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Wednesday, March 27th, 1901:—
Dr. J. T. Conroy. "The Rate of Dissolution of Iron in Hydrochloric Acid."
Dr. J. T. Conroy and others. "The Action of Reducing Gases on Sulphocyanides."
Wednesday, April 24th, 1901.—Discussion on the Storage and Transport of Chemicals.

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Dr. Wm. Frew. "The Valuation of Barleys for Brewing and Distilling."

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NOTICES.

ANNUAL GENERAL MEETING.

The Annual General Meeting will be held in Glasgow, on Wednesday, July 24th, and following days. Full particulars *will appear in a subsequent issue.*

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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.

CANDIDATES FOR ELECTION.

In the Journal for October 1900 will be found a Nomination Form and Prospectus for the use of those members who have a candidate for election to propose. Please keep for use in case of need.

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.

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Parsons, C. Chauncey, 43, Sedgwick Street, Brooklyn, N.Y., U.S.A. Jan. 16.

Liverpool Section.

Meeting held at University College, Liverpool, on Wednesday, January 30th, 1901.

MR. C. LONGUET HIGGINS IN THE CHAIR.

THE DECOMPOSITION OF CHLORIDES BY IGNITION WITH ORGANIC MATTER.

BY HERBERT E. DAVIES, M.A., B.SC.

It is a well-established fact that there is a loss of chlorine when organic matter containing chlorides is ignited, and in consequence the estimation of chlorides in such things as plant-products, animal excreta, &c., is not an easy matter, and the results obtained are generally looked upon with suspicion. From time to time processes have been suggested with the object of preventing this loss, but, as I shall show, they are not very satisfactory, and in some cases they do not take into account the conditions under which the loss occurs. So far as I can find, there has been no systematic investigation into the subject, and no light has been thrown upon the amount of the loss under varying conditions and with various substances, so I feel encouraged to lay before you the results obtained in a series of experiments made in the hope of obtaining some reliable information.

My attention was drawn to the matter in the following way. Cases occur from time to time in which it is of considerable commercial importance to decide whether substances in a ship's cargo have been damaged by sea-water or fresh water, and in such cases the presence of sodium chloride in excess of that normally present in the substance in question is very conclusive evidence of sea-water damage, and the amount of chlorine present is therefore the first point to receive attention. Sometimes it is possible to wash the substance with distilled water and estimate the chlorine directly in the washings, and compare it with that obtained by washing the same substance in the undamaged state. But obviously this is not possible in the case of such things as sugar, flour, molasses, &c., and in these cases we are compelled to ignite the substance with all possible care, and estimate the chlorine in the ash. In spite of every precaution the results are sometimes so unexpected, taking into account the evidence obtained by working on other lines, that after a series of such cases I decided to investigate a little more fully.

For the first series of experiments sugar was chosen as the organic matter to be used, because in the form of powdered lump sugar it is a very pure substance, constant in composition and practically free from chlorides; that which was used containing not more than 0·001 per cent. NaCl. Throughout the experiments grain weights were used, because, having started with 100 grains of organic matter as a convenient quantity, I continued to use the same weights throughout.

In each case 100 grains of sugar were taken, and the salt to be added was dissolved in 25 c.c. of water so as to bring the salt and sugar into intimate association. The mixture was evaporated to dryness on a sand bath in a large platinum dish, and ignited in a muffle at the lowest possible red heat—an operation taking about 20 minutes. A small quantity of carbon generally remains unburnt under these conditions, but after extracting with water the remaining carbon readily burns, and the ash can again be extracted, though it has been found by experience that all the chloride is removed by the first extraction. The chlorine is then estimated volumetrically in the usual way with a standard $AgNO_3$ solution and potassium chromate.

Experiments were first made to find whether any of the salt is lost when heated by *itself*, so various quantities were dissolved in 25 c.c. of water, evaporated to dryness, and heated in a muffle for 20 minutes, the chlorine *then being estimated*, with the following results (all in grains):—

NaCl taken	0·05	0·1	0·2	0·4
NaCl found	0·048 0·05	0·1	0·19	0·4

Then a series was made using 100 grains of sugar with the following quantities of NaCl:—

NaCl taken	0·05	0·1	0·2	0·4	0·5
NaCl found	0·008 0·004 0·006	0·008 0·009 0·008	0·028 0·030	0·182 0·187 0·189	0·23

NaCl taken	0·6	0·8	1	1·5	2
NaCl found	0·35	0·51	0·71 0·76	1·13	1·65

Other substances were then used instead of sugar, the salt being added, as before, dissolved in 25 c.c. of water. First 100 grains of Swedish filter paper were taken, the ash of which contained only a trace of chlorine, for which allowance was made.

NaCl taken	0·4	0·6
NaCl found	0·21	0·42

Potato starch was also used, correction being made for a trace of chlorine found in the ash.

NaCl taken	0·4	0·4
NaCl found	0·17	0·18

As all these substances are somewhat similar, experiments were made using cinchonine as the organic matter. This gave only a trace of ash free from chlorine. 100 grains of cinchonine were used.

NaCl taken	0·1	0·5
NaCl *found*	0·005	0·12

The loss is somewhat greater than with the other substances.

Before leaving this part of the subject a few experiments were made to find whether the proportion of organic matter present has much influence on the loss, so 50 grains of sugar were taken instead of 100, with the following results:—

NaCl taken	0·1	0·5
NaCl found	0·01	0·28 0·26

Showing that the loss depends rather on the absolute amount of salt present than on the relative amount of salt and organic matter.

Experiments were next made to find whether other chlorides are decomposed to the same extent. First, barium chloride was used with 100 grains of sugar, and gave as follows:—

Chlorine taken	0·15	0·25	0·5
Chlorine found	0·05	0·16	0·38

This is rather a smaller loss than with a quantity of NaCl containing the same amount of chlorine.

Calcium chloride was next used. Solutions of calcium chloride were made up and the amount of chlorine estimated. On evaporating 25 c.c. to dryness and igniting, it was found that there is always a slight loss of chlorine, as might be expected; but with the same solution the loss appears to be constant, and the figure found after thus igniting was taken as representing the amount of chlorine used. When these solutions were added to 100 grains of sugar and ignited in the usual way, it was found that there is an enormous loss of chlorine.

Chlorine taken	0·12	0·17	3·62
Chlorine found	0·005	0·006	1·91

Solutions of magnesium chloride were prepared containing, in 25 c.c., 0·1 grain of chlorine and 0·5 grain of chlorine. As might be expected, the chlorine was practically all lost when the solution was evaporated to dryness and ignited, the quantities found being respectively 0·002 and 0·009, and on igniting with sugar a similar result was obtained.

Having thus shown that chlorine is lost, whatever the base in combination with it may be, experiments were made to determine whether the chloride as a whole is volatilised or whether there is a decomposition, the chlorine going off, leaving the base. If the latter be true, there will be an increase of alkalinity in the case of sodium chloride corresponding to the loss of chlorine. Various quantities of NaCl were ignited with 100 grains of sugar, and the alkalinity of the residue determined with decinormal acid and methyl orange.

NaCl taken	0·05	0·1	0·5	1·0
Alkalinity as Na_2O	0·018	0·046	0·133	0·167
Corresponding to NaCl	0·024	0·062	0·176	0·224
NaCl found	0·006	0·008	0·23	0·73
NaCl calculated from alkalinity + NaCl actually found.	0·03	0·07	0·41	0·95

This shows that probably all the loss falls on the acid radicle, and that no base is lost.

As mentioned above, various methods have been suggested to prevent this loss of chlorine. One of these directs that the substance be treated with an equal volume of 20 per cent. solution of calcium nitrate, and, after drying, gently incinerated. On trying this, it is found that generally the mass burns with explosive violence, scattering the material about, and in any case the chlorine is still largely lost. Other methods proceed on the assumption that the loss occurs while the carbonaceous mass first formed is being burned off, and direct you to first gently incinerate the mass, and then treat it in various ways—for example, with alcoholic solution of alkali—before burning off the carbon. This method was also tried and found useless, and investigation showed that the loss occurs during the initial and not at all during the final stage of ignition. To prove this, 100 grains of sugar were heated alone in the muffle until it ceased to give off inflammable gas, and only a copious mass of carbon remained. This was crushed, and 25 c.c. of NaCl solution added, evaporated to dryness, and again heated in the muffle until the carbon was burnt. In no case was there any appreciable loss of chlorine, as is shown by the following results :—

NaCl taken	0·1	0·5
NaCl found	0·09	0·45

It now remained to find some satisfactory method of preventing the loss. The opinion to which I had come during the course of the work is that under the influence of steam and oxygen at a high temperature, hydrochloric acid is formed; so experiments were made of drying and igniting the mixture in an atmosphere devoid of oxygen; but the method was troublesome, and not very successful, so I tried whether adding carbonate of soda in solution, so as to bring it into intimate association with every part of the mass, would retain the hydrochloric acid. This method seems so simple and obvious that I feel sure it must have been tried before, but there is no mention of it in any of the books I have consulted. The quantity of Na_2CO_3 required to give the best results was first determined by treating 100 grains of sugar with 0·5 grain of NaCl in solution, and, after adding various quantities of Na_2CO_3, drying and igniting in the usual way. The results obtained were :—

NaCl taken	0·5	..	..	..
Na_2CO_3 added	1·0	2·0	5·0	10·0
NaCl found	0·38	0·44	0·48	0·47

This showed that the addition of 5 per cent. of Na_2CO_3 is all that is required; and in another experiment, using 0·1 grain of salt, exactly 0·1 grain was found after ignition.

