature, so that the figures may not be coefficients of expansion pure and simple.

In the case of nickel steels (all of them the "reversible steels" of Guillaume, the transformation-points of which are below the temperatures employed), the following results have been obtained :—

Composition.			Mean Coefficients of Expansion from				
Ni.	C.	Mn.	15° to 100° C.	100° to 200° C.	200° to 400° C.	400° to 600° C.	900° to 900° C.
26·9	0·35	0·30	11·0 × 10^{-6}	18·0 × 10^{-6}	18·7 × 10^{-6}	22·0 × 10^{-6}	23·0 × 10^{-6}
28·9	0·35	0·36	10·0	21·5	19·0	20·0	22·7
30·1	0·35	0·34	9·5	14·0	19·5	19·0	21·3
34·7	0·36	0·36	2·0	2·5	11·75	19·5	20·7
36·1	0·39	0·39	1·5	1·5	11·75	17·0	20·3
32·8	0·29	0·66	8·0	14·0	18·0	21·5	22·3
35·8	0·31	0·69	2·5	2·5	12·5	18·75	19·3
37·4	0·30	0·69	2·5	1·5	8·5	19·75	18·3
25·4	1·01	0·79	12·5	18·5	19·75	21·0	35·0
29·4	0·99	0·89	11·0	12·5	19·0	20·5	31·7
34·5	0·97	0·84	3·0	3·5	13·0	18·75	26·7

At low temperatures, it will be seen, great differences exist; but all the coefficients increase so rapidly with temperature, that at temperatures above 500° C. these differences hardly exist.—J. T. D.

Molybdenum Steel; Volumetric Determination of ——. F. T. Kopp.

See under **XXIII.**, *page* 502.

Copper; Analysis of Industrial ——. P. Truchot.

See under XXIII., *page* 501.

Zinc and Aluminium; Thermal Investigation of Certain Alloys of ——. W. Louguinine and A. Schukareff. Arch. Sc. phys. nat. Genève, **13**, [4], 5—29; Chem. Centr., 1902, **1**, [9], 521.

The heat of formation of zinc aluminium alloys was determined by measuring the heat evolved on dissolving the alloy in hydrochloric acid of the composition, $HCl + 10H_2O$, and comparing it with the quantities of heat evolved on dissolving the pure metals under the same conditions. The heats of formation for 1 grm. of each of the alloys were as follows :—

Al_5Zn	Al_4Zn	Al_3Zn	Al_2Zn	$AlZn$	Al_2Zn_3	$AlZn_2$	$AlZn_3$
−131·7	−5·0	+1·4	+23·4	+9·1	+2·3	−4·0	+15·2 cals.

Only in the case of the Al_3Zn alloy is the amount of heat evolved greater than that possibly due to experimental error, and consequently the results cannot be said to point to the formation of definite compounds of the metals.

—A. S.

Tungsten, Molybdenum, Uranium, and Titanium. A. Stavenhagen and E. Schuchard. Ber., **35**, [4], 909—911.

These metals were prepared by Stavenhagen by reduction of their oxides by means of aluminium (this Journal, 1899, 687, and 1900, 52). The authors have now obtained the following alloys of these with other metals :—WCo; WMo; MoU; MoFe; MoSb; UFe; UCo; UMn; TiFe; TiCo; TiCu; PbW; PbMo; FeBa; CrCoWMo; TiWMo; MoUCrTi; FeMnU. In the case of oxides reduced with difficulty, the oxide was mixed as intimately as possible with aluminium powder and filings; but with easily reducible oxides it was necessary to use also some fluxing material, such as fluorspar, as otherwise the reaction proceeded so violently as to cause an explosion. The ignition was effected sometimes by Goldschmidt's method, sometimes electrically, and sometimes by means of smokeless powder. The alloys obtained always contained some aluminium.

When the slags obtained as by-products were subjected to cathode rays, it was found that certain metals, when present, imparted characteristic colours to the luminescence. Thus lead gave a blue, iron and manganese a green, chromium a red, uranium a yellow to brownish-green, and tungsten a violet colour to the light, these colours being more intense if fluorspar was present.—H. B.

English Patents.

Ores; Treatment of ——. H. W. Wallis, London. Eng. Pat. 21,623, Nov. 29, 1900.

The process is intended to be applied chiefly to refractory sulphides, and to ores containing, in addition to precious metals, titanium or tungsten with iron, selenium, tellurium, chromium, manganese, or the like. The ore is to be mixed with an alkaline earth (or its carbonate) in suitable proportion, to be determined by a preliminary test which is described in the specification, and is then ignited, air being as far as possible excluded during this process. The mixture, after cooling, may be amalgamated, the ore being now free-milling, and free from any tendency to cause sickening of the mercury. After the extraction of the precious metals, the ore is concentrated for the separation of other reduced metals, &c.—W. G. M.

Blast Furnaces. C. I. Rader and E. E. Smeeth, U.S.A. Eng. Pat. 25,596, Dec. 14, 1901.

The objects of this invention are (1) to prevent the formation of corrugations or ridges in the bosh lining, (2) to reduce the expense of constructing the bosh portion of the furnace, (3) to prevent the formation of openings and the consequent forcing out of gases at the junction of the jacket and the mantle, in cases where a bosh jacket is used, and (4) to improve the action of the furnace and to prolong its life. There are arranged vertically-extending cooling plates embedded in the masonry of the furnace at the junction of the bosh and the mantle, and the bosh jacket is cooled by a circular spray-pipe discharging water directly upon the jacket. Between the bosh jacket and the tuyères there is a row of horizontal cooling plates.—R. S.

Blast Furnaces. T. Stapf, Ternitz an der Südbahn, Lower Austria. Eng. Pat. 898, Jan. 13, 1902.

To enable blast furnaces to be used continuously, there are provided below the tuyères, a slag-discharge passage consisting of a siphon-trap, and lower down, and preferably on the opposite side, a crude-iron discharge, similarly constructed. By these passages, the slag and the crude iron are continuously and automatically discharged.—R. S.

Metals; Annealing of ——. D. Bates, Huyton, and G. W. Peard, Prescot, both of Lancs. Eng. Pat. 7084, April 4, 1901.

The arrangement is intended primarily for the annealing of wire, rods, strips, or sheets of copper. The annealing oven is provided at each end with a descending mouthpiece which, dipping below water or other suitable liquid, provides a water-seal. The wire to be annealed is fed from, or over, a drum at one end, partly immersed in the sealing liquid, and after passing through the furnace is delivered to a similar drum at the other end. The oven is charged with an inert gas, and the metal, passing directly from this gas in the furnace mouthpiece into water, is prevented from oxidation.—W. G. M.

Metals; Tank for Precipitating ——. A. Berry, Leeds. Eng. Pat. 8752, April 29, 1901.

A tank for the precipitation of cement copper is made in two parts, superposed, and separated by a perforated grid, with holes tapering inwards from below upward, and with projecting pieces on the upper side to prevent the blocking of the perforations. Just above the grid is an exhaust pipe provided with a cock, from which the spent liquor is drawn off after precipitation is complete. The lower division has the shape of an inverted pyramid, and is provided with a valve at the apex (bottom), through which the precipitated copper is withdrawn at the end of the operation; and immediately beneath the grid is a single coil of perforated pipe through which steam (with a little injected air) is forced during the operation. The scrap-iron is placed in the upper portion of the tank, and the copper is swept from its surface constantly by the scouring action produced by the injection of steam and air, and as it separates it settles through the grid into the space below the steam pipe and collects there. The tank is intended for other precipitations as well as that of copper.—W. G. M.

United States Patents.

Precious Metals; Cyanide Process for Extracting ——, *from Ores.* B. W. Begeer, Colorado. U.S. Pat. 694,521, March 4, 1902.

For the solution of 2 atoms of gold by potassium cyanide solution, it is necessary to supply 1 atom of oxygen. In cases where the quantity of gold is large, the oxygen dissolved in the water will not be sufficient. According to this invention, an excess of oxygen is preserved in the liquid by circulating the cyanide solution in an endless path through a centrifugal pump, and providing, at the place where the suction pipe enters the centre of the pump, an inlet for air, which is thus thoroughly incorporated with the liquid.—J. F. B.

Sulphide Ores; Extracting Metals from ——. J. Swinburne and E. A. Ashcroft, London, England. U.S. Pat. 695,126, March 11, 1902.

This process is practically the same as that covered by Eng. Pat. 14,278, of July 11, 1899 (this Journal, 1902, 349). A fireclay vessel, glazed inside, is heated to a dull-red heat by means of a coke fire; a little zinc chloride is then fused separately, and run in; a small quantity of crushed sulphide ore follows; chlorine is then introduced, which decomposes the ore, producing chlorides of the metals present, and free sulphur; more ore is then introduced, and the process continued until the vessel is sufficiently full of the chlorides produced, which remain fluid, the reaction being exothermic. The temperature is controlled by regulating the supply of chlorine. Iron and manganese may afterwards be precipitated as oxides by the addition of zinc oxide, and the action of chlorine or air; they are allowed to deposit with the gangue, and the chlorides are drawn off from the above precipitate, to be treated, first, with metallic lead to collect the precious metals for subsequent recovery, and then with zinc, to deposit the lead; or, instead of treating the chlorides successively with lead and zinc, they may be submitted to fractional electrolysis. Alternative wet methods are described, involving the electrolysis of aqueous solutions. The chlorides left with the gangue may be recovered from it, by a process analogous to that adapted to the treatment of the fused chlorides. The sulphur formed during the treatment is distilled off. If the temperature employed be too high, some metallic chlorides will pass over with the sulphur, but they may be separated by gravitation, if the mixed product be fused at a low temperature.—W. G. M.

Steel; Manufacture of ——, *by the Open-Hearth Process.* W. B. Hughes, Pa. U.S. Pat. 694,752, March 4, 1902.

This invention, which is described in 12 claims, consists essentially in avoiding the waste of time hitherto required for heating the basic additions on the hearth of the furnace, by previously melting the iron oxide and lime in a separate furnace, so as to form a highly oxidising molten basic slag, and then adding this molten slag to the bath of molten iron, on the hearth of the furnace, thereby effecting the removal of silicon and phosphorus, without any risk of injury to the hearth or lining, and at the same time obtaining a more efficient action of the slag constituents.—J. F. B.

Alloys containing Copper and Zinc; Method of Improving Castings of ——. E. S. Sperry, Bridgeport, Conn. U.S. Pat. 694,688, March 4, 1902.

The process claimed consists in adding to the alloy, whilst in a molten condition, a predetermined quantity of arsenic, and then pouring in the usual manner. The resulting casting will be wholly free from arsenic, and without dross or scale.—J. F. B.

Armour-Plates [Tempering]; Manufacture of ——. B. K. Jamieson, Philadelphia, U.S.A. Assignor to National Steel Refining Co., Wilmington, U.S.A. U.S. Pat. 690,961, Jan. 14, 1902.

The plate is heated to a bright red, and then submerged in a bath of hardening liquid to a depth corresponding with the depth to which it is required to harden the plate, while maintaining the bath at a temperature of about 60° or 70° F. The back portion of the plate is subsequently annealed by placing upon it a plate heated to a white heat.—J. H. C.

Armour-Plates [Tempering]; Treatment of ——. B. K. Jamieson, Philadelphia, U.S.A. Assignor to National Steel Refining Co., Wilmington, U.S.A. U.S. Pat. 690,962, Jan. 14, 1902.

The plates are heated to a bright red, and then partially or entirely plunged into a bath containing 3 oz. each of sweet spirits of nitre, aqua-ammonia, sulphate of zinc, and ground alum, 6 oz. of chloride of ammonium and 8 oz. of glycerin to each gallon of water. Sometimes 1 oz. each of sulphate of copper and nitrate of soda are added.—J. H. C.

Steel; [Tempering] Solutions for the Treatment of ——. B. K. Jamison, Philadelphia, U.S.A. Assignor to National Steel Refining Co., Wilmington, U.S.A. U.S. Pat. 690,963, Jan. 14, 1902.

3 oz. each of "ground alum" and sulphate of zinc are dissolved in 1 gall. of water; after about 12 hours, 8 oz. of glycerin, 6 oz. of chloride of ammonium, 3 oz. of "aqua-ammonia," and 3 oz. of "sweet spirits of nitre," are added. Sometimes also 1 oz. each of sulphate of copper and nitrate of soda are added. The solution is used as a tempering bath, and, in order to prevent its too rapid evaporation in use, sufficient machine oil may be added to cover its surface. —J. H. C.

Iron Scrap; Method of Treating ——. M. L. Sly, Medina, New York State, U.S.A. U.S. Pat. 695,177, March 11, 1902.

To obtain purified iron from scrap, a plate of old sheet or scrap iron is laid flat upon the coke in a cupola furnace, a mixture in equal proportions of alumina and iron oxide is deposited on the plate, then a charge of fuel, and a succession, in the same order, of other layers to the desired height. When the mass is melted, the charge is withdrawn in the usual manner.—E. S.

Ore-treating Furnace. A. M. Beam and H. S. Bailey, Denver, Col., U.S.A. U.S. Pat. 689,946, Dec. 31, 1901.

The claim is for a combination of a furnace with inclosing walls, a muffle supported by the said walls, and flues surrounding the muffle, and a combustion chamber adjacent to the flues, which are led into a chimney. Swinging-door partitions are placed within the muffle, so arranged as to divide it into compartments; sometimes there is a second muffle contiguous to and below the first, with swinging-door partitions at its ends. In such cases there is an ore-chute from one muffle to the other at one end, and a hopper and trough at the opposite end, with an arrangement for feeding flux into the ore.—J. H. C.

Furnace; Ore-roasting ——. J. P. Cappeau, Joplin, Missouri, U.S.A. U.S. Pat. 691,112, Jan. 14, 1902.

The long rectangular hearth is supported by standards so as to permit of a free circulation of air beneath it. The floor has an adjustable longitudinal opening or slot through which an external carrier moves a stirring rake. This opening is controlled by a series of gates or shutters, which are automatically opened and closed.—J. H. C.

Zinc; Process of Smelting ——. S. Davies, Iola, Kansas, U.S.A. U.S. Pat. 694,947, March 11, 1902.

Powdered zinc oxide ore, mixed with fragments, of about the size of a pea, of old retorts or the like, is placed in retorts set in a furnace of the Belgian type, a pipe open at the end being previously inserted into each retort to near the bottom, the outer end of the pipe being turned down to pass through the side of the condenser, which, with the pipe, is then suitably luted on. Each pipe has connection to a main pipe conveying hydrocarbon gas, which is passed in when the retorts are strongly heated. The mouth of each condenser is partially closed with some suitable porous substance, that may allow the gas to pass, but not the distilled zinc. The connecting gas pipes are so arranged as to be readily detachable from the pipes entering the retorts, for facility in charging and discharging.—E. S.

Furnace; Brass-founder's Melting ——. A. J. and E. H. Weatherhead, Cleveland, Ohio, U.S.A. U.S. Pat. 691,213, Jan. 14, 1902.

The furnace is built on two beams over a pit, as is usual; the cover is dome-shaped and provided with a counterbalancing arm, by means of which it can be easily rotated; it rests upon a seating-ring, which takes all the heat exposure. The grate also is peculiarly hinged or pivoted, but no claim is made on account of this.—J. H. C.

Copper-smelting Furnace. G. Mitchell, Los Angeles, Cal., U.S.A. U.S. Pat. 691,648, Jan. 21, 1902.

The furnace is preferably water-jacketed. A rectangular air-chamber is constructed over the furnace proper, which is provided with a series of horizontal metal plates or partitions so arranged as to form a zigzag air passage. The air is supplied at the top of this chamber, and on reaching the bottom is driven through pipes, which pass down outside the furnace to the tuyères, thus becoming strongly heated in its passage. Vertically arranged metallic flues pass up through the air-chamber with its horizontal plates or partitions, and lead into a dust-chamber which is constructed above the air-chamber. The fine furnace material which settles in this dust-chamber is automatically returned to the furnace.—J. H. C.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Chlorine with Carbon; Direct Combination of ——. W. v. Bolton. Zeits. für Elektrochem., 1902, **8**, [12], 165—170.

Many gaseous compounds are decomposed by the action of the electric arc in closed vessels, and the behaviour of hydrocarbons in this respect is utilised in the arts. Hydrochloric acid vapour may also be dissociated up to a certain point, at which recombination takes place with explosion. Carbon tetrachloride vapour, exposed to the action of an arc 4 mm. long, playing between carbon poles with a current of 3·5 ampères at 57 volts, is also decomposed; the arc is unsteady, and its luminosity is small, and in one case the carbon points in three hours had burnt away to some extent, while a carbon deposit had formed on their edges and on the walls of the vessel, the deposit being thickest on those parts of the carbon where the temperature was highest. On opening the stopcock of the vessel, a strong smell of chlorine was observable. The arc was next passed between carbon poles in a stream of chlorine, prepared from manganese dioxide and hydrochloric acid. After six hours, with a current of 5 ampères and 43 volts, the carbons were found to have been burnt away a little, but no chlorine compound of carbon was to be discovered in the escaping gas. The laboratory vessel was therefore filled with pure dry chlorine gas, an arc was struck, the excess pressure produced by the expansion of the gas owing to the heating effect of the arc was removed by opening one of the cocks momentarily, and the arc was continued in the closed vessel, with a current of 5·5 ampères at 42 volts. After half an hour, a crystalline deposit was noticed at the lowest part of the glass vessel, and this increased, until after four hours, a crop of fine silky needles was formed. As no further increase in the crop was observable, the circuit was broken. It was found that the positive carbon had gained 0·0012 grm., in weight, while the negative carbon had lost 0·0252 grm. The crystals melted at 225° C., and contained both carbon and chlorine, and probably consisted of hexachlorbenzene (C_6Cl_6). By means of a modified apparatus, a larger crop of fern-like crystals was collected. In six hours, with a current of 6 ampères and 43 volts, 0·6 grm. of a crystalline substance with camphor-like smell, melting and boiling at 184°—186°, was obtained. Analysis and confirmatory tests showed it to be perchlorethane, C_2Cl_6, not C_6Cl_6 as found in the experiment with the smaller closed vessel. The positive carbon had after the experiment a smooth crater, whilst the surface of the negative carbon was covered with a number of symmetrical pittings of about equal size, giving the whole the appearance of caviare. Bromine and iodine appear to act in the same way as chlorine, but the experiments with them are still in progress.—W. G. M.

Platin-iridium Anodes in the Electrolysis of Alkali Metal Chlorides; Chemical Resisting Power of ——. P. Denso. Zeits. f. Elektrochem., 1902, **8**, [10], 147—150.

Alloys containing from 7·6 to 15 per cent. of iridium were used as anodes in strong solutions of KCl (with an addition of about 2 per cent. of potassium chromate) without a diaphragm, in strong sodium chloride solutions with a diaphragm, in each case at temperatures of 20° and 80° C., and also in 20 per cent. solutions of hydrochloric acid at 80° C. The thickness of the electrodes was, in all cases, 0·007 mm., the area of anode surface exposed ranged from 0·5 to 1·2 sq. dcm., the weight of electrode from 4·8 to 9·9 grms., the current density from 10·5 to 30 ampères per sq. dcm., and the ampère hours of an experiment from 80 to 1,200, with intermediate weighings. The maximum loss of weight in any one experiment was 0·0042 grm. In all cases, the loss of weight was greatest at first, and afterwards was little or nothing; in some instances, where electrodes that had been used in one experiment were employed in a second trial, the loss in the latter experiment was *nil*. In one case in which the loss of weight in the second period of the test was greater than that in the first, the result was traced to local impurities, and the irregularity ceased after the faulty parts had been cut out. It is remarkable that, although the alloy with 7·6 per cent. of iridium is soluble in *aqua regia*, whilst that containing 15 per cent. is not, there was little difference observable in their power of chemical resistance to attack as anodes. Most of the alloys were prepared from the purest iridium, but in one case a commercial pure iridium was used, which contained slightly more Rh, Ru, Fe, and Cu, but the result was quite satisfactory. There appears to be no reason why platin-iridium should not be used economically in the industrial electrolysis of chlorides of the alkali metals.—W. G. M.

p-Toluic Acid; Electrolytic Oxidation of ——. H. Labhardt and R. Zschocke. Zeits. f. Elektrochem., 1902, **8**, [7], 93—96.

The author draws the following conclusions from his experiments: (1) In the oxidation of *p*-toluic acid, and probably in that of other organic bodies, other conditions besides those of current density and anode potential influence the result; for example, concentration of solution, presence of other substances in greater or less quantity (in this case caustic potash), and nature of anode. Probably in other instances temperature must also be taken into account. For example, bright platinum anodes caused the greatest absorption of oxygen; platinum black was less satisfactory; mercury formed mercuric oxide; copper remained bright, but yet passed into solution; iron and nickel were not attacked, but exerted an unfavourable influence on the yield. (2) It was not found possible to obtain a theoretical yield of terephthalic acid from the *p*-toluic acid. With high current density, much oxygen is absorbed at the anode, but it is largely used up in energetic oxidation. The best yield of terephthalic acid was obtained when the conditions were such that a large proportion of the oxygen escaped without action.—W. G. M.

Anode Materials; Artificial Graphite and Platin-iridium as ——. F. Foerster. Zeits. f. Elektrochem., 1902, **8**, [10], 143—147.

Graphite made by the Acheson process and supplied by the International Acheson Graphite Co. was experimented with. The material had a true sp. gr. of 2·14, and an apparent sp. gr. (excluding water from the pores) of 1·65, so that the volume of the pores was 22·9 per cent.; the percentage of ash was 0·83. Apparently the interior was completely converted into graphite. The anodes tested consisted of plates 0·7 cm. thick, and 4 × 6·5 sq. cm., cut from prismatic blocks which measured 7 × 7 sq. cm. originally. In a neutral 20 per cent. solution of sodium chloride, in the presence of chromate, at 60° C., the anodes, under the action of a current density of 0·04 ampère per sq. cm., were but little attacked, the energy absorbed in the attack on the anodes being, in two separate experiments, 6·3 and 8·4 per cent. respectively, of the total energy of the current. This is much less than in the case of amorphous carbon, and less also than in the case of French graphite. Moissan has, however, shown that the oxidising effect on the anodes varies with different specimens, and depends largely on the conversion-temperature employed in the production of the graphite. In another experiment, a current density of 0·12 ampère per sq. cm. was applied for 100 hours at 45° C., for the production of chlorate from a neutral potassium chloride solution containing chromate. With a pressure of 3·25 to 3·4 volts, the yield showed a current efficiency of 57 per cent., as against 66 per cent. with platinum anodes under like conditions. The potassium chloride was coloured grey by small particles of graphite, which were easily removed on recrystallisation. At ordinary temperatures the graphite anodes were practically unattacked in binormal caustic soda solution, and none of the brown oxidation products, soluble in alkali, found when amorphous carbon anodes are used, were produced. Even at 60° to 70° C., when 30 per cent. of the energy applied was used in oxidising the graphite, the electrolyte became only slightly yellowish. The graphite anodes were badly attacked when used in the electrolysis of sulphuric acid, and much disintegration was noted, the current density used being 0·04 ampère per sq. cm. The following table gives comparative numbers for the Acheson graphite and amorphous carbon (*cf.* Sprösser's experiments, Zeits. Elektrochem., **7**, 975).

Electrolyte.	Percentage of Energy used up in the Oxidation of the Anode.	
	With Graphite Anode.	With Amorphous Carbon.
Caustic soda, 8 per cent. sol. at 20° C.	2	50—78*
Pure NaCl, 20 per cent. sol. at 60° C. (containing chromate).	7·4	12—41
Sulphuric acid, 20 per cent., at 18° C.	94—96	85—97

* In exceptional cases, 14 per cent.

Hence the difference between graphite and amorphous carbon is by no means constant: the higher the hydroxyl concentration in the electrolyte, and the lower the anode potential at which oxygen appears at the anode, the more the graphite excels in its power of chemical resistance. In the electrolysis of alkali chlorides, the superiority of the graphite is greater when bleach is being prepared than in the production of chlorine. But graphite anodes are not altogether unattacked in the electrolysis of alkali chlorides, and platin-iridium anodes can now be made with so small a weight of platinum in them that they rival graphite anodes in cost.

The chief difficulties formerly met with in producing thin platin-iridium anodes were the brittleness of the alloy then obtainable, and the low conductivity of the metal.

The firm of Heræus discovered that the brittleness was due to the presence of ruthenium, and, having found a process for eliminating this impurity, produce a platin-iridium of great strength and toughness, capable of being rolled into very thin sheets. The defects due to the want of stiffness of such sheets, and to the low conductivity, are met by altering the shape of the anodes; platin-iridium wires are sealed through a glass tube closed at one end, platin-iridium strips 0·0075 mm. thick and 2 cm. wide are welded to these wires outside the tube, whilst within is a copper cable, to which the wires are attached, each by a drop of solder. Such an electrode, with a total available area of 2 sq. dm., may only require 2 grms. of a 90:10 (Pt:Ir) alloy, or about from one-fourth to one sixth of the weight required for an ordinary plate anode of the same material. Experiment has shown that such electrodes, whether as anodes or as cathodes, showed no deterioration after 2,500 ampère-hours in the production of potassium chlorate from a neutral solution of potassium chloride containing chromate at 45° C., with a current density of at least 1,000 ampères per sq. m.—W. G. M.

United States Patents.

Electrode for Purifying Liquids by Electrolysis. [*Water.*] W. F. Chipman, New York. U.S. Pat. 694,933, March 4, 1902.

The electrode is composed of a combination of metallic magnesium and aluminium from which oxyhydrates may be developed by electrolysis with one or more metals, serving as binding material, and one or more metals to harden the compound, together with a suitable flux. An electrode which answers particularly for the purification of water consists of 20 parts of metallic magnesium, 40 parts of aluminium, 15 parts of "Straits" tin, 10 parts of cadmium, 5 parts of nickel, and 10 parts of ferrosilicon, combined by a suitable flux, such as resin or borax.
—G. H. R.

Separator for Storage Battery [*Glass Wool*]. G. M. Willis, Chicago. U. S. Pat. 693,676, Feb. 18, 1902.

The separator is made of glass wool, through the fibres of which binding threads of insulating material, such as asbestos, are passed to form it into an unwoven fabric, and maintain it in the required shape. The fibres of the glass wool extend to the exterior, so as to be interposed between the binding threads and the battery plate to be separated, and thus prevent their contact.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Nickel Steels; Magnetostriction of ——. Remarks on a recent Note by Nagoaka and Honda. F. Osmond. Comptes Rend., **134**, [10], 596—598.

Guillaume, in discussing Nagoaka and Honda's paper, remarked that their results did not accord with Dumas' theory, according to which the magnetic properties of nickel steels, "reversible" or irreversible, are simply the sum of those of the nickel and iron they contain. The author points out that Dumas' theory does not accord with facts which he has already established. His measures of the coefficients of expansion of these steels already indicate that; and direct determinations of the sustaining powers of a series, compared with those calculated from the figures for the iron and nickel they contain, show that reversible nickel steels, which at the ordinary temperature are above their transformation point, and which are not affected by hysteresis, behave magnetically like mixtures of the iron and nickel they contain; but others, which exhibit hysteresis, and in which therefore we may conclude that the transformations are incomplete at the ordinary temperature, behave quite differently. It may be possible, by similar measurements, to determine whether nickel steels containing higher percentages (80 to 90) of nickel consist of mixed crystals of iron and nickel, or contain such a compound as, say, Ni_2Fe, which a maximum in the curve of transformation-points suggests.—J. T. D.

Zinc-, Iron-, and similar Plates; Process for covering ——, *with Copper or Brass by Electrolytic Means.* Popp. Ger. Pat. 122,072, Feb. 27, 1900. Through Zeits. Elektrochem, 1902, **8**, [7], 104.

In coppering a plate in the ordinary way, the surface of the plate is matt, and can only be polished when the deposit is fairly thick, or there would be danger of the film stripping from the basis-metal. In this process the plate is first coated with a thin film of copper, next with a light coat of nickel, and then with copper again. The copper or brass deposited on the nickel is thoroughly adhesive and takes a good polish even though it is very thin.—W. G. M.

Metals; Colouring of ——, *by Rieder's Electro-Chemical Process* Zeits. Elektrochem., 1902, **8**, [7], 101—102.

The object to be coloured is made the anode in an electrolyte gelatinised by means of glue or gelatin, whilst the cathode remains in a fluid electrolyte (Ger. Pat. 113,453 of 1899). Diffusion must be very slow, and the gases deposited on the anode must neither escape nor be absorbed by the electrolyte, so that they have every opportunity of combining with the anode-metal. Thus copper, as anode in gelatinised sodium carbonate and bicarbonate, becomes dark brown; in sodium acetate, clear brown; in sodium phosphate and sodium chloride, olive green; and in potassium ferrocyanide and ammonium chloride, lilac. When the metal has previously been electrolytically covered with a film of another metal, a mixed colour is obtained by Rieder's process. The current density must be moderate, and not so great that there is any perceptible evolution of gas at the anode. Various explanations of the process have been given; the most likely is that, when acetates or chlorides are not present in the electrolyte from the first, a certain amount of acetate is formed by the anode oxidation of the organic substances present, and that this acetate then reacts with the other substances present; the acetate, being prevented from diffusing out by the gelatinous character of the electrolyte, remains concentrated in the pores of the anode surface, and thus leads to the production of a thick, adhesive, and durable coloured film.—W. G. M.

English Patents.

Precious Metals; Recovery of ——, *by Electrolysis.* [*Cyanide of Potassium.*] J. F. Webb, London, J E Lilley, Wealdstone, and J. Chapman, Ealing. Eng. Pat. 5265, Mar. 12, 1901.

The apparatus consists of a revolving barrel or drum within which is the cathode, consisting of a metallic internal periphery connected to an external contact ring, and with or without a mercury bath. The anode, which is also mounted within, is adapted to turn with the barrel, and is connected to an external contact ring. Brushes or equivalent contact devices transmit the electric current through the cyanide solution contained in the drum, on which scoop pipes are arranged so as to automatically charge and discharge the material from it during rotation.
—G. H. R.

Metals for the Manufacture of Compound Wire Bars and the like; Electro-Deposition of ——, *and Apparatus therefor.* R. D. Sanders, Blackheath. Eng. Pat. 9011. May 1, 1901.

The depositing tank or vessel containing the electrolyte is divided by partitions into compartments in which the anodes are placed on either side of a foundation wire in the form of a coil on which the metal is to be electro-deposited, and which is suspended and rotated on an electrified shaft which is insulated from it except at the ends, or at other convenient parts. A similar compartment or support, containing or supporting anodes, is placed inside the coil, which obviates the employment of supporting frames for the wire coil as described in U.S. Patents 189,533 and 638,917. Struts or distance pieces are secured at the end of each coil, with pins at intervals, to prevent the spirals running together, or the same may be effected by forming rings at the ends of the coils. The shaft may be carried below a driving shaft by means of rings, chains, bands, or the like.
—G. H. R.

United States Patents.

Gold from Refractory Ores; Process of Recovering ——. H. R. Cassel, New York. U.S. Pat. 694,349, March 4, 1902.

The process for recovering gold from refractory ores, *e.g.*, tellurides and sulphides, consists in converting the ore to a pulp, adding a salt capable of yielding, by electrolysis, oxidising and dissolving agents, agitating the mixture, and simultaneously electrolysing it under such conditions as to oxidise the refractory elements, dissolving the gold, and reprecipitating the dissolved gold in the form of a black powder, reversing the current to detach the black powder from the electrodes, and finally adding a solvent to redissolve such black powder.—J. F. B.

Precious Metals from Refractory Ores; Apparatus for Recovering ——. H. R. Cassel, New York. U.S. Pat. 694,350, March 4, 1902.

The apparatus for the electrolytic treatment of refractory ores consists of a vessel lined with grooved carbon plates and a backing of cement between the vessel and plates. Metal conducting strips are provided in the grooves between the carbon plates, and are protected from the action of the liquid by means of cement. Inside the vessel is situated an insulated shaft, with metal stirring arms projecting radially from it. The metal stirrers are protected by a carbon covering, and this carbon forms the other electrode. —J. F. B.

Metallurgical Process. [Reduction in the Electrical Furnace.] E. G. Acheson, Buffalo, New York, U.S.A. U.S. Pat. 693,482, Feb. 18, 1902.

Pulverised ore is mixed with graphite in sufficient quantity to bring about complete reduction, and treated in the electric furnace. The success of the operation depends upon the ore and graphite being well rubbed together, since the graphite acts both as conductor and reducing agent; condensing chambers are used in the reduction of a volatile metal. Graphite produced in the electric furnace is especially suitable for the process on account of its purity, electrical- and heat-conductivity, and capacity for coating the ore particles.--J. W. H.

Metals; Art of Refining Composite ——. T. Ulke, Ontario, Canada. U.S. Pat. 694,699, March 4, 1902.

The main object of this invention is to extract copper and nickel of commercial purity from nickeliferous copper material; the principle is also applicable to the treatment of copper-cobalt, copper-zinc, and cadmium-zinc. The process consists in depositing the copper from an acid solution of the material with an anode of the same material, periodically withdrawing a portion of the electrolyte as it becomes poorer in copper and richer in nickel, separating chemically the copper and nickel salts in the withdrawn electrolyte, electrolytically depositing the nickel from a non-acid bath of the nickel salt by the use of an insoluble anode, such as lead, periodically withdrawing and concentrating portions of the impoverished nickel bath, and periodically restoring to the copper and nickel baths respectively the copper and nickel salts obtained from the withdrawn solutions, so as to keep up their normal strengths. —J. F. B.

Electric Welding; Method of ——. R. M. Hunter, Philadelphia. U.S. Pat. 690,958, Jan. 14, 1902.