The method therefore seems to be all that can be desired, but it was subjected to a very stringent test before I was satisfied, because I thought that if it will retain the chlorine of magnesium chloride it will answer under any circumstances. Two solutions of magnesium chloride were prepared in which the chlorine in 25 c.c. was found to be 0·11 grain and 0·46 grain respectively. The usual experiment was made with 100 grains of sugar and 25 c.c. of the solution, with the addition of 5 grains of Na_2CO_3. The results obtained were :—

Chlorine taken	0·11	0·46
Chlorine found	0·11	0·45

Many other experiments have been made, with equally satisfactory results. The following may be instanced because it shows incidentally how the method affects the determination of the chlorine naturally present in an organic substance.

A good sample of rice was taken, and in every case 100 grains were ignited. First it was ignited by itself, and the chlorine determined in the ash. Then 0·5 NaCl (containing 0·303 Cl) was added to the rice, and the chlorine determined after ignition. Then the rice was ignited after the addition of 5 grains Na_2CO_3 in solution, and finally the rice with 0·5 grain NaCl and 5 grains Na_2CO_3 was ignited. The results obtained were :—

—	Chlorine present.	Chlorine found.
100 rice	..	0·006
100 rice + 0·5 NaCl	0·309	0·066
100 rice + $5Na_2CO_3$	..	0·033
100 rice + 0·5 NaCl + $5Na_2CO_3$	0·336	0·324

It will be agreed that these results are very satisfactory.

To sum up, therefore, the following results seem to be fairly well established:—

(1) When any organic matter containing chlorine is ignited, there is a loss of chlorine.

(2) The percentage of loss is greatest with small quantities of chlorides, and decreases regularly as the amount of chlorides increases.

(3) The loss occurs during the early stages of ignition, and does not occur during the combustion of the carbon.

(4) The loss can be altogether prevented by adding, before ignition, a solution containing Na_2CO_3 equivalent to 5 per cent. by weight of the organic matter.

Newcastle Section.

Meeting held at the Durham College of Science, on Thursday, January 31st, 1901.

MR. N. H. MARTIN IN THE CHAIR.

The Chairman pointed out that by the death of Lord Armstrong the Section had lost one of its oldest members, he having been an original member of the "Newcastle Chemical Society," and having joined the Society of Chemical Industry when the two societies amalgamated in 1883. The following resolution was unanimously adopted:—"That this Section desires to place on record its sense of the loss which it has sustained in the death of Lord Armstrong, who was one of the original members of the 'Newcastle Chemical Society,' and who, during his long life, used his splendid talents to benefit his native city, and to promote the welfare and success of the various local societies with which he was connected."

DU PONT'S NITROMETER.

BY G. LUNGE.

At the October meeting of the New York Section of the Society of Chemical Industry (see this Journal, November 1900, 982), Mr. J. R. Pitman gives a description of the methods for testing nitric and mixed acids, containing nothing but elementary matter. Just to cite one instance: the author issues a warning against measuring the acids instead of weighing them, because the pipette and flask may be inaccurately graduated, and slight errors may occur in reading—as if a chemist who needs such and similar instructions would not be liable to other mistakes when weighing the acid—a proceeding which, by the way, I have prescribed in all my own publications on that subject!

The remainder of the paper is equally devoid of any interest or novelty for anybody acquainted with the methods hitherto in use—in particular with the descriptions given in my various publications, which I have every reason for believing to be known on the other side of the ocean, and to which Mr. Pitman himself makes reference. I should not trouble myself or the Society with any remarks on this, if the author had not devoted a great part of his paper to "Du Pont's modification of Lunge's nitrometer," as a much more accurate and rapidly working instrument than my own—to which statement I must take decided exception. If anybody chooses to call it a "modification" when using a bulb of 250 c.c. instead of 150 c.c., or a slightly different kind of stand, he has a right to do so for his private gratification. But it is hardly fair, on the strength of such and other equally unimportant changes, to proclaim himself before the world as the inventor of a new instrument to which a new name must be attached, while another man had conceived all and every one of the original ideas incorporated in that apparatus, and had elaborated it into the shape in which hundreds of chemists are using it every day.

From Mr. Pitman's description nobody would guess that "Du Pont's five-part nitrometer" (as opposed to "Lunge's two-part nitrometer") is to all intents and purposes absolutely identical with the instrument described by myself in 1890 as "gasvolumeter," and gradually improved in various ways, all of them duly published in the "Berliner Berichte," in the "*Journal of the Society of Chemical Industry*," in the "Alkalimakers' Handbook," and in every other place where chemists might look for them. There are differences *in a few details, none of which is an improvement or in any way essential.* The assertion that by these "modifications" the instrument admits of more accurate and rapid work, is as unfounded as it is unintelligible, as was pointed out by Mr. Willcox in the discussion on Pitman's paper. Such an assertion can be made only when making the entirely inadmissible comparison between a "five-part" and a "two-part" instrument, both of which, as is well known, are constructed by myself. I have pointed out that the old two-part instrument, which for many purposes still retains its usefulness, is much less adapted for the analysis of nitrates, of nitrocellulose, of nitric acid, and other cases where large quantities of nitric oxide are given off, and I invented the five-part instrument for that very reason, so that Mr. Du Pont has come many years too late for this. Least of all can he be credited with the greater accuracy *and speed aimed at and attained by me,* and that by the identical means.

I must claim a short space to notice the various "modifications" introduced by Mr. Du Pont. By enlarging the burette and generating vessel from 150 to 240 c.c., he enables us to increase the weight of the sample in the ratio of 3:5. But this involves employing a wider graduated tube; in fact, in his instrument this contains 400 divisions (4 per cent. nitrogen divided in 1/100), against 500 divisions in the ordinary gasvolumeter (50 c.c. in 1/100), thus giving to the latter an advantage of 20 per cent. in the accuracy of reading. I had taken care, when constructing my instrument, to go to the *extreme limit of capacity compatible with a handy length of the tube*, and I have thus attained the limit of accuracy in reading. Du Pont has overshot the mark; for nothing *is gained by enlarging the capacity, if you must enlarge* the width of the burette, as you are compelled to do.

Exactly the same thing has happened to him when graduating the tube directly for percentages of nitrogen, which principle is not even his invention, but mine. By doing so between the limits of 10 and 14 per cent., a fraction of a minute is saved in the case of nitrocellulose, which is again lost by the necessity of weighing out a constant quantity for analysis; and in every other case, notably that for which Pitman recommends Du Pont's instrument, the calculation becomes decidedly more complicated than when graduating in c.c. I, for my part, when first describing my instrument, pointed out and practically *applied the division in other parts than c.c. for special* cases; for instance, the estimation of nitrogen in elementary analysis of organic bodies, the determination of vapour densities, for calcimeters, &c.; and the division adopted by Du Pont would be merely a special case of this sort, but in the present case it is decidedly not advisable, since all those who use the nitrometer for nitrocellulose require it equally for the analysis of nitric acid. I had also at that time forestalled Du Pont's "universal tube."

In another point Du Pont and Pitman are decidedly not *up to date.* They still use my original arrangement of sealing off the compensating tube at the top, instead of closing it by a vertical tap sealed by a special mercury cup. *For many years past I have abandoned the old method for* the latter, which furnishes an absolutely certain seal for any length of time, combined with the facility of readjusting *the tube when anything has happened to disturb it.*

A further modification consists in providing the generating bulb with a tap at the bottom, in order to facilitate the shaking. I had certainly not overlooked this obvious device, but I discarded it because I found that my students managed the shaking quite as well without it, while they sometimes had accidents with the plug coming out by the violence of the movement. There is not much in it one way or another.

Lastly, the stand adopted by Du Pont, without being less simple or expensive than that constructed by me as the result of great practical experience, does not offer the various advantages secured by the latter.

This exhausts the differences between Du Pont's instrument and my gasvolumeter. All of them are unessential *to the principle or to the working of the apparatus*; *none* of them is an improvement, and it is impossible to see where the features come in which are supposed to render *the former four times as accurate and four times as rapid* as my gasvolumeter. Those, certainly, who do not happen to know that instrument, in spite of its being described in so many places, would, by the communication of Mr. Pitman, most probably be drawn to the conclusion that Mr. Du Pont had invented the "five-part instrument," which dates many years before Mr. Du Pont affixed his name to an apparatus containing every essential feature of mine, and differing from it only in a few paltry details, none of which constitutes an improvement.

I have in vain sought for any other feature of novelty in Mr. Pitman's paper, which contains nothing previously unknown to any student of chemistry, and I must give up as hopeless the task of discovering what is the use of such papers to the chemical world.

DISCUSSION.

Mr. F. A. WILLCOX said that in the analysis of nitric and *mixed acids*, provided the weighings were made with equal care with each instrument, the rapidity and accuracy in the Du Pont instrument could only be increased by the use of the volumeter, and in the analysis of nitrates, guncotton, &c., the weighing of one gramme exactly, and reading in $\frac{1}{100}$ per cent., must be assumed to be a more rapid and more accurate operation than weighing from a weighing bottle and reading to $\frac{1}{10}$ c.c. and calculating the result.

Whether it was more rapid or more accurate to weigh off one gramme than to weigh from a bottle depended upon the accuracy to which the gramme must be weighed in order to enable the result to be fixed accurately to 0·01 per cent. nitrogen.

Taking the case of pure potassium nitrate of 13·88 per cent. nitrogen, the weighing of one gramme must be accurate to 0·0005 grm. in order to allow of the measuring burette to be read to 0·01 per cent. nitrogen; that was to say, an error of 0·0005 grm. would not affect the result in the second place of decimals, but an error of 0·001 grm. would.

In the case of the two-tube Lunge nitrometer 0·60 grm. was usually weighed from a weighing bottle, but not exactly, and the weighings must be accurate to 0·0004 grm. in order to read the result accurately to 0·01 per cent.

There was no difficulty in accomplishing this in a weighing bottle, but it was questionable whether such a bulky and dusty substance as guncotton could be weighed in quantities of 1 grm. accurately to 0·0005 grm., and such a weighing must take considerable time—a source of error, since this substance rapidly absorbed moisture when in the dry state.

Mr. Pitman had stated that erratic results were given by the two-tube Lunge nitrometer, and also that estimations of nitrogen in both instruments were affected by the use of pure sulphuric acid. His own experience did not bear this out, and since the two-tube Lunge instrument was used by practically all explosive manufacturers in Great Britain, it might be presumed that they also had not had any such experiences.

The results in the case of guncotton appeared to be *affected by the method of transferring the substance to the* cup, and by the method of solution. Below were given the percentages of nitrogen found in the same sample of guncotton, the instrument used being the two-tube Lunge nitrometer; the methods of introducing the substance into the nitrometer being different.

Method I.—0·5 grm. weighed on a rough balance, transferred to a weighing bottle, and then weighed accurately from the bottle directly into the cup, dissolved there in pure sulphuric acid, and washed into the nitrometer.

Method II.—1·50 grm. weighed on a rough balance, transferred to a weighed bottle, sulphuric acid added, and whole weighed; when solution was complete, about one-third weighed into the cup and washed in with pure sulphuric acid.

Method I.		Method II.	
	Nitrogen. Per Cent.		Nitrogen. Per Cent.
	12·98		13·15
	12·98		13·14
	13·07		13·20
	13·07		13·18
	13·11		13·16
	13·02		13·14
Mean ...	13·04	Mean ...	13·16
G.D.	0·13	G.D.	0·06

These estimations were made by Mr. C. R. Borland, in the laboratory of the American E.C. and Schultze Gunpowder Company, Oakland, N.J., during the summer of 1900, and on days when the temperature varied very considerably owing to the prevalence of tropical heat and thunderstorms.

The first method gave both lower and more erratic results than the second, and this would be expected on account of the unavoidable loss in transferring guncotton directly from a weighing bottle to the cup of the nitrometer; but all the results pointed to the fact that even under adverse climatic conditions the two-tube Lunge nitrometer gave results as accurate and regular as could be expected or desired, when they considered that there were errors such as the solubility of the nitric oxide gas in the sulphuric acid, &c., which were attached to the use of the mercury nitrometer, and possibly would not justify them in reading to such accuracy as 0·01 per cent.

To overcome the difficulty which the use of pure sulphuric acid introduced, Mr. Pitman recommended the use of a good grade of commercially pure sulphuric acid, which might contain traces of nitric and nitrous acid as impurities. This appeared to be a very bad suggestion when they were told that these impurities sometimes produced a difference of 1·0 per cent. in the nitrogen estimation. However, a method of standardising was described which they were told entirely compensated any error due to such impurity. It was interesting to consider whether this method of standardising really compensated any error due to such impurity.

Take the cases of (1) the estimation of nitrogen in pure potassium nitrate, using an acid which made a difference of 1·0 per cent. nitrogen; (2) the estimation of nitrogen in a nitrocellulose of 11·0 per cent. nitrogen, using the same acid—

Using 1 grm. substance, every 16·1 c.c. gas = 1·0 per cent. nitrogen.

1 grm. KNO_3, 13·88 per cent. N yields..	222·1 c.c. gas at N.T.P.
Impure acid yields......................	16·1 „ „
Total gas	238·2 c.c.
1 grm., 11·0 per cent. nitrogen nitrocellulose yields........................	176·0 c.c. gas at N.T.P.
Impure acid yields	16·1 „ „
Total gas..................	192·1 c.c.

The standardising simply amounted to the statement that 238·2 c.c. gas represented 13·88 per cent. nitrogen (the reduction of the volume to 222·1 c.c.; the 13·88 per cent. mark did not affect the question), and other volumes would be in proportion; therefore the percentage of nitrogen in the nitrocellulose would be—

$$\frac{192{\cdot}1}{238{\cdot}2} \times 13{\cdot}88 = 11{\cdot}19 \text{ per cent.}$$

If they considered the volumeter, let them assume, for the sake of argument, that the gas was reduced from 238·2 c.c. to 222·1 c.c., the 13·88 per cent. mark at normal temperature; then the air in the volumeter would be under a pressure $p_o \times \frac{238{\cdot}2}{222{\cdot}1}$ when the mark is made.

If the gas from the nitrocellulose were measured at the same temperature, it would be under a pressure of $p_o \times \frac{238{\cdot}2}{222{\cdot}1}$; therefore its volume will be—

$$\frac{192{\cdot}1 \times 222{\cdot}1}{238{\cdot}2} \text{ c.c.,}$$

and the percentage of nitrogen—

$$\frac{192{\cdot}1 \times 222{\cdot}1}{238{\cdot}2} \times \frac{1}{222{\cdot}1} \times \frac{13{\cdot}88}{1} = 11{\cdot}19 \text{ per cent.}$$

Consequently it appeared that the method of standardising did not get over the difficulty, but led us to erroneous results.

From Prof. Lunge's paper and the above considerations it appeared, then, that the so-called Du Pont modification of the Lunge nitrometer was merely the Lunge nitrometer fitted with the volumeter, that it was not more accurate than the Lunge two-tube nitrometer, and that the claim of superior rapidity had not been sustained.

Mr. **Collins** drew attention to a paper by Dr. Grossmann, in the November 1899 number of this Journal, in which the errors of chemical manipulation were dealt with, and went on to say that chemists who used every refinement in the determination of the atomic weight of nitrogen admitted an error of, say, 4 per 1,000, whilst chemists who sacrificed some refinements to speed in technical analysis of the same element attempted to discuss errors as small as 5 per 10,000.

Mr. C. E. **Stuart** exhibited a collection of nitrometers of various types and different patterns lent by Messrs. Brady and Martin, and Messrs. Mawson and Swan, and pointed out that to appreciate Dr. Lunge's remarks it was only necessary to compare his instrument with that of Du Pont, when it would be seen that there was no essential difference.

After giving a short review of the development of the nitrometer he showed Lunge's "Volumeter" (this Journal, 1890, 547—549), the essential idea of which was to save time and trouble by doing away with corrections for temperature and pressure.

New York Section.

Meeting held on Friday, December 21st, 1900.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

POWDER EXPLOSION AT INDIAN HEAD, MARYLAND.

BY F. KNIFFEN.

On the night of October 24th, at about 10 o'clock, the storage magazine at the naval proving ground, containing about 45,000 lb. of powder of various kinds, exploded. The effect was spectacular in the extreme. Persons in a position to observe saw a brilliant cloud shoot skyward to a height of four or five hundred feet; it was sprinkled throughout with burning powder grains, which looked like myriads of stars. In a few moments the brilliancy was obscured by a dense smoke, which enveloped everything for half a mile around, and filled the buildings in the immediate vicinity, even penetrating into closed rooms. The sound was heard for ten miles in the direction of the wind. The reflection of the light was seen for a somewhat greater distance. The effect of the shock may be inferred from the condition of the nearest buildings. Of these, three small buildings, located in the same ravine which contained the magazine, and therefore in direct range of flying *débris*, were set on fire and burned. To what extent they were wrecked by the explosion itself, aside from the fire, cannot be determined. Another brick building in the ravine, about 300 feet from the magazine, had the end facing the magazine partially crushed in. A machine shop, located in the ravine, but not quite so directly in range, lost all of its doors and windows. The *dwelling-houses* had been carefully located on a flat, elevated tract, across one end of which ran the valley containing the magazine and other buildings for the storage of explosives. Thus the brow of the hill formed a natural protection for them against shock proceeding from the valley. The damage sustained by them was trifling. The house occupied by the writer, which was about 200 yards from magazine, was a typical example: panes in six of the windows were broken, two doors facing the magazine were blown in, and some of the plastering was loosened, though none fell from the walls. The buildings of the smokeless powder factory, which is entirely distinct from the proving ground, and located a mile away, suffered to the extent of a few broken window panes.

The force of the explosion seems to have proceeded along three radial lines about equidistant from each other. Trees along these lines were blackened and torn, while others only a few feet away were not injured. No person was in the vicinity of the magazine at the time of the occurrence, and no one was injured.

The small buildings just referred to as having been burned, were of brick, with wooden platforms. They contained, chiefly, shells, cartridge cases, and photographic apparatus. As the loaded shells were heated by the burning woodwork to the ignition point of the combustibles contained in them, each burst. How much of the demolition of these small buildings was due to the explosion of the magazine, and how much to the subsequent bursting of the shells, it is impossible to say.

The explosion was as unsatisfactory from a scientific, as it was from an economic, standpoint. Like a total eclipse of the sun, such a phenomenon is of rare occurrence, and the possibilities for the acquirement of scientific knowledge would be correspondingly valuable. But in the case of the Indian Head explosion there were too many variable quantities. We do not know what powder exploded, we do not know how much of it exploded, and we do not know why it exploded. The 45,000 lb. of powder contained in the magazine may be divided into 30,000 lb. of smokeless, 10,000 lb. of the old-style black powder, and 5,000 lb. of brown cocoa powder. The greater part of the smokeless was of the modern variety, made from pure nitrocellulose only, though there was a small quantity which contained metallic nitrates. In which of these varieties did the trouble originate? The ignition, by any means, of any variety would have been sufficient to fire the remainder. Direct evidence is, of course, entirely lacking, and in the realm of conjecture there is room for any number of opinions.