Two wide, thin, flat sheets of metal can be welded together so as to form one continuous sheet by first forming at the end of one or both sheets, a large number of small independent projections or points in the line of weld transversely across the sheets; or the projections may be made on the edge of one or both plates, which are then overlapped so as to bring them into electrical contact at the points only. "A current of electricity of uniform voltage and fixed maximum current" is generated and passed simultaneously through all the projections, pressing the sheets together as the metal about the points of contact melts, whereby a large series of small fluid portions of metal are formed, and gradually increased in area, and separated by gradually decreasing areas of solid parts, until the several fluid portions just meet to form a long weld. The resistance becomes so low as the weld proceeds, that the current ceases to be sufficient in volume to continue the weld after a given extent has been made, and the current is automatically interrupted when the required maximum is reached which secures the union of the sheets and guards against the destruction of the lapped portions.—G. H. R.

Electrolytic Process [Bath]. J. Meurant, Liège, Belgium. U.S. Pat. 694,658, March 4, 1902.

Metals which are easily oxidised can be coated with those less oxidisable, and whose chlorides are soluble in water, such as zinc and tin, by forming an aqueous solution of the chlorides of the metals, and adding to it a compound of a metal of the alkalis containing oxygen, and adding thereto ammonium chloride and a solution containing a carbohydrate. In coating with zinc, a solution is formed of chloride of zinc, which is precipitated by the addition of a carbonate of an alkali metal, which is dissolved by means of ammonium chloride, and gelatin is added to the solution. The body to be coated is placed in the bath as cathode with a suitable anode, and an electric current is passed through it of not more than 1 volt, with a density not exceeding 1 ampère per square decimetre.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Cacao-Butter; Composition of ——. J. Klimont. Monatsh. für Chem., 1902, **23**, [1], 51—59.

Hitherto cacao-butter has been regarded as a mixture of the triglycerides of stearic, palmitic and oleic acids, with smaller proportions of those of lauric and arachidic acids. Its low melting point, however, has always been inconsistent with this view, and, in explanation of this, the lowering of the melting points in the case of metallic alloys has been suggested as a parallel. But direct experiments with mixed fats show that such lowering of the melting points does not occur. In the case of a mixture of triglycerides like tallow, the employment of acetone as a solvent affords a ready means of separating the glycerides of the solid fat acids from those of the liquid acids. On cooling the solution, there is an immediate crystallisation of tristearin and tripalmitin. Cacao-butter, when similarly dissolved in acetone, behaves quite differently, the solution remains quite clear for a long time after cooling, before a few crystals are produced.

The author has conducted a systematic examination of cacao-butter by fractional crystallisation from acetone. The first fraction of crystals obtained by the spontaneous evaporation of the solvent was identified as a mixture of tristearin and tripalmitin, with melting point 64° C. and saponification number 198; no arachidic acid or its glyceride could be detected.

The second fraction obtained from the solution crystallised in beautiful white plates, which had a constant melting point of 31°·4 C., iodine number 29 and saponification number 197·3—198·9. This substance, on examination, was identified as a mixed glyceride of stearic, palmitic, and oleic acids.

By evaporation of the mother liquors a third fraction was obtained, melting at 25°—27° C., saponification number 210·5—212·5, iodine number 31·7—32·6. It was not possible to identify this with certainty, but it was probably a mixed glyceride of myristic, palmitic, and oleic acids.

The author concludes that cacao-butter is not, as hitherto supposed, a mixture of tristearin, tripalmitin, and triolein, but rather that tristearin and tripalmitin are only accessory, and that the fat consists substantially of a mixed glyceride of stearic, palmitic, and oleic acids, together with other mixed glycerides of fatty acids of lower molecular weight, in combination with oleic acid.—J. F. B.

Fatty Acids; Distillation of ——. F. Kassler. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [3], 48—50.

The author gives the following details of the method of distillation in use in his works. He states that in a well-managed stearin factory, widely divergent results seldom occur.

Pressed tallow and Chinese vegetable tallow were first saponified with magnesia in an autoclave without subsequent acidification of the fatty acids, whilst the fatty acids of palm oil, tallow, and bone fat were treated with 2 per cent. of sulphuric acid (66° B.) at 110° C. before distillation. In no case was more than 0·8 per cent. of neutral fat present in the fatty acids submitted to distillation.

The retorts are constructed of cast-iron and have a capacity of about 1,800 kilos. They receive a charge of about 1,400 kilos., whilst subsequently in proportion as distillate passes over, fatty acid previously heated to 110° C. is allowed to flow in. The steam effecting the distillation is heated to 300° C., and reduced to a pressure of 0·3 atmosphere.

In the distillation of pressed tallow, tallow, bone fat, and vegetable tallow fatty acids, two fractions are obtained, of which the first, known as the "distillate," is subjected directly to hot or cold expression; whilst the second, the "retourgang," is mixed with the corresponding fraction from palm oil and again distilled.

In the case of palm oil fatty acids, the first fraction (distillate) yields three smaller fractions, of which the first can be mixed directly with finished stearin, whilst the second is only subjected to hot expression, and yields a white practically non-crystalline stearin. The third part, which possesses a marked crystalline structure, is mixed with the distillates from other crude material and subjected to cold and hot expression.

The "retourgang" consists of the last portions of the distillate. It has a greenish colour and an unpleasant smell, and contains a considerable proportion of hydrocarbons.

The average yields thus obtained by the author are shown in the subjoined table, in which the duration represents the time from the commencement of the heating to the end of the distillation. The time required for heating up is about $4\frac{1}{2}$ hours.

Material.	"Distillate."	"Retourgang."	Pitch.	Duration.	Quantity Distilled.
	Per Cent.	Per Cent.	Per Cent.	Hours.	Kilos.
Fatty acids of—					
Pressed tallow	95·6	2·1	2·3	36	8,012
Chinese vegetable tallow	92·4	4·0	3·6	35	5,055
Tallow...............	94·6	2·6	2·8	33	7,037
Bone fat	90·3	5·4	4·3	34	5,627
Palm oil	91·0	5·3	3·7	32	4,898
Average........	92·8	3·9	3·3	34	6,126

—C. A. M.

Saponification; Method of ——. P. Pollatschek. Chem.-Zeit., 1902, **26**, [21], 228—229.

In the ordinary process of manufacturing curd soap, the latter is separated by the addition of salt, the ley withdrawn, the mass again boiled with water, and again treated with a smaller quantity of salt, and then fitted. After removal of the neat soap, the residual soap is salted out and used in the next saponification.

The author proposes to use caustic soda for the separation of this residual soap, thus obtaining a ley ready for the next saponification, effecting a concentration of the glycerin, introducing less impurities, and saving time and labour.—C. A. M.

English Patents.

Fat from Substances containing the same; Extraction of ——. E. G. Scott, London. Eng. Pat. 7802, April 16, 1901.

In the process claimed, the crude fat is placed in a casing with a perforated bottom, which fits into the digester where it rests upon a ledge upon the bottom. Steam heat is applied and the outlet valves immediately opened, so that the fat (tallow) is removed as soon as it is separated. It is then conducted over a perforated plate, through which it falls in a fine state of sub-division into a clarifying vessel, where it is readily washed. The advantage claimed for this process is that it effects a separation of the better fat first rendered, from the inferior quality subsequently liberated, whilst at the same time it removes the water, which has a deleterious effect upon the crude fat and gelatinous substances.

Claim is also made for a special apparatus for carrying out this process.—C. A. M.

Soap and other Substances; Machinery for Enclosing Tablets of ——, *in Wrappers of Paper, Tinfoil, or other Material.* Lever Bros., Ltd., and J. F. Phillips, both of Cheshire. Eng. Pat. 7819, April 16, 1901.

Arrangements are provided for the automatic feeding of both the tablets and the wrappers in which they are to be enclosed. The two operations are effected in an intermittent manner, in such a way that, simultaneously with the feeding and gripping of a wrapper, a tablet in another position is directed to its position for being partially enclosed, whilst another tablet that has been partially wrapped is at the same time ejected and placed in a corresponding receiver, by which its position at delivery is reversed, and by the delivery of succeeding tablets, the ends of the enclosing wrapper are turned down in position for delivery.—A. S.

Soap or other Plastic Composition; Apparatus for Use in the Manufacture or Treatment of ——. A. J. Boult, London. From L. B. Lehmann, Dresden. Eng. Pat. 1430, Jan. 18, 1902.

The apparatus claimed consists of a vertical (conical) receiver for the liquid soap, surrounded by a cooling jacket, and having a central shaft carrying a screw conveyor or worm, so arranged that there is a space between it and the shaft. Through the centre of the shaft passes a tube conveying superheated steam, which, reaching the bottom, passes upwards through a space between the tube and the boring of the shaft, and escapes through a valve at the top.

On charging this apparatus with soap solidification takes place on the exterior, whilst the part around the shaft remains fluid. The solid portion can then be expelled by means of the screw conveyor in the form of strips or bars through perforations in the base of the receiver, whilst the fluid central portion travels upwards.—C. A. M.

United States Patent.

Oleaginous Substances; Press for ——. G. W. Zoder and W. P. Hayne, Louisiana, U.S.A. U.S. Pat. 691,430, Jan. 21, 1902.

This is an improvement on U.S. Pat. 649,503, May 5, 1900, and has for its object the providing of means for preparing a charge for the pressing box, whilst the preceding charge is being expressed. The heated oleaginous material is fed into a measuring box, which conveys it into position beneath the open end of the charging box and over the follower of the ram. By means of the follower, the sections of the measuring box with their contents are forced up into the charging box, each section being kept in position by means of pawls. Finally, when the charging box is full, it is run under the pressing box, and the charge driven through it into the latter by means of the ram, whilst the charging box is withdrawn through a special door.

—C. A. M.

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

(*B.*)—RESINS, VARNISHES.

English Patents.

Lacquers and Varnishes; Processes for the Manufacture of ——. E. Hecht, Vienna, and G. Poulenc, Paris. Eng. Pat. 4702, March 5, 1901.

The objection to the use of Japanese wood oil (tung oil) in the manufacture of varnishes is that the heat required to dissolve copals renders the tung oil sticky. In the present patent this is obviated by using the fatty acids instead of the oil itself. A suitable proportion of the fatty acids is mixed with a drying oil, and the mixture heated to 250° C., a clear liquid being thus obtained, which mixes well with linseed and poppy-seed oils, &c., and can be diluted with turpentine.

Copals can also be readily brought into solution by mixing them in a powdered condition with the anhydrous fatty acids (say in the proportion of 25 to 50 per cent.), and heating the mixture to 280° C. The resulting varnish is diluted with turpentine to the required consistency.

—C. A. M.

Nitrocellulose Compounds for Various Useful Purposes. A. Browne, London. From J. B. G. Bonnaud, Ostend, Belgium. Eng. Pat. 8063, April 19, 1901.

According to this invention, nitrocellulose is prepared for coating or varnishing purposes by dissolving it in a suitable solvent, *e.g.*, methylated spirit and camphor, and the film obtained on drying is rendered flexible by adding to the solution gum copal dissolved in boiling castor oil. Sugar of lead, litharge, white copperas, and a small proportion of vanillin may also be added.—J. F. B.

United States Patent.

Coating Preparation. H. A. Bentley, Glen Falls, New York, U.S.A. U.S. Pat. 690,915, Jan. 14, 1902.

This is a composition to be applied to any surface other than canvas in order to render the material suitable for being painted upon either in oil or water colours. The paper, pasteboard, or textile fabric first receives a coating composed of pyroxylin, 1 dram; amyl acetate, $\frac{1}{2}$ pint; and a large teaspoonful of oil of cedar. When dry, a layer of gelatin or isinglass, dissolved in sufficient water to make it a strong jelly when cold, is painted on. The finished material is free from gloss, and can be used as above mentioned; or the composition can be applied to an engraving or picture in monochrome, the whole being treated with colours afterwards.—F. H. L.

(*C.*)—INDIA-RUBBER, &c.

India-rubber Goods; Analysis of ——. A. Heintz.

See under XXIII., *page* 503.

English Patents.

India-rubber; Process for the Devulcanisation of ——. O. F. J. Duwez, Enghien, Belgium. Eng. Pat. 4803, March 6, 1901.

The india-rubber is heated with water containing lime (or a substance of which lime is an ingredient, *e.g.*, cement), which has previously been heated to redness and sifted, the proportion of lime depending upon the quantity of sulphur to be removed, but usually amounting to 30 to 50 per cent. The rubber is kneaded, and then boiled with the lime and sufficient water to cover both for 15 to 20 minutes. The liquid is then decanted, and the caoutchouc washed and rolled.

It is stated that, whereas ordinary lime would yield an almost insoluble sulphide in this process, lime heated to redness gives an almost completely soluble "hydrosulphate."
—C. A. M.

[*India-rubber*] *Crude Rubber; Treatment of*——. J. Thame and the South Western Rubber Co., Ltd., London. Eng. Pat. 9920, May 13, 1901.

The rubber is first soaked in a 2 to 10 per cent. solution of potassium or sodium hydroxide at a temperature of from 80° to 100° C., then sliced up and laid on grids in a closed tank. Here it is covered for 18 or 24 hours with one of the chlorides or the bisulphide of carbon, or some similar compound, next treated with water, and finally washed in a current of boiling water for several hours, till all the impurities are rinsed away, live steam being also employed if desirable. The rubber is taken out of the tank, and passed through hot rolls or pressed into blocks, and dried in a dark room at a temperature of 15° to 20° C.—F. H. L.

Gutta-percha; Substitute for ——. A. Gentzsch, Vienna. Eng. Pat. 24,590, Dec. 3, 1901.

This is a mixture of wax, resin, asphalt, tar, or pitch, with water, calcium carbonate, magnesium carbonate, calcium sulphate, magnesium hydroxide, ferric oxide, caoutchouc, and cotton-seed or mineral oil, some or all of these ingredients being mixed together in the manner specified. Eng. Pat. 15,255, 1899, this Journal, 1899, 927, is referred to.
—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

English Patents.

Raw-Hide; Process of Manufacturing Resistible (*Waterproof*) *Objects of* ——. C. Neuhaus, Vienna. Eng. Pat. 7484, April 11, 1901.

An addition of a chromate, especially potassium bichromate, is made to the cement (mostly fish glue) used to unite the layers of hide, and the object is exposed to the action of light, with the result that the cement is rendered insoluble in water and the material waterproof.

Claim is also made for the use of the Röntgen rays to render the cement completely insoluble, especially in the case of thicker objects of raw hide in which the cement would not be readily acted upon by rays of light.
—C. A. M.

Tanning Extracts; Manufacture of ——. Max Hönig, Brünn, Austria. Eng. Pat. 21,863, Oct. 30, 1901.

Waste liquors obtained in the manufacture of sulphite pulp are treated with zinc dust and a sufficient quantity of an acid such as sulphuric acid to set free the combined sulphurous and acetic acids, the solution is stirred for one hour, lime is then precipitated by the addition of a soluble sulphate, phosphate or oxalate, and the precipitate removed by means of a filter press The clear liquid is then concentrated in a vacuum apparatus to a density of 28° to 30° B.—J. T. W.

United States Patents.

Leaching Tan Bark; Apparatus for ——. E. F. Smith, Bradford, Penn., U.S.A. U.S. Pat. 693,748 and 693,749, Feb. 18, 1902.

The apparatus claimed comprises a series of leaching-tanks with perforated false bottoms and removable covers, with branch-pipes issuing from under the false bottoms, said branch-pipes, which are provided with shut-off plugs, leading to a main pipe connected with a heating-tank placed above the leaching-tanks. The liquor is conveyed from the leaching-tanks to the heating-tank by means of a pump provided with a return-pipe extending under the bottoms of the leaching-tanks and connecting with the suction of the pump, a branch-pipe, with shut-off plug, connecting each of the tanks with the return-pipe, a pipe leading from an overflow in each tank to the return-pipe, and a pipe leading from the discharge of the pump to the heating tank. Pumps are also provided for passing the liquor from one leaching-tank to another, the pumps discharging into vertical boxes, with shut-off plugs, connected with pipes leading to the bottoms of adjacent tanks.—A. S.

Hides; Apparatus for Colouring —— A. Rigaud. U.S. Pat. 691,075, 1900.

See under VI., *page* 475.

XV.—MANURES, Etc.

Nitrification; Studies in ——. J. G. Lipman. J. Amer. Chem. Soc., 1902, **24**, [2], 171–186.

The first series of experiments were made with the use of flower pots, watered and stirred occasionally, ammonium sulphate being added in each case. These experiments were designed to study the influence of sodium chloride, sulphur, frequent stirring and monopotassium phosphate respectively on the course of nitrification. No nitrification was set up but, on the other hand, the nitrates were reduced by denitrifying processes. The second series of experiments was conducted with 100 grms. of calcareous sand in closed flasks of 750 c.c. capacity, and infected with 1 c.c. of rich soil extract.

In Expt. I. the effect of varying the water added from 8 to 12 c.c. was studied; within these limits, the quantity of water affected the nitrification but little, practically the whole of the ammonium sulphate being oxidised. In Expt. II. increasing quantities of sodium chloride were added; there was a distinct decrease of nitrates formed as the quantities of salt were increased; the differences, however, were not great. Whilst quantities of salt up to 3,500 lb. per acre retard nitrification, they do not stop it entirely. In Expt. III. the influence of ferrous sulphate was investigated, and the results showed that this substance had but little influence on nitrification, although larger proportions seemed to retard it slightly. In the next experiment, equivalent quantities of calcium carbonate and calcium sulphate were studied side by side separately. The nitrification in presence of calcium sulphate was fairly uniform and less than in presence of calcium carbonate. Lastly, nitrification was carried out in presence of large quantities of organic matter, linseed meal containing 4·51 per cent. of nitrogen being employed. From these experiments it appeared that more nitrate was produced where 1 per cent. of organic matter was present than where only 0·5 per cent. was present. On the other hand when 3 per cent. of organic matter was used, only traces of nitrates were found at the end of the experiment.—J. F. B.

Manure; Utilisation of Waste Liquors from Sulphite Cellulose Manufacture as ——. T. Knösel. Chem. Zeit., 1902, **26**, [21], 229.

The spent liquors from the manufacture of sulphite cellulose have frequently been used, after treatment, for manurial purposes, but they are difficult to transport, and the soil is only capable of assimilating a limited quantity.

In order to convert them into dry and not too readily soluble manure, the author concentrates them to about 25° B., and then mixes them with an approximately equal weight of Thomas slag-meal. There is a spontaneous evolution of heat, and in a short time a solid mass, easily distributed, is obtained. The products thus obtained are brownish-yellow in colour, have a pleasant odour, recalling vanillin, and only dissolve slowly in water, yielding a brownish-yellow solution.

The chemical composition differs greatly from that of Thomas meal, which only contains about 75 per cent. of its phosphoric acid in a citrate-soluble form, whereas in the new manures practically the whole of the phosphoric acid is soluble.

The following analyses show the amounts of potassium oxide and phosphoric acid in four of these preparations. In the case of the fourth sample, a considerable excess of slag-meal had been added, so that less phosphoric acid was in the citrate-soluble form.

——	I.	II.	III.	IV.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Total phosphoric acid (P_2O_5).	8·61	8·68	8·85	10·60
Citrate - soluble acid (P_2O_5).	8·45	8·45	8·40	9·10
Potassium oxide (K_2O) .	0·30	0·30	0·22	0·29

The alkali in the Thomas meal is neutralised by the sulphurous and lignin-sulphonic acids in the sulphite liquors, so that the new manures can be used, even in admixture, with ammoniacal manures without fear of injuring the plants.

Owing to the presence of the organic matter, the addition of turf usually made to Thomas meal is unnecessary in the case of the new products.

The process here described is protected by the German Pat. 128,213.—C. A. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Low Syrups; Destruction of Sugar in working up ——. H. Claassen. Zeits. Vereins Deutsch. Zuckerind., 1902, **52**, [553], 104—113.

Regarded generally, sucrose which is contained in pure or impure solutions may be destroyed or changed into other bodies in the following manner: (1) by inversion or separation into dextrose and levulose in consequence of the action of heat, of acids, or of micro-organisms; (2) by breaking up into other products of decomposition; or (3) by conversion into condensation products similar to dextrin. In all probability sucrose first changes into dextrose and levulose, and these sugars then either remain as such, form condensation products, or are further decomposed.

The hydrolysis of sucrose may be disregarded, the necessary acidity being absent in normal work, a distinct alkalinity to phenolphthaleïn being maintained in all syrups and molasses, and the high temperature and concentration of the syrups is not favourable to the activity of micro-organisms. The so-called foaming fermentation occasionally occurring in the working up of alkaline syrups which become acid through the decomposition at high temperatures of non-sugars of high molecular weight, with formation of carbon dioxide and non-volatile acids, may also be left out of account, as this decomposition with its injurious effects may arise, both in the old method of boiling to string or jelly proof and the newer process of boiling to grain.

Degener and von Lippmann have shown that dextrin-like condensation products are formed only in neutral or faintly acid solutions. Should an increase in polarisation at times occur in alkaline solutions, it is only small and quickly disappears, an indication that alkalis have here a destructive action as in the presence of invert sugar.

The only point requiring attention is, therefore, the decomposition of sucrose into products of an acid character. A decomposition of sugar without formation of acid is, as far as the author's experience goes, unknown If, therefore, on heating alkaline sugar solutions, there is no reversion of the alkalinity, no sugar has been decomposed.

Although Herzfield found varying and smaller amounts, it may be taken roundly that 1 grm. of CaO destroys 4 grms. of sucrose or its equivalent of invert sugar. A loss of 0·01 of alkalinity therefore represents the destruction of 0·04 grm. of sugar as a maximum.

From an examination of the results obtained during five seasons, when the losses were calculated both from measurements of the massecuites and from alkalinity, the former showed results owing to the uncertainty of the tank measurements which gave losses evidently too high. Using the factor 4 with the alkalinity, the losses expressed in percentages of the second massecuite were 0·25, 0·23, 0·38, 0·18, and 0·17 respectively, from 1896–7 to 1901–2. In the first three seasons, the syrup was boiled to jelly or string proof in $\frac{1}{2}$ to 1 hour, and then left 5 to 8 days to crystallise. The syrup from this was reboiled and then stood 2 to 3 months. The boiling to grain occupied 20 to 30 hours and the mass was then stirred in crystallisers for 4 to 5 days.

It is evident that the loss of sugar by the latter method is distinctly less than by the former. As regards the stage at which the greatest loss of alkalinity occurs, the maximum was in the tanks. This is not surprising, as the author has previously shown that time plays an equally important part with temperature in the destruction of sugar.

In conclusion it seems clear that in working sound and alkaline syrups, the loss of sugar is very small by either method.—L. J. de W.

Carbohydrates in the Presence of Ferrous Salts; Action of Hydrogen Peroxide on ——. R. S. Morrell and J. M. Crofts.

See under XXIV., *page* 506.

Raffinose; Determination of ——. G. Reinhardt.

See under XXIII., *page* 504.

Arabinose; Derivatives of ——. G. Chavanne.

See under XXIV., *page* 506.

Heptacetylchlorlactose. A. Bodart.

See under XXIV., *page* 506.

Heptacetylchlormaltose. R. Foerg.

See under XXIV., *page* 506.

English Patent.

Centrifugal Separators [Syrup from Massecuite]; Improvements in ——. W. T. Matheeuwissen, Kraksaan, Java. Eng. Pat. 24,993, Dec. 7, 1901.

This apparatus has for its object the separation of the syrup spun from the massecuite—the first runnings—from the washings or second runnings which are of a higher degree of purity. The outer casing of the machine is provided with a large number of stationary paddles, attached at an angle almost tangentally to the periphery of the centrifugal drum. When the crude massecuite is being spun, the centrifugal drum is revolved in one direction, so that the syrup does not penetrate between the paddles, but when the sugar is being washed, the direction of rotation is reversed, and the second runnings are projected between the paddles and are collected in a separate channel.—J. F. B.

UNITED STATES PATENT.

Sugar; Method of Manufacturing ——. J. H. Lavolay and G. E. Bourgoin, Paris. U.S. Pat. 693,408, Feb. 18, 1902.

SEE Eng. Pat. 22,767, 1900; this Journal, 1901, 489.
—J. F. B.

Clarifier, [Sugar Juices]. L. Litty, Donaldsonville. U.S. Pat. 694,871, March 4, 1902.

THIS apparatus consists of a tank divided at the middle into two compartments, with steam heating coils at the bottom. The liquid enters at one end of the tank and is deflected towards the bottom by a baffle plate; it flows over the partition at the other end of the compartment and is immediately deflected to the bottom of the second compartment, leaving this compartment at the bottom of the other end. At the entry end of the first compartment is arranged a conveyor on an endless chain, which skims the impurities from the top of the liquid and conveys them to a mud trough; at the corresponding part of the second compartment is placed a paddle wheel, which agitates the liquid and directs the flow of the scum towards the conveyor. A telescopic syphon is used for regulating the height of the liquid in the tank.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast and the Changes in the Enzyme Content during Fermentation and Storage; Connection between the Physiological Condition of ——. Delbrück. Ann. de la Brass., **5**, [3], 49—55.

IN view of the novel aspect imparted to fermentation by the discovery of Buchner's zymase, the author, in conjunction with Lange, Koenig, and Haymann, has repeated the researches of Hayduck, and finds that yeast juice exhibits increased activity in proportion as the yeast is richer in nitrogen. They then endeavoured to ascertain whether the life history of yeast is divisible into a period during which the organism absorbs nitrogen, and a second stage wherein it transforms this nitrogen into diastase. With this object they stored fully-developed, washed and pressed yeast for some time, examining its fermentative power from time to time by the Hayduck method, and at the same time determining the proportion of zymase present. The results showed that a diminution in fermenting power is accompanied by a decrease in the amount of zymase.

To determine whether the zymase content increases or decreases during storage, samples of bottom-fermentation yeast were kept at the following temperatures: 1·25°—2·5° C., 6·25°—7·5° C., 17·5°—18·75° C., and 27·5°—28·75° C. The results showed that, at low temperatures, the yeast remained unaltered for about 12 days, after which time the fermentative power began to diminish, though, even at the end of 36 days it was still expressed by 120° Hayduck, the original power having been 367°. At 6·25°—7·5° C. the fermenting power sank to 314 by the end of 12 days, and to 120 after 24 days. On the other hand at 17·5°—18·75° C. it declined to 220 in five days, and, by the eighth day, the yeast had become completely liquefied, the fermenting power being reduced to zero, though the cells still retained vitality. In the case of the samples stored at 27·5°—28·75° C., the fermenting power entirely disappeared in three days and the yeast had liquefied, but only one-half the cells had perished—a proof that the presence of zymase is not a certain indication of vitality in the yeast cell.

Top-fermentation yeast was found to withstand storage for a longer period at higher temperatures, though the maximum fermentative power was exhibited after keeping a week at 17·5°—23° C., the activity diminishing more rapidly at 27°·5—28°·75 C. At a storage temperature of 1°·25—2°·5 C., however, the fermenting power gradually increased from the outset (225° Hayduck) to 233° in three days, 264° after a fortnight, 320° after 38 days, and attaining a maximum (324°) after 48 days. The same applies to storage at 17°·5—18°·75 C., the maximum (320°) being reached in 25 days.

On the suggestion of Haymann that the zymase content of the yeast could probably be modified at will, during storage, by changing the conditions of temperature, experiments were made with this object, samples of yeast being kept for three days at 23·75° C.—during which time the fermenting power declined from 199° to 162°—and then cooled down to a low temperature, whereupon the fermenting power revived, and in fact rose to 256°, which value it retained for a considerable time.

The liquefaction of the yeast on the proportion of zymase being reduced, is attributed to the action of the proteolytic diastase, discovered in yeast juice by Buchner and Hahn, on the zymase, so that autodigestion proceeds within the cells. There are thus two conflicting influences at work, the one building up zymase, under the favouring action of low temperatures; the other, stimulated by warmth, facilitating the production of a proteolytic enzyme that destroys zymase.

Applying these considerations to the study of baker's yeast, it would appear that these yeasts require to be rich in peptic enzyme during the period of reproduction; but that this enzyme must afterwards be reduced in quantity in order that they may keep, without liquefaction, during transport and storage.

An important question for the brewing industry is how to develop the fermenting power of yeast to a maximum, and why does this power suddenly disappear before all the sugar present has been fermented, thus necessitating additions of fresh yeast or fermenting wort ("kräusen"). The experiments conducted by Lange demonstrate that, contrary to general opinion, the fermentative power of yeast is at its highest two hours after pitching, at a time when the process of cell reproduction is most active. Though new cells are formed later, there is no increase in the total fermentative power, all that occurs being the distribution of the ready-formed zymase throughout the mass of the yeast. The formation of zymase is favourably influenced by aëration and by the presence of sugar; in fact, by all circumstances tending to improve the vitality of the yeast. It may, therefore, be assumed that—as is the case with animal cells—when the life of the organism is prejudiced, the peptic diastases begin to attack the substance of the cells, or at least the most susceptible nitrogenous constituent, namely zymase. On this basis a new conception may be formed of the phenomena attending the stoppage of secondary fermentation, namely, that when this stage is reached, the yeast, having no longer occasion to do work, suffers a diminution in its zymase content and loses its fermentative power. This explains the beneficial action of added fermenting wort ("kräusen"), or fresh yeast, whereby the old exhausted cells are replaced by cells rich in zymase.

The proteolytic diastase may, under certain circumstances, become an exceedingly useful ally, *e.g.*, where the yeast is to be converted into substitutes for meat extract, since this enzyme dissolves the nitrogenous matters and facilitates their extraction.—C. S.

Extract; Some Causes Diminishing the Yield of ——. A. Fernbach. Ann. de la Brass., **5**, [2], 25—27.

EVEN with a good malt, the yield of extract depends on the treatment in brewing; a malt low in diastase, for instance, may give poor results when mashed by the infusion method at high initial temperatures—though this process answers so well with English malts—whereas by infusing at a low initial temperature, saccharification will proceed normally and a high yield of extract will result. The alleged superiority of the decoction method in point of extraction is true only in so far as less friable malts are in question, there being, ordinarily, but little difference between the two methods. The same also applies to the setting of the malt rolls so as to produce a finer grist.

The yield is also affected by defects in the mashing process, inasmuch as the ill-considered addition of hot liquor at too high a temperature will perhaps kill the diastase and injuriously affect the conversion of the starch. Even when this defect has been safely avoided, there remains the problem how to separate from the grains all the extractive matter they have retained, and convey the same to the copper. This greatly depends on the sparging, and, in order that the operation may be thoroughly well performed, it is necessary to keep the first runnings as concentrated as possible, so that there will be sufficient room in the hopping copper to hold all the spargings. With this object the volume of the principal wort should not exceed one-fourth to one-third that of the total; if this limit be passed, the wort will have to be concentrated in the copper, at some considerable cost for fuel. The ideal method of working is to so manage that by the time the copper is full, the wort will be of exactly the gravity desired, leaving the grains completely exhausted. The employment of indirect steam heat facilitates the attainment of this ideal, since it obviates the necessity of adding hot liquor, and thus increasing the bulk of the wort, in order to raise the temperature. Considerable influence on the filtration of the grains is also exerted by the number and arrangement of the perforations in the false bottom; since, if the total working orifice of these perforations be insufficient in places, the drainage there will be imperfect, and a quantity of extract will be left behind.

In the author's opinion, the best means of ascertaining whether sparging has been properly conducted, is that adopted in the brewing school at the Pasteur Institute, namely, to determine the gravity of the final spargings, then take a sample of about 20 lb. of the grains (from top to bottom of the layer), place the latter in a bag, squeeze them in a hand-press, and test the gravity of the runnings. The greater the difference the more defective the sparging.

—C. S.

Galactose; Separation of —— from Glucose by means of Saccharomyces Ludwigii. P. Thomas. Comptes Rend., **134,** [10], 610—612.

In preparing galactose by the inversion of lactose, the ordinary method of separating the galactose from the accompanying glucose gives a very poor yield. The author prepares cultures of *Saccharomyces Ludwigii* by growing it in 400—500 c.c. of nutritive fluid in 1,500 c.c. flasks, decanting off the fluid after development of the yeast, and then pouring into each flask about 1,000 c.c. of the solution of inverted lactose (1,000 grms. of lactose, 4 litres of water, 60 grms. of strong sulphuric acid; heat in autoclave at 106°—107° C. for an hour; remove sulphuric acid; ultimate volume of liquid about 8 litres). After about 10 days at 25° C., fermentation is complete, and the liquid is filtered, concentrated *in vacuo,* clarified by alcohol, the alcohol distilled off, and the syrup, after adding a crystal of galactose, gives a crop of nearly pure galactose, in quantity about 85 per cent. of the theoretical. Repetition of the process on this galactose will completely remove the little remaining glucose; it cannot be removed by longer continuance of the first fermentation, for the yeast has become impoverished.—J. T. D.

English Patents.

***Yeast Cells; Process for obtaining the Contents of* ——.** **R. B. Ransford, Upper Norwood. From L. W. Gans, Frankfort-on-the-Maine, Germany. Eng. Pat. 8722, April 27, 1901.**

The claims provide for obtaining the contents of yeast cells by causing organic solvents or liquid organic compounds, which are indifferent towards the protoplasm of yeast cells, to react upon moist yeast in small quantities (5 per cent. or less of the weight of the yeast) by mixing the yeast and organic compound, stirring or kneading, and afterwards separating the liquid from the empty cells and treating it to obtain albumin and other extracts.

Further, the use of the vapours of such organic compounds as are somewhat volatile at ordinary temperatures (except ethyl ether) is claimed for a similar purpose.

—J. F. B.

Brewing, and Appliances therefor: Improvements in ——. P. Meura, Tournai, Belgium. Eng. Pat. 16,032, Jan. 10, 1901.

According to this process the raw materials are pulverised in a mill, then transferred by means of a hopper into a closed converter where they are boiled and saccharified under pressure. When saccharification is complete, the whole mass is transported by means of an air pressure into a filter-press.