The properties of black and brown powders, and the relation of those properties to spontaneous combustion, have been studied for years; but smokeless powder, especially that variety used in the U.S. Navy, is a comparatively new arrival in the field. While it has stood the stability tests to which it has been subjected, it is not yet old enough to have stood the test of long storage. Had the contents of this magazine been entirely smokeless powder, some light might have been shed upon this extremely important point, *viz.*, its stability; but the presence of other varieties of powder prevent the drawing of any conclusion. That any considerable portion of the smokeless powder detonated is hardly conceivable. The detonation of any such large amount of nitrocellulose in any form would have wrecked every building in the neighbourhood. Moreover, the greater part of the smokeless powder was scattered around the ground in every direction for a distance of a quarter of a mile. The grains were only slightly burned, the flame having been extinguished by their rapid projection through the air. Five tons have been picked up and boxed. Some quantity of every size of smokeless powder which was in the building, except that in the form of strips or flakes, having a thickness of less than 0·018 inch, has been recovered unburned.

The spontaneous decomposition of some of the nitrocellulose powders, with generation of sufficient heat to fire the whole mass, is, to be sure, among the possibilities. But it is extremely improbable. The powders on hand, with two exceptions, had easily passed the stability test with potassium iodide and starch. (Two small sample lots, however, which had been sent to the proving ground for trial, had failed to meet the full requirements of the stability test; but they were not regarded as in any sense dangerous, and the poorer of the two has since been heated at 100° C. for 40 hours without showing any appearance of decomposition.)

The black and cocoa powders were, as far as can be ascertained, normal in every respect. Only a small amount of the cocoa was burned, large quantities having been found scattered among the grains of smokeless strewn over the ground. The 10,000 lb. of black powder were entirely consumed. No trace of it has been found.

Discussion.

Dr. C. H. Volney complained that the paper furnished no data which would enable the meeting to get at the facts, and he regretted the absence of the author, who might have given them the necessary information for a discussion. Without plans and descriptions of the magazine, and details as to the storage and condition of the different powders that exploded, it was impossible to fully discuss the causes of the explosion.

He had had long experience in storing powders, but had always considered it bad to store in the same magazine different kinds of powder. This case exemplified the evil of such a practice. He considered black powder more dangerous than so-called "smokeless powders," which, like all colloidal nitrocellulose powders, even those with high percentages of nitroglycerin, were so indifferent to shock, percussion, and heat that the idea of their explosion from such external causes might be dismissed.

This lack of sensitiveness to concussion and heat which smokeless powders exhibited might be inferred from experiences which he had had with such powder containing high percentages of nitroglycerin. Several tons of such powder were tried for use in blasting, and proved perfectly inactive in bore holes, even by using 30 and 40 grain fulminate caps. Only after adding larger quantities of free, *viz.*, unabsorbed, nitroglycerin could such powder be made available for blasting purposes, as otherwise it could not be brought to explosion by any practical means.

Mr. Jno. R. Pitman said that the following instance would show the unlikelihood of guncotton powders having detonated:—At the Laflin and Rand Powder Works, in August 1900, a service magazine, containing about 3,000 lb. of dry guncotton, exploded; the guncotton was stored in wooden boxes, with loose wood covers, weighing about 8 lb.; each box held a charge of 50 lb. The weather was very hot; temperature in magazine at 3 p.m. was 102° F. The explosion occurred at 9 o'clock in the evening; cause doubtful, but might have been due to defects in the window glass. The stability of this cotton was beyond question. Tested by standard method at 65·5° C., the KI starch test papers showed no trace after 60 minutes. There was no detonation; only a portion of the guncotton exploded, the balance being thrown out and afterwards burned. The building was wrecked, but many of the boxes were found uninjured, except that they were slightly scorched on the inside.

On August 27th, about one week later, during a very severe electrical storm, a guncotton dry-house was struck by lightning, and 3,000 lb. of guncotton exploded. There was no detonation; the guncotton, placed on zinc trays as usual, exploded and wrecked the building. The lightning was unusually heavy. With a colloidal guncotton, in the form of powder, there was less, if any, liability to detonate.

During the autumn it was necessary to destroy 2,900 lb. of a pyrocellulose cannon powder. This was placed in a heap about 15 ft. in diameter and about 4 ft. high, and fired by a train of powder. Although this burned fiercely, the flame being considerably over a hundred feet high, there was not the slightest indication of an explosion, not even of the individual grains. Considering the mass and the great heat, this would indicate that unless confined, as in the chamber of a gun, there was no tendency to explode.

He could confirm Dr. Volney's remarks as to the difficulty of detonating nitroglycerin powders. Captain Aspinwall and himself had often tried to detonate powders containing high percentages of nitroglycerin, using strong caps with 33 grains of fulminate of mercury, and had been unsuccessful. Sir Andrew Noble never succeeded in detonating cordite, which contained 58·0 per cent. of nitroglycerin.

Dr. R. C. Schüpphaus entirely agreed with Dr. Volney in regard to the storing of black and smokeless powder in the same magazine. In the early days of smokeless military powder in the United States it was one of their great points to call attention to the decreased danger in storing. As far as deterioration in storage was concerned, he had little fear if the nitrocellulose and powder were properly made. During the last 17 years he had made nitrocellulose for every conceivable purpose, and knew that nitrocellulose could be made of sufficient stability, chemical and physical, for all practical purposes. This presupposed the employment of suitable raw materials and intelligent treatment. No chemical compound was made for all eternity, and organic preparations less than any others.

Meeting held on Friday, January 25th, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

Before proceeding to the business of the evening it was resolved "That the New York Section sincerely sympathises with the parent Society in its national bereavement in the death of the Queen," and the Secretary was instructed to send a message to London by cable, conveying this resolution to the Council.

The attention of the meeting having been called to the death of their late fellow-member, Major Charles Chauncey Parsons, it was resolved "That the New York Section of the Society of Chemical Industry, having learned with deep regret of the death of their late fellow-member, Charles Chauncey Parsons, a committee be appointed to express our deep sympathy with his family in this bereavement, and that this resolution appear in full upon the minutes of this meeting; also that a suitable obituary notice be published in our Journal."

Nottingham Section.

Meeting held on Wednesday, December 19th, 1900.

PROF. F. STANLEY KIPPING, F.R.S., IN THE CHAIR.

INTERNATIONAL ASSOCIATION METHOD OF TANNIN DETERMINATION.

BY H. R. PROCTER.

(Abstract.)

In order to overcome the difficulty of obtaining a clear filtrate from the hide-powder filter in the analysis of such materials as quebracho extract, F. A. Blockey proposes to dilute such solutions so that they contain approximately 0·4 grm. "tannin" per 100 c.c., instead of making a solution containing 0·7 grm. total soluble.

An average sample of oakwood extract contains 42 per cent. of "total soluble," which includes 26 per cent. of "tannin." Hence a weight of such an extract which will give 0·7 grm. of "total soluble" per 100 c.c. will give 0·4 grm. of "tannin" per 100 c.c., but a quebracho extract in the quantity yielding 0·7 grm. of "total soluble," on evaporation would yield no less than 0·6 grm. of "tannins," or one and a half times as much as the oakwood extract.

The results given in the following table were obtained from a pasty quebracho extract. They are expressed in percentages, and show the differences found when such an extract is analysed by the I.A.L.T.C. method and by the method now proposed, which differs from the other in that the solution of the extract is made of such a strength that 100 c.c. of it shall contain, as nearly as possible, 0·4 grm. of "tannins," instead of the weight of "total soluble" being recognised as the basis, as at the present time.

—	Strength of Solution based on Amount of	
	"Total soluble" (13 grms. per litre).	"Tannins" (9 grms. per litre).
Total solids	52·1	52·1
Total soluble matter	47·3	51·3
Insoluble	4·8	0·8

—	Tannin.	Non-tannin.	Tannin.	Non-tannin.
Hide-filter:				
Hide-powder "Oct"	43·5	3·8	47·5	3·8
"No. 3"	42·5	4·8	46·6	4·7
"Freiberg"	44·6	2·7	48·5	2·8
Palmer:				
"Oct"	40·8	6·5	45·4	5·9
"No. 3"	36·6	10·7	43·0	8·3
"Freiberg"	39·1	8·2	44·7	6·6

The most noticeable feature about these results is the fact that all the "insoluble" which has gone into solution is returned as "tannins," thus confirming the suggestion of Mr. A. B. Searle, as the result of his experiments in quite a different direction, that the matter returned as "insoluble" is reported under a wrong heading, and that it has a tanning value equal in every respect to that returned under the head of tannins.

(Note.—Mr. Blockey's suggestion has been adopted by the International Association of Leather Trades Chemists at their Paris conference last year, and they now direct that solutions for analysis should contain not more than 0·45 and not less than 0·35 grm. of "tanning matter" per 100 c.c.—H. R. P.)

Obituary.

CHAS. CHAUNCEY PARSONS.

Member of the Society of Chemical Industry.

Chas. Chauncey Parsons was a son of Theophilus Parsons, Dean of Harvard Law School, and was born June 18, 1840. He graduated from Harvard University with honours, in 1860, and from the Harvard Law School in 1862 entered the Army, a few days after graduation, as Second Lieutenant, and in 1864 was promoted to a Captaincy, in 1865 becoming Major of the Fifth Massachusetts Cavalry.

Mr. Parsons was a born chemist, and was one of the first to engage in the refining of petroleum, becoming superintendent of oil works in Boston immediately after leaving the Army. He subsequently became a manufacturer of sulphate of ammonia in St. Louis and New York, and in 1880 he was engaged as secretary and general manager of the Columbia Chemical Works in Brooklyn—a position he filled at the time of his death. He was a member of the American Chemical Society, and served on the Committee on Patent Legislation of that Society.

Mr. C. C. Parsons died suddenly of heart failure, at Hampstead, N.Y., Jan. 16, 1901.

STEVENSON MACADAM, Ph.D., F.R.S.E.

Lecturer on Chemistry at the Surgeons' Hall, Edinburgh; Member of the Society of Chemical Industry and of the Publication Committee of its Journal.