The special form of filter-press claimed is distinguished by the flutings of the filter-plates being wider, further apart, and deeper than those at present used, whereby the cloths are prevented from touching the bottom of the channels The feed passage to the filter-press is of large section, and a pipe is arranged upon the end-plate of the press, provided with three branches for the admission of steam, hot water, and compressed air respectively.

—J. F. B.

Beer and the like; Method of and Apparatus for Brewing ——. A. M. Clarke. From L. Nathan, Zürich, and H. Bolze, Mannheim, Germany. Eng. Pat. 8526, April 25, 1901.

According to this process the hot wort is treated in a closed fermenting vessel, provided with a cooling jacket and a special form of stirrer, which circulates the liquid from below outwards against the walls and towards the centre downwards again at the top. During cooling the wort is saturated with filtered air admitted from the bottom. When the temperature of 7° C. has been reached. pure culture yeast is sucked in and the stirrer rotated rapidly for about two hours. The rotation of the stirrer not only circulates the liquid, but also effects a whirling motion, which causes a minute subdivision of all solid and gaseous particles, a vortex being produced at the centre. Such minute subdivision and aeration of the yeast has an essential influence on the rapid generation of a great quantity of cells. The liquid is then allowed to remain at rest for three or four hours to permit of an accumulation of fermentative power. The periods of rotation and rest are continued alternately for two or three days, beginning to stir when the cells of the former period are fully matured, and stopping the stirring when the budding aggregates are broken up. Towards the end of the fermentation, a period of twelve hours rest is allowed, in order to obtain a matured flavour, after which the stirrer is run slowly for a short time to obtain a "break." During the early stages of fermentation a slight aeration is given, after which the air supply is stopped, carbon dioxide being then injected. The beer is then drawn off, pasteurised if necessary, re-gassed, filtered, cooled to 2° C. and impregnated with carbon dioxide under pressure (see also this Journal, 1901, 919).

—J. F. B.

Beer; Manufacture of ——. L. Briant and H. C. Rigaud, London. Eng. Pat. 7131, April 4, 1901.

The inventors claim the use of compressed air for simultaneously agitating, mixing and aërating the mash or wort, particularly in the conversion of raw grain.

—J. F. B.

United States Patents.

Malt Drum. F. Knüttel, Charlottenburg, Germany. U.S. Pat. 689,728. Dec. 24, 1901.

The inventor claims, in connection with pneumatic malting drums of the type invented by him (compare this Journal, 1902, 268), a provision for increasing the supply of air by perforating the outer shell of the drum in the spaces between the ventilating pipes, whereby the cross-sections for the inlets of air are considerably enlarged.—J. F. B.

Rice; Method of Malting ——. E. C. Schrottky, Dresden. U.S. Pat. 693,569, Feb. 18, 1902.

See Eng. Pat. 9823, 1901; this Journal, 1902, 132.
—J. F. B.

Beer; Process of Converting Yeast into ——. O. Selg and C. Guntrum, Brooklyn, N.Y. U.S. Pat. 694,584, March 4, 1902.

The process here described provides for the fermentation of the wort, the removal of the yeast, and the clarification and impregnation with carbon dioxide of the beer all in the same apparatus. It consists in first adding yeast to the wort in a tub provided with an upper opening, to effect a main fermentation and a simultaneous ejection of the scum through this opening; then separating the main body of the yeast at the bottom of the liquid, leaving a residue of yeast in the tub; then closing the tub, and subjecting the liquid to after-fermentation by the residue of yeast, and simultaneously cooling the upper strata of the liquid. Whilst after-fermention is proceeding, the beer is clarified by the settling of the sediment in the yeast separator.
—J. F. B.

Beer; Apparatus for Converting Wort into ——. O. Selg and C. Guntrum, Brooklyn, N.Y. U.S. Pat. 694,585, March 4, 1902.

The apparatus claimed consists of "a fermenting tub having a sloping bottom, a communicating yeast-chamber arranged below the level of the bottom, an intervening cock, a sloping top having an opening at its apex for discharging the impurities, a cover for said opening, a gallery around said opening, and an attemperator in the upper portion of the tub." This apparatus is intended for working the process described by the inventors in U.S. Pat. 694,584 (see preceding abstract).—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Cassava. E. Leuscher. Zeits. öffentl. Chem., **8**, 10—11. Chem. Centr., 1902, **1**, [8], 493. (See also this Journal, 1901, 502.)

In the preparation of meal from cassava, a plant belonging to the Euphobiaceæ, a juice is obtained which contains hydrocyanic acid. Raw cassava paste is used in Jamaica as a healing ointment. The sweet cassava "manihotaipi" is stated to yield a milky, non-poisonous juice; from the starch which separates from the milk on standing, tapioca is prepared by heating on metal plates. A sauce named *cassareep* is prepared from the juice of poisonous cassava. The composition of cassava root, as shown by the average of six analyses, is:—Water, 70·25; starch, 21·44; nitrogenous matter, 1·12; crude fibre, 1·11; sugar, 5·13; ethereal extract, 0·41; and ash, 0·54 per cent.—A. S.

Coal Tar Dyestuffs; Poisonous and Injurious Effect of certain ——. G. W. Chlopin. Zeits. Untersuchung der Nahrungs u. Genussmittel, **5**, [6], 241—245.

Metanil Yellow has no poisonous action on dogs when taken daily in doses of 2—3 grms., nor on human beings in daily doses of 0·2 grm. It may therefore, perhaps, be regarded as practically harmless. Mandarin must be condemned as injurious. 0·2 grm. of this dyestuff are poisonous.—H. L.

English Patents.

Food Preparations (Molasses Food-stuffs); Manufacture of ——. H. Popper, Vienna. Eng. Pat. 5525, March 15, 1901.

To prepare a dry molasses food-stuff, the patentee adds to the molasses to be used, from 3 to 15 per cent. of size, before mixing with the oilcake flour, malt dust, brewers' grains, &c. The size may also be added after the molasses has been mixed with the other ingredients.—W. P. S.

Chocolate; Manufacture of ——. M. Rieck, Hamburg, Germany. Eng. Pat. 7800, April 16, 1901.

In the process claimed, the raw cocoa beans, after being shelled, are heated with "invert" sugar, and then ground up with or without the addition of cocoa-butter.
—W. P. S.

Milk, Butter, and other Substances; Process and Apparatus for Sterilising and Pasteurising ——. C. J. A. de Bock, St. Josse-ten-Noode, Belgium. Eng. Pat. 16,207, Aug. 12, 1901.

This invention consists essentially in causing the substance to be sterilised to flow by its own weight through small vessels or chambers surrounded by heating and refrigerating liquids, so that a thin layer of the substance is under treatment. The process is continuous, and the sterilising heat is gradually increased as the substance passes through the chambers. In the case of butter, the sterilised fat is afterwards conducted into a special form of churn (also claimed), where it is re-mixed with water and packed for use. Arrangements are provided for regulating the flow of material.—W. P. S.

Separators; Centrifugal [Cream] ——. C. A. Hult and O. W. Hult, Stockholm, Sweden. Eng. Pat. 312, Jan. 4, 1902.

The inset of the centrifugal apparatus consists of plates arranged in series around the axis of the drum, each series comprising a number of plates superposed in the direction of the axis, and set at an inclination to the radius of the drum, so that they have substantially the shape of a sector or a semicircle. The plates are held in their proper inclined position by their radial edges resting against partition walls, which extend from the centre of a frame placed in the drum, the outer edges of the plates resting against the wall of the drum, &c. The plates are hinged to the frame, or are pivoted to each other, so that when the inset is removed from the drum, the plates can be swung about an edge to facilitate cleansing.—R. A.

Eggs; Process for Preserving ——. C. Aufsberg, Wiesbaden, Germany. Eng. Pat. 1661, Jan. 21, 1902.

The eggs are immersed for five seconds in a solution containing 15—25 per cent. of magnesium sulphate and 0·5 per cent. of calcium sulphate, and are then placed in a cold solution of sodium silicate. The eggs may be kept in the latter solution or may be taken out and dried.
—W. P. S.

United States Patent.

Alimentary Product [Flaked Cereal]; Method of making an ——. E. W. Ayres, Washington, Columbia. U.S. Pat. 693,485, Feb. 18, 1902.

The product claimed is prepared by first cleaning and grading any cereal, such as wheat, barley, or oats. The cleaned cereal is then soaked in water for 24 hours, steamed under pressure at a temperature of 305° F., rapidly cooled, and air-dried. It is then mixed with malt extract (8—17 per cent. of its weight), pepsin (0·5 per cent.), and salt. This mixture is "flaked" by passing through hot rollers, and the moist flakes are heated to a temperature of 135°—145° F. for one hour, being at the same time subjected to a current of hot air. The flakes are then baked.
—W. P. S.

Coffee Substitutes; Process of obtaining ——. H. S. Maxim, London. U.S. Pat. 693,662, Feb. 18, 1902.

See Eng. Pat. 3129, Feb. 13, 1901; this Journal, 1902, 269.—W. P. S.

Milk; Production of Dry Condensed ——. W. A. Hall, Bellows Fall, Vermont, U.S.A. U.S. Pat. 694,100, Feb. 25, 1902.

The process claimed consists in removing the cream from the milk, evaporating the skimmed milk to dryness, and thoroughly mixing with the dry solids a quantity of cream equal to the cream first removed. This mixture is then further dried at a temperature not exceeding 100° F.
—W. P. S.

Separators [Cream]; Liner for Centrifugal Liquid ——. N. W. Gales, Waterloo, Iowa, U.S.A. U.S. Pat. 694,736, March 4, 1902.

In centrifugal cream separators the bowl is constructed with a removable central tube having discharge openings leading into a conical distributor. Above the distributor are arranged a number of corrugated separating cones provided with suitable exit tubes.—J. W. H.

Egg-Preserving Compound. J. M. Stukes, Texas, U.S.A. U.S. Pat. 694,899, March 4, 1902.

The compound claimed is prepared by melting 2 lb. each of beeswax and paraffin wax in 1 gall. of warm cotton-seed oil. This mixture is then partially cooled and receives the further addition of one half-ounce of salicylic acid. The finished product is rubbed over the shells of the eggs.
—W. P. S.

Fruits [and Foods]; Process of Preserving ——. A. L. de Stürler, Holland. U.S. Pat. 694,301, Feb. 25, 1902.

The fruit, or other food such as meat, eggs, and the like, is first treated with sulphurous acid, formic aldehyde, or boric acid, and is then closely enveloped in a wrapper, consisting of paper, cotton, or similar material, which has previously also been impregnated with one of the above sterilizing media. The wrapper is now coated with melted paraffin wax or spermaceti.—W. P. S.

Tea Leaves; Method of Withering ——. C. U. Shepard, S. Carolina, U.S.A. U.S. Pat. 694,795, March 4, 1902.

Fresh tea leaves are passed through a rotating cylinder, being subjected at their point of entrance to a current of highly-heated air. The leaves are moved through the cylinder by means of spirally-arranged flanges, which, besides imparting an onward movement to the leaves, also pick up and drop them during the rotation.—W. P. S.

Alimentary [Yeast] Extracts; Process of Preparing ——. E. C. L. Kressel, London. U.S. Pat. 694,102, Feb. 25, 1902.

The process (see Eng. Pat. 15,885, 1895 (this Journal, 1896, 608), and Ger. Pat. 89,819, 1896) consists in heating washed yeast in a closed vessel by steam to a temperature of 180° to 200° C. After about 30 minutes' heating, the proteid matter of the yeast is converted into soluble peptones which are filtered off and evaporated.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

English Patents.

Feed-Water for Steam Boilers; Process and Apparatus for Purifying the ——. J. B. Lemaire-Destombes, Tourcoing (Nord), France. Eng. Pat. 5653, March 18, 1901.

The feed-water is admitted into the purifying vessel above the water level, and a mixture, taken from the boiler, of steam and water containing sodium carbonate is simultaneously admitted below the water level. The feed-water, falling in a shower, is thus heated by the rising steam before meeting water charged with the reagent, and is then thoroughly agitated therewith by the steam, and having deposited its impurities at the bottom of the vessel, the clarified water is taken from the top and passes to the boiler.—L. A.

Water Softening and Liquid Purifying Apparatus ——. R. Scott and W. Paterson, New Wandsworth, Surrey. Eng. Pat. 7170, April 4, 1901.

This apparatus works on the continuous-flow principle. The water, mixed with reagent solutions in suitable proportions, enters the cylindrical softening and settling tank through a central, vertical pipe, fitted internally with baffles and terminating in a cone, which, at its outlet, occupies just half the area of the tank. Thus, the water in flowing downwards through the cone, and then upwards outside the cone, is continually spread over a larger area, which decreases the rate of flow, and enables the precipitate to settle in the grooves of corrugated sloping plates which are fixed in the upper part of the tank, and fall to the bottom, whilst the nearly clear water is withdrawn from the top through an annular pipe, perforated with holes. A suitable arrangement of floats and valves automatically regulates the flow of water and reagent solutions in proper proportions.—L. A.

Refuse Matter or other Material; Furnaces and Apparatus for Burning ——. H. Heenan. Eng. Pat. 7041, 1901.

See under II., *page* 460.

United States Patents.

Liquids; Apparatus for Vaporising ——. W. G. Lyle and J. E. Stewart, New York. U.S. Pat. 694,396, March 4, 1902.

The invention relates especially to a means of automatically maintaining the humidity of the air in a room constant, and consists of a closed vessel containing the liquid (water) to be vaporised and a movable wick, which carries the water to a sponge to feed the main wick for vaporisation. The movable wick is controlled by a hydrometer and is lifted from the sponge by electrical means when the humidity of the air reaches the maximum allowed, and is lowered again when the hydrometer indicates a minimum.—J. W. H.

Purifying Liquids (Water) by Electrolysis; Electrode for ——. W. R. Chipman. U.S. Pat. 694,933, 1902.

See under XI. A., *page* 485.

XIX.—PAPER, PASTEBOARD, Etc.

Wood-Pulp; Determination of Moisture in ——. C. Hofman.

See under XXIII., *page* 502.

Manure; Utilisation of Waste Liquors from Sulphite Cellulose Manufacture as ——. T. Knösel.

See under XV., *page* 489.

English Patents.

Paper Pulp and like Material; Apparatus for Straining ——. J. White, Edinburgh. Eng. Pat. 24,381, Nov. 30, 1901.

The form of pulp strainer claimed is characterised by a plurality of strainer drums or elongated tubular vessels secured, within a vat or trough, to and alongside a central rocking shaft, with their axes parallel to the axis of the shaft. When two drums or flattened tubular vessels are used, they are secured one to either side of the shaft, the shells of the drums being composed of strainer plates and their ends being connected by flexible tubes to a delivery box beyond the vat.—J. F. B.

Paper, Card-Board and the Like; Method and Composition for Impregnating ——. J. Back, Vienna. Eng. Pat. 7344, April 9, 1901.

The inventor claims a method for impregnating paper, cardboard, &c., for the purpose of increasing its stiffness, by soaking the materials with a composition consisting of a mixture of calcium hydrate, dextrin, meal, or starch and water.—J. F. B.

Celluloid-like Products; Manufacture of New ——. J. Y. Johnson, London. From Deutsch. Celluloidfabr., Plagwitz-Leipzig, Germany. Eng. Pat. 12,863, June 24, 1901.

In the manufacture of products resembling celluloid, the inventors claim to substitute for the whole or part of the camphor usually employed, "an acidyl product of secondary amines containing only aromatic radicles, such as acetyl-diphenylamine, formyl-diphenylamine, acetyl-phenyltolylamine, and acetyl-phenylnaphthylamine."—J. F. B.

United States Patents.

Wood-Pulp; Apparatus for Separating Clean from Refuse Chips in the Manufacture of ——. T. P. Burgess, Berlin, New Hampshire. U.S. Pat. 693,684, Feb. 18, 1902.

The apparatus claimed, effects the separation of refuse chips of bark and knots from the clear chips suitable for boiling to pulp. Its operation depends on propellers which gently push a floating layer of mixed chips in a horizontal plane over the surface of a liquid and at the same time move the chips about relatively to each other and break up the layer in all directions. In this way, the heavier refuse chips are enabled to sink to the bottom, since their tendency to float, supported by the superior buoyancy of the clear chips, is destroyed by the motion.—J. F. B.

Pulp and Paper-making Machine. H. Parker, Bellows Falls, Verm. U.S. Pat. 693,896, Feb. 25, 1902.

This invention refers principally to a special form of doctor, adapted for removing the pulp picked up on the making-cylinder of a cylindrical paper making machine. The apparatus consists of a stack, connected at the top with a suction apparatus and at the bottom with a stand-pipe, which may lead to another part of the machine. A hollow snout of substantially the same width as the roll has an orifice along the edge adjacent to the roll; at the rear the snout is preferably reduced to an ordinary cylindrical pipe extending into the stack. The stand-pipe being filled with sufficient water to form a trap, the suction draws the wet web of pulp off the making-cylinder and carries it into the snout, whence it is discharged into the stack in a concentrated form (see also this Journal, 1902, 271).—J. F. B.

Paper-making Machine. T. H. Savery, Wilmington, Del. U.S. Pat. 694,427, March 4, 1902.

This invention relates to improvements in the construction of paper-making machines of the Fourdrinier type. In such machines the making wire runs round the couch roll to the breast roll at the further end and then back again underneath to the couch roll. It is customary to drive the couch roll and use the making wire as a belt to drive the breast roll, thus involving considerable wear and tear on the wire when the breast roll is very large and heavy. The 18 claims of this specification deal with means for driving both the couch roll and breast roll independently of the making wire, and for compensating the gearing of the breast roll, so that any inequalities in the speed of the two rolls do not cause any friction on the wire.—J. F. B.

Paper-Pulp; Screen Apparatus for ——. D. Sharpe, South Hadley Falls, Mass. U.S. Pat. 694,678, March 4, 1902.

The claims relate to improvements in screens for paper-pulp, providing for improved means for operating the diaphragm, which makes the suction beneath the strainer bed or screen, changing the length of the working play or stroke of the diaphragm, and varying the speed of its reciprocation.

Improvements are also claimed in the construction and arrangement of the strainer bed, and means are provided for flushing the dirt off the surface of the screen periodically; an arrangement of the conduit for taking away the strained pulp is also described.—J. F. B.

Paper-making Machine. J. W. Moore and J. A. White, Philadelphia. U.S. Pat. 694,772, March 4, 1902.

The improvements claimed in this specification relate to means for the vertical adjustment of the free end of the shake-frame in machines of the Fourdrinier type, so as to work it at different angles. The improvements are especially applicable to shake-frames provided with flexible suspension plates.—J. F. B.

Paper; Machine for Making ——. H. Parker, Bellows Falls, Verm. U.S. Pat. 693,895, Feb. 25, 1902.

In this specification the eight claims relate to an improved cylindrical type of machine for making paper or pulp for future use, in continuous webs. The interior of the making cylinder is divided into a number of radial compartments, the dividing walls being curved instead of flat; means are also provided for exhausting and introducing air from or into the compartments at different points of the revolution. The removal of water and air, and the introduction of air are effected by means of three independent sections of the central pipe.—J. F. B.

Paper-making Machine. H. Parker, Bellows Falls, Verm. U.S. Pat. 693,897, Feb. 25, 1902.

In a paper-making machine of the cylindrical type, the interior of the making cylinder is divided radially into a number of longitudinal compartments. Against the end of the cylinder a stationary plate is adjusted and pressed in position by springs, so as to cover the ends of any number of compartments, preferably four. As the cylinder emerges with the pulp picked up from the liquid, the compartments covered by the plate are subjected to the action of a suction maintained through the plate, so that the removal of the excess of moisture is materially facilitated.
—J. F. B.

Wool-Paper; Manufacture of ——. H. Zilles, Mannheim, Germany. U.S. Pat. 693,941, Feb. 25, 1902.

The claim deals with the manufacture of paper, having rough surfaces, and a mottled, woolly, appearance, by forming a pulp of fine fibrous material, dyeing relatively coarser wood fibres with a free-running colour, contrasting with the colour of the pulp, then mixing these dyed coarse wood fibres with the pulp, and transferring some of their colouring matter to the pulp, and finally converting the mixture into a paper with the coarser fibres projecting from the surfaces.—J. F. B.

Rosin Soap for Paper Size. H. F. Chappell, Chicago. U.S. Pat. 694,728, March 4, 1902.

The inventor claims a process for making a rosin soap, containing minimum proportions of uncombined rosin and soda ash, by effecting the reaction in the ordinary way and then subjecting the product to a heat above 212° F., such as is obtained by superheating it in a pan on an open fire short of scorching, stirring all the time, the resinate being obtained in a desiccated state.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Neodymium and Praseodymium; Acid and Basic Sulphates of ——. C. Matignon. Comptes Rend., **134**, [11], 657—660.

By dissolving the normal sulphates in boiling sulphuric acid, crystals are obtained on cooling of $M(SO_4H)_3$, and by heating the normal sulphates for some time at close upon 1000° C., residues are left having the formula $(MO)_2SO_4$. ($M =$ either Nd. or Pr.) The acid sulphates form silky needles acting strongly on polarised light, very deliquescent and unstable. The basic sulphates are insoluble amorphous powders, rose - coloured (neodymium) and pale green (praseodymium) respectively.—J. T. D.

Sodium Phosphate; A New ——. H. Joulie. Comptes Rend., **134**, [10], 604—606.

By adding syrupy phosphoric acid to crystallised sodium phosphate (when the temperature falls to – 13° C.) till the mixture is neutral to litmus and then concentrating continuously at 45°—50° C., oblique prisms are deposited of a sesqui-sodium phosphate $Na_3H_3P_2O_8$. The salt has no water of crystallisation, is not deliquescent, and is soluble in water in almost any proportion. From the therapeutic point of view it presents several advantages:—It is very soluble in water, and its solutions, even when concentrated, do not crystallise. It is a more active drug than the disodium salt. Its taste is not disagreeable. It could be employed hypodermically in much more concentrated solution than the disodium salt.—J. T. D.

Benzoyl - Acetyl and Diacetyl Peroxides; Formation, Decomposition, and Germicidal Action of ——. P. C. Freer and F. G. Novy. Amer. Chem. J., 1902, **27**, [3], 161—192.

A MIXTURE of benzaldehyde and refractionated acetic anhydride placed in a freezing mixture and subjected to the action of a current of cooled dry air, solidified in seven hours. The yield of benzylidene diacetate was almost theoretical; only traces of benzoyl acetyl peroxide and benzoic acid were formed. At 13°—14° C., under the same conditions, the mixture remains almost unchanged. The reaction is greatly accelerated by the presence of certain metals; with iron at the ordinary temperature, it is complete in a few minutes. If the acetic anhydride is previously freed from acetic acid by standing over sodium, benzylidene diacetate is not formed in appreciable quantity until after the lapse of 36 hours, even in the presence of iron. The authors conclude that the reaction is one of simple addition, the catalysers effecting the rate of change of the aldehyde from the keto to the enol form.

In examining the influence of surface on the oxidation of mixtures of benzaldehyde and acetic anhydride, it is necessary to use anhydride free from acid, in order to avoid excessive formation of benzylidene diacetate. The amount of benzoyl acetyl peroxide produced, is determined by measuring the gas evolved on heating. The following equation empirically represents the decomposition:— $2C_9H_8O_4 = 3CO_2 + CH_4 + C_{14}H_{12}O_2$. The residue is of complex composition; it contains high-boiling hydrocarbons and (probably) phenyl benzoate. A current of thoroughly dried air was slowly passed through a mixture of equal parts of benzaldehyde and acetic anhydride, both dry, containing strips of pure metal. The amount of peroxide obtained was much increased by magnesium and iron; with tin, platinum, and filter paper there was a smaller increase. An experiment, conducted with special precautions to exclude moisture, showed that the presence of water is not essential to the formation of the peroxide. The oxidation is most simply assumed to result from the addition of oxygen to the enol form of benzaldehyde, producing benzoperacid, which then reacts with acetic anhydride to give benzoyl acetyl peroxide.

The best method for producing the peroxide in quantity is as follows:—Strips of filter paper or muslin, hung in a large covered glass jar, are saturated with a mixture of equal parts of benzaldehyde and acetic anhydride. The strips must not be crowded, or they may char, or even take fire. A current of dry air is passed through until the odour of aldehyde has disappeared, the paper or muslin is extracted by low boiling petroleum spirit, the solution washed with a little soda solution until the washings just become alkaline (very little benzoic acid is produced, hence little benzoyl acetyl oxide was formed), the ether solution concentrated on a bath of luke-warm water and placed in a freezing mixture. An explosion may result, if the temperature of the bath exceeds 80° C. The crystals of peroxide are separated and recrystallised from the same solvent; the mother liquor yields a further quantity. The yield often reached 68 per cent. of the theoretical. When pure, the peroxide is perfectly stable; in the presence of moisture, traces of alcohol, ether, and acids, it gradually decomposes, becomes liquid, and deposits crystals of dibenzoyl peroxide. The pure peroxide melts at 40°—41° C. It is odourless and is not an oxidising agent: in ethereal solution, it does not oxidise aniline until acetanilide and benzoperacid are formed, the latter then gives azoxybenzene and benzoic acid. When benzoyl acetyl peroxide is hydrolysed by water, benzoyl peroxide is deposited and a solution is left containing acetic and benzoic acids, some benzoperacid, but chiefly acetoperacid. The solubility of benzoyl acetyl peroxide in water at 25° C. is 0·639 grm. per litre, which is equivalent to 0·0568 grm. of active oxygen per litre.

Acetyl peroxide is best prepared by covering commercial barium dioxide with water, cooling in a freezing mixture, and then adding acetic anhydride and dilute hydrochloric acid in small quantities alternately. The liquid must not be allowed to become alkaline; it is finally acidified with hydrochloric acid and the separated crystals of acetyl peroxide dried and recrystallised from petroleum spirit. On standing with water, acetyl peroxide, unlike benzoyl acetyl peroxide, gradually gives off oxygen.

Benzoyl peroxide is soluble with difficulty, is not hydrolysed, has no oxidising action, and is without effect on bacteria. Hydrogen peroxide is known to have some germicidal action. Acetyl peroxide and benzoyl-acetyl peroxide produce on hydrolysis, acetoperacid and benzoperacid respectively; these peracids are extremely active, both chemically and germicidally, their solutions containing only 0·01, or even 0·005 per cent. of active oxygen, destroy all known disease-producing bacteria within a minute, including the spores of such resistant forms as the potato bacillus. A hydrogen peroxide solution containing 0·05 per cent. of active oxygen was without action on many bacteria, even in 60 minutes, whilst a 5 per cent. solution of phenol failed to destroy the spores. —A. C. W.

Nitro- and Amino-Acetophenone (Hypnone). R. Camps. Archiv, 1902, **240**, [1], 1—18.

THE author confirms the statement of A. Emmerling and C. Engler that on nitrating acetophenone, the amount of *m*-nitro compound produced decreases as the temperature of nitration increases. In a series of experiments carried out between – 15° and + 35° C., with 200 grms. of acetophenone in four 50 grm. portions, it was found that the yield of *o*-nitroacetophenone only varied within narrow limits (116 grms. at — 15° C., 114 grms. at 35° C.), but the yield of the *m*- compound is highest at — 15° C. (152 grms.) and attains a minimum at 35° C. (76 grms.). At temperatures between + 15° and + 35° C., nitrous gases are produced, and these act on the *m*-nitroacetophenone with formation of *m*-nitrobenzoylformoxime (*m*-nitroisonitrosoacetophenone).

Nitration of Acetophenone.—50 grms. of acetophenone were slowly added, with constant stirring, to 500 grms. of fuming nitric acid (sp. gr. 1·51) cooled to — 10° C., the temperature at no time being allowed to rise above — 8° C. After standing for 15 minutes, the liquid was poured in a thin stream, into four litres of ice-cold water, when the *m*-nitro-acetophenone separated as a flocculent, plastic mass. The acid mother liquor was immediately rendered alkaline by the addition of sodium carbonate, first in the solid form and then in solution, and was then exhausted with ether. From the ethereal extract, a reddish-yellow oil was obtained, consisting mainly of *o*-nitroacetophenone. The plastic mass was freed from the oily *o*-compound, and both the latter and the crude *m*-derivative purified by treatment with sodium carbonate and extraction with ether. 200 grms. of acetophenone yielded 118 grms. of *o*-nitroacetophenone (85 grms. of which were isolated from the acid mother liquor) and 147 grms. of *m*-nitroacetophenone.

m-Nitrobenzoylformoxime.—This is formed in greatest quantity at temperatures between 30° and 35° C. It can be easily separated from *o*- and *m*- nitroacetophenone by treatment with ether, in which it is only slightly soluble. From benzene it separates in aggregates of needles melting at 152° C., and exploding when heated above this point. It is only slightly soluble in alcohol, more readily in hot glacial acetic acid.

m-Aminoacetophenone.—The *m*-nitroacetophenone was reduced with tin and hydrochloric acid, 60 grms. thereof yielding 45 grms. of *m*-aminoacetophenone. The base melts at 96·5° C., distils without decomposition at 289°—290° C., and is only very slightly volatile with steam, a property which is of importance for its separation from the *o*-aminoacetophenone.

o-Aminoacetophenone.—*o*-nitroacetophenone was reduced as above, and the alkaline solution (treatment with caustic soda) distilled. The distillate (oil and water) was treated with ether, and the ethereal extract dried and evaporated. The base so obtained forms an oil boiling at 250°—252° C. under atmospheric pressure, and at 135° C. at 17 mm. *o*-aminoacetophenone possesses a peculiar odour, which in a diluted condition is very persistent and resembles that of jasmine flowers.

From 200 grms. of acetophenone, by the methods described, there were obtained, on the average, 145 grms. of *m*-nitroacetophenone and 120 grms. of *o*-nitroacetophenone (90 per cent. purity), and from the latter 75—80 grms. of *o*-aminoacetophenone.—A. S.

Mentha Pulegium; Proximate Analysis of Essence of ——. L. Tétry. Bull. Soc. Chim. **27**, [6], 186—193.

The essence, fractionated under a pressure of 20 mm., yielded a considerable fraction passing below 105° C., a small portion between 105° and 110°, the main portion (or crude pulegone) at 110°—112°, and practically none boiling above this temperature.

In the crude pulegone, the presence of menthol was demonstrated, both by converting it into menthyl benzoate, which was separated and identified, and by converting the ketones into oximes and distilling, when the portion coming over between 110° and 120° was shown to be menthol, both by conversion into menthylphenylurethane, and by re-fractionating and crystallising the pure menthol. In the fractionation of the oximes, a portion coming over at about 50° was found to be acetoxime; and as a later portion of the distillate gave figures indicating a mixture of the oxime of pulegone with that of a ketone of lower molecular weight, probably β-methylcyclohexanone, the author assumes that in presence of excess of hydroxylamine, Beckner and Pleissman's "abnormal" oxime—

$$CH_3.C_6H_8O.C(NHOH).(CH_3)_2$$

is first formed, then forms an oxime—

$$CH_3.C_6H_8(NOH).C(NHOH).(CH_3)_2,$$

which breaks up into β-methylcyclohexanoxime —

$CH_3.C_6H_2.(NOH)$, and acetoxime $C(NOH).(CH_3)_2$.

Probably the "crude pulegone," in addition to pulegone and menthol (the latter estimated at 10 per cent.) contains small amounts of α or β-isopulegone.

From the portion of the essence boiling below 105° C. the author isolated menthone, identified by the properties of its semicarbazone. This portion was also found to contain a mixture of terpenes, which, however, the author was not able to isolate and identify.—J. T. D.

Lactic Fermentation; Study of the —— *by Observation of Electrical Resistance.* Lesage and Dongier. Comptes Rend., **134**, [10], 612—614.

Determinations of the specific resistance of a large number of samples of milk taken at random in the "Crémeries" of Paris (using Ostwald's apparatus and Kohlrausch's method) gave values lying between 230 and 275 ohms. (temp. 16°·7 C.) A number of milks of known origin gave values between 235 and 265 ohms, while daily observation, for four months, of the milk of a single cow, gave values between 245 and 265 ohms. The resistance of all these samples of milk gradually lessened on keeping, and coagulation set in in all of them when the specific resistance had fallen to 185—175 ohms. After coagulation the resistance is sensibly constant for a month, if the milk is kept in closed bottles, but falls, though slowly and at a decreasing rate (to 156 ohms in a fortnight) if the milk be in open vessels. If the casein be filtered off, however, the resistance of the buttermilk falls further (in closed bottles to 141, in open vessels to 93 ohms, after six days). The measurement of the specific resistance thus affords valuable information as to the progress of the fermentation. Addition of water to the fresh milk raises the resistance; with 10 per cent. addition, the increase is 15—20, with 30 per cent. 65 to 70, with 50 per cent. 73 to 100 ohms.
—J. T. D.

Alkaloids; The Lactates of certain ——. Ssergejew. Chem.-Zeit. Rep., 1902, 70.

The lactates of quinine, berberine, narceïne, and codeïne are crystalline; chelidonine and cinchonine lactates could not be obtained in the crystalline form. Berberine lactate is soluble in 330 parts of water at 17° C., and in 143 parts of 96 per cent. alcohol at 17° C.; it melts at 187°—188° C. with decomposition. Quinine lactate melts at 100° C.; it appears to contain water of crystallisation.—A. C. W.

Corydalis Alkaloids. J. Gadamer. Archiv d. Pharm, **240**, [2], 81—113.

In continuation of a previously published communication, the author describes as comprising the corycavine group, the two alkaloids, corycavine and corycavamine. This grouping has been determined more from negative than from positive reactions. Neither alkaloid contains methoxyl or hydroxyl groups, and both react when treated with alcoholic iodine solution. The author considers that there are points of relationship between corycavine $C_{23}H_{23}NO_6$, corycavamine $C_{21}H_{21}NO_5$, protopine $C_{20}H_{19}NO_5$, and, perhaps, chelidonine $C_{20}H_{19}NO_5.H_2O$.