Stevenson Macadam was the son of a Glasgow magistrate, and one of four brothers, three of whom adopted the profession of chemistry. He was born in Glasgow in 1829, and received his early training, under his brother John, at the Mechanics' Institute in Glasgow, and later on proceeded to Edinburgh, there becoming assistant to the late Dr. George Wilson on the appointment of his brother John, Dr. Wilson's assistant, as first professor of chemistry in the University of Melbourne. In 1855 he instituted a course of lectures to pharmaceutical students in the rooms of the North British branch of the Pharmaceutical Society. Dr. Macadam was subsequently appointed lecturer in chemistry to the Edinburgh School of Medicine, first at the School of Arts, and afterwards at Surgeons' Hall, where he continued to lecture till the end of last summer session, thus completing a period of fifty years as a lecturer. As lecturer and teacher he is said to have been very successful, and to have attracted large classes; he also conducted a large consulting business, and took particular interest in the technical applications of chemistry. He was a prominent member of the Royal Scottish Society of Arts from 1854, and President from 1862 to 1864. In this connection he was brought into contact with the late Prince Consort, of whom he had many pleasant memories. In early life he graduated as a Ph.D. of the University of Giessen. He was an original member of this Society, as well as of the Institute of Chemistry.

Dr. Macadam died at the age of 72, of blood poisoning, Jan. 24, at his residence, Brighton Crescent, Portobello, N.B.

Journal and Patent* Literature.

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* Any of these specifications may be obtained by post by remitting 8*d.*—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.

PATENTS.

Scale in Steam Boilers; Improved Composition for the Removal of ——. T. Rümler, Ducherow, Germany. Eng. Pat. 25,427, Dec. 22, 1899.

The claim is for a composition for preventing the formation of boiler scale, consisting of 152 parts of quartz powder, 57 parts of calcined soda, and 50 parts of potash, mixed together with an equal quantity by weight of water, and evaporated down to 33 per cent. This liquid is to be added to the feed water when the boiler is being filled, and again 14 days before it is put out of use. It is stated that when this composition is used, the separated boiler scale will lie at the boiler bottom as mud, easy to be withdrawn by a scoop or rake.—E. S.

Calcareous Matters from Metal Surfaces [Boiler Scale]; Compositions for Removing ——. S. Metcalf, Preston, Lancaster. Eng. Pat. 4219, March 6, 1900.

The composition is prepared by mixing hydrochloric acid, 50 parts; gelatinous matter, preferably animal, 40 parts; and creosote, 10 parts. The mixture is applied by a brush to the boiler or other metallic surface to be cleansed, and after some time is washed or brushed off.—E. S.

Lime, Cement, Dolomite, or the like; Furnaces for the Treatment of ——. E. Gobbe, Jumet, Belgium. Eng. Pat. 552, Jan. 9, 1900.

The object of the inventor is to remove the carbon dioxide, formed by the combustion of the fuel or the heating of the material under treatment, as soon as formed, so as to prevent its being converted into carbon monoxide by further contact with fuel. The upper part of the furnace is divided into a series of cells by vertical walls containing flues to carry off the gaseous products from the baking zone below; while the layers of fuel and material to be treated lie in these cells they become heated by contact with the hot walls of the cells, which in turn are heated by the gases carried off from the baking zone; the baking zone (only 2 to 3 metres long) has its walls provided with vertical ribs to reduce the contact surface to prevent "scaffolding." The cooling zone below this and immediately over the grates is supplied with cold air in excess of that required by the baking zone, the excess being carried off by special flues in the walls of the furnace.—J. W. H.

Evaporators; Vacuum ——. E. G. Scott, London. Eng. Pat. 3748, Feb. 26, 1900.

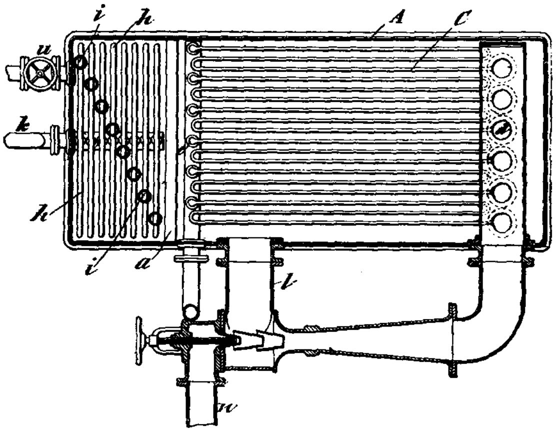
The vacuum evaporating pan is provided with a movable plate or valve, which may be in the form of a float valve, mounted on suitable guides, &c., and normally uncovering the vapour outlet, but adapted to rise and close the said outlet when the contents rise to the top of the pan. When the valve closes the outlet, it is held in that position by the vacuum, thus placing the pan out of operation until the necessary attention has been given to it.—R. A.

Liquids; Apparatus for Cooling and Concentrating ——. H. Schaffstädt, Giessen, Germany. Eng. Pat. 5916, March 29, 1900.

The apparatus consists essentially of a series of arms spirally arranged on a revoluble vertical spindle. The liquid under treatment drops downward from arm to arm, and is acted on by the air which passes upwards between the arms. The spindle may be rotated by the liquid, by delivering the latter on to a series of suitable blades or vanes at the top of the spindle. The arms and vanes act as a kind of ventilator to increase the upward air current, whilst the vanes serve also to distribute the liquid on to the arms.—R. A.

Still [Water]; Improved ——. S. Bessonoff, St. Petersburg, Russia. Eng. Pat. 21,734, Nov. 30, 1900.

The accompanying figure is a sectional plan of the still, the section being taken near the top of the apparatus. The reservoir A is divided into two compartments by the partition *a*, which extends nearly to the top of the reservoir. The larger compartment contains the heating battery C, each element of which is made of parallel metal plates, riveted together, bent or folded twice longitudinally, and connected at the ends to the pipes *d*, *e*. The elements, *h*, of the condensing battery in the smaller compartment are similarly formed, opening below into the delivery pipe, *k*, and terminating above in pipes, *i*, which have funnel-shaped mouths directed towards the heating compartment. The water to be evaporated is delivered through the pipe *u*, rises through the condensing compartment, in which it condenses the steam received from the heating compartment through the pipes *i*, and then passes through apertures in the partition *a* into the heating compartment. The steam supplied to the heater C through the pipe *n* passes through the steam injector shown. By the action of the injector, a portion of the steam generated in the heating compartment is withdrawn through the pipe *l*, compressed, and carried, with the steam supplied by the pipe *n*, through the heater. The water formed by the steam condensed in the heater passes up through an external pipe, and is discharged into the pipes *i*, or it may be withdrawn directly from the external pipe through a cock provided for that purpose.—R. A.



Filter-Press; Improved ——. W. Sommer, Bavaria, Germany. Eng. Pat. 19,224, Oct. 26, 1900.

The filter-press has only one main inlet and outlet channel, *x*, *y*, which extends over the whole surface of the filtering frames, *b*, and the intervening grating, *c*, containing the connecting channels, *d*, the main channel, *x*, *y*, forming reservoirs for the inflowing and outflowing liquid, and so maintaining a uniform pressure. The connecting channels, *d*, between the main channel and the filtering chambers, are arranged near to one another on their respective gratings, *c*, and are alternately connected to the inlet *x* and the outlet *y*, so that the liquid completely and uniformly covers the whole surface of the filter, and flows through the chambers without any counter current.—R. A.

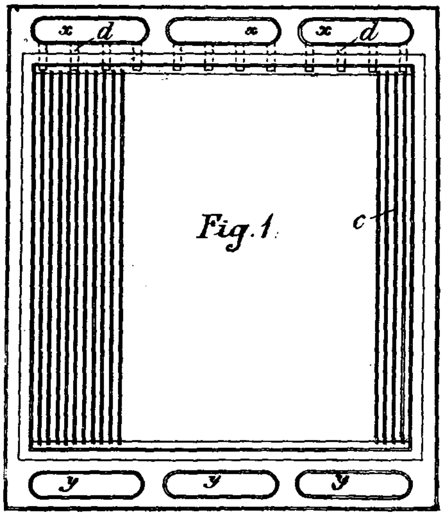


Fig. 1.

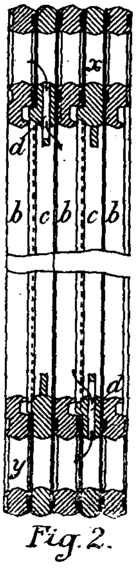


Fig. 2.

II.—FUEL, GAS, AND LIGHT.

"Mond" Gas. Ironmonger, Feb. 16, 1901, 296.

Some interesting particulars relating to "Mond" gas and the process of producing it were given on Feb. 9, to the members of the Staffordshire Iron and Steel Institute by Mr. A. Rollason, of Nottingham. By the new process, he said, a ton of ordinary slack is made to yield 140,000 to 160,000 cubic feet of gas, applicable to all classes of furnace work, eminently suitable for gas engines also, and yielding the ammonia equivalent to 90 lb. of sulphate of ammonia. The gas obtained per ton of fuel is of greater heating and explosive power, if calculated on the percentage of combustible matter contained in the fuel used, than that from any other gas-producer. It is free from tar, washes quite free from solid particles, soot and dust, and also contains less sulphur than ordinary producer-gas. It is cooled to a sufficiently low temperature to admit of its being sent through pipes for long distances without inconvenience from condensation products. It is especially valuable in heating operations in which the flame comes in direct contact with the products to be heated, such as glass, china, glazed earthenware, &c. In the manufacture of open-hearth steel it not only effects a great saving, but produces also a better material, because it contains less sulphur than ordinary gas. In the manufacture of iron and steel it is eminently suitable for heating iron piles and steel ingots in mill-furnaces, annealing castings, plates, sheets, and wire, firing forging-furnaces, heating and welding boiler plates and tubes. It is available in the foundry for core and mould drying, and in chemical works for firing evaporating and other furnaces, roasting ores, and drying. A plant for the manufacture of this gas, with recovery of the sulphate, has been in use for some years at the works of Brunner, Mond, and Co. (Ltd.), gasifying on an average 200 tons of slack per day, the gas made being used in their furnaces and for the production of power in gas-engines. Up to the present time this plant has gasified over 600,000 tons of slack, and other large plants are now being erected and at work in different parts of this country, on the Continent, and in the United States.