Corycavine.—By repeated re-crystallisation from alcohol, corycavine is obtained in colourless rhombic tables of the m.p. 215°—216° C., which do not contain any water of crystallisation. Wagner and Ziegenbein have previously found the formula to be $C_{23}H_{23}NO_6$ and not $C_{23}H_{23}NO_5$, as stated by Freund and Josephi.

Corycavamine was isolated from the amorphous basic residues from which all the crystalline bodies had been removed either as free bases or hydrochlorides, by means of its sulphocyanide compound, which is very insoluble, especially in the presence of excess of ammonium sulphocyanide. To obtain the pure base it is converted into the nitrate, which is then re-crystallised. The base is liberated from the crystals by ammonia, and twice crystallised from ether, when it is obtained in rhombic columns of m. pt. 148°—149° C. Analysis of the crystals gave figures agreeing well with the formula $C_{21}H_{21}NO_5$. The alkaloid is dextrorotatory, $[\alpha]^{20}_{D} = +\ 166{\cdot}6°$. The salts of corycavamine, with the exception of the sulphate, are easily crystallisable. The hydrochloride, $C_{21}H_{21}NO_5HCl$, and hydrobromide, $C_{21}H_{21}NO_5HBr$ form fine needles; the hydriodide, $C_{21}H_{21}NO_5HI$, bulky, light yellow needles. The sulphate, $(C_{21}H_{21}NO_5)_2H_2SO_4 + 6H_2O$, forms rosettes of needles, the nitrate, $C_{21}H_{21}NO_5HNO_3$, long glittering needles. The gold and platinum double salts were prepared by direct precipitation and cannot be crystallised. The gold salt, $C_{21}H_{21}NO_5H.AuCl_4$, is a whitish yellow powder. The platinum salt, $C_{21}H_{21}NO_5H_2PtCl_6$, is an amorphous powder.

Corycavamine, heated with alcoholic iodine, adds 4 atoms of iodine.

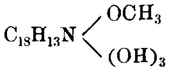
On reduction of this body by zinc and sulphuric acid, instead of the expected hydro-corydaline iodide, there was obtained a body melting at 200° C., which probably is identical with *i*-corycavamine.

Iso-corycavamine. — By heating corycavamine with acetic anhydride and sodium acetate on the water bath, diluting with water and saturating with $NaHCO_3$, a body was obtained, which, crystallised from ether, had the m. pt. 216°—217° C., and was identified as iso-corycavamine. This substance, however, may be easily prepared by simply heating corycavamine to 180° C. for a few minutes, and recrystallising the product from alcohol. Analysis of the crystals gave figures showing $C_{21}H_{21}NO_5$ to be the formula, and it is probably a racemic combination. *i* - Corycavamine resembles cryptopine, $C_{21}H_{23}NO_5$, and as the formulæ differ by only two H atoms, it was thought that they might be identical, but further investigation, however, showed that this was not so.

Bulbocapnine Group.—In this group are the three alkaloids, bulbocapnine, corytuberine, and the hitherto unknown corydine.

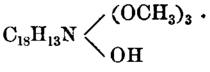
Bulbocapnine, $C_{19}H_{19}NO_4$. — Ziegenbein has previously showed that this alkaloid contains three hydroxyl groups and one methoxy group. He has tried to obtain a methylated bulbocapnine by the action of CH_3I in alkaline solution, but only succeeded in obtaining bulbocapnine-methyl-iodide. Gadamer and Ziegenbein have also failed to obtain, for the purpose of oxidation, tri-methylated bulbocapnine by the action of sodium methylate on tri-acetyl bulbocapnine. By oxidation of tri-acetyl bulbocapnine, a small quantity of an acid was obtained, insufficient for examination.

Corydine.—This alkaloid constitutes the principal part of the amorphous alkaloid of Merck. Solutions of corydine are very easily oxidised, and to prepare the pure base, the pure hydrochloride must first be obtained. From this corydine may be obtained by liberation wth ammonia, and repeated recrystallisation of the base from anhydrous ether, from which it separates in crystals melting at 129°—130° C. This purification is attended with great loss. Corydine crystallises from alcohol in shining silky needles melting at 103°—105° C., which contain water or alcohol of crystallisation. The composition has not yet been exactly determined; analysis of the base and several salts give the formula $C_{21}H_{25}NO_4$, while the analysis of the nitrate gives $C_{21}H_{22}NO_4$, the latter being considered more correct on account of its analogy to that of bulbocapnine. The base contains one hydroxyl and three methoxyl groups, and, since bulbocapnine contains one methoxyl and three hydroxyl groups the formulæ may be expressed thus :—



$$C_{18}H_{13}N\begin{cases}OCH_3\\(OH)_3\end{cases}$$

Bulbocapnine.



$$C_{18}H_{13}N\begin{cases}(OCH_3)_3\\OH\end{cases}$$

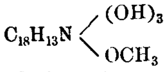
Corydine.

Both alkaloids are dextro - rotatory. Bulbocapnine $[\alpha]_D = + 237{\cdot}1°$; corydine $[\alpha]^{20}_D = + 204{\cdot}35°$.

The salts of corydine are, as far as examined, free from water of crystallisation, and are easily crystallisable. The hydrochloride occurs in brilliant detached crystals, the nitrate in fine needles.

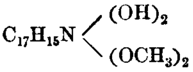
Corytuberine.—This alkaloid was discovered by Dobbie and Lauder by extracting Schuchardt's crude corydaline with water. Corytuberine is insoluble in chloroform, benzene, and ether, but is soluble in water.

They assigned the formula $C_{19}H_{25}NO_4$ to it. Wagner considers the formula $C_{19}H_{23}NO_4 + 5H_2O$ more accurate. Corytuberine crystallises in white glittering laminæ, melting at 240° C., with slight decomposition; it is dextro-rotatory $[\alpha]_D = 282{\cdot}65°$. It is a feeble base. The hydrochloride, $C_{19}H_{23}NO_4HCl$, occurs in colourless crystals; the hydrobromide, $C_{19}H_{23}NO_4HBr$, in colourless crystals; the sulphate, $(C_{19}H_{23}NO_4)_2H_2SO_4 + 4H_2O$, in small colourless crystals; the platino-chloride, $(C_{19}H_{23}NO_4HCl)_2PtCl_4 + 3H_2O$, is easily reducible and cannot be crystallised; it is a light yellow micro-crystalline powder. Dobbie and Lauder have stated that the alkaloid contains two methoxyl groups, which the author confirms. On acetylation and subsequent crystallisation from alcohol, greyish crystals were obtained, m. pt. 72° C. Analysis of these indicated the formula $C_{19}H_{21}NO_4(C_2H_3O_2)_2 + C_2H_6O$. The base therefore contains two hydroxyl groups as well as two methoxyl groups, and its relationship to bulbocapnine may be shown by the following formulæ :—



$$C_{18}H_{13}N\begin{cases}(OH)_3\\OCH_3\end{cases}$$

Bulbocapnine.



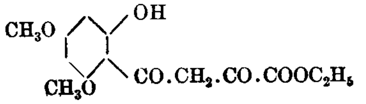
$$C_{17}H_{15}N\begin{cases}(OH)_2\\(OCH_3)_2\end{cases}$$

Corytuberine.

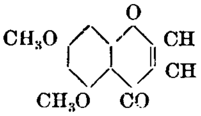
Attempts were made to methylate the base and to oxidise the product by means of silver oxide and silver carbonate, but without definite result.—J. O. B.

1.3-*Dihydroxychromone.* V. Kostanecki and J. C. de Ruijter de Wildt. Ber., **35**, [4], 861—866.

Oxalic ether condenses with phloracetophenone dimethylether in the presence of metallic sodium to form the *ethylester of* 4·6 *dimethoxy-2-hydroxybenzoylpyruvic acid*—



m. pt. 149° C., which may be converted into 1.3-*dimethoxychromone-β-carboxylic acid*, m. pt. 244·5° C., by means of alcohol and hydrochloric acid. 1.3-*dimethoxychromone*—



m. pt. 131°—132° C. is formed by heating the latter substance above its melting point. The methyl groups are removed by boiling with hydriodic acid (sp. gr. 1·9) and 1.3-*dihydroxychromone*, m. pt. 273° C., is thus obtained. 1.3-Dimethoxychromone is not identical with limettin, a substance obtained by Tilden and Beck from the essential oil of *Citrus-limetta*. The view of Tilden that limettin is probably 1.3-dimethoxycumarin thereby receives confirmation.—H. L.

Lactic Acid; Two New Micrococci capable of forming ——. Hashimoto.

See under XXIV., *page* 506.

United States Patent.

Iodine Preparations; Manufacturing ——. M. Cohn, Berlin. U.S. Pat. 694,945, March 11, 1902.

An antiseptic compound of iodine, intended as a substitute for iodoform, is prepared by dissolving 100 parts of gelatin and 3 parts of potassium iodide in 1,000 parts of water, then adding 1½ parts of iodine, as vapour or otherwise, and lastly about 1 per cent. of a hardening or solidifying agent, such as chrome alum. The mixture is dried on threads and powdered. The compound is described as odourless, but when applied in surgery, under the action of moisture, iodine is set free, and acts as iodoform under like conditions. Instead of pure water, a decoction of chamomile or lavender may be used in the preparation, and the proportions of the constituents may be varied.—E. S.

XXI.—PHOTOGRAPHY.

English Patent.

Photographic Plates and Films; Devices for Testing ——. E. S. Shepherd and C. Jones, London. Eng. Pat. 5356, March 13, 1901.

The device employed is essentially a combination of four different testers, and comprises, (1) a set of 25 sections of increasing opacity, as in the usual Chapman Jones apparatus; (2) a series of (say) four coloured patches and a strip of grey, all five having approximately the same luminosity, as in the Abney colour sensitometer; (3) a series of four pure coloured patches of such absorptions that they divide the spectrum into an equal number of separate portions; and (4) a combination of a line design with a superposed half-tone negative. Of the four pure-coloured patches, one transmits all light that ordinary plates are usually sensitive to, *viz.*, ultra-violet, violet, and blue as far as the Frauenhofer lines E or *b*; the second transmits the same *plus* the green that isochromatic plates respond to; the third passes only the red that some orthochromatic plates reproduce; and the last transmits only the red beyond line C.—F. H. L.

United States Patent.

Photographic Flash-Light Lamp. J. L. Zweck, Chicago, U.S.A. U.S. Pat. 690,508, Jan. 7, 1902.

A metal tube open at one end and closed at the other, with a hemispherical cap in which a slit is cut, telescopes into another tube bearing a lateral tube near its base, the whole fastening into a conical stand. Round the outer tube, near the point where the slit of the inner tube is, there is arranged a circular open chamber filled with absorbent material moistened with alcohol. The inner tube is loaded with the necessary quantity of the flash-light powder, and a current of air is driven through the side tube by means of a rubber ball. The magnesium escapes into the alcohol flame, catches fire, and, owing to the slit-shaped orifice, forms a wide thin sheet of flame, which prevents the pictures being so "hard" as when taken by the aid of a smaller source of light.—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patent.

Matches, of every Description, ignitable on any Surface. A New Process for Manufacturing Non-Poisonous Mixtures for ——. A. Purgotti and L. Purgotti, Perugia. Eng. Pat. 1074, Jan. 15, 1902.

The composition of the dipping paste is given as :—Special amorphous phosphorus (50 parts), zinc oxide (120 parts), sulphur (30 parts), pulverised glass (120 parts), potassium chlorate (40 parts), gelatin (40 parts), glue (10 parts), water (250 parts). The special amorphous phosphorus is prepared by dissolving sulphate of copper (1 kilo.) in water (2·5 litres), and boiling phosphorus (1 kilo.) in this solution for two hours. A "phosphuret powder" is thus obtained non-hygroscopic and non-poisonous.—G. W. McD.

United States Patents.

Gunpowder. F. W. Jones, Barwick, England. U.S. Pats. 693,547 and 693,548, Feb. 18, 1902.

See Eng. Pat. 15,553, 1898; this Journal, 1899, 858.
—G. W. McD.

Powder-granulating Machine. M. P. Wilkins and H. C. Aspinwall, New Jersey, U.S.A. U.S. Pat. 695,129, March 11, 1902.

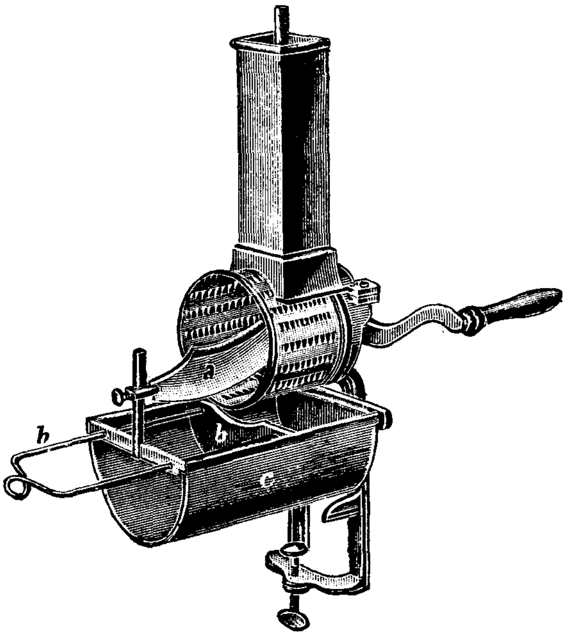
The claim is for a powder-granulating machine with a cutting-wheel having its knives set transversely, a pair of discs, spaced apart, with transverse knives, guides for directing rods or cords to the knives and feeding rollers. Drawings are given.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, &c.

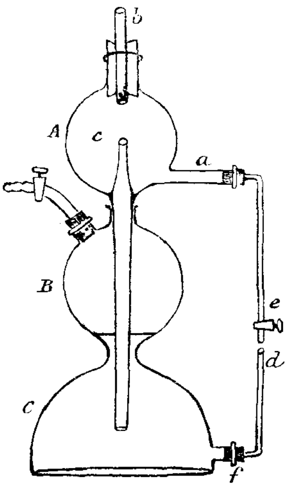
Ice Mill; An ——. C. Schwalbe. Chem. Centr., 1902, **1**, [9], 509.

In preparing freezing mixtures and in cooling liquids, such as diazo solution, it is advantageous to use ice in a fine state of division. By means of the mill shown in the accompanying diagram, it is possible to rapidly convert ice into the form of powder. The pieces of ice are fed into the top chamber and are pressed against the perforated drum by means of a wooden stamp. The edges of the perforations are bent upwards, so that on rotating the drum, thin layers of ice are shaved off, and fall into the interior of the drum in the form of powder. The scraper, *a*, causes the ice powder to fall into the receiver, *c*, from which any desired quantity can be removed by the movable plate, *b*. The drum is made of thin iron plate, and becomes cooled through almost instantaneously, so that the ice powder is obtained in a dry condition. It is stated that 1 kilo. of ice can be easily reduced to powder in 5—7 minutes. The mill can easily be taken to pieces for cleaning and drying.—A. S.



Kipp's Apparatus; Modification of ——. C. Arnold. Chem.-Zeit., 1902, **26**, [21], 229—230.

The apparatus shown in the figure is a slightly-altered form of a modification devised by Thiele (Chem.-Zeit, 1901, **25**, 468). The upper receptacle, A, has the glass tube, *c*, fused into its lowest part, and this passes into the receptacle, C, though not to the bottom. The acid saturated with salts can be drawn off by disconnecting the tube *d* from *e*, and turning it with its opening downwards. The tube, *c*, is considerably narrower than in the old Kipp's apparatus, whilst the neck between the bottom and centre vessel is so narrow that not more than a space of 0·5 cm. is left. The side tubulure of B is 5·5 to 6 cm. in diameter, to allow large fragments of iron sulphide, &c., to be introduced. A piece of india-rubber or lead, with a hole in the centre to receive the tube, C, can also be introduced into B, and on this is placed a layer of coarse pumice stone. The capacity of the bulbs is 3·5 to 4 litres.



The author states he has used this apparatus for months, without recharging, for the evolution of hydrogen sulphide, the tube, *b*, being connected with a long tube passing through the roof.—C. A. M.

Litmus-Silk; Notes on ——. F. Emich. Monatsh. für Chem., 1902, **23**, [1], 76—80.

The author contributes further information with regard to the litmus-silk which he has devised for microchemical reactions (see this Journal, 1901, 1142). The blue litmus-silk, prepared by means of alkalis, has the drawback that the alkali is easily washed out during the test. The author finds that a more satisfactory blue silk, in this respect, is obtained by immersing the dyed silk in a solution of lead acetate. Silk thus blued by lead oxide is rather less sensitive than that blued by alkalis; it is not suitable for the microchemical detection of weak acids which give insoluble lead salts. Silk thus prepared contains 3·8 per cent. of litmus colouring matter and 18·6 per cent. of lead oxide.

The lead oxide litmus-silk, or lead oxide silk without the litmus, is eminently suitable for the microchemical detection of soluble sulphides, $\frac{1}{10000}$ mgrm. of sodium sulphide being readily detected.

The author has employed litmus-silk for the detection of the acid produced by the oxidation of sulphur by the air when exposed at the ordinary temperature. The principle of observing colour reactions under the microscope by fixing them on fibres is capable of extended application; for instance, sulphide of iron can be distinguished by its greenish tint from the sulphides of nickel and cobalt.

—J. F. B.

INORGANIC—QUALITATIVE.

Platinum Metals; Detection of the ——, by the Action of Sodium Peroxide. Leidié and Quinnessen. Bull. Soc. Chim., **27**, [6], 179—183.

A scheme of distinction (and partial separation) of the platinum metals from one another. The metal, either precipitated, or as extremely fine filings, is mixed with five or six times its weight of sodium peroxide, and heated gently in a nickel basin or crucible over a small flame. When pasty, the mass is well stirred; the heat is continued till the whole is semi-fluid, and then the whole allowed to cool. The vessel is placed in a larger basin, covered with a funnel, and water (10 to 12 times the weight of the peroxide used) added. After reaction, the whole is transferred to a tall narrow vessel, allowed to settle, the clear liquid decanted, and the residue washed with water and filtered.

Osmium is converted into sodium osmate, which forms a yellow solution; on warming and passing a current of chlorine through, osmic peroxide volatilises, and can be collected in iced water in an appropriate recipient, and recognised by the formation of potassium osmate when potassium nitrite or alcohol and potassium chloride are added.

Ruthenium forms sodium perruthenate, which reacts with the water to form an orange solution of ruthenate. If the solution be treated with chlorine as above, ruthenium peroxide comes over, and can be recognised by the reduction to ruthenium by alcohol and potassium chloride.

Palladium yields a yellow solution of sodium palladate. No palladium compound distils with chlorine, but if the remaining solution be neutralised with hydrochloric acid, and carefully evaporated with potassium chloride and a little nitric acid, ruby-red crystals of potassium chloropalladate deposit, insoluble in saturated solution of potassium chloride.

Iridium dissolves as "basic sodium iridate," $IrO_3.4Na_2O$, forming a blue solution. This solution, treated like the palladium solution, gives black crystals of potassium chloroiridate.

Platinum forms sodium platinate, which remains on the filter with the oxide of nickel. The whole is dissolved in hot concentrated hydrochloric acid, filtered, most of the excess of acid boiled off, sodium nitrite added to neutrality, then sodium carbonate; the solution is boiled and filtered. The filtrate is treated with excess of hydrochloric acid, and evaporated to dryness; the residue, taken up with water, yields the characteristic chloroplatinate precipitate with ammonium chloride.

Rhodium also remains on the filter as dioxide and sesquioxide. The former dissolves in hydrochloric acid; and on submitting the solution to the treatment just described, shows itself by the rose-colour of the solution of $6NaCl.Rh_2Cl_6$, when the excess of sodium carbonate is neutralised by hydrochloric acid.—J. T. D.

Nitric and Nitrous Acids; The Brucine Reaction for ——. G. Lunge. Zeits. angew. Chem., **15**, [11], 241—242.

Experiments were made on the effect of adding brucine to a number of solutions containing equal quantities of nitrous acid (as pure silver nitrite), but varying quantities of sulphuric acid, and an exactly parallel series with equivalent amounts of nitric acid (as pure potassium nitrate) in place of the nitrous acid. Solutions of nitrous acid, containing not too much sulphuric acid, gave the brucine reaction; those containing much sulphuric acid (and in which, therefore, the nitrous acid is converted into nitrosylsulphuric acid) did not. With nitric acid solutions, on the contrary, the reaction is only given in presence of a considerable excess of sulphuric acid. The author consequently withdraws his statement (this Journal, 1902, 190) that brucine does not react with nitrous acid.—J. T. D.

INORGANIC—QUANTITATIVE.

Hydrochloric and Hydrocyanic Acids; The Quantitative Separation of ——. T. W. Richards and S. K. Singer. Amer. Chem. J., 1902, **27**, [3], 205—209.

The dissociation constant of hydrochloric acid is about 9,000 times greater than that of hydrocyanic acid in decinormal solutions (Walker and Cormack, J. Chem. Soc., 1900, 5). It was, therefore, probable that all the hydrocyanic acid could be expelled by evaporating a dilute solution of both acids. Richards and Mallinckrodt have found that a decinormal solution of hydrochloric acid loses only an inappreciable quantity of acid in its vapour. In the experiments described below, the solutions were kept at this concentration by the frequent addition of water. An ordinary retort of 500 c.c. capacity, with the neck directed upwards at an angle of 45°, was finally adopted for the evaporations, though other vessels gave fairly satisfactory results. From solutions of pure hydrocyanic acid, every trace of acid was expelled by boiling for two hours. Commercial potassium cyanide was boiled with sulphuric acid, and the chlorine precipitated by silver nitrate; after boiling for two hours, the amount of precipitate was constant. When potassium chloride was added to the cyanide, it was necessary to boil for 8—9 hours before all the hydrocyanic acid was expelled.—A. C. W.

Iodine in presence of Bromine or Chlorine; Quantitative Estimation of ——, by Electrolysis. E. Müller. Ber., **35**, [4], 950—954.

Iodides may be quantitatively converted into iodates by electrolysis in alkaline solution (concentration of alkali, $\frac{1}{10}$—$\frac{1}{100}$ normal), in the presence of bromides of normal concentration, or of chlorides in saturated solution, without the production of hypobromite or bromate in the one case, or of hypochlorite or chlorate in the other. The following conditions should be observed:—

(1) A small amount of soluble chromate (1—2 centigrms. of potassium chromate) should be present to prevent reduction of iodate to iodide. The necessary correction for this is made in the final titration with thiosulphate.

(2) The pressure of the current used should be about 1·6 volts; this suffices to convert the iodide to iodate, but no periodate is formed, despite the alkalinity of the solution.

(3) The anode should consist of a smooth plate of platinum of about 14 sq. cm. area, platinised according to the method of Lummer and Kurlbaum, for half a minute, with a current of 1 ampère. This anode loses its sensitiveness by use, and after each experiment should be replaced by a new one, or rendered active again by employing it as a cathode in dilute sulphuric acid for two minutes, with a current of 1 ampère.

(4) The cathode, to ensure the greatest possible pressure, should be made of a smooth platinum wire, 10 cm. long and ½ mm. thick, wound into a coil.

Experiments were made with the following solutions:—No. 1, potassium chromate (1 c.c. = 10·6 c.c. of N/100 thiosulphate. No. 2, N KOH. No. 3, KI (1 c.c. = 9·13 c.c. of N/10 silver nitrate), and gave results as under:—

Estimation of Iodine alone.—A liquid made by mixing 2 c.c. of No. 1, 1 c.c. of No. 2, 10 c.c. of No. 3, and 90 c.c. of water, was electrolysed for 20 hours with 1·6—1·61 volts, and then made acid with dilute sulphuric acid, and potassium iodide added. This required 54·85 c.c. of N/10 thiosulphate (corrected for chromate present), which corresponds to 0·11594 grm. iodine, instead of 0·1158 grm. taken.

A second similar experiment showed 0·11632 grm. iodine.

Estimation of Iodine in presence of Chlorine.—A mixture of 2 c.c. of No. 1, 1 c.c. of No. 2, 1 c.c. of No. 3, and 100 c.c. of solution of NaCl (saturated) was electrolysed for 20 hours with 1·59—1·60 volts. The titration was carried out as in previous experiments. Amount of iodine taken = 0·01158 grm.; found (*a*) 0·01163 grm.; (*b*) 0·01167 grm.

Estimation of Iodine in presence of Bromine.—A mixture of 2 c.c. of No. 1, 1 c.c. of No. 2, 1 c.c. of No. 3 + 100 c.c. of N potassium bromide solution was electrolysed for 22 hours with 1·60—1·61 volts.

Result: Amount of iodine taken = 0·01158 grm.; found (*a*) 0·001158 grm.; (*b*) 0·01170 grm.

All reagents should be tested whether they liberate iodine from a mixture of potassium iodide and sulphuric acid, as the caustic alkalis do this sometimes. The anode must be completely immersed in the liquid to avoid loss of iodine, and the electrolysis continued for two hours after a test with starch and potassium iodide fails to give a blue coloration. Alkaline earths interfere with the reaction, and should be removed previously.—R. L. J.

Chromates and Manganates; Analysis of ——. W. Herz. Ber., **35**, [4], 949.

The author recommends the use of hydrazine sulphate (commercial) as more expeditious and satisfactory for the estimation of chromates and manganates than the reagents usually employed.

0·1533 grm. of potassium bichromate was dissolved in about 10 c.c. of water, solid hydrazine sulphate was added in excess, and the mixture gently warmed. Reduction was complete in a few minutes, and, on addition of ammonia, 0·0796 grm. of Cr_2O_3 was precipitated. This represents 35·55 per cent. of Cr, as against the theoretical number 35·4. In a similar manner 0·3009 grm. of potassium permanganate gave, when finally precipitated with carbonate, 0·1460 grm. of Mn_3O_4, which represents 34·95 per cent. of Mn instead of the theoretical percentage 34·8.—R. L. J.

Sodium Thiosulphate, Sulphite, and Sulphide; Determination of ——. Dupré, jun., and W. Korn. Zeits. angew. Chem., 1902, **15**, [10], 225—226.

The determination of the amounts of these three salts in a solution containing them all, is carried out as follows:—(1) By running the liquid into N/10 iodine solution acidified with hydrochloric acid, the number of c.c. (*a*) required for the three salts is found. (2) In a further portion of the liquid, the sodium sulphide is precipitated by means of cadmium carbonate, and the filtered liquid divided into two parts. In one of these, the number of c.c. (*b*) of N/10 iodine solution corresponding with the amount of sodium sulphite and thiosulphate is determined by the Finkener-Volhard method, whilst in the other the thiosulphate is determined as follows: the sulphite is completely decomposed by boiling the liquid for about half an hour with acetic acid and a quantity of sodium acetate equal to 3 mols. of the salt for each mol. of the acid; the last traces of the sulphite are destroyed by the addition of a small quantity of potassium chlorate, and the liquid then titrated with N/10 iodine solution, (*c*, c.c.). Then the numbers of c.c. of the decinormal iodine corresponding with each of the salts present are: sulphide, *a—b*; sulphite, *b—c*; and thiosulphate, *c*.—T. H. P.

Potassium Ferrocyanide in Spent Gas-Purification Material; Determination of ——. O. Bernheimer and F. Schiff. Chem.-Zeit., 1902, **26**, [21], 227—228.

Knublauch's method (this Journal, 1889, 732) is the one most commonly employed, but, according to the author, it does not always yield uniform results, since, in the titration with copper sulphate, potassium copper ferrocyanide is formed in addition to copper ferrocyanide. The author has made attempts to calculate the amount of potassium ferrocyanide ($K_4Fe(CN)_6 + 3H_2O$) from the total quantity of iron contained in the precipitated and purified Prussian blue. The latter was dissolved in Knublauch's alkaline solution, which was made up to definite volume, and aliquot parts taken for the titration by Knublauch's method and for the determination of the iron left on ignition. The results obtained with five samples of spent gas-purification material were as follows:—

——	By Knublauch's Method.	Calculated from the Yield of Iron.
	Per Cent.	Per Cent.
I.	11·74	12·45
II.	11·49	13·72
III.	5·03	6·99
IV.	12·39	14·06
V.	12·94	13·87

These determinations show that the results calculated from the percentage of iron are invariably higher than those given by Knublauch's method.

Similar determinations were made of the amount of nitrogen in the reprecipitated Prussian blue. The amounts of nitrogen found by Kjeldahl's method in pure potassium ferrocyanide, and in the Prussian blue obtained from it, were 20·01 and 20·1 per cent., as against the theoretical quantity 19·90 per cent.

The amounts of potassium ferrocyanide, calculated from the proportion of nitrogen in the Prussian blue precipitated from the spent gas material and purified by re-precipitation, were:—Sample II., 13·76; III., 6·73; and IV., 13·96 per cent.

This agreement with the results obtained by the determination of the iron appeared inconclusive to the author, since slight differences in the determination of the nitrogen would not be a criterion of the purity of Prussian blue, which has so high a molecular weight; and also because similar compounds containing about the same proportion of nitrogen might be present.

Further experiments were therefore made to determine whether the spent gas-purification material contained any other compounds, in addition to potassium ferrocyanide, that could be precipitated with iron salts.

In one of the samples of spent material it was found that other iron-containing compounds were absent. This liquid, on titration by Knublauch's method, gave 12·39 per cent. of potassium ferrocyanide, as against 12·20 per cent. calculated from the amount of iron present. On the other hand, a determination of the iron in the corresponding precipitate of Prussian blue gave 14·06 per cent. of potassium ferrocyanide—a result which seemed to point to Knublauch's titration method being correct.

In order to determine whether iron-free compounds precipitable by iron salts were present, the twice precipitated Prussian blue, prepared from the same sample of spent material, was treated with potassium hydroxide solution, the iron determined both in the precipitate and in the solution, and each result calculated into potassium ferrocyanide in accordance with the equation—

$$Fe_7(CN)_{18} + 12KOH = 3K_4Fe(CN)_6 + 2Fe_2(OH)_6$$

The amount of potassium ferrocyanide calculated from the iron in the filtrate was 12·14 per cent., whilst the result calculated from the iron in the precipitate was 15·64 per cent.

This showed that the precipitation of other compounds than potassium ferrocyanide was the cause of the higher results obtained by the determination of the amount of iron, but the nature of these was not determined.

There appeared to be no doubt, however, that in the determination by Knublauch's method, certain compounds which are precipitated by the iron chloride are not precipitated by the copper in the titration. Thus another sample of spent material was found to contain 11·27 per cent. of potassium ferrocyanide by Knublauch's method and 11·85 per cent. by the iron method. After the titration in the former method, the liquid was filtered, and the filtrate treated with iron chloride and hydrochloric acid, and concentrated on the water-bath. This caused the precipitation of a blue compound, which, on treatment with alkali, yielded potassium ferrocyanide. The amount of iron in this precipitate corresponded with 0·7 per cent. of potassium ferrocyanide, and this amount, added to the result obtained by the titration, gave 11·57 per cent., which was in close agreement with the 11·85 per cent. obtained by the other method (this Journal, 1901, 225).

—C. A. M.

Sodium Methylarsenite; Alkalimetric Titration of ——. A. Astruc. Comptes Rend., **134**, [11], 660—661.

This substance (arrhénal), $CH_3 . AsO(ONa)_2$, can be titrated by means of N/10 or N/20 sodium hydroxide, if litmus, or still better, rosolic acid, be used as indicator. Under these circumstances, 1 molecule of the substance corresponds to 1 molecule of the alkali. Phenolphthaleïn or methyl-orange cannot be used.—J. T. D.

Gold and Silver; Detection and Determination of Small Quantities of ——. L. Wagoner. Chem.-Zeit. Rep., 1902, 68.

The process, which is adapted to the determination of very small quantities of gold and silver in minerals, sea water, &c., consists in using very pure lead without fluxes, the blowpipe method, and extraction by cyanide. The pure lead is obtained by electrolysis of lead acetate solution, rejecting the first portions, which are richer in silver. The author has found that all the usual fluxes, except boric acid, increase the proportion of silver; even chemically pure soda was found to contain 3 grms. of silver per ton. The bead of metal is measured under a microscope, magnifying to 40—60 diameters, with an etched scale in the eye-piece. The bead is held in a bent watch spring. Readings may be made to 0·01 m.m.; the bead is not spherical; one scale division (0·02 m.m.) = 0·00007598 grm. Au or 0·00004213 grm. Ag. The bone-ash cupel must be examined with a lens for stray particles. The addition of lead should not be more than 8—10 mgrms. The bead of gold and silver is first measured as silver, the operation of parting then takes place on a fragment of white porcelain. The bead is brought by a needle into a drop of water, touched by a needle point wetted with sodium amalgam if it is too small for observation, nitric acid then added and warmed until the silver is dissolved. The gold is fused to a bead with 2—3 mgrms. of lead and measured.—A. C. W.

Mercury Ores (Dalmatian), and their Chemical Examination. C. Ehrmann and J. Slaus-Kantschieder. Chem.-Zeit., **26**, [19], 201—202.

Four samples of ore examined by the authors, yielded the following results :—

	Metallic Mercury. Per Cent.
Sample 1, Spizza	1·448
„ 2 „	4·560
„ 3 „	1·490
„ 4 Nehaj	2·599

A complete chemical examination of samples 1 and 4, gave the following results :—

——	Sample 1 (Spizza).	Sample 4 (Nehaj).
	Per Cent.	Per Cent.
Moisture	0·410	0·635
CO_2	..	
SiO_2	1·016	0·532
S	5·726	0·415
SO_3	28·923	32·451
BaO	55·314	62·011
CaO	Traces	1·121
MgO	„	Traces
Al_2O_3	1·157 $Al_2O_3 + Fe_2O_3$	0·259
Fe	4·622	..
Mn	Traces	..
Zn	0·639	..
Cu	0·046	..
Pb	0·950	Traces
Hg	1·448	2·599
Ag	Traces	Traces
As	„	..
Sn	0·047	..

Sample 4 (from Nehaj) is a slightly impure heavy spar (94·4 per cent. $BaSO_4$) interspersed with cinnabar (3 per cent. HgS). The complete analysis of the ores was carried out by the usual analytical methods.

Eschka's test for mercury did not give good results and neither the usual fluxes of PbO, iron powder, or ZnO nor Janda's mixture of MnO_2 and soda gave satisfactorily agreeing numbers. The mercury was determined by the authors by an abbreviated wet method which can be carried out in a comparatively short time. According to this method the ore is heated with dilute nitric acid till the sulphides are as completely decomposed as possible, three times the volume of concentrated hydrochloric acid is then added, and the whole gently warmed till the residue is no longer dark in colour and the smell of chlorine has completely disappeared. After cooling and filtering, the solution is precipitated by H_2S and again filtered through asbestos in a Gooch porcelain crucible. The contents of the crucible are then treated with a small quantity of bromo-hydrochloric acid and well washed with water. After expelling the excess of bromine by a gentle stream of CO_2, the heavy metals are again precipitated with H_2S. The H_2S precipitate is then filtered through asbestos in a weighed ignited Gooch porcelain crucible and washed with hot water till free from chlorine. Any sulphides of the arsenic group are removed by repeated digestion with hot yellow ammonium sulphide, filtered off, washed with water, and the contents of the filter treated with 1:3 nitric acid to remove PbS and CuS. After removing the nitric acid with water, the contents of the crucible are finally treated several times with a concentrated solution of sodium sulphite to remove any sulphur present, well washed with hot water, the HgS dried at 100° C., and weighed till the weight is constant. Where large quantities of lead are present, it is preferable to treat the precipitate with a concentrated solution of ammonium acetate prior to the final washing, to remove any lead sulphate which may perhaps have been formed. Though apparently complicated, it is stated that an estimation may be carried out by this method in a few hours.—H. F. C. G.

Thallium; Volumetric Determination of ——. V. Thomas. Comptes Rend., **134**, [11], 655—657.

The thallium solution is completely converted into thallic salt by heating with hydrochloric acid and potassium chlorate. After complete conversion, ebullition is continued till the excess of chlorine is completely removed. To the diluted thallic solution, excess of decinormal sodium thiosulphate solution is added, then excess of potassium iodide (free from iodate) and a little starch, and decinormal iodine solution is run in till the blue colour is struck. When the thallium solution is dilute, any vessel may be used for the titration; but with strong solutions, it is best to use a stoppered flask, so that the liquid can be well shaken after adding the potassium iodide. When this is done the thallous iodide readily collects at the bottom of the vessel, and the blue coloration is more readily and certainly seen. The author gives figures showing the applicability of the method to large and small quantities of thallium in concentrated and weak solutions.
—J. T. D.

Copper; Analysis of Industrial ——. P. Truchot. Ann. Chim. anal appl., **7**, 1—5 and 58—61. Chem. Centr., 1902, **1**, [9], 543; [12], 735—736.

Ten grms. of the sample are dissolved in a mixture of 50 c.c. of nitric acid (36° Bé.) and 10 c.c. of sulphuric acid (53° Bé.), with the addition of water, any sulphur present is oxidised by bromine, a further 5 c.c. of sulphuric acid added, and the solution evaporated till most of the sulphuric acid is expelled. The residue is treated with dilute sulphuric acid, filtered from insoluble matter (SnO_2, Sb_2O_3, $PbSO_4$, &c.), and the filter washed with water acidulated with sulphuric acid. The residue is digested for two hours with 25 c.c. of a saturated solution of ammonium acetate, filtered, and the filter washed with water containing ammonium acetate. The filtrate is mixed with 40—50 c.c. of nitric acid (36° Bé.), diluted to 300 c.c., and the lead separated electrolytically as PbO_2 by a current of 0·2 ampère and 2·50 volts, with an anode surface of 80 sq. cm.

To the main filtrate obtained in the first part of the process, 10—15 c.c. of nitric acid are added, and the copper separated electrolytically with a current of 0·4—0·5 ampère and 2·50 volts; a correction must be made for the amount of silver present. The solution, after separation of the copper, is evaporated on the sand-bath to expel the sulphuric acid, the residue dissolved in hydrochloric acid, sulphuretted hydrogen passed in, and the solution filtered. The filtrate is boiled to expel sulphuretted hydrogen, oxidised with bromine, and the iron precipitated twice as basic acetate, and finally as oxide by ammonia. The filtrate from the iron is evaporated with hydrochloric acid to expel acetic acid, neutralised with sodium carbonate, then faintly acidified with acetic acid and zinc, nickel and cobalt precipitated as sulphides. In the filtrate, the manganese is precipitated as phosphate, and then titrated in neutral solution with permanganate. The precipitated sulphides are dissolved in hydrochloric acid, and to the hot solution caustic soda is added, whereby cobalt and nickel are precipitated as oxides. In the alkaline filtrate, the zinc is determined electrolytically.

Arsenic and antimony are determined by Hollard's method (this Journal, 1900, 563), using 5 grms. of material. For the determination of selenium and tellurium, which are frequently present in copper from the Western United States, the author recommends Keller's method (this Journal, 1895, 303). In this method any phosphorus present is oxidised to phosphoric acid, and passes into the filtrate from the sulphide precipitate. The solution is boiled to expel hydrogen sulphide, and the phosphoric acid precipitated first as ferric phosphate and finally by molybdic acid. For the determination of gold, 50—100 grms. of the copper are dissolved in nitric acid quite free from chlorine, the solution filtered, and the filter carefully incinerated, and the gold determined in the usual manner by the dry method. In the filtrate the silver is precipitated as silver chloride, and the latter treated by the usual dry process. The following table gives results of the analysis of four samples of commercial copper products: I. "Black copper" from Boléo; II., "bluestone" from Boléo; III. and IV., electrolytic sludge from Butte city (Keller):—

—	I.	II.	III.	IV.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Copper	92·960	61·4200	11·010	13·820
Sulphur	1·003	22·9000	SO_4 5·268	10·680
Iron	4·687	13·5900	..	0·800
Manganese	0·084	0·9940	..	..
Cobalt	0·738	0·3640	..	..
Nickel	0·197	0·1060	..	..
Zinc	0·223	0·2140	..	..
Lead	0·116	0·0225	0·916	2·070
Antimony	0·012	0·0021	0·250	2·440
Arsenic	0·009	..	2·107	1·090
Tellurium	0·000	0·0000	1·174	0·892
Selenium	0·000	0·0000	0·394	0·718
Phosphorus	0·186	0·0199	..	..
Silver	0·0146	0·0063	53·894	55·150
Gold	0·0000	0·0000	0·2959	0·198

—A. S.

Copper; Electrolytic Determination of ——. — Willame. Bull. Assoc. Belge des Chim., **15**, [11—12], 414—415.

In cases where it is necessary to guarantee the percentage of copper to the second place of decimals, the amount of substance taken for the test must be sufficient to preclude tenths of a milligram exercising any influence on this second decimal place in the weighing. The author therefore recommends increasing the amount of substance from 0·5—1 grm. to about 10 grms., in which event about 99·67 per cent. of the copper will be deposited at the cathode. He employs a weak current, and effects the electrolysis of copper sulphate in presence of 20 c.c. of HNO_3 (1·20) in a total volume of 200 c.c. The operation is complete in 48 hours. The spiral anode and conical cathode are placed about 15 mm. apart.—C. S.

Molybdenum Steel; Volumetric Determination of ——. F. T. Kopp. J. Amer. Chem. Soc., 1902, **24**, [2], 186—188.

Half a grm. of the sample is dissolved in a large platinum crucible with 2 c.c. of sulphuric acid (sp. gr. 1·58) and 12 c.c. of water. When the sample is completely dissolved, the water is evaporated and 30 grms. of fused potassium bisulphate are added. The mixture is carefully fused, cooled and dissolved in 500 c.c. of hot water; after digesting at the boiling point until the solution is clear, 100 c.c. of ammonia are added and the liquid is made up to a litre. After mixing, the precipitate is removed by passing through a dry filter, 500 c.c. of the filtrate are taken, 40 c.c. of sulphuric acid are added and the solution reduced by passing through a column of zinc (Jones' reductor). The reduced molybdenum in the solution, after the addition of 10 c.c. of sulphuric acid, is then titrated with permanganate. A "blank" experiment is made with a solution containing 450 c.c. of water, 50 c.c. of ammonia, and 40 c.c. of sulphuric acid, in order to correct the errors caused by the impurities in the zinc.

Tungsten Steel.—When tungsten is present, 1 grm. of the sample is weighed into a small beaker and dissolved in 25 c.c. of dilute nitric acid (sp. gr. 1·20), 10 c.c. of hydrochloric acid being subsequently added; the solution is evaporated to dryness, baked to separate the silica and redissolved in 15 c.c. of strong hydrochloric acid which will separate the tungsten as trioxide. The solution is diluted to 100 c.c. filtered through a dry filter, 50 c.c. of the filtrate are taken and evaporated with 10 c.c. of sulphuric acid and fused with potassium bisulphate as described above.

Ferromolybdenum.—The process is similar to that described for molybdenum steel with the exception that 0·5 grm. of the sample is first dissolved in 15 c.c. of strong nitric acid before evaporating with sulphuric acid, no water being added with this latter.—J. F. B.

Wood-Pulp; Determination of Moisture in ——. C. Hofmann. Papier-Zeit., 1902, **27**, [23], 817—816.

The author points out that in Germany there is as yet no standard procedure for the determination of the moisture in consignments of wood-pulp. So far as the actual determination of the moisture in the sample is concerned, no difficulty exists, since apparatus such as those of Schopper and Knöffler enable this to be done with ease and accuracy.

Some misapprehension seems to exist as to the calculation of the air-dry weight from the dry weight, some German text-books stating the air-dry moisture allowed as 12 *on* the hundred instead of 12 *in* the hundred. By applying the formula: Air-dry weight = $\frac{\text{Dry-weight}}{0\cdot88}$, no ambiguity can occur.

The only difficulty attending the determination of the moisture in wood-pulp lies in the correct sampling of the bulk. The British Associations have already recognised the necessity of establishing a standard method of sampling. The author considers that the proportion of 2 per cent. of the bales generally taken for sampling is not sufficient if the pulp has been stored for a long time, and yet the labour involved in opening a larger number would be too great. He would prefer to cut samples with a knife, if possible from all the bales. It is true that only the upper and lower parts of the bales would thus be accessible, but he thinks that a correct average would be obtained, since the lower side of the bale naturally contains more moisture than the upper side. A form of analytical report similar to that in use in this country would meet with the author's approval.—J. F. B.

Hydrogen Peroxide; Behaviour of Chromic Acid towards ——. A. Bach. Ber., **35**, [4], 872—877.

By an investigation of the action of chromic acid, the author throws some light on the action of oxidising agents generally on hydrogen peroxide. On the one hand, pure chromic acid, acting on hydrogen peroxide, free from acid, produces a dark brown colour, which disappears gradually with evolution of oxygen. Quantitative examination shows that the oxygen given off is exactly that due to the hydrogen peroxide used, and that the chromic acid is reproduced. It is, therefore, capable of decomposing an indefinite quantity of hydrogen peroxide. On the other hand, in presence of sulphuric acid, the author has shown that the following equation exactly represents the reaction in respect of the ratio of chromic acid to hydrogen peroxide, and also of oxygen set free—

$$4CrO_3 + 8H_2O_2 + 6H_2SO_4 = 2Cr_2(SO_4)_3 + 14H_2O + 7O_2.$$

Traube's hypothesis as to the action of hydrogen peroxide with oxidising agents, *viz.*, that the hydrogen is oxidised by the oxidising agent, and the total oxygen of the hydrogen peroxide is then given off, does not hold here, since the chromic acid is not reduced, and only half of the hydrogen peroxide oxygen is disengaged in absence of acids, and, in presence of acids, the reaction should go, according to Traube's view, thus—

$$2CrO_3 + 3H_2O_2 + 3H_2SO_4 = Cr_2(SO_4)_3 + 3O_2 + 6H_2O\,;$$

but it does not, there being less chromic acid consumed and less oxygen liberated than this equation requires.

Berthelot's hypothesis that hydrogen trioxide is formed as an unstable intermediate compound also does not agree well with this reaction, since only six of the eight hydrogen peroxide molecules could act in this way, while the other two would be decomposed in some other way.

The author puts forward the theory that a higher stage of oxidation occurs in the added element and not in the hydrogen peroxide. In some cases (U, V, Ti, Mo, W, Nb, Ta) this intermediate product is stable; in others (Cr) it is unstable, but its presence is shown by its colour, and in others (Ag, Hg, Pt, Pb, &c.) the intermediate product does not show itself at all.—A. M.

Hypoiodous Acid. R. L. Taylor. Proc. Chem. Soc., **18**, [249], 72.

It has been concluded by Orton and Blackman (this Journal 1900, 564), that "the solutions obtained from iodine and mercuric oxide contain only a small quantity of hypoiodite, and that the iodine is chiefly present as iodate." This is contrary to the results described by the author in a former paper (*Mem. Manchester Phil. Soc.*, 1897, **41**, 8), where he used aqueous iodine (1 part in 5000) and obtained 80 to 90 per cent. of the possible amount of hypoiodite. He has made further experiments and finds that the proportion of iodine existing in the filtrate as hypoiodous acid increases with the fineness of division of the iodine, and diminishes as the proportion of iodine to the water employed increases and with the time occupied in shaking and filtering. Using powdered iodine, about 2 parts to 1000 of water, and occupying (as Orton and Blackman did) 15 minutes in shaking and 10 minutes in filtering, the author obtains results not very different from theirs; but using *precipitated* iodine with the same proportion of water and taking only a little over a minute in shaking and filtering, the filtered liquid contains 44 to 52 per cent. of the possible amount of iodine as hypoiodous acid, and of the total iodine in the filtered liquid, 90 to 95 per cent. exists as hypoiodous acid and only 5 to 10 per cent. as iodic acid. The solution of hypoiodous acid decomposes very rapidly, beginning to turn brown, owing to the liberation of iodine, almost immediately after filtering, unless a very dilute solution of iodine has been employed. Consequently it is impossible to obtain good results unless all the operations are performed very quickly. The filtered liquid always contains a little mercury. The author has estimated this, and finds that although the hypoiodite in the filtrate may exist partly as mercuric hypoiodite, there is so little mercury present that a considerable proportion of the iodine must exist as hypoiodous acid.

ORGANIC—QUALITATIVE.

Berberine, Occurrence and Detection of, in Plants. H. M. Gordin. Archiv der Pharm., **240**, [2], 146—149.

Five to 20 grms. of the powdered substance are extracted with hot alcohol, and the solvent evaporated off on the water-bath. 20 to 40 c.c. of water are added to the residue and a little talc, and the mixture filtered. 2 or 3 c.c. of the filtrate are mixed with a little 10 per cent. potassium iodide solution; if no precipitate fall, berberine is not present in appreciable quantity, but if a precipitate be obtained, the following method is followed. 10 c.c. of the filtrate are mixed with 1 or 2 c.c. of 10 per cent. NaOH solution, and, if turbid, filtered. The filtrate is warmed to about 50° C., mixed with 5 c.c. of acetone, and set aside. If a considerable quantity of berberine is present, good crystals of berberine-acetone form in 15—20 minutes.

Should no crystals form in two hours, 30 c.c. of water are added, and the mixture left over night; if no crystals have formed by the morning, the 10 c.c. of filtrate taken contain less than 0·01 grm. of berberine.

When the potassium iodide solution gives a precipitate and no crystals are obtained with acetone and NaOH, the plant contains only a trifling quantity of berberine. In this case 10 or 20 c.c. of the filtrate are mixed with excess of 20 per cent. potassium iodide solution, the precipitate is collected on a filter, and washed by means of a suction-pump with water containing potassium iodide and finally with water. The filtrate is collected in a test tube or very small flask, concentrated to about 2 c.c. and a few drops of NaOH solution and 1 c.c. of acetone added. After some hours the liquid is diluted with twice its bulk of water, and left over night. If 0·001 grm. of berberine be present, good crystals of berberine acetone will be deposited by the morning.

Berberine has been detected in *Berberis vulgaris*, *B. aquifolia*, *Hydrastis canadenis*, *Xanthorhiza aquifolia*, and *Coptis trifolia*. It has not been found in *Cocculus palmatus*, *Pariera brava* (*Chondrodendron tomentosum?*) *Menispermum canadense* or *Jeffersonia diphylla*.

—J. O. B.

ORGANIC—QUANTITATIVE.

Phosphoric Acid in Organic Substances; Determination of ——. F. Rieger. Zeits. physiolog. Chem., **34**, 109; Zeits. angew. Chem., 1902, **15**, [10], 227—228.

In order to obviate the difficulties of obtaining a white, absolutely carbon-free ash from organic substances, more especially milk, the author recommends the following three methods:—(1.) 50 c.c. of the milk are evaporated to dryness in a platinum basin with calcined sodium carbonate. The residue is then heated until carbonised, covered with a layer of one part of anhydrous sodium carbonate and two parts of potassium nitrate, and heated for a quarter of an hour over a triple burner, being stirred meanwhile with a glass rod or platinum wire. After cooling, the white pasty mass is dissolved in dilute nitric acid, and when the silica has been separated, the phosphoric acid can be precipitated in the usual way with molybdate solution. (2.) The milk may be treated with copper sulphate and caustic soda to precipitate the albuminoids, the whole of the phosphoric acid passing into the precipitate. The latter is then heated as in (1), and the ash used for the determination of the phosphoric acid. (3.) 50 c.c. of the milk or urine, mixed with 5 c.c. of concentrated nitric acid, are evaporated to about 20 c.c. in a Kjeldahl's flask by means of a small flame. 20 c.c. of concentrated nitric acid are then added, and the liquid heated until brown fumes cease to be evolved. After cooling, the solution is mixed with 20 c.c. of concentrated sulphuric acid, and the black liquid thus obtained heated, with gradual addition of 25 grms. of ammonium nitrate, until it becomes colourless. After being allowed to cool, the liquid is first made alkaline, and then strongly acidified with nitric acid. The insoluble portion is then removed by filtration, and the phosphoric acid precipitated with molybdate solution.—T. H. P.

India-Rubber Goods; Analysis of ——. A. Heintz. Chem.-Zeit., 1902, **26**, [23], 247—248.

The amount of rubber present in rubber goods is usually determined by difference after the other constituents have been separately estimated. The author considers that the desired result may be obtained more rapidly, and on the whole with greater accuracy, by direct combustion (after removal of organic admixtures), and calculation from the amount of water obtained on the basis of the formula $(C_{10}H_{16})_x$ for rubber. A weighed quantity of the material should be extracted with solvents, such as ether, nitrobenzene, and alcoholic soda to remove unsaponifiable oil, asphaltum, or fatty compounds, should qualitative examination have indicated their presence. The residue is washed, dried, and burnt in the combustion tube. If weighed when dry, an aliquot part only need be burnt, the sulphur of vulcanisation, in either case, being held back by suitable means.

Despite the varied origin of rubber, all washed and purified samples have an average composition of $(C_{10}H_{16})_x$. Washed rubber, as prepared for commercial manufacture (especially shoe-making), constantly shows 97 per cent. of this chemical substance, and this correction is recommended for technical use.

Two samples were examined by estimating the inorganic constituents, the sulphur and the organic components (other than rubber), and were found to contain, by difference, 21·63 per cent. and 19·38 per cent. of rubber. When analysed by combustion, after treatment with solvents as described, the amount of rubber indicated was 20·84 and 19·21 per cent. respectively, these values being corrected on the basis of 97 per cent. purity of the commercial rubber employed. Two other samples gave in a similar manner 75·11 per cent., as against 76·75 per cent. obtained by indirect estimation, and 49·65 instead of 49·30 per cent. The latter contained only inorganic admixtures.—R. L. J.

Raffinose; Determination of ——. G. Reinhardt. Zeits. Vereins Deutsch. Zuckerind., 1902, **52,** [553], 114—116.

Animal charcoal washed with hydrochloric acid to prepare it for clarifying purposes lowers the reading of an inverted solution of sugar by its absorbent action. If, however, a mixture of sucrose and raffinose be inverted, the clarified solution reads further to the left than the unclarified solution, when the proportion of raffinose is higher than 2·5 per cent. The calculation of the percentage from the raffinose formula of Herzfeld gives too much or too little raffinose according as the amount present is below or above 2·5 per cent. The amount of char used to obtain these results is 3 grms. of prepared char per 100 c.c. of half-normal inverted solution.

The increase of the levo-rotation is attributed to a strong absorption of the dextro-rotatory melibiose, which along with levulose is formed on inverting raffinose.—L. J. de W.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Distribution of a Base between Two Acids; Method of Determining the Ratio of ——. H. M. Dawson and F. E. Grant. Proc. Chem. Soc., **18,** [249], 68.

The method consists in shaking up an aqueous solution containing two acids and a base (the latter being insufficient for saturation of the acids) with a second liquid which is but slightly miscible with water, and which is capable of extracting one, and one only, of the four substances present in the solution. Tartaric, malic, succinic, and citric acids are not extracted from their aqueous solutions by chloroform, but considerable quantities of acetic acid are.

Determinations of the ratio of distribution of acetic acid between water and chloroform at 20° have been carried out, and show that this ratio increases very considerably with the dilution. By means of a diagram on which the acetic acid concentrations are plotted as abscissæ, and the distribution coefficients as ordinates, the concentration of the acid in water corresponding to any given concentration in chloroform can be readily ascertained. The influence of the presence of the salts and the second acid on the distribution ratio of the acetic acid has been investigated and found to be small.

On shaking up an aqueous solution containing soda and acetic and tartaric acids with chloroform and determining the concentration of the acetic acid in the latter, then, from the diagram, the concentration of the free acetic acid in the aqueous solution can be ascertained. If the original concentrations of the base and the two acids are known, the concentrations of the free tartaric acid and of the two salts can be calculated.

The aqueous solutions were prepared in such a manner that, after shaking up with an equal volume of chloroform, the base and the two acids were present in as nearly as possible equivalent quantities, the excess of acetic acid required in the original solution being determined from the preliminary distribution experiments.

Several series of experiments have been carried out in which acetic acid is compared with the several acids above mentioned, three or four concentrations being investigated in each case, and the ratios determined for the distribution of the base between acetic and each of these acids.

This method of determining the ratio of distribution of a base between two acids can also be employed where the second liquid takes up two of the components, for example, the two acids from the aqueous solution, but the ratios of distribution of the two acids between water and the second liquid must differ considerably from one another at any given concentration.

Methane; New Syntheses of ——. P. Sabatier and J. B. Senderens. Comptes Rend., **134,** [9], 514—516.

The authors have applied the reducing action of recently-reduced nickel to the synthesis of methane from a mixture of hydrogen with either carbon monoxide or carbon dioxide.

In the case of carbon monoxide, the reaction sets in at 190° C., and reaches its maximum speed at 250° C. At this temperature a mixture of 3 volumes of hydrogen and 1 volume of carbon monoxide is completely converted into methane (1 volume) and water. Excess of carbon monoxide retards the reaction. The nickel is not affected, and can be used over again several times.

In the case of carbon dioxide, the initial temperature of reaction is about 230° C., and the most favourable temperature is above 300° C. With 2 vols. of hydrogen to 1 vol. of carbon dioxide, practically the whole of the hydrogen, and with more than 4 vols. of hydrogen to 1 vol. of carbon dioxide, the whole of the carbon dioxide, is converted into methane.—J. T. D.

Silicon Hydride; Preparation and Properties of a New ——. H. Moissan and S. Smiles. Comptes Rend., **134,** [10], 569—575.

Magnesium and silicon, heated together in a stream of hydrogen, yield a magnesium silicide of somewhat variable composition, which, when treated with hydrochloric acid, gives a mixture of hydrogen with other gases. When this gaseous mixture is cooled by liquid air, it deposits a white solid; and this substance, when its temperature is allowed to rise slowly to the ordinary temperature, gives off a gas, which the authors have not yet examined, and leaves behind a liquid, boiling at 52° C., and melting (after refreezing) at −138° C. This liquid inflames spontaneously in air, and has the formula Si_2H_6; is, in fact, the silicon ethane.—J. T. D.

Calcium Silicide. H. Moissan and W. Dilthey. Comptes Rend., **134,** [9], 503—507.

When excess of lime is heated with silicon in the electric furnace, the silicon is completely oxidised and converted into calcium silicate; but if the silicon be in excess, calcium silicide, $CaSi_2$, is formed, according to the equation $2CaO + 5Si = 2CaSi_2 + SiO_2$. It appears as a mass of small greyish crystals, of density about 2·5, insoluble in alcohol, ether, benzene, turpentine, or liquid ammonia. It is rapidly and violently attacked by fluorine, and by chlorine at a red heat; but air or oxygen, even at a red heat, has but little action on it. Water decomposes it very slowly, with evolution of hydrogen (difference from calcium carbide); and hydrochloric acid, which attacks it rapidly, yields also hydrogen, and produces no hydride of silicon.—J. T. D.

Mercuric Iodide in Solution; The Nature of ——. J. H. Kastle and J. V. Reed. Amer. Chem. J., 1902, **27,** [3], 209—218.

Solutions of mercuric iodide in organic solvents are yellow, and the yellow modification separates on crystallisation. If the solution be kept in contact with the separated yellow crystals, the latter turn to red; there is no equilibrium possible. From supersaturated solutions of mercuric iodide in melted naphthalene, the yellow form is separated on the introduction of a few yellow crystals, powdered glass, or other substances in coarse powder; the red crystals do not produce crystallisation. The yellow iodide, which crystallises from various solvents, differs greatly in stability; the more viscous the solvent, the slower is the change to the red variety. Light accelerates the transformation. Yellow crystals obtained from vaselin have remained under the vaselin almost unchanged for 18 months.—A. C. W.

Tellurium Tetrachloride. V. Lehner. J. Amer. Chem Soc., 1902, **24,** [2], 188—190.

When an excess of sulphur chloride is brought in contact with metallic tellurium at the ordinary temperature, the tellurium is rapidly attacked, with evolution of heat, and white needle-like crystals of tellurium tetrachloride separate out. The reaction may be represented as follows :—

$$Te + 2S_2Cl_2 = TeCl_4 + 4S.$$

The sulphur remains in solution in the excess of sulphur chloride, which is decanted off, and the crystals are washed with carbon bisulphide. Tellurium tetrachloride is permanent in dry air, but is decomposed in moist air with formation of the oxychloride. Excess of water gives tellurous acid. When tellurium is heated in a current of sulphur chloride vapour, the black dichloride is first produced, the tetrachloride being subsequently formed.—J. F. B.

Zinc Oxide ; Action of Hydrogen Peroxide on ——. De Forcrand. Comptes Rend., **134,** [10], 601—604.

By the action of hydrogen peroxide on moist zinc oxide (or hydroxide), the two being kept in contact for 12 hours with constant agitation, a compound was obtained of the formula $Zn_4O_7.6\frac{1}{2}H_2O$, which gradually loses water to the limit $Zn_4O_7.4H_2O$. Increase in the proportion of hydrogen peroxide or in the time of contact makes no change in the state of oxidation of the product ; but if the dried substance be freshly treated with hydrogen peroxide, an unstable compound containing oxygen very little short of the formula ZnO_2 is formed. If the last compound be kept for some months in a desiccator at the ordinary temperature, or if the compound Zn_4O_7 be heated to 100° C., an oxide, Zn_3O_5, with $2H_2O$ or $3H_2O$, is obtained. As these three compounds always contain at least as many molecules of water as of atoms of oxygen in excess of ZnO, the author thinks it possible that they are really compounds of ZnO or $Zn(OH)_2$ with H_2O_2.—J. T. D.

Ferric Oxide ; Crystallisation of ——. A. Ditte. Comptes Rend., **134,** [9], 509—512.

When a mixture of crystallised ferrous sulphate and common salt is heated to redness, the ferric oxide formed is found partly in the condition of minute crystals. These crystals do not arise from the solution of the oxide in fused common salt, for (1) not nearly the whole of the ferric oxide produced is so crystallised, and increasing the proportion of common salt present has no perceptible effect on the amount of crystallised oxide formed ; and (2) previously formed ferric oxide heated with common salt is not dissolved. Nor does the addition of ferric or ferrous chloride or of sodium sulphate to the common salt in the last experiment increase the solubility of the oxide. As, moreover, the crystals are not produced when the ferrous sulphate is completely dehydrated and the common salt very thoroughly dried before the mixture is made and heated, the presence of water seems necessary to their formation, and the author assumes that they are produced by the reaction, at the high temperature, of water vapour on the vapour of ferric chloride, the latter produced by the reaction of hydrochloric acid (formed from sulphuric acid and salt) on some of the ferric oxide. Obviously, the production of the sulphuric acid just mentioned implies the presence of water in the mixture. The addition, to the mixture of salt and ferrous sulphate, of a little potassium fluoride increases the amount and the brilliance of the crystals formed. The sulphates of nickel, cobalt, manganese, or aluminium, substituted for that of iron, give no crystals of their respective oxides ; in all of them, the temperature of decomposition of the salt is far above that of its complete dehydration.

The oxidation of pyrites, and the heating of the ferrous sulphate thus formed with common salt, may explain, in some instances at least, the occurrence of crystallised ferric oxide in the crust of the earth.—J. T. D.

Manganese and Cobalt Chlorides ; Compounds of Alcohol with ——. F. Bourion. Comptes Rend., **134,** [9], 555—557.

By evaporating solutions of these salts in alcohol, the compounds $MnCl_2.3C_2H_6O$ (rose-coloured crystals, rapidly losing alcohol *in vacuo* or in air) and $2CoCl_2.5C_2H_6O$ (blue needles, extremely deliquescent) are obtained. Nickel chloride is practically insoluble in alcohol.—J. T. D.

Glucophosphoric Acid ; Preliminary Communication on ——. P. A. Levene. J. Amer. Chem. Soc., 1902, **24,** [2], 190—191.

The author has examined a substance first obtained by Palladin from various seeds. He has prepared a copper salt having the following composition :—Carbon, 16.95 per cent. ; hydrogen, 2·85 ; nitrogen, 2·41 ; phosphorus pentoxide, 24·10 ; cupric oxide, 35·66 ; and ash, 57·67 per cent.

The acid occurs in nature in the form of its calcium magnesium salt, which is precipitated by alkalis and by sodium acetate, and is soluble in dilute acid. A comparatively dilute solution of it in acetic acid gives a precipitate with Witte's peptone. On hydrolysis with mineral acids, orthophosphoric acid is produced ; no glycerin or fatty acids are formed. With phenylhydrazine the products of hydrolysis yielded a crystalline deposit resembling a glucosazone.—J. F. B.

Trinitroxylenol ; The Symmetrical ——. J. J. Blanksma. Rec. trav. chim. Pays-Bas, **20,** 422—424. Chem. Centr., 1902, **1,** [7], 419.

By the action of nitric acid on Knövenagel's symmetrical xylenol, symmetrical trinitroxylenol, $C_6(OH)(CH_3)_2(NO_3)_3$ [$OH_2 : (CH_3)_2 : (NO_3)_3$, 1.3.5.2.4.6], is produced. It crystallises from dilute nitric acid in colourless needles, which melt at 104° C. Symmetrical trinitroxylenol resembles picric acid in many of its properties, but, unlike the latter, is not attacked by potassium cyanide, apparently because it contains no hydrogen atoms in the ring between the nitro groups.—A. S.

Protein Bodies ; Sulphur in ——. T. B. Osborne. J. Amer. Chem. Soc., 1902, **24,** [2], 140—167.

The author communicates the results of estimations of sulphur in several of the better-known proteins. In most cases a large number of different preparations were analysed, and the mean of the most reliable numbers was taken ; in a few cases, however, the results were very variable, owing to the ill-defined character of the proteins.

The *total sulphur* was determined by alkaline oxidation with sodium peroxide ; the *loosely-combined sulphur, i.e.*, that which yields sulphide when treated with alkaline lead acetate, was determined (1) by Schulz's method, boiling with 30 per cent. caustic lye in presence of lead acetate and metallic zinc ; (2) by heating under pressure with 50 per cent. alkali and a little lead acetate. The latter method generally afforded the best results, especially when the decomposition was effected at a temperature of 165° C.

After describing in detail the experiments in each case, the author gives a table in which he has compiled, from what he considers to be the most reliable analytical numbers, the elementary composition and formulæ of 24 animal and vegetable proteins. The molecular formulæ are calculated by multiplying those indicated by analysis by the whole number required to bring their molecular weight as near as possible to 15,000, this value being taken as representing the minimum size of the protein molecule.

In the table on next page the sulphur contents of various proteins are set forth, most of the determinations being the results of the present work.

From considerations discussed in the paper, it seems probable that the whole of the loosely-bound sulphur, especially in those proteins which are rich in sulphur, cannot be obtained in the form of lead sulphide, under the conditions of the experiments. It appears that when only one atom of loosely-bound sulphur is present, this can always be converted quantitatively into sulphide, but that, when more than one atom of such sulphur is present, the results

Protein.	Total Sulphur.	Atoms of Sulphur in the Protein Molecule on the 15,000 basis.	Loosely-bound Sulphur.	Proportion of total Sulphur in the form of loosely-bound Sulphur.	
	Per Cent		Per Cent.	Per Cent.	Ratio.
Seralbumin...........	1·930	9	1·280	66	2/3
Oxyhæmoglobin, dog..	0·568	3	0·335	59	
Seroglobulin, horse ...	1·110	5	0·630	57	
Gliadin...............	1·027	5	0·619	60	
Oxyhæmoglobin, horse	0·380	2	0·190	50	1/2
Vignin	0·426	2	0·214	50	
Amandin	0·429	2	0·217	50	
Globin	0·420	2	0·200	48	
Glycinin	0·710	4	0·320	46	
Vicilin	0·200	..	0·092	46	
Legumin	0·385	2	0·165	41	
Edestin	0·880	4	0·346	40	
Zein	0·600	3	0·212	35	1/3
Ovovitellin	1·028	5	0·348	34	
Fibrin................	1·100	5	0·380	34	
Excelsin..............	1·086	5	0·350	32	
Ovalbumin	1·616	8	0·491	30	
Phaseolin.............	0·312	..	0·072	23	1/4
Casein................	0·800	4	0·101	13	1/8

of analysis by the alkaline lead methods are too low. There are probably two kinds of protein complexes containing loosely-bound sulphur reacting with alkaline lead solutions, one yielding the whole of its sulphur under these conditions, and the other, comparable with cystin, present in those proteins which are rich in sulphur, yielding only a part.—J. F. B.