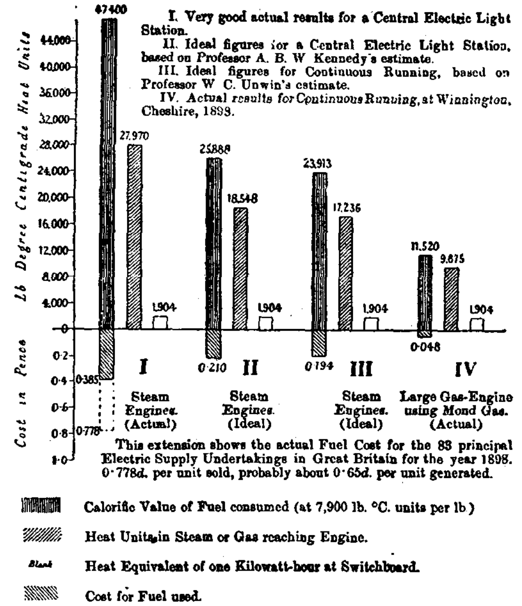
The process of manufacture is as follows:—Common bituminous slack, brought by railway-waggons into the works, is mechanically handled by elevators and creepers, and deposited into hoppers above the producers. From these it is fed in charges of 8 to 10 cwt. at a time into the producer "bell," where the first heating of the slack takes place, and the products of distillation pass downwards into the hot zone of fuel, before joining the bulk of the gas leaving the producer. This destroys the tar and converts it into a fixed gas, and also prepares the slack for its descent into the body of the producer, where it is acted upon by an air-blast saturated with steam at 185° F., and is superheated before coming into contact with the fuel. Unlike other producers, the quantity of steam introduced into the blast is relatively very large, and amounts to 2½ tons for every ton of fuel gasified, of which, however, nearly 40 per cent. is recovered and returned to the producer over and over again. This large quantity of steam keeps down the working temperature of the producer within such limits as to prevent the formation of clinkers or the destruction of the ammonia, yet permits the fuel to be so thoroughly burned that good ashes are obtained. Half a ton of steam is decomposed in the producer for every ton of fuel burnt, yielding thereby free hydrogen to the extent of 29 per cent. by volume in the final gas. The hot gas and undecomposed steam leaving the producer first pass through a tabular regenerator in the opposite direction to the incoming blast. An exchange of heat takes place, and the blast is still further heated by passing down the annular space between the two shells of the producer on its way to the fire-grate. Then the hot products from the producer are further passed through a "washer," which is a large rectangular wrought-iron chamber with side lutes, and they meet a water spray thrown up by the revolving dashers, which have blades skimming up the surface of the water contained in the washer. The intimate contact thus secured causes the steam and gas to be cooled down to about 194° F., and by the formation of more steam, tending to saturate the gas with water vapour at this temperature, the bulk of the sensible heat is converted into the latent form. Then passing upwards through a lead-lined tower, filled with tiles to present a large surface, the gas produced meets a downward flow of acid liquor, circulated by pumps, containing sulphate of ammonia with about 4 per cent. excess of free sulphuric acid. Combination of the ammonia of the gas with the free acid takes place, giving still more sulphate of ammonia, so that to make the process continuous some sulphate liquor is constantly withdrawn from circulation and evaporated to yield solid sulphate of ammonia, and some free acid is constantly added to the liquor circulated through the tower. The gas, being now freed from its ammonia, is conducted into a gas-cooling tower, where it meets a downward flow of cold water, which further cools and cleans the gas before it passes to the main. The cooling of the gas with its burden of steam, results in the condensation of the steam, and the raising of the temperature of the cooling water, so that the latter leaves the tower as hot water, and is utilised in a third tower, called the "air-heating tower," through which the air blast from the blower is directed. Here the contact of hot water and cold air gives hot air, saturated with vapour at 163° F., and cold water. By this method of utilising the heat of the gas from the producer, nearly one ton of steam is added to the producer blast for every ton of fuel gasified, and this cyclical exchange of heat is always going on, and forms one of the distinctive features in the economy of the plant. It will be understood that the hot water from the gas-cooling tower is circulated through the air-heating tower, and being cooled thereby is again pumped up to the top of the gas-cooling tower. Both towers are filled with tiles to give large surfaces of contact, and the circulating water acts as the heat-carrying agent between the hot gas and the cold air. The charging of fresh fuel into the top of the producer and the withdrawal of the ashes from the bottom in no way interfere with the continuous steady work of the producer. Moreover, the large volume of steam employed, acts as a most perfect regulator in keeping the quality of the gas uniform.

Central Station Installations.—For a central station the plant should be in units of a convenient size, each being complete in itself, with producers and regenerators, blowers, pumps, washers, acid tower, with pump and tanks, gas-cooling and air-heating towers, steam and air mains, steam-raising plant (which should consist of gas-fired automatically regulated boilers), and sulphate plant, one of the producers and one washer to be spare ones. A diagram accompanied the paper showing a unit of this size, consisting of six 10-ft. producers, each capable of gasifying 20 to 24 tons of slack per day. This complete plant is arranged for continuous working night and day, and will make gas of practically the same composition. The quantity made may vary from 50,000 to 750,000 cb. ft. per hour according to the demand. Each unit of this size will correspond to the capacity of one main, and will not require a gasholder for storage purposes. In the Mond producer the make of gas can be controlled automatically in the most perfect manner, so that the gas made and supplied to the distributing main is always equal to that consumed. A Mond producer will respond at once to a sudden increase in the demand for gas: the speed of the air-blower furnishing the blast to the producer can be controlled by the pressure of the gas in the supply mains, and any fluctuation is automatically balanced so as to keep the supply pressure constant. The limits within which a Mond producer will make good gas are said to be surprising, and a producer can be shut down and left with fire in for over a week, and still be ready to start again at short notice.

Mond Gas, and its Application to Gas Engines. H. A. Humphrey. Paper read before the Inst. Mech. Eng. J. Gas Lighting, 1900, **76**, [1962], 1509—1513.

The author discusses the question of the use of power-gas and large gas engines as a factor in the solution of the problem of the production of cheap power, special reference being made to the application, in this direction, of the Mond gas-producing plant. The question is considered under the following headings:—(1) The possibility of using cheap fuel, and of recovering its ammonia. (2) The greater economy of gas engines as compared with steam engines. (3) The simplicity and reliability of gas engines. (4) The superiority of gas-producers over steam boilers. (5) Costs.

Under the first heading the author gives a description of the Mond process for the manufacture of gas from cheap fuel, with recovery of the ammonia (see this Journal, 1889, 505—510; 1894, 938; 1896, 529, 643; 1897, 522; 1898, 34, 1032).



The greater economy of gas engines and Mond producers, as compared with steam engines and boilers, is shown in the accompanying diagram. The economy is effected in three directions:—(*a*) The fuel for generating Mond gas is cheaper than the fuel used at central stations for producing steam. (*b*) For a given expenditure of heat, the calorific value of the Mond gas from the producer is greater than the calorific value of the steam from the boiler. (*c*) The gas engine utilises the heat it receives much more efficiently than the steam engine. It is shown that the actual results obtained with Mond gas and gas engines are superior, not only to the actual, but also to the ideal figures for central stations using steam-driven plant.

Results obtained in actual practice are given showing the reliability of the gas engine. Thus, Mond gas used in a 60 nominal horse-power gas engine, direct-coupled to a Siemens dynamo, gave, during two years, an average thermal efficiency of 25·1 per cent., calculated on the indicated horse-power and the calorific value of the gas used. The consumption of coal fed into the producer averaged 1·05 lb. per indicated horse-power hour, and the consumption of oil about 0·0235*d*. per unit. The average indicated horse-power was 114·7, and the effective horse-power, 88·8.

It has been shown in the United States that gas engines, coupled to alternators, are suitable for running in parallel for the generation of two-phase currents, and the author states that an alternative method would be to work all the gas dynamos on direct current, and use this current to run motor alternators.

Amongst the chief advantages of gas-producers over steam boilers, are:—(1) Gas under a slight pressure is much easier to handle than high-pressure steam, and there are no losses due to condensation. (2) With gas producers, the "stand-by" losses are reduced to a minimum. The author states that another important point is that a Mond producer will respond at once to a sudden increase in demand for gas; indeed, the speed of the air-blower furnishing the blast to the producers can be controlled by the pressure of gas in the supply mains, and any fluctuation automatically balanced so as to keep the supply pressure constant.

The author concludes by giving a detailed estimate of the cost for a 20,000 effective horse-power central station gas-engine plant worked with Mond producer gas. The cost of fuel, oil, labour, repairs, and maintenance, ranges from 0·082*d*. to 0·241*d*. per unit sold, according to the load factor and the price of coal, whilst, it is stated, the combination of Mond producers, recovery plant, gas engines, and dynamos, compares favourably, as regards capital outlay, with the best class of steam-driven plant, when the boiler-house, chimney, slack-handling plant, foundations, and erection, are included in the cost of steam dynamos, boilers, condensers, and auxiliary machinery.—A. S.

Blast-Furnace Gases; Use of ——, in Gas Engines. J. W. Richards. J. Franklin Inst. **140,** [6], 1900, 415—430.