Arabinose; Derivatives of ——. G. Chavanne. Comptes Rend., **134**, [11], 661—663.

By the method of Koenigs and Knorr (this Journal, 1901, 626), the author has obtained from arabinose both *acetobromarabinose* (hard, colourless, transparent needles, melting at 137° C., soluble in acetic acid, chloroform, benzene, but little in other solvents, slowly decomposed by moisture, strongly lævo-rotatory, reducing Fehling's solution when heated), and *acetochlorarabinose* (m.p. 148° C., closely resembling the bromo-compound in all the properties enumerated). The author has attempted with these substances to prepare tetracetylarabinose, and has obtained crystals melting at 80° C., but not yet in sufficient quantity for analysis.

The author has also prepared the phenylhydrazone of arabinose, in white crystals, m.p. 150°—151° C., apparently identical with that prepared by Tanret by a different method.
—J. T. D.

Lactic Acid; Two New Micrococci capable of Forming ——. Hashimoto. Hygien. Rundsch., **11**, 821—834. Chem. Centr. 1902, **1**, [7], 438.

The author has detected in imperfectly-sterilised milk, two micrococci which have the power of curdling milk with the formation of acid. The author divides the micrococci capable of forming lactic acid into two main classes, *viz.*, simple micrococci and streptococci, with subdivisions depending upon their capability or otherwise of liquefying gelatin. The two micro-organisms isolated by the author produce *d*-lactic acid from milk sugar; one belongs to the group of simple micrococci, and the other to that of streptococci. The former is very nearly allied to, if not identical with, *Micrococcus acidi paralactici liquefac.* Halensis Kozai; for the streptococcus, the author proposes the name, *Streptococcus acid. paralact. non-liquefac.* (Halensis).
—A. S.

Heptacetylchlorlactose. A. Bodart. Monatsh. für Chem., 1902, **23**, [1], 1—8.

Attempts at the acetylation of milk sugar by a mixture of acetic anhydride and sulphuric acid did not lead to satisfactory results. When the product of reaction was poured on to ice, nothing but an uncrystallisable resin was obtained. When the product was purified under anhydrous conditions, neutralised with fused sodium acetate and treated with organic solvents, the only product isolated was *pentacetylglucose*, m.p. 111·5° C. No galactose derivative could be isolated from the amorphous residue.

Acetylation in presence of hydrochloric acid gave better results, and was carried out as follows:—10 grms. of dry milk sugar were mixed with 83 c.c. of acetic anhydride and saturated with dry hydrogen chloride gas, whilst immersed in a freezing mixture. The vessel was then sealed up and allowed to remain for several days, until the sugar was all dissolved. The excess of acetic anhydride and chloride was distilled off *in vacuo*, and the residue purified by benzene and petroleum spirit. The product consisted of *heptacetylchlorlactose*, melting unsharply at about 120° C. $[\alpha]_D$ in chloroform solution = + 71·75°. It was converted by silver acetate into octacetyllactose; alkyl lactosides could not be prepared.—J. F. B.

Heptacetylchlormaltose. R. Foerg. Monatsh. für Chem., 1902, **23**, [1], 44—50.

Heptacetylchlormaltose was prepared in a manner similar to that employed in the case of heptacetylchlorlactose (see preceding abstract).

Its conversion into the heptacetates of methylmaltoside and ethylmaltoside was readily effected by the process of Koenigs and Knorr (see this Journal, 1901, 626), but no acetonitrose could be obtained.

This heptacetylchlormaltose, $[\alpha]_D$ in chloroform solution = − 159°, prepared directly from maltose, appears to be different from that described by Fischer and Armstrong (see this Journal 1901, 1151), obtained by the action of liquid hydrogen chloride on octacetylmaltose. The former melts at 118°—120° C., whilst that of Fischer and Armstrong melts at 64°—66° C. On the other hand, the melting points of the acetylmethylmaltosides are not very different.
—J. F. B.

Ketoses; Isolation of ——. C. Neuberg, Ber., 1902, **35**, [4], 959—966.

It is well known that phenylhydrazine yields the same osazones with all the sugars of allied groups, making no distinction between aldose sugars and ketose sugars. The author has discovered that unsymmetrical, secondary, substituted hydrazines of the type $\genfrac{}{}{0pt}{}{C_6H_5}{R}>N.NH_2$, especially methyl phenylhydrazine, react with ketose sugars to form osazones, whilst with aldose sugars they form only colourless hydrazones. The osazones are strongly coloured and are readily separated from the aldose hydrazones. Hydrazines substituted in the benzene nucleus behave like phenylhydrazine.

d-Fructose-methyl-phenylosazone is the most important compound described by the author and is prepared as follows:—To a solution of 1·8 grm. of lævulose in 10 c.c. of water, 4 grms. of methylphenylhydrazine are added, together with sufficient alcohol to make a clear solution. After the addition of 4 c.c. of 50 per cent. acetic acid, the liquid, which rapidly becomes yellow, is heated for 5 or 10 minutes on a water bath. On standing, crystallisation soon begins and is complete after 2 hours. Crystallised from 10 per cent. alcohol, this osazone occurs as reddish yellow needles melting at 153° C.; it is readily soluble in most solvents, sparingly soluble in benzene and insoluble in light petroleum.

The *methyl-phenylosazone* of a *ketopentose*, obtained by the oxidation of *d*-arabite by Fenton's process, is described, m. pt. 172° C., also *dioxyacetone methyl-phenylosazone* m. pt. 127°—130° C. The sorbose derivative was prepared and analysed, but could only be obtained in the form of an oil.

This method for the isolation of ketose sugars is especially serviceable for the characterisation of lævulose in mixtures, particularly in physiological experiments.—J. F. B.

Carbohydrates in the presence of Ferrous Salts; Action of Hydrogen Peroxide on ——. *III.* R. S. Morrell and J. M. Crofts. Proc. Chem. Soc., **18**, [248], 55.

The specific action of hydrogen peroxide in the presence of ferrous sulphate was first demonstrated by Fenton in the oxidation of tartaric acid to dihydroxymaleic acid (this

Journal, 1893, 467). Glucose, lævulose, arabinose, and rhamnose have been shown by the authors to be transformed by this peculiar reaction into osones, which were recognised by their power to react with substituted hydrazines at the ordinary temperature (Trans. Chem. Soc., 1899, **75**, 786, and 1900, **77**, 1219). It has been found that mannose on oxidation gave an osone which yielded with phenylhydrazine at the ordinary temperature phenylglucosazone. The preparation of pure glucosone from both glucose and lævulose has been attempted, and a white, amorphous solid has been obtained which gave analytical results agreeing with the formulæ, $C_6H_{12}O_6$ and $C_6H_{10}O_6$. This substance reacted readily with phenylhydrazine at the ordinary temperature and furnished a good yield of phenylglucosazone. The glucosone from glucose was feebly dextrorotatory, whilst that from lævulose was slightly lævorotatory. Glucosone obtained by E. Fischer (this Journal, 1889, 296), is lævorotatory.

An aqueous solution of glucosone prepared from either glucose or lævulose on oxidation with bromine at 40° furnished a good yield of the calcium salts of a trihydroxybutyric acid. The barium salt of the same acid has been obtained, and both the calcium and barium salts seem to be identical with *d*-erythronic acid (Ruff, this Journal, 1900, 282). The calcium and barium salts of this acid obtained from glucosone prepared from either dextrose or lævulose have yielded butyric acid on reduction with hydriodic acid and phosphorus.

New Book.

MINERAL RESOURCES OF THE UNITED STATES, CALENDAR YEAR 1900 (Department of the Interior. United States Geological Survey. Charles D. Walcott, Director). DAVID T. DAY, Chief of Division of Mining and Mineral Resources. Washington, U.S.A.: Government Printing Office. 1901.

8VO VOLUME containing table of contents, introduction, summary of the mineral production of the United States in 1900, pages 13—38, and other subject-matter filling 865 pages. The volume ends with an alphabetical index of subject-matter. The following are the items upon which geographical and industrial details are given:—I. Iron Ores. II. Iron and Steel, at the close of the 19th Century. III. Gold and Silver. IV. Manganese Ores. V. Copper. VI. Clay Products. VII. Cement. VIII. Precious Stones. IX. Talc and Soapstone. X. Abrasive Materials. XI. Phosphate Rock. XII. Sulphur and Pyrites. XIII. Gypsum. XIV. Salt. XV. Mica. XVI. Fluorspar. XVII. Asbestos. XVIII. Lithographic Stone. XIX. Graphite. XX. Mineral Paints. XXI. Barytes. XXII. Fuller's Earth. XXIII. Flint and Felspar. XXIV. Chromite or Chromic Acid Ore. XXV. Mineral Waters.

Trade Report.

I.—GENERAL.

INDIGO, SYNTHETIC; REVOCATION OF PATENTS RELATING TO THE PRODUCTION OF ——.

Chem.-Zeit., 1901, 245, 1110.

By decision of the Austrian Ministry of Commerce (Handelsministerium), dated June 30, 1900, and Oct. 10, 1900, fifteen patents of the Badische Anilin und Sodafabrik, Ludwigshafen, have been revoked on the ground of their not having been worked in Austria. These patents were granted for the production of synthetic indigo and of intermediate products used in the manufacture of synthetic indigo, such as phthalic acid (from naphthalene). The following is an abstract of the reasons on which the decision is based.

The holder of a patent must commence to work his patent in the course of the first year after the patent is granted. Within this time at the least, all the preliminary arrangements must be made for working his invention permanently and on a manufacturing scale. Within the second year his invention must be actually worked on the large scale. Should difficulties in the sale or manufacture of the patented article occur, a stoppage of working may be permitted for a period, not exceeding two years, subject to the condition that the invention has actually been previously carried out on the large scale. The public demand for the patented article cannot be taken into consideration, and hence the plea of the defendants that there was no demand in Austria for the intermediate products patented, could not be entertained. The mere carrying out of the patented process or the production of the patented article on a single occasion or experimental working cannot be deemed to fulfil the requirements of the law.—F. N.

FUTURE OF CHINA:—THE INDUSTRIAL OUTLOOK.

Standard, April 1, 1902.

Dr. A. von Rosthorn, Councillor of Legation, and Austrian *Chargé d'Affaires* at Pekin during the siege of the Legations, recently read a paper on China at an Industrial and Commercial Club in Vienna. He gave some hints as to the articles which Austria might successfully export to China, and he specially mentioned beer, wine, mineral waters, sugar, conserves, enamelled ironware, cottons, ribbons, artificial flowers, cheap leather goods, paper, &c. He thought that the demand for a better class of goods was increasing. For some years past the import of inferior cotton goods has fallen off, and that of woollen cloth has increased. Several European articles, such as lamps, mirrors, and glassware, will, in future, sell much more extensively than they have hitherto done. The introduction of railways will increase the demand, not so much by cheapening freight, as by bringing larger sections of the native population in contact with European settlements, and by thus making them acquainted with Western comforts and luxuries.

CUSTOMS DECISIONS IN THE NETHERLANDS.

Bd. of Trade J., March 20, 1902.

The following decisions affecting the Dutch Tariff have recently been published in the official *Verzameling.*

Under certain conditions, collodion for use in the manufacture of gas mantles, may be admitted free of duty.

Sheets of paper pulp or wood pulp manufactured in such a way that they can be immediately used as cardboard or packing paper are dutiable as "paper of all kinds," at the rate of 5 per cent. *ad valorem.* If, however, such articles be not capable of being used immediately as paper, either because they are insufficiently prepared, or because they are perforated, they are exempt from duty.

EXPORTS FROM PORTUGUESE AFRICAN COLONIES.

Foreign Office Annual Series, No. 2746.

The principal articles exported from Angola in 1900 were 2,151,000 kilos. of india-rubber, valued at 3,685 contos of reis (571,200*l.*); 435,000 kilos. of wax, valued at 284 contos of reis (44,000*l.*); and 88,000 kilos. of oleaginous seeds.

The exports from the islands of St. Thomas and Principe included small quantities of wax and india-rubber

BRITISH CHEMICALS IN RUSSIA.

An Encyclopaedic Dictionary of raw materials and manufactured products is now being brought out in St. Petersburg, under the editorship of Mr. Boris M. Brandhendler, M.R.A.S., 6, Pracheshny, St. Petersburg.

The attention of British manufacturers of chemicals and chemical products is drawn to this work, and their assistance is requested in furnishing information with regard to these articles of commerce, under the following heads:—

(*a.*) *Kinds and Varieties* (commercial), with short description of each article.

(*b.*) *Packing* (material, quantity, &c.), with reference to each article.

(*c.*) *Statistics* (where exact details cannot be given, average figures may be furnished), relating to each article, explaining the amount of general production or trade with different countries, and with Russia, in particular.

Information is requested with regard to ammonium salts, aluminates, and other chemicals beginning with "A";

also with regard to barytes, benzaldehyde, borax, boric acid, carbonate of lime (of Scotch origin), coal-tar naphtha, and shale-naphtha.

All details should be sent to the above address.

Exports of the Straits Settlements in 1901.

Bd. of Trade J., March 20, 1902.

The following table shows the quantities of the principal articles of produce exported from the Straits Settlements to the continent of Europe and the United States of America in 1901 :—

Exports of Principal Articles of Produce in 1901.

Articles.	To Continent of Europe.	To United States of America.	To United Kingdom.
	Tons.	Tons.	Tons.
Gambier	8,150	12,500	14,500
Tin	6,600	18,650	24,350
Gutta percha	1,350	630	3,500
Jelutong rubber	770	6,250	360
Hides, raw	400	140	2,070
„ tanned	..	..	600
Gum copal	750	2,270	2,000
Borneo rubber	120	90	170
Gum benjamin	160	15	160
Cubebs	..	170	5
Illipi nuts	710	..	..
Sugar	90	..	3,760
Copra	33,200	10	..
Canes per mill	1,220	..	558
Isinglass	..	..	115
Gum dammar	50	120	50

Customs Decisions in New Zealand.

Bd. of Trade J., March 20, 1902.

The following Customs Decisions have reference to the Tariff of New Zealand :—

Articles, and how classed.	Rate of Import Duty.
Druggists' shop fittings, bottles for—	
As druggists' sundries	15 °/₀ *ad val.*
Tanning extract (mixture of "tannin" acid and sugar)—	
As chemicals, n.o.e.	15 „ „

Chemical Instruction and Chemical Industries in Germany; Supplementary Report on ——.

Foreign Office Miscellaneous Series, No. 573.

The information contained in the present report deals with the facilities for and expenditure on chemical instruction at the two Prussian technical high schools at Berlin and Hanover, respectively, and at the University of Berlin, and is intended to supplement the information given in the report on chemical instruction and chemical industries in Germany, published under No. 561 of the Miscellaneous Series (this Journal, 1901, 849). In the chemical department of the Berlin Technical High School, there are six professors for the following branches of chemistry :—Organic Chemistry, Inorganic Chemistry, Chemical Technology, Metallurgy, Electro-chemistry, Photo-chemistry; six lecturers for the following branches :—Chemistry of Foods, Agricultural Chemical Technology, Vegetable and Animal Fats, Oils, &c., Designing of Chemical Works and Plants, Architectural Chemical Technology, Physical Chemistry; finally, 12 private lecturers for the following branches :—Electrolytic Metallurgy, Chemistry of Foods, Ceramics and Mortar, Chemistry of the Growth of Plants, Investigation of Oils, Fats, and Naphtha, Technology of the Proteins and Albuminoids, Repetition of Organic Chemistry, Special Chemistry of Cement, Lime, &c., Qualitative and Quantitative Analysis, Aniline Dyestuffs, Terpenes and Camphor, Modern Synthetic Drugs.

Particulars are given regarding salaries of the staff, also number of professors, lecturers, and students. In 1899, there were no less than 41 professors, lecturers, private lecturers, and assistants to 278 students or about one instructor to seven instructed.

At the Hanover Technical High School, the proportion of instructors to instructed is 23 to 285, or about 1 to 12. The department of chemistry at the Berlin University forms one of the sub-divisions of the faculty of philosophy, and the professors of chemistry are members of the philosophical faculty. The lectures in the various branches of chemistry are open, not only to the students of chemistry, but also to the students of medicine and pharmacy, and to future schoolmasters and professors for mathematics and natural science. In 1899, the number of students in the Philosophical Faculty was 2,162; in the Mathematical and Natural Science divisions, 784 The total expenditure for new apparatus, instruments, chemicals, repairs, &c. in the First Chemical Institute, Second Chemical Institute, Technological Institute, and Pharmaceutical Institute, in 1901, was 4,079*l.* Particulars as to cost of buildings, &c. are given.

The various figures show clearly the large proportion of chemical instructors to students, the increase in the number of students, and the facilities provided for instruction in almost all conceivable branches of chemistry. They indicate that the Prussian State, in spite of the expenditure already incurred and the leading position attained by the chemical industries, is far from regarding the present means of instruction as adequate for future contingencies, but is at all times, upon representations from the requisite industrial and educational quarters, prepared for lavish public outlay should future developments reveal this necessity.—C. T. T.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Oil Prospecting Regulations in Western Australia

Bd. of Trade J., March 20, 1902.

The *Government Gazette* of Western Australia, of Nov. 29 last, publishes the text of new regulations under the Mineral Lands Acts, 1892—99, with regard to prospecting areas for oil. Oil is defined as including mineral oil, shale, bitumen, or any mineral fuel other than coal.

The above regulations may be seen by persons interested on application to the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, S.W.

Petroleum in Germany.

Chem. Trade J., March 29, 1902.

The production of crude petroleum in Germany rose from 192,232 barrels, in 1899, to 358,297, in 1900. The increase of 1899 over 1898 was 8,808 barrels only. The mean price obtained, in 1900, was 10*s.* per barrel, as against 8*s.*, in 1899, and 8*s.* 3*d.* in 1898.

Oil at Pensacola (United States).

Foreign Office Annual Series, No. 2752.

Recent indications of oil have been discovered in and around Pensacola, and from samples obtained, oil of good quality is likely to be found.

Companies have been formed for the purpose of boring wells, and shares have been issued to the public.

IV.—COLOURING MATTERS, Etc.

Indigo Market in Germany in 1901.

U.S. Cons. Reps., March 6, 1902.

The year 1901 witnessed a slow but steady increase in the prices of natural indigo, with a relatively satisfactory business. Towards the end of summer the demand slackened, due to the fact that the large colour works at Höchst and Ludwigshafen offered artificial indigo at greatly reduced prices, in order to reduce their stocks.

The Consul calls attention to the wisdom of giving preference to the natural product when prices are satisfactory, and states that should producers be compelled to discontinue the cultivation of indigo on account of its unprofitableness, consumers would become entirely dependent upon the colour manufacturers, who would probably combine and raise prices, as was done in the case of Alizarin Blue.

Owing to the improved method of production, natural indigo will at least remain an equal rival of the synthetic product, and advices from Calcutta regarding the new crop quote prices which will allow the natural product to successfully compete with the artificial.

The finer qualities of Bengal indigo were again least affected by fluctuations of prices. The limited supply found a ready market. The greatest demand was for medium qualities, and the stocks have been much reduced. Java indigo maintained its preferred position and brought relatively high prices. Of the new crop, a considerable quantity is said to have been already sold at high prices for future delivery.

The stock on hand in Europe amounted to 9,000 cases at the end of the year 1901, against 8,500 cases in 1900, 10,000 cases in 1899, 13,500 cases in 1898, 19,000 cases in 1897, and 14,000 cases in 1896.

INDIGO; ARTIFICIAL *v.* NATURAL ——, IN GERMANY.

Drogisten Zeit., Jan. 31, 1902.

The following announcement has been issued from the clothing department of the Prussian Ministry of War, with reference to the reported decision of the Prussian Government to substitute artificial for natural indigo in the dyeing of the blue cloth used in the army :—

Manufacturers are quite free to use either artificial or natural indigo, whichever they may prefer, in the dyeing of cloth for military purposes. (See this Journal, 1902, 81.)

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

IMITATION SILK YARN: CUSTOMS DECISION (UNITED STATES).

Bd. of Trade J., March 20, 1902.

Imitation silk yarn, made partly of pyroxylin, but which has been denitrated in the process of manufacture, and which, in its imported condition, is not composed in chief value of pyroxylin or a compound of pyroxylin, is dutiable as "silk yarn or thread," under par. 385 and the provisions of Section 7 of the Tariff.

HEMP-BLEACHING COMPOUND DUTY-FREE IN CANADA.

U.S. Cons. Reps., March 18, 1902.

The Canadian Government has recently transferred a number of articles, heretofore dutiable, to the free-import list, with a view to increase their manufacture in that country. Among these articles, which will be admitted free only when imported by manufacturers for use in their own factories, is hemp-bleaching compound, for the manufacture of rope.

VII.—ACIDS, ALKALIS, SALTS, Etc.

ARSENIC IN PORTUGAL.

Bd. of Trade Notice, March 17, 1902.

The only mine producing arsenic in Portugal is that of Pintor, situated in the parish of Nogueira do Cravo, township of Oliveira de Azemeis, district of Aveiro.

This mine has produced the following quantities of arsenic (As_2O_3) :—

Year.	Metric Tons.	Value per Ton in Reis.
1898	751	60,190
1899	1,082	52,460
1900	{ 500	66,000
	{ 500	56,000
1901	1,010·457	66,990

There is only a small importation of arsenic, which nearly all comes from Germany, fetching a better price in lumps than in powder. The wholesale price is about £7 to £8 per ton. The druggists of Lisbon and Oporto together do not import more than 10 to 20 tons per annum, and the glass factories about 3 tons per annum.

CHEMICALS IN SPAIN.

U.S. Cons. Reps., March 8, 1902.

The following are the principal chemicals imported by Spain :—Caustic soda (25,000—30,000 tons per annum) from Great Britain, Belgium, and France; chloride of lime from France, Belgium, and Great Britain; "ammonia alkali," or "ammonia ash" (about 8,000 tons a year), from Belgium and Germany; lump silicate of soda (about 1,000 tons per annum) from Great Britain, Germany, and Belgium; also bicarbonate of soda, chlorates of soda and potash, acetic acid, chloride of ammonium, and sulphate of copper. Between 1896 and 1899, a works was established at Flix, about 100 miles from Barcelona, for the electrolytic production of caustic soda and chloride of lime, the estimated output being 5,000 tons of chloride of lime and 2,000—2,500 tons of caustic soda. The products were first placed on the market at the end of 1899, but the competition does not appear to have injured foreign manufacturers to any considerable extent, the imports of bleaching powder and caustic soda during the past two years showing little, if any, falling off.

—A. S.

NITRATE IN CHILE.

Chem. and Druggist, March 22, 1902.

As a result of the Nitrate Combination, the Chilean Government propose to increase the export duty on nitrate by 6*d.* per quintal. This will produce 50,000,000 dols. per annum extra revenue.

CARBONIC ACID SYNDICATE IN AUSTRIA-HUNGARY.

Chem. and Druggist, March 22, 1902.

A syndicate of Austro Hungarian carbonic acid manufacturers has been definitely arranged. It came into force on March 1, and will last for five years.

SALT IN THE NETHERLANDS: EXCISE DUES ON ——.

U.S. Cons. Reps., Feb. 19, 1902.

A Royal Order of December 27, 1901, provides for the exemption from excise dues of salt used in the preparation of bleaching powder by electrolysis, on the basis of the Royal Order of August 19, 1899.

SULPHUR IN JAPAN.

Bd. of Trade J., March 20, 1902.

Sulphur produced, in 1900, in Hokkaido, Rikuzen, Asumi, Shinano, and other provinces amounted to 14,435 tons, valued at 312,835 yen (about 31,000*l.*).

ELECTROLYTIC PRODUCTION OF CAUSTIC SODA AND CALCIUM CHLORIDE IN ITALY.

Chem. and Druggist, March 29, 1902.

A company with a capital of about 44,000*l.* has just been formed at Milan for the electrolytic manufacture of caustic soda and of calcium chloride. These two products have up to the present been imported into Italy. The works of the new company will be situated at Varallo, where some 600 horse-power will be obtained from the River Sesia. The company expect, with some 350 working-days, of 24 hours, to produce about 2,359 tons of calcium chloride solution, and 2,880 tons of caustic-soda solution. The estimate of the income and cost show an annual profit of 14 per cent.

VIII.—GLASS, POTTERY, Etc.

WINDOW-GLASS MANUFACTURE IN JAPAN.

U.S. Cons. Reps., March 15, 1902.

After some discussion in the Japanese Diet in regard to the promotion of window-glass manufacture in Japan, the Government has decided to establish at the industrial experiment station a model factory, or technical school, for training workers in window-glass manufacture. Japan affords the necessary materials for this industry and the cheap labour, but lacks the skilled artisans necessary to make it a success. All the window-glass now used in Japan is imported, and the market is an increasing one, since it is used for buildings of both foreign and Japanese style. The importation of window-glass, in 1899, was valued at 1,250,000 yen (625,500 dols.). Belgium furnishes the greater part of this import. It is estimated that a box of glass which now costs, imported, 7 to 10 yen (3.49 dols. to 4.98 dols.) would, if made in Japan, cost about 5½ yen (2.75 dols.). It is expected that the factory, for which money will probably be appropriated at the next session of the Diet, will be working in a year, and in the course of two or three years will be able to supply enough skilled Japanese artisans to carry on the work in private factories. In the meantime, one or two Japanese have been sent to Germany to study the art; but it is probable that foreigners will be employed to teach methods, assist in the selection of machines, and in other arrangements for the plant.

X.—METALLURGY.

Mineral Exports of Portugal.

Foreign Office Annual Series, No. 2746.

The quantity and value of the minerals exported from Portugal, in 1900, is shown in the following table :—

Description.	Quantity.	Value.	
		Currency.	Sterling.
	Tons.	Milreis.	£
Copper	404,015	1,092,731	169,200
Lead	3,233	135,732	20,900
Manganese	5,008	16,926	2,500
Antimony	407	10,110	1,550

Platinum and Copper in the Urals (Russia).

U.S. Cons. Reps., Feb. 21, 1902.

According to a statement of the Mining Department, the production of platinum in the Ural district, for 1901, was 380 poods (1,368 lb.), showing a decrease, in comparison with 1900. The copper industry seems to be advancing, as several new works have been opened up for the production of this metal.

Platinum in the Cauca (Colombia).

Foreign Office Annual Series, No. 2747.

The Cauca possesses very rich alluvials and river washings, yielding platinum, this being the only part of the country in which this metal is found. The district known as the Choco is famous for its rich river washings, but the climate is very unhealthy.

Tin in Johore.

Bd. of Trade J., March 27, 1902.

The following particulars relating to tin in Johore are taken from a report prepared, after an extensive tour through Johore territory, by Mr. A. B. Snow, mining expert to the Sultan of Johore, and published in the *Straits Budget* of the 18th ult. :—

As regards the Johore River district, Mr. Snow says that there had been considerable work done in mining for tin in former years, and in washing from the surface at Ayer Puteh, he got a good sample of tin. The tin is of a very fine kind, and is associated with iron, which makes it difficult to clean in the ordinary Chinese way of tin washing. He estimates that there are thousands of tons of tin in the vicinity of Ayer Puteh, and that, when once bed rock is reached, there is no reason why the tin should not be of a coarser quality, and pay handsomely to work in a modern way.

In summing up his report, Mr. Snow says that he is prepared to state that there is a distinct tin belt of country running in a northerly direction from Sungei Raidan in the south to Bukit Tanah Abang in the extreme north of the State. It is more than 60 miles in length, and has an average breadth of three miles.

Mineral Wealth of Indo-China.

Eng. and Mining J., March 8, 1902.

M. Marc Bel, a mining engineer, who has recently travelled over a large part of Indo-China, on behalf of certain mining associations and of the Minister of Public Instruction, has communicated to the Society of Commercial Geography, of Paris, the result of his observations in regard to the mineral wealth of the country, as well as the prospects of mining enterprise there.

He states that the geological formations are such as should contain minerals in abundance, whilst the economic conditions are eminently favourable to the development of the mining industry. It is known that tin, copper, zinc, antimony, lead, iron, coal, marble, and china-clay exist. Tin is worked to a very small extent, and lead, copper, and antimony not at all.

Chemical Hard Lead in Missouri (United States).

Eng. and Mining J., March 8, 1902.

This term is used to designate certain brands of lead which are produced from the non-argentiferous ores of South-eastern Missouri. It is especially adapted to the manufacture of sheet and pipe which have to withstand the action of acids, and it finds a ready market for that purpose, usually at a premium of 5 cents per 100 lb. above the price of common Missouri lead. At one time, in 1901, there was an especially good demand for chemical lead, and temporarily it commanded a price somewhat higher than that for desilverised lead. The relative values of the different brands of lead in the St. Louis market are frequently subject to such variations. As to what constitutes chemical hard lead, there is no definite rule. Its peculiar property appears to be due to small percentages of copper or antimony, or both, in its composition, which are not removed by the methods of refining (liquating and poling) in use in the district, but no attempt is made to control the composition within precise limits. The artificial preparation of chemical hard lead is the subject of a patent recently granted to H. Leyendecker, of Cologne, Germany (Eng. Pat. 2756, 1901; this Journal, 1902, 124).]

XII.—FATS, OILS, AND SOAP.

Linseed-growing in New Zealand.

Bd. of Trade J., March 20, 1902.

In the February issue of *Australasian Hardware and Machinery*, it is stated that, in the Poverty Bay district of Auckland, a thorough trial of the growth of linseed for industrial purposes is being made; fully 3,000 acres having been put under cultivation this year. Only a small quantity has been hitherto grown, and that for the seed only, the flax itself being rendered useless for want of special machinery. Now this is to be remedied, and the fibre saved, the local paper mills having offered to try the product for paper making. Last year, when the seed sold at 15*s.* per bushel, the crop realised 8*l.* per acre. By utilising the fibre as above, it is expected that this year's crop will realise 14*l.* per acre.

Olive Oil from Portugal.

Foreign Office Annual Series, No. 2746.

The exportation of olive oil amounted to 37,950 hectolitres, valued at 694 contos of reis (107,500*l.*), an increase of 15,000 hectolitres, as compared with the previous years. The olive oil industry in Portugal is capable of large development. Olive trees abound, and large quantities of oil are manufactured annually. It is only the want of care in its preparation that makes it unsuitable for the European markets, so that the greater part of the oil exported has to be sent to Brazil and the Portuguese colonies.

QUILLAYA BARK, &c.: CUSTOMS DECISIONS IN SWITZERLAND.

The following decisions have been arrived at by the Swiss Customs Department establishing the classification of the following articles under the Customs tariff :—

Description of Articles.	Tariff No. under which classed.	Tariff Rates of Duty.	English Equivalents.
		Per 100 kilos.	Per Cwt.
Quillaya bark, soap wort, soap-wort root—		Frs. cts.	£ *s.* *d.*
In barrels, bags, &c. .	76	1 25	0 0 6
In boxes or packets of 4 kilos. or less.	77	2 50	0 1 0¼

OLIVE OIL IN ANDALUSIA (SPAIN) IN 1902.

U.S. Cons. Reps., March 13, 1902.

The olive crop of Andalusia is unusually good, and the output of oil in consequence will reach large figures. But for heavy frosts last month, the oil produced in the provinces of Malaga, Cordoba, and Jaen would have reached 112,500,000 to 125,000,000 lb., and, even as it is, it is thought the crop will amount to about 87,500,000 lb., or some 37 per cent. more than in 1899, 1900, or 1901.

The crop now being pressed was grown in 1901, but it is known none the less as the crop of 1902, since it is marketed this year; the oil is of an excellent quality, both in colour and taste, and is much superior to the product of the three previous years.

Malaga is sending her olive oil this year principally to Italy, Russia, France, Germany, England, Holland, Norway and Sweden, and the United States.

The cheapest grade goes largely to Russia.

It is said here that the failure of the crop in Italy is due to the ravages of the "mosca" (*Dacus olea*). The same pest appeared in this province in 1894 and 1895.

STEARIN IMPORTS OF VENICE (ITALY).

U.S. Cons. Reps., March 8, 1902.

The demand in this district for American stearin, paraffin, and tallow is increasing, imports for the last quarter having shown a decided advance. Mr. Guglielmo Olper, Calle dei Barcaroli, 1731, of Venice, asks to be put in communication with exporters of these materials.

OIL SEEDS AT KIEFF (RUSSIA).

Foreign Office Annual Series, No. 2750.

At the end of 1901, the ruling prices were :—

———	Price.	
	Per Pood.	Per Cwt.
	R. c.	*s.* *d.*
Linseed	1 85	12 1
Rape-seed	1 65	10 9
Poppy-seed	3 0	19 7

XIII. C.—INDIA-RUBBER, Etc.

RUBBER IN CEYLON.

Bd. of Trade J., March 27, 1902.

Rubber is receiving more attention; it is being steadily planted, both in the low country, and also on estates situated at moderate elevation. The yield and quality of rubber obtained from the Pará variety, growing in the Kalutara district, has been very satisfactory, some of the rubber realising 4*s.* 2½*d.* a pound. Steps are being taken to import the seeds and plants of the best varieties of *Castilloa* into the Island.

XIV.—TANNING; LEATHER; GLUE, Etc.

LEATHER INDUSTRY IN ITALY.

U.S. Cons. Reps., 68, [258], *March*, 1902.