THE author briefly reviews the evolution of the gas engine from the original single horse-power, using illuminating gas, to the large 700 horse-power engine of the Cockerill Company, Seraing, Belgium, constructed to burn blast-furnace gas. Their previous 200 horse-power engine (this Journal, 1898, 765, 926) has now been steadily at work for over two years, driving a dynamo, without any wearing out of the parts, the inside of the cylinder showing only a very thin brown skin, which does not affect the efficiency. The present 700 horse-power gas engine is constructed with a blowing cylinder, so that the one engine supplies the blast to one end of the furnace, and is worked by the exit gases from the other. This engine was described, with the results of the first six months' working, to the Iron and Steel Institute in May 1900. The diameter of the gas cylinder is 51 ins., the length of stroke 55 ins., and the speed 80 revolutions per minute normal. The pressure of blast with 84 revolutions was 7·75 lb. per sq. in., which could be increased to 12 lb. The effective horse-power developed in the blast cylinder was 561 to 725. The gas consumed was 2·86 cb. m. per effective horse-power hour, or 2·33 cb. m. per indicated. The distribution of the heat energy of the gas was approximately 30 per cent. converted into work in the cylinder, 50 per cent. carried away by the cooling water, and 20 per cent. in the escaping gases.

After enumerating the actual plants in Europe, the author states that not a single instance of the application of the improvements to American blast-furnace practice can be cited. To bring out the great saving of power under the varying conditions of locality and working, he calculates the minimum, average, and maximum surplus of power which might be obtained by replacing the boiler and steam-engine plant by a gas engine. The results show a surplus of 1,090 horse-power per 100 tons of pig iron daily, in the case where the conditions would be most unfavourable for the generation of power from the gases. With about the average type of furnace, the surplus would be 4,490 horse-power, whilst with a small older type, it would be about 7,290 horse-power. These results are supported by calculations of the power raised by steam boilers and engines with three different efficiencies—3, 6, and 12 per cent. Taking the 6 per cent. case, which is about the efficiency of the furnace in good practice with low fuel consumption, the surplus power works out to a minus quantity in the first instance just given of unfavourable conditions, and to 430 and 1,230 horse-power respectively, as compared with the figures given for the average type and the small older type of furnaces. The contrast is still greater, of course, with the 3 per cent. efficiency, which is that of the average small blast-furnace steam plant.

Obviously, with such a low efficiency under boilers, and with an efficiency of 20 to 30 per cent. in the gas engine, there must be great economy in the latter, and an instance is cited showing that the gases from the production of 600 tons of pig iron daily would, with an efficiency of 2·5 per cent. through boilers and engines, yield 2,300 horse-power, whereas in the gas engine, with 20 per cent. efficiency, the horse-power developed would be 18,400, or a surplus of about 16,000 horse-power available for other purposes. It is estimated that in one works with three blast-furnaces, in Pennsylvania, the saving in the coal bill alone would be at least 150,000 dollars in one year by the utilisation of the waste gases in a gas engine, the outlay for which would be 500,000 dollars.—A. W.

Calcium Carbide; Manufacture of ——. J. B. C. Kershaw. Electrician, 1900, **46,** [5], 164—165; [7], 245—246; and [8], 267—268.

THE author has brought together all the available information relating to the efficiency and yield of carbide furnaces.

I. *Calculations of the Theoretical Yield of Carbide Furnaces.*—Nine estimates are given, and these, reduced to a comparable form, are given in Table I.

TABLE I.

Kilowatt Hours theoretically necessary to produce 1 *metric ton* (2,204 *lb.*) *of Calcium Carbide containing* 80 *per cent. of Carbide.*

Authority.	Reference.	Kilowatt Hours.
Sieber	This Journal, 1898, 564..............	1,523
Addicks	Mineral Industry, 6, —	1,941
Bredel	American Gaslight Journ. 1895, 261 .	1,960
Wolff	Zeits. für angew. Chem. 1898, 919....	2,043
Pictet	Le Carbide, 1896, 28	2,640
Haber	"Elektrochemie," Chapter X........	2,670
Gin...........	L'Eclairage Electrique, 1899, May 6th	3,069
Lewes	Acetylene, 1900, 301	3,290
Allen	Electrical Review, 1900, Jan. 5th....	3,293

II. *Experimental and Estimated Yields of Carbide.*—The various yields, reduced to a common form, are given in Table II.

TABLE II.

Kilowatt Hours necessary to produce 1 *metric ton* (2,204 *lb.*) *of Calcium Carbide containing* 80 *per cent. of Carbide. Experimental and Estimated Figures.*

Authority.	Reference.	Kilowatt Hours.
Lewes	Journ. Gas Lighting, 1897, Nov......	4,105
Korda	Rev. de Chim. Indust. 7, 341	4,380
Houston and Kennelly.	Chem. Trade J. **18**, 385	4,393
Bullier........	L'Eclairage Electrique, 1896, April 4th.	4,470
Liebetanz.....	Zeits. für angew. Chem. 1899, July ..	4,800
Wolff	„ „ „ 1898, 919.... (This Journal, 1899, 818, 1004.)	5,111
?	Engineer	6,514

III. *Actual Yields of Carbide.*—The yields, again reduced to a common form, are contained in Table III. (Compare this Journal, 1900, 330 and 813.)

The author then gives some particulars regarding three types of furnace, *viz.*, the Deutsche Gold und Silber Scheide-Anstalt furnace; the Willson furnace, as used at Foyers; and the Gin and Leleux furnace. In conclusion, he points out that the highest yields found amongst the figures

TABLE III.

Kilowatt Hours necessary to produce 1 *metric ton* (2,204 *lb.*) *of Calcium Carbide containing* 80 *per cent. of Carbide. Actual Figures.*

Authority.	Reference.	Kilowatt Hours.
?	Electrician, 1896, April 17th	3,576
Lewes	Acetylene, 1900, 302	3,788
Keller	Electrician, 1900, Sept. 29th	3,871
Carlson	Zeits. für Elektrochem. 1900, Feb.	4,104
Patten	Electrician, 1899, Jan.	4,105
Borchers	Zeits. für Elektrochem. 1899, Oct. 5th	4,157
Keller	L'Eclairage Electrique, 1899, May 6th	4,291
Lewes	Journ. Acetylene Gas Lighting, 1899, July.	4,351
Haber	"Elektrochemie," 408	4,470
Pierard	L'Ind. Electrochimique, 1899, Dec.	4,920
Nikolai	Stahl u. Eisen, **18**, 727	5,066
Carlson	Zeits. für Elektrochem. 1900, Feb.	5,616
Haber	"Elektrochemie," 408	5,960

coming under examination have been obtained in furnaces working on the intermittent system, with movable box-hearths, in which the carbide produced is allowed to cool. The adoption of another form of furnace and of the continuous system of working at Foyers, for the sake of a saving in the cost of labour, does not detract from the correctness of this conclusion. Where electrical power is developed at a very low cost, and manual labour is costly, it may be wise to expend more kilowatt hours per ton of carbide produced, in order to obtain a reduction in the wages bill.

The continuous type of furnace, from which the carbide is tapped at intervals, is therefore being adopted in localities where power is cheap and labour dear; while the intermittent form is in use where the opposite conditions obtain. (Compare this Journal, 1900, 330 and 813.)—J. S.

Calcium Carbide Mass for Acetylene Manufacture; Preparation of ——. Desq and Francou. Rev. Prod. Chim. **3**, [18], 277.

ONE thousand parts, by weight, of commercial molasses are heated at 110° C. to remove water, and, after cooling down to 95°—100° C., are mixed, by brisk stirring, with 100 parts of powdered potassium bichromate. When the mass has become of a decided bottle-green colour, a mixture of sodium carbonate, 200 parts, and litharge, 200 parts, is stirred in, the temperature being kept at 85°—90°. When the paste is fluid, viscous, and homogeneous, it receives an addition of calcium carbide in small fragments (about $\frac{1}{5}$ in. diameter) previously soaked in a mixture of rectified petroleum, 600; spirit of turpentine, 400; and camphor, 10 parts. The whole is kept well stirred at 65°—75° C. until thoroughly mixed, and is then placed in moulds heated to 50° C., where it is pressed and cooled, the blocks being finally wrapped in paper steeped in paraffin, &c. To increase their resistance to moisture, the blocks, on leaving the moulds, may be soaked in a cold solution of albumin. —C. S.

Acetylene Flame; Temperature of the ——. E. L. Nichols. Phys. Rev. 1900, **10**, 234—252. Proc. Inst. Civil Eng. 1900, **142**, [4], 78.

WIDELY different numbers have been hitherto given for the temperatures at different points of an acetylene flame; thus Le Chatelier gave 2,100°—2,420° C., Lewes found a maximum temperature of 1,517° C., whilst the values obtained by Smithells were intermediate between these two. In the author's experiments, thermo-electric couples, composed of platinum and platinum-rhodium (10 per cent.) wires, varying in thickness from 0·01996 to 0·00821 cm., were used, and the mode of preparing them is described. In order to observe the acetylene flame, and to measure the distance between its median plane and the thermo-element, a magnified image was produced on the ground glass of a micro-camera, the plane of the flame being arranged parallel to the axis of the camera. The thermo-junction was placed at a distance of 6 mm. from the median plane, and the temperature taken by balancing the potentiometer, the couple then being gradually brought to the middle of the flame, and the temperature at each new position determined. With each of the four thermo-couples used, the temperature was found to increase gradually at first, but at a distance of about 0·4 cm. from the middle, the curve suddenly becomes steep, so that this distance probably measures the thickness of the layer of non-luminous gas surrounding the well-defined luminous layer, which has a thickness of about 0·065 cm. Before this luminous layer was reached, the temperature curve showed signs of approaching a maximum, the thicker junctions (0·01996 and 0·01598 cm.), however, being coated with carbon, and considerably cooled when coming into contact with the luminous zone. The thinner thermo-couples gave temperature curves lying above those of the thicker ones; they gave no deposit of carbon, but were melted in the middle portion of the flame, one of them after passing the median plane, and the other before that plane was reached. The temperatures at various parts of the flame for a thermo-junction of negligible cross-section was estimated by extrapolation; in this way the temperature at the middle of the flame was found to be 1,900° C., whilst at 1 mm. from the middle, the value was 1,920° C. Similar experiments with a luminous coal-gas flame, and a candle flame, showed the highest temperatures to be 1,780° C., and 1,670° C. respectively. The author shows that the fact that a thin platinum wire—prepared by Wollaston's method of silver-plating it, then repeatedly drawing through a die to diminish its thickness, and finally dissolving away the silver—can be melted in a candle flame, is due to the presence of impurities in the wire, in consequence of which it melts at 1,674° C., whilst pure platinum melts at 1,775° C. The temperatures given above are based on an arbitrary scale, in which the melting point of platinum is taken as 1,775° C., and that of gold as 1,070° C.—A. S.