In the *Revue de Commerce Extérieur* of Dec. 28th, 1901, it is stated that the leather industry in Italy is making notable progress. In 1899, there were in operation 1,226 tanyards, with a total of 19,921 vats, and employing 13,168 workmen, working, on an average, 263 days per annum. Of these tanyards, 255 use machines to a total number of of 3,026; 1,593 are worked by steam, 1,370 by hydraulic power, and 63 by gas.

Comparing these figures with those of 1896, the number of establishments is found to have decreased by 90, and the number of workmen, to have increased by 2,430. The motive power has trebled.

TANNERIES IN MAINE (UNITED STATES).

Foreign Office Annual Series, No. 2749.

There were 31 establishments engaged in the tanning, currying, and finishing of leather, in 1900, with 587 wage-earners, and products valued at 491,343*l.* In 1890, 51 establishments were reported, with 852 wage-earners, and products valued at 672,534*l.* The decrease in the value of products during the decade was 181,200*l.*, or about 27 per cent.

There were 200 tanneries in Maine in 1810, with an annual average of 275 hides and skins tanned, and an average product valued at 231*l.* In 1840, 395 tanneries were reported, whilst the total number of hands employed (454) averaged less than two to an establishment. York county alone contained 101 tanneries, with but 102 hands employed. Between 1840 and 1860, several tanneries of considerable size were built, and the industry received a further stimulus through the demands of 1861 and the time immediately following, so that during the next 15 years, many large sole-leather plants were established in the eastern part of the State. Hemlock bark has always been the principal material used for tanning purposes in the State, and it is to the increasing scarcity of this bark that the decline in the industry since 1870 must be attributed.

XV.—MANURES, Etc.

ARTIFICIAL MANURES IN RUSSIA.

Foreign Office Annual Series, No. 2750.

The employment of artificial manures in the "black-soil" district of Russia is in its infancy; in fact, the use of manure of any kind is of comparatively recent date. Nevertheless, the farmers are already appreciating the advantages of manuring their land, and as it is impossible for them to obtain a sufficient supply of farmyard manure, they are using artificial fertilisers instead. Hitherto the farmers depended entirely upon the richness of the black soil, but when harvests began to deteriorate, they bestowed their attention on means to enable it to recuperate its fertility, and profiting from the results shown them by the various agricultural institutes, they are adopting the suggested remedies to insure themselves against bad harvests.

In the cultivation of beetroot, in the south-western district (Kieff, Podolia, Wolhynia, and Chernigoff), superphosphate plays a very important part in strengthening the plants, during the spring, against the ravages of insects, and at the same time producing an increase in the size of the roots as well as a greater percentage of sugar.

As yet artificial manure is very little used in the cultivation of winter grain, as the selling price of grain does not leave a margin for the employment of fertilisers. Nevertheless, trials have been made with grain crops, and no doubt the increase in the yield will lead to a more extended use of fertilisers in the future.

In 1901, it is estimated that, in the "black-soil" district of Russia, the following quantity of fertilisers was used :—

——	Quantity.	
	Poods.	Tons.
Superphosphate	400,000	6,452
Chili saltpetre	40,000	645
Kainit	30,000	484
Basic slag	50,000	806

XVI.—SUGAR, STARCH, Etc.

SUGAR IN RUSSIA.

Foreign Office Annual Series, No. 2750.

The beetroot crop is above the average. The roots contain a high percentage of sugar, ranging from 55 to 62 lb. per "berkowetz" of 360 lb. The official returns show that the total area sown under this crop, in 1901, was 1,483,894 acres, as against 1,371,485 acres, in 1900; but of this quantity, 89,251 acres turned out a failure, so that the actual area yielding a crop was 1,394,643 acres, or 23,158 acres more than the actual area of 1900.

The yield expected from the above area is given as 8,170,600 tons of roots, or an increase, when compared with the yield of 1900, of 1,727,504 tons. The average yield per acre would, therefore, be about 117⅙ cwts., as against 99 cwts., in 1900, 148 cwts., in 1899, 104½ cwts., in 1898, 116 cwts., in 1897, and 121 cwts., in 1896.

The quantity of sugar expected to be produced from the above yield, with 278 factories in operation, is given as 955,930 tons, or 173,498 tons more than the estimated production of 1900. In order to obtain, as nearly as possible, the exact quantity of sugar available, it will be necessary to add to the above :—

——	Quantity.	
	Poods.	Tons.
Estimated amount of sugar produced by 278 factories.	59,267,676	955,930
Balance of "inviolable reserve"	1,500,092	24,195
" "free reserve"	2,708,903	43,692
Total	63,476,671	1,023,817

In comparing the yield of sugar from the beetroot, it will be seen that, in order to produce 1 ton of sugar, 8·55 tons of beetroot were required, as against 8·23 tons, in 1900.

The quantity of sugar, as fixed by the Ministry of Finance, for home consumption, from the campaign of 1901–2, is 629,032 tons, and an "inviolable reserve" of 80,645 tons. There will, therefore, be about 314,140 tons of a "free reserve" for export.

SUGAR PRODUCTION, IN 1901–2, IN RUSSIA.

Bd. of Trade J., March 27, 1902.

According to a circular notification of the Minister of Finance, published in the *Official Gazette*, of the 16th Feb.—1st March, 1902, the general output of all the Russian sugar works during the working season of 1901–2 is established at 63,610,092 pouds (1,025,969 tons).

Deducting from this quantity 39,000,000 pouds (629,032 tons), which should proportionately be supplied to the home market, the surplus quantity of manufactured sugar would amount to 24,610,092 pouds (396,937 tons). In view of this, and the remainders from last year, M. de Witte has sanctioned the disposal in the home market of 45·7 per cent. of the whole quantity of the output of sugar of this season, without additional payment of excise, over and above the 60,000 pouds (968 tons) manufactured by each sugar works; at the same time, 10·7 per cent. of the quantity manufactured is to constitute an inviolable reserve stock. All the remaining quantity of sugar will constitute a free remainder for exportation abroad.

SUGAR IN THE NEW ORLEANS DISTRICT (UNITED STATES).

Foreign Office Annual Series, No. 2752.

The past commercial year has been productive of very satisfactory results to all interests kindred or allied to the sugar planting and manufacturing industries, in the State of Louisiana and City of New Orleans.

In round figures, the production, as shown by the receipts from plantations, at this market, gave an excess of 700,000 barrels and 24,000 hogsheads over the production of 1899-1900, or, approximately, 1,500,000 barrels and 56,000 hogsheads, as against 750,000 barrels and 32,000 hogsheads for the previous year. On the other hand, the production of molasses showed a slight decrease in volume. Prices were better, and values ruled throughout upon a uniformly higher plane than obtained during the preceding year.

There was a decided decrease in the amount of beet sugar shipped to New Orleans, attributed to the unsettled laws concerning the reciprocity question. The production of cane sugar, however, exceeds that of last year.

BEET-SUGAR INDUSTRY OF THE UNITED STATES.

Bd. of Trade J., March 27, 1902.

The New York *Journal of Commerce*, for the 8th inst., with reference to a report by the special agent of the Department of Agriculture in charge of the beet-sugar investigations, quotes the following figures relating to the industry during the past year :—

The total production of beet-sugar in the United States, in the season 1901–1902, has aggregated 185,000 tons, an increase of 140 per cent. from the 77,000 tons produced during the season 1900–1901. There were 31 factories in operation, in 1900, according to the census figures, and 11 more were started, in 1901.

SUGAR PRODUCTION IN GERMANY.

Bd. of Trade J., March 27, 1902.

According to statements published in the *Reichsanzeiger*, the quantity of raw sugar produced in Germany, in January last, amounted to 136,097 metric tons, and the quantity of refined, to 131,649 metric tons.

The output, in February, amounted to 41,449 metric tons of raw sugar, and 110,028 metric tons of refined. The output of raw and refined sugar in Germany in the period from Aug. 1st, 1901, to Feb. 28th, 1902, the first seven months of the 1901–2 sugar campaign, compares as follows with the corresponding period of the 1900–1 campaign :—

——	August, 1900, to February, 1901.	August, 1901, to February, 1902.
	Metric Tons.	Metric Tons.
Raw	1,688,422	1,977,828
Refined	780,961	831,611

NOTE.—Metric tons = 1,000 kilos. = 2,204 lb. avoir.

NEW BY-PRODUCT OF SUGAR IN BRITISH GUIANA.

Bd. of Trade J., March 27, 1902.

According to the *Argosy* (Demerara), of 22nd Feb., experiments have been carried out in the colony, in connection with the manufacture of a new cattle food, to which the name "molascuit" has been applied.

"Molascuit" is a composition of molasses and cush-cush of megass—the finest part of the fibre of sugar cane. Fifty per cent. of cush-cush is stated to be digestible and nutritive. The proportions of the composition are 80 or 85 per cent. of molasses, and 15 or 20 per cent. of cush-cush. This composition is dried in the air, or by means of the gases from the factory furnace. When ready for the market, it presents the appearance of very finely-ground oil cake, and to the taste, it is sweet and agreeable.

As a by-product of sugar, it is considered that the manufacture of "molascuit" should be of considerable advantage to planters, who will thus be able to dispose of molasses in the manufacture of rum and "molascuit"; and when the rum market is over-stocked, the benefit of this will be apparent.

SUGAR INDUSTRY IN BULGARIA.

Bd. of Trade J., March 27, 1902.

The directors of the Sofia Sugar Factory and Refinery Company have decided to suspend operations when they have finished refining the product of last year's crop. They have consequently given notice to the Government and the peasants that they will make no contracts for beet for the coming season.

Owing to the low price at which imported sugar can be sold, the company has been carrying on business at a loss ever since it started. Even this season, when the amount of beet supplied to it—43,000 tons—was within a few thousand tons of the limit of the capacity of the factory, it estimates that the loss will amount to more than 100,000 francs if the Government bounty be paid; if not, it will be some 200,000 francs more.

BEET-SUGAR IN MONTANA (UNITED STATES).

Montana Experimental Station. Bull. No. 33, *Jan.*, 1902.

The opinion is officially expressed that conditions in Montana are favourable to the production of sugar-beets of high sugar content and standard purity.

Montana seems to be the natural habitat of root crops, and the difficulty is to keep down the growth and prevent the formation of too large roots.

The yield, sugar content, and purity can be kept far above the standards adopted as the minimum values by sugar-experts; fuel is easily and cheaply obtained, water is pure and abundant, and limestone of great purity is obtainable.

On one experimental farm, the yield was 25·6 tons to the acre of beets, of 19·38 per cent. sugar content, and 86·4 per cent. purity.

SUGAR TARIFF VALUATION IN BRITISH INDIA.

Bd. of Trade J., March 20, 1902.

In a Customs circular (No. 6 of 1902), issued by the Finance and Commerce Department of the Government of India on the 12th February last, a revision of the Tariff valuation for "soft or raw sugar" imported into India from all places with the exception of Mauritius, Egypt, or China from Rs. 9 8a. to Rs. 8 8a. per cwt., is notified, the reduction to take effect from the 20th Feb. 1902.

CANE SUGAR CROP IN MALAGA (SPAIN).

U.S. Cons. Reps., March 20, 1902.

The unusual frosts of December and January have wrought so much damage to the sugar cane of this province, that not more than a half crop of sugar can be expected this year.

Sugar cane is grown all along the coast of Malaga, and the annual yield of sugar is about 30,000 tons. There are 17 sugar factories in the provinces of Malaga and Granada, employing many thousand hands. Grinding generally begins about the middle of March. This year it may commence earlier.

The loss of the sugar cane crop has resulted in the refusal of the manufacturers to take any part in the proposed organisation of Spanish sugar makers, with the view of limiting production. There has been an over-production of sugar—particularly of beet sugar—in Spain for several years, and strenuous efforts were recently made to form a syndicate of all the sugar manufacturers in Spain, for mutual benefits along certain lines. This is understood to have failed, because one of the most important beet sugar factories refused to participate, and for the further reason that the cane sugar manufacturers, in view of the largely decreased crop, saw no advantage in any further plan to limit production.

XVII.—BREWING, Etc.

APPARATUS FOR THE USE OF ALCOHOL, EXHIBITION OF ——, IN PERU.

Bd. of Trade J., March 27, 1902.

The Board of Trade have received, from the Peruvian Consul at Southampton, particulars of an exhibition to be open in Lima for 30 days from Sept. 1 next, of articles and apparatus connected with the use of alcohol in the production of motive power, heat, and light.

The Consul states that he is prepared to receive catalogues and other information from the manufacturers of such apparatus, who may be desirous of exhibiting their goods at the Lima exhibition.

The Consul adds that he is expecting further particulars and the detailed programme of the exhibition, and will communicate the same to all intending exhibitors.

COMPETITION OF ALCOHOL MOTORS IN FRANCE.

U.S. Cons. Reps., March 8, 1902.

The following is an official notice of an international competition of motors and apparatus using alcohol for generating motive power, light, and heat, to be held in Paris, in May, 1902. This competition will include practical tests, after which medals and certificates will be awarded, and it will be followed by a public exhibition from May 24 to June. 1, 1902. The competition includes: (1) Automobile boats; (2) lighting and heating apparatus; (3) fixed motors, locomobiles, and motor groups. The exhibit will include, besides motors and apparatus using alcohol, apparatus producing industrial alcohol, receptacles for storing and transporting this product, apparatus worked by exposed motors, and compounds of alcohol. Sites for exhibition are free.

DISTILLING MILLET IN SCOTLAND.

U.S. Cons. Reps., March 15, 1902.

Scotch distillers have lately experimented with Russian millet, and the results were unsatisfactory. Although the quality of the spirits was excellent, so great a proportion of rye or barley was necessary, that the process proved too expensive. Whilst millet has not been finally rejected by the two Edinburgh companies that have tried it, the common opinion is that any further effort to make an economical use of it for distilling purposes will fail.

POTATO SPIRIT IN GERMANY.

Chem. and Druggist, March 22, 1902.

Last year 390,000 proof gallons of German potato spirit were imported into this country for methylation purposes, the bulk being an increase of 329,000 gallons over the 1899—1900 imports. The increase is said to be due to the superior quality of the German product, and to the fact that it suits the purpose of the methylator better, whilst it is at the present time 2*d*. a gallon cheaper than British grain spirit. The production of German spirit is in the hands of a ring which is known as the "Verwerthungsverband Deutscher Spiritusfabrikanten," which was founded in 1899,* and appears to have met with a fair amount of success. The organisation consists of three bodies—distillers, rectifiers, and those who combine both industries. The department which transacts all the necessary business regarding the sales and the monetary accounts of all the participators is known as the "Centrale für Spiritusverwendung." The large capital necessary for such an enterprise has been provided by making use of all moneys and plant existing in the trade. For this reason the retailers are not shut out, but are allowed to participate on condition of paying a certain commission to the distillers. In the same way, the refiners buy the raw spirit from the distilleries on payment of the commission, and deliver according to the dictation of the "Centrale," chiefly to their former clients. The undertaking differs from a trust principally in the respect that the spirit ring does not limit the production in order to maintain a remunerative selling

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* See also this Journal, 1899, 797.

price. The ring is, moreover, actively employed in extending the trade by making spirit available for various trade purposes, particularly heating and lighting. The "Centrale" has a separate department in which arrangements are made with railway and other authorities for the introduction of novelties in spirit-lamps and cooking and heating apparatus. One great means by which these aims are furthered is the cheapening of denatured spirit by the "Centrale." Another means of combating a possible over-production is the encouragement and extension of the export trade. The ring is to have an estimated duration of nine years, but a certain number of distillers who were unwilling to sacrifice their independence so long were allowed to join for a period of one, two, or three years. As showing the extent of its operations, it is found that, from Oct. 1, 1900, to Sept. 30, 1901, the total production of pure alcohol, in Germany, amounted to 406,000,000 litres, of which the ring produced 340,000,000 litres, or 77·3 per cent., the remainder being produced by "outsiders." Of the total quantity, the "Centrale" sold 279,000,000 litres, in 1900—1901, as against 265,000,000 litres, in 1899—1900. The quantity exported amounted to 16,000,000 litres, included in the foregoing. The chief aim of the ring being to increase the utilisation of methylated spirit at no matter what cost, it allows the retailer a profit of 25 per cent. to 30 per cent. The spirit is bottled, and the labels bear the retail selling price, with a guarantee that the contents represent 80 per cent. (by weight) of spirit. The retail selling price, in Germany, last year (in which there was practically no variation), was 25pf. to 28pf. per litre, equal to 3½*d.* per litre or 1¾*d.* to 2*d.* per pint.

XVIII. A.—FOODS.

"Inspection of Meat" Law in Germany.

Bd. of Trade J., March 20, 1902.

Referring to the German "Inspection of Meat" law of June 3rd, 1900, an Imperial decree has been issued, putting into force, from Oct. 1st next, sec. 21 of the law, together with the penal clauses relating thereto. This section prohibits the importation into Germany of meat prepared by processes or with ingredients which might impart injurious properties thereto, and empowers the Bundesrath to determine what ingredients and methods of preparation fall under this regulation.

In this connection, a notice has been issued, of which the following is a translation:—

"The provisions of sec. 21 (1) of the law are applicable to the following substances, as also to any preparations containing them:—

"Boric acid and salts thereof.
"Formaldehyde.
"Alkali and alkaline earth hydroxides and carbonates.
"Sulphurous acids and salts thereof; also sulphates.
"Hydrofluoric acid and salts thereof.
"Salicylic acid and compounds thereof.
"Chlorates.

"The same applies to colouring matters of all kinds; with the exception, however, of their application to make margarine yellow and for colouring the skins of sausages, so long as their use is not contrary to other existing regulations."

XIX.—PAPER, PASTEBOARD, Etc.

Paper Trade in Constantinople (Turkey).

U.S. Cons. Reps., **68**, [258], *March*, 1902.

The *Moniteur Officiel du Commerce* states that the paper trade in Constantinople has scarcely changed in the last five years. The imports, in 1900, were as follows:—

	Metric Tons.
Brown wrapping paper	3,813
Ordinary paper	2,810
Letter and other fine papers	548
Paper hangings	50
Music paper	3
Blotting paper	1
Emery paper	12
Pasteboard	1,151

The consumption of printing paper is of considerable importance, on account of the great number of papers printed in Constantinople. Paper made from wood pulp is coming into use, and Norway and Sweden furnish the most favourable prices—6·17 dols. to 6·56 dols. per 220·4 lb., f.o.b. Constantinople. Austria manufactures a superior article, which sells for 6·90 dols. to 7·71 dols. per 220·4 lb.

Wrapping paper is a very important article of import, and many qualities are handled. One variety, called patent paper, of a yellowish-brown colour, manufactured in Italy and in the Austrian Tyrol, is greatly in demand. The price is established at 4·63 dols. for 220·4 lb. Italy furnishes a strong wrapping paper, used in the retail trade; also a heavier paper called "carto-mano," the price of which varies from 5·40 dols. to 5·79 dols. A lighter and much better quality of wrapping paper comes from Venice, which costs 11·19 dols. to 11·58 dols. for 220·4 lb. Paper made from straw formerly came exclusively from France. It is now imported from other countries, especially Italy. The price is 3·86 dols. per 220·4 lb. Another wrapping paper called "wapenveld," is imported from Amsterdam and sells for 4·44 dols. per 220·4 lb. Coloured poster paper is sold in great quantities.

Wood and Paper Pulp in Maine (United States).

Foregn Office Annual Series, No. 2749.

There were 36 establishments engaged in the manufacture of paper and wood pulp, in 1900, with 4,851 wage-earners and products valued at 2,644,655*l*. In 1890, there were 17 establishments, with 1,509 wage-earners, and products valued at 656,210*l*. The increase in the value of products was 1,988,445*l*., or 303 per cent. Paper manufacture has been carried on in Maine in a small way since 1735, but it is only within recent years that it has attained importance. With the discovery of wood pulp as a material for paper manufacture, great changes were brought about. One of the pioneer pulp mill sin the State was erected at Brunswick, in 1870. Since that date, numerous and costly plants have been built for the manufacture of ground wood-, soda-, and sulphite-pulp. These mills are situated chiefly along the three principal rivers of the State, the Androscoggin, Kennebec, and Penobscot. Recently, immense plants have been constructed at Millinoket, on the Penobscot waters, at Madison on the Kennebec River, and at Rumford Falls on the Androscoggin River. Spruce is used generally in the manufacture of wood pulp. A few mills use also small quantities of poplar, fir, pine, and hemlock, whilst three plants use poplar only.

XX.—FINE CHEMICALS, Etc.

New Intoxicating Drug in India.

Chem. and Druggist, March 29, 1902.

In the last Excise report of the Central Provinces of India, the Commissioner mentions the alleged substitution of juar-root for ganja in the Hoshangabad district. It appears that juar-root is used to enhance the intoxicating powers of bhang by the lower classes. This enables them to get the desired amount of intoxication a little more cheaply. Juar-root appears, however, to be very rarely used by itself, as it is too potent a narcotic to be used alone by any except the most hardened drug-smokers; but, like datura and other substances, it is used to strengthen ganja for the *blasé* smoker.

Poisons Ordinance in Ceylon.

Chem. and Druggist, March 29, 1903.

The following articles are declared in the Ceylon *Government Gazette*, of March 5, to be poisons within the meaning of the Ordinance:—

All poisonous vegetable alkaloids and their salts.
Atropine and its preparations.
Preparations of cantharides.
Preparations of metallic cyanides.
Preparations of strychnine.

All vermin-killers containing any of the above preparations, and those preparations mentioned in part I, clause 2, of the amended draft regulations.

Chloral hydrate and its preparations.

Corrosive sublimate preparations and all other mercury salts.

Nux vomica and its preparations.

XXII.—EXPLOSIVES, Etc.

Prohibited Importation of Phosphorus Matches into the Netherlands.

Bd. of Trade J., March 20, 1902.

According to a Supplement to the Dutch Tariff, which has recently been issued by the International Tariffs Bureau, the importation into the Netherlands of phosphorus matches, in quantities exceeding 100 grms. at a time, is prohibited by a Law of the 28th May last. Such matches may, however, be imported in transit.

Match Imports of Colombia.

Foreign Office Annual Series, No. 2747.

Swedish and American wooden, and French, Belgian, and Italian wax matches have the largest sale. British wax matches were very popular before the war, for, though dearer than the Belgian, French, or Italian article, they are infinitely superior in quality. With the ruling high exchange, however, they cannot be sold.

Patent List.

N.B.—In these lists, [A] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is suffixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those 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.

[A.] 6468. J. P. Bayly.—From D. A. Keizer, Canada. *See under* IX.

„ 6486. O. Thiel. *See under* X.

„ 6507. E. Edwards.—From H. Geppert, Germany. Absorption refrigerating apparatus. March 17.

„ 6544. H. Cruse. Apparatus for generating and superheating steam. March 18.

„ 6545. H. Cruse. Apparatus for heating feed water and superheating steam. March 18.

„ 6552. S. F. McKee and A. C. Browne. *See under* II.

„ 6606. B. C. White. Machines for moulding plastic or granular materials, or the like.* March 18.

„ 6672. J. Hughes. Gaseous fluid compressors. March 19.

„ 6682. J. Riekie. Steam superheaters. March 19.

„ 6736. F. Paul, jun., and A. F. Gundlack. *See under* II.

„ 6786. J. Ingleby. Continuously acting presses. March 20.

„ 6859. J. H. Pearce. *See under* IX.

„ 6864. A. L. Christenson. Partitions for centrifugal drums. March 20.

„ 6892. T. Kerrod. An improved cooling apparatus for use in connection with cold storage rooms and other chambers. March 21.

„ 7069. J. W. Rollings. Apparatus for spraying or diffusing medicated and other liquids. March 22.

„ 7167. J. A. Larsen. Apparatus for determining the relative components of a compound fluid.* March 24.

[A.] 7278. V. Taboulevitch. New or improved process of vaporisation at high temperatures, and apparatus therefor.* March 25.

„ 7288. A. J. Boult.—From J. F. Hardy, United States. Safety filling devices for fluid reservoirs. March 25.

„ 7318. M. Marquardt and E. Höffner. Steam superheaters. March 26.

„ 7354. C. F. Zeller. Process of and contrivances for evaporating and drying various materials and substances. March 26.

„ 7365. Galloways, Ltd., and W. Bayliss. Steam superheaters or dryers.* March 26.

„ 7451. L. Rousseau. Crucibles.* March 27.

„ 7488. P. Blaubach. Moulds. March 27.

„ 7569. W. Berrenberg. Air-pumps. March 29.

„ 7636. M. J. Adams. Distributor for percolating filters. April 1.

„ 7662. W. L. Jameson. Steam separators.* April 1.

„ 7690. E. S. Arrighi. Thermometers. April 1.

„ 7745. M. K. Bamber and J. Roger. Improved method of filtering and separation of suspended solids from a fluid. April 2.

„ 7774. H. H. Lake.—From C. T. Lee, United States. Processes for reducing materials to pulp. April 2.

„ 8015. G. G. M. Hardingham.—From H. Johnson, Belgium. Filter presses. April 5.

[C.S.] 5556 (1901). Brookes and Barnes. *See under* VIII.

„ 7339 (1901). Desaulles. *See under* XVI.

„ 9021 (1901). Crossman. Apparatus for spraying measured quantities of liquids into casks or other receptacles. April 3.

„ 9144 (1901). Honiball. Evaporating, condensing, and feed-water heating apparatus. April 3.

„ 9271 (1901). Bennett. Apparatus for roasting, drying, and similar purposes. April 9.

„ 9604 (1901). Noakes. Manufacture of metal drums, casks, and the like. April 9.

„ 9813 (1901). Clubbe and Southey. Steam generators and superheaters. April 3.

„ 11,070 (1901). Whitwell. Steam heating apparatus. April 9.

„ 12,447 (1901). Holland. Centrifugal machines. April 9.

„ 12,507 (1901). Reeves. *See under* XVII.

„ 24,610 (1901). Kindermann. Level indicators for non-transparent liquid containers, and especially applicable for lamp reservoirs. April 3.

„ 26,169 (1901). Lundquist and Kern. Nebulizers or spray producers. March 26.

„ 2074 (1902). McPhail. Apparatus for superheating or drying steam. March 26.

„ 2863 (1902). Jewell. Distilling apparatus. April 9.

„ 3228 (1902). Friesdorf. *See under* XII.

„ 3860 (1902). Baker. *See under* XII.

II.—FUEL GAS, AND LIGHT.

[A.] 6454. F. A. Powell and E. Tournet. Carburettors. March 17.

„ 6504. M. Graetz. Petroleum and like burners. March 17.

„ 6525. A. J. F. Miller and C. P. Marshall. Furnaces.* March 17.

„ 6552. S. F. McKee and A. C. Browne. Liquid fuel apparatus for heating purposes. March 18.

„ 6610. C. Jeffery. Anti-vibration burners for incandescent gas lighting. March 18.

„ 6684. G. Hookham. Incandescent electric lamps. March 19.

„ 6712. A. Sharp.—From A. Charon, Canada. Process of preparing peat for fuel. March 19

[A.] 6713. A. Sharp. — From A. Charon, Canada. Machines for preparing peat for fuel. March 19.

,, 6725. H. H. Lake.—From Battistini Orengo and Co., Italy. Treatment of fuel for furnaces and the like.* March 19.

,, 6736. F. Paul, jun., and A. F. Gundlack. Collapsible tanks for gas-generating plants.* March 19.

,, 6787. A. H Hoad. Hoad's combination oil-furnace and blow-lamp. March 20.

,, 6826. D. W. Bishop. Acetylene gas generators.* March 20.

,, 6843. H. L. Bermann. Carburetting devices. Mar. 20.

,, 6858. D. W. Bishop. Acetylene gas generators.* March 20.

,, 6916. J. G. Forbes. *See under* X.

,, 6927. W. Tawlks. *See under* XVII.

,, 6974. L. Denayrouze. Incandescence lamps burning vapour of liquid hydrocarbons.* Filed March 21. Date applied for, Aug. 7, 1901, being date of application in France.

,, 7003. N. Cleminson, J. W. Butterworth, and A. Morrison. Incandescent electric lamps. March 22.

,, 7004. C. Musker, A. Musker, and W. G. Hay. Oil-burning. March 22.

,, 7034. L. Liais. Incandescence vapour lamps.* March 22.

,, 7136. J. B. Bessey. Improved process for the manufacture of peat-coal. March 24.

,, 7151. The British Thomson-Houston Co., Ltd.—From W. C. Fish, United States. Electric arc lamps.* March 24.

,, 7163. E. H. Power.—From J. D. Swensson, Russia. Apparatus for spraying liquid fuel.* March 24.

,, 7171. H. E. Kent and D. Campbell Furnaces. March 24.

,, 7248. H. H. Lake – From Pressgas Gesellschaft Mercur zu Berlin, G. m. b. H., Germany. Apparatus for the manufacture of carburetted air. March 25.

,, 7257. S. Cowper-Coles and The Cowper-Coles Inventions Development Co., Ltd. Manufacture of electric conductors for use as leading-in wires or strips in the manufacture of incandescent electric lamps, vacuum tubes, and the like. March 25.

,, 7260. H. J. Leeves-Johnson. Electric incandescent lamps, and means for connecting the same in electric circuits. March 25.

,, 7271. O. Wiederhold and G. E. Morse. Machine for saturating mantle material for incandescent gas lighting.* March 25.

,, 7285. H. Schünemann. Process and apparatus for gasifying spirit and liquid hydrocarbons.* March 25.

,, 7321. G. Hookham. Electric incandescent lamps. March 26.

,, 7340. H. E. Bottlewállá. Oil lamps. March 26.

,, 7364. P. F. Holmes, E. D. Holmes, and E. G. Cameron. Apparatus for washing and scrubbing gases. March 26.

,, 7368. H. A. Hoy. Motive fluid distributing apparatus for engines. March 26.

,, 7380. F. Proctor. Electric arc lamps. March 26.

,, 7383. P. Högner. Electric arc lamps.* March 26.

,, 7446. L. Kamm. Carburator. March 27.

,, 7471. G. Watson and F. L. Watson. Furnaces for forced draught, and ventilating apparatus to be used in connection therewith.* March 27.

,, 7475. G. Hookham. Electric incandescent lamps. March 27.

,, 7496. T. Clarkson. Burners for liquid hydrocarbon. March 27.

,, 7527. A. E. Tucker and C. Cory. Artificial fuel. March 29.

,, 7585. J. F. Wakelin. Improved method of utilising filaments which are of higher resistance when cold, for electric lighting. March 29.

[A.] 7588. C. Wegener. Furnaces. March 29.

,, 7594. J. Ledru. Acetylene gas generating plant.* March 29.

,, 7608. M. T. Sale and A. W. Onslow. Means for obtaining high-pressure gas.* March 29.

,, 7613. J. S. Daniels and F. L. Daniels. Gas producers. March 29.

,, 7618. J. Law and T. Law. Machines for the production of acetylene gas. April 1.

,, 7620. C. Scouller. Hydrocarbon burners. April 1.

,, 7626. G. Parker. Improved arrangement of Siemens' furnace. April 1.

,, 7683. L. C. Graessle. Improved hydrocarbon burner. April 1.

,, 7809. H. S. Scott, H. F. Tyzack, and T. J. Wright. Improved electric arc lamp.* April 3.

,, 7826. T. S. C. Lowe. Manufacture of coke and apparatus employed therein.* April 3.

,, 7845. Husson's Safety Acetylene Syndicate, Ltd., and W. H. Weston. Acetylene generators. April 3.

,, 7884. S. G. Coulson. Manufacture of artificial fuel. April 4.

,, 7888. H. N. Leask. Destructors or furnaces for burning refuse or other materials. April 4.

,, 7925. Sir W. G. Armstrong, Whitworth, and Co., Ltd., and E. L. Orde. Furnaces for the combustion of liquid fuel. April 4.

,, 7956. H. G. Hills. Manufacture of gas for illuminating, heating, power, or similar purposes. April 5.

,, 7968. J. Farmer and C. Stewart. Appliances for burning oil in steam boiler and other furnaces April 5.

,, 7971. W. G. Gibbins. Method of lighting incandescent burners. April 5.

,, 7996. J. Busĕk. Steam boilers heated by spirit or alcoholic vapours. April 5.

,, 8004. A. J. Boult.—From La Companie pour la Fabrication des Compteurs et Matérial d'Usines à Gaz, France. Gas reservoirs. April 5.

,, 8008. E. A. Wood. Incandescent gas lighting. April 5.

[C.S.] 4229 (1901). Clamond. Incandescence mantles. April 9.

,, 4302 (1901). MacKean. Apparatus for burning and seasoning incandescence mantles. April 9.

,, 5940 (1901). Taylor. Furnaces. April 3.

,, 6336 (1901). Cranston. Incandescence oil lamps. March 26.

,, 6357 (1901). Boult.—From Chavanon. Gas generators. April 3.

,, 6468 (1901). Schwarz. Process for coking badly caking coal, and mechanical appliance for same. April 3.

,, 6507 (1901). Jones. *See under* XVIII. B.

,, 6861 (1901). Lambourne and Wood. Acetylene generators. April 3.

,, 6895 (1901). Newton.—From O'Brien. Pipe-joint pouring apparatus, and combined hydrocarbon vaporiser, and burner therefor. April 9.

,, 6952 (1901). Janz. Apparatus for burning down incandescent light mantles. April 9.

,, 7821 (1901). Thompson Furnaces where gas is used. April 9. Post-dated, May 25, 1901.

,, 7995 (1901). Terraneau. Atmospheric gas burners April 3.

,, 9414 (1901). Whitworth. Furnaces of steam boilers. April 3.

,, 9437 (1901). Crosland. Application of gaseous fuel in kilns or ovens used for calcining lime, cements, gypsum, and other materials. April 3.

,, 9643 (1901). Hancock. Atmospheric burner for gas combustion. April 9.

[C.S.] 10,758 (1901). Ram and Nernst Electric Light, Ltd. Electric incandescent lamps, in which the glower or light-giving body is a conductor of the second class. March 26.

„ 11,135 (1901). Johnson. Electric arc lamps. Mar. 26.

„ 11,356 (1901). Milbourne. Gas purifiers. April 3.

„ 11,785 (1901). Lux. Incandescent gas burners. Apr. 3.

„ 19,261 (1901). Brandon. Oil stoves, tanks, and other vessels, oil lamps, such as table suspension lamps, applicable also to oil containers generally, and like purposes. April 3.

„ 20,906 (1901). Bloxam. — From Ganz and Co. Smoke-consuming apparatus for boiler furnaces. April 9.

„ 23,449 (1901). Bowman. Gas or vapour heating devices. April 9.

„ 24,610 (1901). Kindermann. *See under* I.

„ 24,974 (1901). Frenay. Carburetters for use in connection with explosion motors. March 26.

„ 26,169 (1901). Lundquist and Kern. *See under* I.

„ 26,337 (1901). Walther. Vapour lamps. March 26.

„ 26,707 (1901). Bonelli. Hydrocarbon burners. March 26.

„ 1039 (1902). Thompson.—From Philbrook. Lighting devices. April 9.

„ 2117 (1902). Kemp. Carburetters. April 3.

„ 2541 (1902). Borner. Appliances for preventing damage or breakage of incandescent gas mantles. April 3.

„ 2751 (1902). Harris. Manufacture of gas. April 3.

„ 3481 (1902). Collin and Nicholls. Carbide feed mechanism for acetylene gas machines. March 26.

„ 4353 (1902). Forbes. Manufacture of acetylene gas. April 3.

„ 4755 (1902). McOuat. Incandescent electric lamps. April 3.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 6972. H. McPhail. Distillation of mineral oils, and their distillates.* March 21.

„ 7119. C A. Halse. *See under* VII.

„ 7319. F. G. Holmes. Apparatus for distilling tar, oil, and the like. March 26.

[C.S.] 6739 (1901). Gaster. Distillation or utilisation of tar, pitch, petroleum, and other hydrocarbon mixtures, and the extraction of carbon suitable for the manufacture of electrodes, calcium carbide, and other industrial products. April 9.

„ 11,082 (1901). Scott. Distillation of ammoniacal and other liquors, and apparatus therefor. April 9.

„ 2863 (1902). Jewell. *See under* I.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 6615. J. Y. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture of azo colouring matters, and intermediate products relating thereto. March 18.

„ 6616. J. Y. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture and production of colouring matter containing sulphur. March 18.

„ 6987. J. Y. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture and production of colouring matters containing sulphur. March 21.

„ 7153. J. Y. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture of azo colouring matter, and colouring lakes therefrom. March 24.

„ 7387. J. Y. Johnson.—From Bad. Anilin und Soda Fabr., Germany. Manufacture and production of colouring matters of the anthraquinone series. March 26.

[A.] 7822. A. G. Bloxam.—From Chem. Werke vorm. Dr. Heinrich Byk, Germany. Manufacture of sulphurised colouring matters. April 3.

„ 7849. H. H. Lake. — From Chem. Fabr. vorm. Sandoz, Switzerland. Manufacture of sulphur dyes. April 3.

„ 7871. I. Levinstein, H. Levinstein, and Levinstein, Ltd. Production of blue colouring matters containing sulphur. April 4.

[C.S.] 8636 (1901). Imray. — From Farbwerke, Höchst. Manufacture of directly dyeing sulphurised dyestuffs from 1 : 8-dinitronaphthalene. April 3.

„ 9694 (1901). Johnson.—From Bad. Anilin und Soda Fabr. Manufacture and production of colouring matters and intermediate products derived from methyl-anthraquinone. April 9.

„ 9999 (1901). Newton. — From Farbenfabr. vorm. F. Bayer and Co. Manufacture or production of anthracene derivatives. April 3.

„ 10,728 (1901). Johnson. — From Bad. Anilin und Soda Fabr. Manufacture and production of a brown colouring matter. March 26.

„ 10,886 (1901). Johnson. — From Bad. Anilin und Soda Fabr. Manufacture and production of colouring matters of the anthracene series and of intermediate products for use therein. April 3.

„ 11,163 (1901). Meyenberg, Lévy, and Clayton Aniline Co., Ltd. Manufacture and production of colouring matters containing sulphur. April 9.

„ 11,358 (1901). Willcox. — From Bad. Anilin und Soda Fabr. Manufacture and production of new halogenised bodies, new indigo colouring matters, and of indigo. April 9.

„ 12,021 (1901). Johnson. — From Bad. Anilin und Soda Fabr. Manufacture of an amidophenol derivative and new intermediate products relating thereto. April 3.

„ 19,587 (1901). Imray. — From American By-Products Co. Manufacture of dyestuff from cottonseeds. March 26.

„ 26,061 (1901). Imray.—From Farbwerke, Höchst. Manufacture of indoxyl and its homologues. Apr. 3.

„ 2722 (1902). Imray.—From Basle Chemical Works. Manufacture of green sulphurised dyestuffs. March 26.

„ 4551 (1902). Imray.—From Dye Works, formerly L. Durand, Huguenin, and Co. Manufacture of new leuco-gallocyanides. April 9.

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

[A.] 6455. P. M. Matthew. Calendering or friction-coating fabrics with rubber, and apparatus therefor. March 17.

„ 6499. O. Imray. — From Fabriques de Produits Chimiques de Thann et de Mulhouse, Germany. Improved process for printing with sulphurised colouring matters. March 17.

„ 6650. S. H. Sharp. Machinery or apparatus for producing patterns or designs on textile or felted fabrics. March 18.

„ 6664. H. H. Lake. — From J. W. Fries, United States. Machines for steaming, oxidising, drying, or otherwise treating yarn or textile material.* March 18.

„ 6873. W. H. Perkin, jun., and Whipp Bros. and Tod, Ltd. Treatment of raw cotton and cotton goods to reduce the inflammability thereof. March 20.

„ 6894. J. Dutton. Machinery for lustreing cut pile fabrics. March 21.

„ 7073. C. D. Abel.—From Act.-ges. für Anilinfabrikation, Germany. Process for dyeing and printing. March 22.

[A.] 7074. O. Imray.—From Farbwerke, Höchst, Germany. Improvement in the mordant process for dyeing Turkey red. March 22.
„ 7124. R. Brandts. Textile materials. March 24.
„ 7148. T. Eck and W. Becker. Machines for washing yarns.* March 24.
„ 7262. R. S. Carmichael, J. H. Carmichael, and F. R. Carmichael. Apparatus for making products or emulsions specially suitable for oiling and weighting or loading textile materials and fabrics. March 25.
„ 7386. W. H. Perkin, jun., and Whipp Bros. and Tod, Ltd. Treatment of raw cotton and cotton goods to reduce the inflammability thereof. March 26.
„ 7695. J. D. Morel. Machines for the treatment of textile material.* April 1.
„ 7703. H. A. Bentley. *See under* VI.
„ 7716. B. Cohnen. Process and apparatus for treating textile and other materials with liquids, and subsequently drying the same. April 2.
„ 7870. F. C. Theis. Method of and apparatus for bleaching textile piece goods. April 4.
[C.S.] 4017 (1901). Vogelsang. Electrolytic bleaching of cotton and other textile materials, and apparatus for use in connection therewith. April 3.
„ 8577 (1901). Dobson and Barlow, Ltd., and Rushton. Frames for gassing yarns and threads. April 3.
„ 8828 (1901). Gebauer. Apparatus for washing or bleaching or other treatment of fabrics or fibrous materials with liquids or lyes. March 26.
„ 19,555 (1901). Römer. Treatment of yarns with liquids, and apparatus therefor. April 3.
„ 26,115 (1901). Hindley, Walker, and Rose. Apparatus for dyeing, scouring, bleaching, and otherwise treating yarn in cop or other similar compact form. March 26.
„ 1406 (1902). Tyms. Bleaching keir with circulation valves. April 3.
„ 2304 (1902). Walsh. Apparatus for steaming, ageing, and drying fabrics. March 26.

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

[A.] 6698. J. S. Schmitz. Printed and painted wall-paper and the like.* March 19.
„ 7529. A. B. Carlisle. *See under* XIX.
„ 7703. H. A. Bentley. Preparation of paper and fabric to receive artists' colours, prints, and the like, to render paper and fabric transparent, and to treat transparent paper and fabric to facilitate removal of colours or ink without injury to the surface. April 2.
„ 7743. J. Funcke. Rotary machine for colour printing on both sides of the sheet. April 2.

VII.—ACIDS, ALKALIS, AND SALTS.

[A.] 6642. A. Vosmaer and A. Lebret. *See under* XVIII. B.
„ 6749. W. Trantom. Treatment or purification of brine and other saline solutions. March 19.
„ 7048. L. Kamm. Oxygen generators. March 22.
„ 7119. C. A. Halse. Carbonisation of wood or matter of a similar nature, sawdust, wood shavings, and the various kinds of cellulose, also lignite, straw, &c., &c., with the object of producing a substitute for animal charcoal. March 24.
„ 7309. D. Donnachie. Appliances for the manufacture of nitric acid.* March 26.
„ 7364. P. F. Holmes, E. D. Holmes, and E. G. Cameron. *See under* II.
„ 7463. O. Meurer. Improved process for obtaining sulphates from mattes. March 27.
„ 7505. G. W. Johnson. From Chem. Fabr. Griesheim-Elektron, Germany. *See under* X.
[A.] 7767. O. Haltenhoff. Apparatus for carbonising wood waste or similar material.* April 2.
„ 7832. F. B. Crossley. Treatment of spent iron pickling or cleaning liquors, or other solutions containing sulphate or chloride of iron, for obtaining sulphate or chloride of iron, or other useful products therefrom. April 3.
[C.S.] 7256 (1901). Electric Ozone Syndicate, Ltd., and Smith. *See under* XVIII. B.
„ 10,729 (1901). Johnson. — From Bad. Anilin und Soda Fabr. Manufacture and production of contact bodies for use in catalysis, especially intended for use in the catalytic process for the manufacture of sulphuric acid. April 3.
„ 10,825 (1901). McKerrow. Preparation of fullers' earth, silicates, and siliceous matters for use in the treatment of oils, fats, and greases. April 3.
„ 12,186 (1901). Johnson.—From Chemische Fabrik Griesheim-Elektron. Electrolytic production of lead dioxide. April 3.
„ 12,250 (1901). Johnson.—From Chem. Fabr. Griesheim-Elektron. Manufacture or production of chromium compounds or alkalis. April 3.
„ 24,684 (1901). Berry and J. B. Lawes and Co., Ltd. Method or process for the recovery, collection, and utilisation of waste carbonic acid gas given off in the manufacture of certain acids and acid salts. March 26.
„ 698 (1902). Ostwald. Manufacture of nitric oxide and nitrogen oxides. March 26.
„ 848 (1902). Sachse and Kaufmann. Brine evaporators. March 26.

VIII.—GLASS, POTTERY, AND ENAMELS.

[A.] 6495 P. H. Mellor and S. W. Hassall. Process of moulding clay or other earthenware. March 17.
„ 6663. R. Stanley, D. B. Bates, and R. H. Bates. Process and apparatus for applying glazes, enamels, or bodying material to bricks, tiles, and other like goods. March 18.
„ 6774. H. W. Woodfield and W. Harmer. Apparatus for the manufacture of glass bottles, jars, phials, and the like. March 20.
„ 6910. C. H. Ridsdale. *See under* X.
„ 7413. W. Illingworth. Machine or device to assist in pressing articles of pottery, either china, earthenware, or other bodies used in the making of pottery ware. March 27.
„ 7682. W. de P. Keyes. Manufacture of plate glass. April 1.
„ 7696. P. Aigner. Ceramic vessels. April 1.
„ 7930. W. W. Pilkington. Manufacture of sheet glass or glass cylinders. April 4.
[C.S.] 5556 (1901). Brookes and Barnes. Kilns for drying bricks, tiles, pipes, seggers, and other earthenware. March 26.
„ 7178 (1901). Hughes. *See under* IX.
„ 24,629 (1901). Stevens. Compound or composition to be used as a backing for opal facing tiles or other articles of glass. April 9.
„ 1429 (1902). Boult.—From Weber and Rauschenbach. Method of and apparatus for drying earthenware articles. March 26.

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

[A.] 6468. J. P. Bayly.—From D. A. Keizer, Canada. Brick making and moulding machines. March 17.
„ 6495. P. H. Mellor and S. W. Hassall. *See under* VIII.
„ 6601. D. F. Cooksey. Bricks, tiles, and terra-cotta, and apparatus for making same. March 18.
„ 6606. B. C. White. *See under* I.

[A.] 6663. R. Stanley, D. B. Bates, and R. H. Bates. *See under* VIII.

„ 6844. A. J. Boult.—From Hülsberg and Co., Germany. Impregnation of wood and other porous materials.* March 20.

„ 6859. J. H. Pearce. Machines for mixing plastic compositions.* Filed March 20. Date applied for Oct. 10, 1901, being date of application in United States.

„ 7110. C. R. Gostling. Improved method for the production of Portland cement from chalk and clay, and in conjunction with the rotary kiln process, or any other kind of kiln for burning cement. March 24.

„ 7165. W. R. Ormandy. Manufacture of bricks or artificial stone made from a mixture of a siliceous material and lime. March 24.

„ 7181. A. Picha. Paving tiles. March 24.

„ 7219. T. Kendrick. Manufacture of artificial stone. March 25.

„ 7232. J. P. B. Fiske. Kilns, or means or apparatus for facilitating the drying of bricks and the like.* March 25.

„ 7381. H. Warrington and H. J. Warrington. Treatment of fireclay for use in the manufacture of fireproof goods, such as potters' saggars, fire-bricks, crucibles, and the like. March 26.

„ 7436. C. E. Challis. Materials and apparatus for precipitating lime. March 27.

„ 7541. J. H. Pickles. *Bricks and other building* materials. March 29.

„ 7550. C. Marson. Improved material and method for and of building construction. March 29.

„ 7647. J. C. Sellars. Manufacture of building blocks, bricks, and other articles. April 1.

„ 7694. J. R. Horton. Kilns or apparatus for calcining purposes. April 1.

„ 7759. E. Kreft. Presses for the manufacture of artificial stones, tiles, and the like.* April 2.

„ 7796. E. P. Hooley. Means for and method of tarring broken slag, macadam, and other similar materials. April 3.

„ 7836. W. Schultness. Processes for colouring building materials, such as lime, mortar, bricks, and artificial stone. April 3.

„ 7891. C. Pryce. Brick presses. April 4.

„ 7906. W. Ratcliffe. Bricks, cornices, mouldings. and the like, employed in the construction of buildings and similar places. April 4.

[C.S.] 6982 (1901). Morton and Bradshaw. Apparatus for removing or recovering fusible matter from stones, blocks, and other matter to which it is adhering. March 26.

„ 7178 (1901). Hughes. Kilns for burning bricks, tiles, and pottery. April 9.

„ 9437 (1901). Crosland. *See under* II.

„ 9892 (1901). Carter. Manufacture of artificial stone. April 9.

„ 24,683 (1901). Berry and J. B. Lawes and Co., Ltd. Cements or plasters, and manufacture of bricks, tiles, slabs, artificial stone, electric insulating compositions, and the like. March 26.

„ 3426 (1902). Brookes.—From Fiske. Brick and such like kilns. April 9.

„ 3657 (1902). Cummings. Insulated electrical conductors. April 3.

X.—METALLURGY.

[A.] 6486. O. Thiel. Ore hearths and reverberatory furnaces.* March 17.

„ 6622. B. Deby. Hardening, tempering, or toughening iron and steel. March 18.

[A.] 6727. W. Joukoffsky and P. de Strowe. Treatment of iron or steel.* March 19.

„ 6728. L. V. Pratis. Manufacture of steel. March 19.

„ 6752. V. Bermont. An improved industrial process for the direct extraction of zinc. March 19.

„ 6888. F. H. Keane and T. Maxwell. Method of manufacturing chilled castings in iron or steel. March 21.

„ 6903. D. Matthews. Treatment of copper and other ores. March 21.

„ 6910. C. H. Ridsdale. Heating of metallic and other bodies for annealing and like purposes. March 21.

„ 6916. J. G. Forbes. Furnace for smelting scrap or other metals; for reducing metals from their ores into a condition of practical purity; and for casting metals into a malleable state. March 21.

„ 6951. C. Jousset and W. R. McKay. *See under* XIII. A.

„ 6955. J. Ornstein. Extraction of gold from seawater. March 21.

„ 6969. W. P. Thompson.—From O. Nicolai and F. Börner, Germany. Solders, especially applicable for soldering aluminium and aluminium alloys.* March 21.

„ 7037. J. M. K. Letson and F. W. Burpee. Soldering machine.* March 22.

„ 7091. A. D. Pennellier. Manufacture of wire from rolled gold plate, gold, or other metals. March 22.

„ 7213. J. F. Crowley and W. H. Hatfield. Production of mottled or white iron, in pigs or castings. March 25.

„ 7229. P. Müller. Process for the manufacture of crucible cast steel.* March 25.

„ 7255. H. H. Lake.—From Duisburger Maschinenbau Akt.-ges. vorm. Bechem and Keetman, Germany. Improved method of welding. March 25.

„ 7256. Sherard Cowper-Coles and The Cowper-Coles Inventions Development Co., Ltd. Improved process for nickel plating iron and steel. March 25.

„ 7352. R. W. Wallace. Manufacture of iron, steel, nickel, and the like. March 26.

„ 7395. W. Hutchinson, jun. Manufacture of ingot iron and steel. March 27.

„ 7463. O. Meurer. *See under* VII.

„ 7505. G. W. Johnson.—From Chem. Fabr. Griesheim-Elektron, Germany. Manufacture of the metals of the alkalis. March 27.

„ 7535. C. H. Berry and W. T. Hill. Improved self-lubricating alloy or anti-friction metal. March 29.

„ 7584. F. Irvine. Improved means of extracting metals from their ores. March 29.

„ 7626. G. Parker. *See under* II.

„ 7660. H. H. Lake.—From Electric Furnace Co., United States. Manufacture of steel.* April 1.

„ 7671. H. B. Atha. Process of preparing sand moulds for steel castings.* Filed April 1. Date applied for, July 10, 1901, being date of application in United States.

„ 7672. H. B. Atha. Process of preparing sand moulds for steel castings.* April 1.

„ 7701. A. Gutensohn. Improved process of recovering metals from their solutions or salts. April 2.

„ 7778. A. B. Hadfield. Treatment of steel. April 2.

„ 7799. W. Hutchinson., jun. Manufacture of ingot iron and steel. April 3.

„ 7841. J. Penhale. Separation of gold from slimes, and apparatus therefor. April 3.

[C.S.] 5846 (1901). Hatton. Manufacture of iron and steel. March 26.

„ 8208 (1901). Scott. Casting in chills of iron or steel articles. April 9.

[C.S.] 8511 (1901). Ulmann and Schlag. Method of soldering or joining together aluminium and other metals or substances, and material therefor. March 26.

„ 10,865 (1901). Lones, Holden, and Lones. *See under* XIII. A.

„ 12,308 (1901). Van der Ploeg. Method of extracting antimony from ores or residues. April 3.

„ 13,864 (1901). Bloxam. From La Compagnie des Forges de Chatillon, Commentry, and Neuves Maisons, and Charpy. Manufacture of armour plates. April 9.

„ 15,471 (1901). Breedon. Method, with apparatus therefor, for treating kaolin slimes, saponaceous earthy matter, and the like, preparatory to the extraction, by either amalgamation, chlorination, leaching, or such like processes, of the precious metals contained therein. March 26.

„ 21,176 (1901). Lake. — From Hawley Down-Draft Furnace Co. Method of and apparatus for melting and treating metals. March 26.

„ 21,481 (1901). Meininghaus. Process of making iron and steel, and apparatus used therein. April 9.

„ 2231 (1902). Clarke. Manufacture of crucible steel. March 26.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 6478. H. C. Porter. Storage batteries.* March 17.

„ 7039. S. Z. de Ferranti. Electric fuses. March 22.

„ 7125. P. K. Stern. Improved electrical ozonising and circuit-breaking apparatus. March 24.

„ 7169. C. A. Allison.—From W. C. Banks, United States. Battery.* March 24.

„ 7661. A. G. Betts. Electrolytic refining of lead and lead alloys.* April 1.

„ 7670. R. Wichand. Means for generating electricity.* April 1.

„ 7773. A. Nodon and J. Piettre. Improved process of oxidation by means of electric currents. April 2.

„ 7851. H. H. Lake.—From L. D. Giroux and L. E. Seddon, United States. *See under* XVIII. A.

„ 7858. M. Krouchkoll. Electric-vacuum discharge tubes.* April 3.

„ 7864. H. Korten. Secondary batteries. April 3.

„ 7921. A. Nodon. Electrolytic condensers. April 4.

„ 7923. E. Goldberg. Electrolytically coating iron with zinc. April 4.

„ 7995. P. Jensen. From Dr. G. Langbein and Co., Germany. Production of metallic deposits by electrolysis.* April 5.

„ 8014. G. Schauli and D. Loewenstein. Improved galvanic dry cell. April 5.

[C.S.] 4017 (1901). Vogelsang. *See under* V.

„ 4489 (1901). Vogelsang. Electrolytic cells, and electrodes therefor. April 9.

„ 6352 (1901). Drake and Gorham. Electric accumulators. April 3.

„ 6723 (1901). Pescatore and Tutor Accumulator Co., Ltd. Means for applying the active materials to the plates of secondary batteries. April 3.

„ 6780 (1901). Hirst and Bevis. Vessels for use with electric liquid resistances or other electrolytic solutions. April 9.

„ 10,879 (1901). Dickson. Voltaic cells. April 3.

„ 12,186 (1901). Johnson. — From Chem. Fabr. Griesheim-Elektron. *See under* VII.

„ 118 (1902). D'Andrimont. Anodes for electrolytic operations. March 26.

„ 4521 (1902). Apple. Storage batteries. April 3.

XII.—FATS, OILS, AND SOAP.

[A.] 6634. J. McFarlane and D. C. Reinohl. Process of extracting oil from cotton-seed.* March 18.

„ 7262. R. S. Carmichael, J. H. Carmichael, and F. R. Carmichael. *See under* V.

„ 7319. F. G. Holmes. *See under* III.

[C.S.] 9392 (1901). Clarkson. Separation of oil. April 3.

„ 9569 (1901). McDougall. Apparatus for extracting grease and oil from exhaust steam. April 3.

„ 10,825 (1901). McKerrow. *See under* VII.

„ 11,155 (1901). Scott. Melting tallow and like fat bodies. April 9.

„ 12,825 (1901). Roger. Tubes or casings for containing soap, paste, and similar plastic substances. April 9.

„ 13,135 (1901). Thompson. — From Maschinenbau Act.-ges. vorm. Beck and Henkel. *See under* XV.

„ 3228 (1902). Friesdorf. Oil and water separators for steam. April 3.

„ 3860 (1902). Baker. Apparatus for separating oil or water from steam. April 9.

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

A.—Pigments, Paints.

[A.] 6951. C. Jousset and W. R. McKay. Application of any kind of metallic bronzes. March 21.

[C.S.] 10,659 (1901). Walker, Freestone, and Freestone. Metal keg or drum for holding paints and analogous substances. April 9.

„ 10,865 (1901). Lones, Holden, and Lones. Processes or combination of processes for the manufacture of a white pigment from zinc, and for utilizing residual products obtained during the conducting of the said processes or combination of processes. March 26.

B.—Resins, Varnishes.

[A.] 6714. G. F. Priestley. Means for coating or impregnating boxes, cisterns, and the like with resin, pitch, bitumen, and similar insulating compositions. March 19.

C.—India-rubber, &c.

[A.] 7917. J. T. Dickey. Method of and apparatus for covering flexible conduit with rubber in cement or liquid form or other similar elastic liquids.* April 4.

[C.S.] 8437 (1901). Claremont. Manufacture of vulcanised electric cables. April 3.

„ 11,149 (1901). Heyl-Dia. Desulphurising vulcanised rubber. April 3.

„ 347 (1902). Campbell. Dental vulcanisers. April 3.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 7088. L. Lederer. Manufacture of artificial horn and similar substances. March 22.

„ 7469. A. Billaud. Apparatus for depilating skins and furs. March 27.

[C.S.] 25,071 (1901). Jeffery. Apparatus for melting and applying marine glue and other convenient substances. April 9.

XV.—MANURES, ETC.

[C.S.] 6507 (1901). Jones. *See under* XVIII. B.

„ 8483 (1901). Delattre. Process for treating fish and fish refuse, and apparatus therefor. March 26.

[C.S.] 13,135 (1901). Thompson. — From Maschinenbau Act.-ges. vorm. Beck and Henkel. Process for obtaining fatty and fertilising substances from fecal substances. April 3.

„ 23,143 (1901). Cartter. Apparatus for sterilising soil fertilisers and the like. March 26.

XVI.—SUGAR, STARCH, AND GUM, ETC

[A.] 6738. G. Charles. A new or improved agglutinant composition. March 19.

„ 7436. C. E. Challis. *See under* IX.

„ 7564. H. Vaupel. *See under* XVIII. A.

„ 7693. J. Koštálek. Filters for sugar juices and other liquids.* April 1.

[C.S.] 23,415 (1900). Thompson.—From Geerligs and Hamakers. Process of extracting sugar from beetroot, sugar-cane, sorghum, and other plants. April 3.

„ 7339 (1901). Desaulles. Separation of liquids from solid matters, especially applicable in sugar manufacture. March 26.

„ 8086 (1901). Schwerin. Extraction of sugar. Mar. 26.

„ 25,695 (1901). Manoury and Naudet. Treatment of bagasse. Filed April 3. Date applied for under International Convention, June 1, 1901.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 6796. M. Weyermann. Process for producing tasteless, roasted malt decoctions.* March 20.

„ 6927. W. Tawlks. Kiln furnace for malt drying. March 21.

„ 7028. R. Anderson. Process for treating water, to render it suitable for brewing purposes. March 22.

„ 7168. H. C. Russell. Apparatus for washing and cleansing casks, barrels, and the like vessels. March 24.

„ 8000. E. De Meulemeester. Method of and means for rapidly and completely extracting saccharification worts in brewing. April 5.

[C.S.] 9752 (1901). Rouser apparatus for brewers' vats. April 3.

„ 11,035 (1901). Hancock. Method of obtaining diastase and preparing it for use. April 3.

„ 12,507 (1901). Reeves. Thermometers for the use of brewers and others. April 9.

„ 391 (1902). Duffy. Method for refining, ageing, mellowing, and purifying malt and spirituous wines and liquors. March 26.

„ 392 (1902). Duffy. Apparatus for refining, ageing, mellowing, and purifying malt and spirituous wines and liquors. March 26.

„ 2863 (1902). Jewell. *See under* I.

„ 5105 (1902). Knox, Ranger, and Thornley. Apparatus for use in brewing and distilling with unmalted or imperfectly malted grain. April 9.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[A.] 6549. A. H. Jones. "Visvitæ" food. March 18.

„ 7054. S. D. Rowland and W. Defries. Methods and apparatus for the concentration of animal and vegetable organs and tissues, and in the preparation of fine precipitates. March 22.

„ 7066. A. Grünfeld. Improved substitute for coffee extract, and process for making same. March 22.

„ 7425. A. B. Graham, jun. Apparatus for pasteurising and sterilising milk and other liquids. March 27.

„ 7431. J. W. Bain and C. Hannay. Preservation of fruits, vegetables, and the like.* March 27.

[A.] 7473. C. Beale. Method of and appliances for the preservation of food and other perishable matters. March 27.

„ 7564. H. Vaupel. Improved process and apparatus for the manufacture of molasses food.* March 29.

„ 7744. J. Roger and M. K. Bamber. Producing a pure soluble extract of tea.* April 2.

„ 7851. H. H. Lake.—From L. D. Giroux and L. E. Seddon, United States. Electrical sterilising and preserving apparatus.* April 3.

„ 7919. M. Woolf. New concentrated article of food. April 4.

[C.S.] 6792 (1901). Rawson. Apparatus for sterilising liquids. April 3.

„ 6882 (1901). Stack. Treating milk at dairies, and apparatus therefor. April 9.

„ 9653 (1901). Manasse. Process for preserving foods. March 26.

„ 11,328 (1901). Mayer. Process for the production of tea-extract. April 3.

„ 1788 (1902). Von Rom. Preserving of meat. April 9.

„ 4512 (1902). Schmitz. Composition of matter to be used for coating yeast and other articles of food. April 3.

B.—Sanitation; Water Purification.

[A.] 6642. A. Vosmaer and A. Lebret. Ozonisers. Mar. 18.

„ 6827. H. W. Hemingway. An improved insecticide, germicide, or fungicide. March 20.

„ 7048. L. Kamm. *See under* VII.

„ 7238. E. R. Candy. Tanks and apparatus for effecting the purification of sewage and other polluted liquids, and in the method of manufacture of substances for use in connection therewith. March 25.

„ 7436. C. F. Challis. *See under* IX.

„ 7470. J. C. Thresh. Disinfection of clothing or other articles. March 27.

„ 7495. G. S. Baker. Refuse destructors and the like. March 27.

„ 7635. M. J. Adams. Improved fittings for so-called septic tanks. April 1.

„ 7786. J. Anstee. Measuring wheel for sewage and other liquids. April 3.

[C.S.] 149 (1901). Scott. Treatment of condensed water for boiler supply. April 9.

„ 6507 (1901). Jones. Treating house-dust, garbage, and other refuse for the purpose of converting them into fuel, artificial manure, and other products. April 3.

„ 6754 (1901). Tippetts. Apparatus for obtaining a uniform flow of water from reservoirs, sewers, and the like. April 9.

„ 7256 (1901). Electric Ozone Syndicate, Ltd., and Smith. Ozonisers. March 26.

„ 9201 (1901). Harris. Apparatus for the treatment or purification of feed water. March 26.

„ 15,992. Bernardi. Apparatus for washing and sterilising linen and the like. April 9.

„ 23,143 (1901). Cartter. *See under* XV.

„ 1819 (1902). Goodridge. Non-septic purification and utilisation of sewage from country mansions and large houses. April 3.

XIX.—PAPER, PASTEBOARD, ETC.

[A.] 6746. A. Mabille and G. Leclerc. Process for rendering celluloid incombustible.* March 19.

„ 7089. H. H. Lake.—From C. S. Bird, United States. Manufacture of sheets of paper for making tubes.* March 22.

„ 7140. J. S. Hughes. Wood pulp presses.* Filed March 24. Date applied for July 3, 1901, being date of application in United States.

[A.] 7141. J. S. Hughes. Improved process of forming wood-pulp into sheets.* Filed March 24. Date applied for July 3, 1901, being date of application in United States.

„ 7388. A. Marx. New product formed from cellulose for the manufacture of combs or similar appliances. March 26.

„ 7529. A. B. Carlisle. Improved grounding-machine for enamelling papers. March 29.

„ 7700. L. Lebateux. Coated papers, and method of preparing the same. April 1.

[C.S.] 25,978 (1901). Töbelmann. Treatment of coated paper. April 3.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 7054. S. D. Rowland and W. Defries. *See under* XVIII. A.

„ 7744. J. Roger and M. K. Bamber. *See under* XVIII. A.

„ 7993. H. E. Newton.—From Farbenfabr. vorm. F. Bayer and Co., Germany. Manufacture and production of a new pharmaceutical compound. April 5.

[C.S.] 11,165 (1901). Weyl. Manufacture of compounds of fatty acids and their derivatives with ozone. April 3.

„ 11,191 (1901). Shakespear and Hincks. Medical solutions or dressings. April 3.

„ 11,328 (1901). Mayer. *See under* XVIII. A.

„ 12,021 (1901). Johnson.—From Bad. Anilin und Soda Fabr. *See under* IV.

„ 26,061 (1901). Imray.—From Farbwerke, Höchst. *See under* IV.

XXI.—PHOTOGRAPHY.

[A.] 7684. A. J. Bonella, D. H. Bonella and Son, Ltd., E. E. R. Bryant, C. H. Bryant, and E. W. Bryant. Improved electric arc light mechanism, applicable for rapid exposure photography. April 1.

[A.] 7835. H. Trant. Apparatus for producing light for photographic and like purposes. April 3.

[C.S.] 8457 (1901). Lehmann and Schönhals. Photo-lithographic and like transfer processes. April 9.

„ 26,386 (1901). Iltz. Baths for photographic purposes. March 26.

„ 3023 (1902). Ludwig. Process for developing photographic plates and the like in open daylight. April 3.

XXII.—EXPLOSIVES, MATCHES, ETC.

[A.] 6925. T. F. Durham. Safety blasting cartridges. March 21.

„ 7033. T. Nichol and W. H. Nichol. Cartridge loading machines.* March 22.

„ 7157. E. W. Bovee. Improved means for igniting matches.* Date applied for, March 23, 1901, being date of application in United States.

„ 7253. H. J. F. Crosby. Fog signals. March 25.

„ 7302. A. Brock. A new explosive. March 25.

„ 7986. A. Reichwald.—From F. Krupp, Germany. Percussion fuses for exploding shells. April 5.

[C.S.] 6159 (1901). Kisanow. Blasting cartridges. April 3.

„ 7148 (1901). Bielefeldt. Detonating or priming compositions for explosives. April 9.

„ 12,172 (1901). Reichwald.—From F. Krupp. Percussion fuses for exploding shells. April 3.

„ 25,233 (1901). Bate. Explosive mixtures or compounds for blasting purposes, for use in safety cartridges and other ways. April 3.

„ 26,456 (1901). Czerweny. Match-making machines. April 9.

„ 3238 (1902). Hess. Method for the treatment and use of detonating compositions. March 26.

„ 3951 (1902). Lake.—From Aktieselskabet "Progress." Manufacture of wooden matches. March 26.

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