Hydrogen obtained by the Electrical Decomposition of Water; Lighting with ——. J. für Gasbeleucht. **43**, [51], 971.

HYDROGEN, compressed in steel cylinders to 150 atmospheres, has been proposed by O. Schmidt for lighting purposes, by means of Auer mantles. He states that he can obtain by the electrolytic decomposition of water 1 cb.m. of hydrogen, compressed to 150 atmospheres, for an expenditure of 6·25 kilowatt-hours; and that 1 kilowatt-hour thereby gives a lighting value of 80 Hefner-hours; whereas, if expended on the production of carbide, the acetylene obtained therefrom would have a lighting value of only 51 Hefner-hours. The latter, however, is too low an estimate, and 80 Hefner-hours would be more nearly correct in this case also. The expenses for materials for carbide manufacture might turn the balance in favour of the hydrogen, in cases where distance did not make the cost of transport of the steel cylinders excessive. Near the source of power electric lighting must be cheaper than either acetylene or hydrogen lighting, but it seems likely that hydrogen might prove the cheaper means of providing small lights in a zone which is too far from the source of power for electric lighting to be cheap, and too near it for the transport costs to give carbide (acetylene) the advantage.—J. A. B.

Peat; Analysis of ——. H. Bornträger.

See under XXIII., *page* 159.

PATENTS.

Fuel, Liquid, to Burners; Means or Apparatus for Supplying ——. Sir W. G. Armstrong, Whitworth, and Co., Ltd., and E. L. Orde, Newcastle-on-Tyne. Eng. Pat. 236, Jan. 4, 1900.

THE necessary constituents for combustion are heated before reaching the burner, *i.e.*, the oil is forced through a filter into a heating coil or vessel situated in a suitably heated position (*e.g.*, in the smoke box or furnace of a steam boiler), the oil being heated at constant volume to prevent decomposition and deposits of carbon; the steam is superheated in a coil or vessel, the air is also heated in a similar manner, and the three heated constituents are conveyed to the burner by pipes.—C. S.

Water Gas; Process for the Production of ——. A. J. Boult, London. From E. Fleischer, Dresden-Strehlen. Eng. Pat. 1959, Jan. 31, 1900.

The process is an improvement on the process described in Dellwik's Eng. Pat. 29,863, 1896 (this Journal, 1897, 431), in which carbonic acid is generated during the blast period, and in which short blast periods alternate with long gas-producing periods. This method of working is applied in this patent to treating bituminous fuel in twin generators. The gas produced in one generator causes distillation of the fuel in the same generator, and the whole amount of gas produced passes through the other generator.—R. S.

Gas Producers. E. J. Duff, Liverpool. Eng. Pat. 410, Jan. 8, 1900.

The gas producer has inclined gratings at opposite sides of the lower portion of the casing, leaving a central space between the gratings, through which the ashes fall to a water-sealed trough. Air, or a mixture of air and steam, for combustion or gasification is admitted to the space beneath one inclined grating. The gases given off from the top of the bituminous fuel used are admitted beneath the other grating, a communicating pipe being used. By this arrangement the condensable gases from the fuel are caused to pass through the hotter regions of the fuel bed, whereby they become fixed and freed from condensable matters. The gas outlet is arranged on one side of the producer at about half the height of the fuel bed.—R. S.

Gas Producers. E. J. Duff, Liverpool. Eng. Pat. 3631, Feb. 24, 1900.

The improvements consist in providing gas producers, which have a water-sealed ash trough and an air-receiving chamber, with a casting or casing extending right across the producer above the air chamber. This casting is provided with sloping or inclined unperforated sides, forming a kind of ridge across the furnace, beneath the lower edges of which the air is admitted to the furnace near the normal level of the water in the trough.—R. S.

Burners; Hydrocarbon ——, *for Use in any kind of Furnace.* C. A. Rosier, Levallois Peret, France. Eng. Pat. 9802, May 28, 1900.

The burner consists of a horizontal tube, closed at one end, and divided along its whole length into two chambers by a partition, the only communication between them being by an opening near the closed end of the tube. The hydrocarbon is fed to the lower chamber and vaporised by applying heat from below, the vapour then traversing the upper chamber into a collector which is bent back upon itself and terminates in a burner nozzle, the flame from which enters the furnace through a funnel-shaped pipe, through which it draws the air necessary for producing smokeless combustion. A series of these burners and tubes may be mounted in a fire-box, in which case the tubes will take the place of fire-bars. It is claimed that no part of this apparatus becomes red-hot while in work.—C. S.

Liquids [*Fuel*] *for Lighting and Heating Purposes, and Products for Producing the same.* J. Bonal and C. Fietz, Paris. Eng. Pat. 17,181, Sept. 27, 1900.

The inventors claim a liquid, adapted to be burnt through the medium of a wick, for lighting and heating purposes, "which consists of a solution, in water or other suitable solvent, of a mixture of metallic oxides such as those of lithium, strontium, titanium, erbium, cerium, and the like, with sulphur and alcohol." The proportions recommended are lithium oxide, 290 parts; strontium oxide, 200 (or cerium oxide, 20); and titanium oxide, 20 parts; melted separately at at least 90° C., then mixed and cooled to 10° or 20° C., 200 parts of sulphur being next stirred in by degrees, followed by 290 parts of alcohol, at 90° C. The product is dissolved in water to form a 0·2—0·3 per cent. solution.—C. S.

Carbon Dioxide; Means for Indicating and Recording the Amount of ——, *in the Products of Combustion from Boiler and other Furnaces.* C. Ericsson, Stockholm, Sweden. Eng. Pat. 17,527, Oct. 3, 1900.

Indications and records as to the firing of a boiler or other furnace are obtained by using apparatus consisting of two gas meters, a carbonic acid-absorbing vessel, and a differential mechanism provided with an indicator. A portion of the products of combustion passes continuously through one meter, then through the absorption apparatus, and finally through the second meter. The difference between the volumes of gas measured by the two meters indicates the percentage of carbonic acid in the gases. The registering apparatus records this by a curve or diagram.
—R. S.

Sulphuretted Hydrogen; Improved Means applicable for Use in the Desulphurisation of ——. J. Dewrance, Southwark, Surrey, and J. H. Paul, Charlton, Kent. Eng. Pat. 2146, Feb. 2, 1900.

Sawdust or the like is saturated with solution of a ferric salt, such as the sulphate or chloride, and is treated with ammonia, so that ferric hydroxide may be deposited throughout upon the material, from which the soluble salts are then washed out. The mixture thus obtained is used in a purifier to absorb the hydrogen sulphide from coal-gas, or other sulphuretted gas, water and ferrous sulphide being formed. The spent material is revivified by moistening and exposure to the air for some days. Ferrous sulphate or chloride may be substituted for the ferric salt in the process, but in that case the impregnated sawdust, after the treatment with ammonia and washing, must be exposed to the air or otherwise oxidised before use.—E. S.

Coal- and other Gases for Illuminating Purposes, and Appliances connected therewith; Processes for Enriching or Carburetting ——. C. B. Tully, Sligo. Eng. Pat. 4134, March 5, 1900.

The enriching oil is pumped into a reservoir at the bottom of the carburetter, and is thence raised by the same pump and sprayed over a mass of absorbent material in the upper part of the apparatus. The gas to be carburetted is introduced through a transverse pipe, provided with orifices at one end and fitted with a valve, and connected with a perforated vertical pipe, so that the gas either ascends through the absorbent mass, and escapes, enriched, down the vertical pipe and through the other end of the transverse pipe, or *vice versâ*, according to which end of the latter is used as the feed pipe. Suitable means are provided for gauging the quantity of enriching oil in the reservoir, observing the action of the pump, and making the whole apparatus self-contained.—C. S.

Acetylene Gas; Method of Purifying ——, *with the necessary Apparatus connected therewith.* B. R. Chicken and A. G. Smith, both of Aberdeen. Eng. Pat. 1336, Jan. 22, 1900.

The acetylene is passed through a washer, with an inclined baffle-plate, containing dilute acid, which is intended to remove ammonia from it; then through an oxidising agent, such as chloride of lime, which may be mixed with porous material, and is intended to remove phosphuretted hydrogen and sulphuretted hydrogen; and finally through a dehydrating agent, such as unslaked lime. The chloride of lime may contain some free lime, with the object of absorbing any nitrogen chloride which may be formed through ammonia which has escaped absorption in the washer.
—J. A. B.

Acetylene Gas Generators. A. Messer, Höchst-on-the-Main, Germany. Eng. Pat. 3745, Feb. 26, 1900.

A covered generating tank containing water has passing through its top a pipe, through which is introduced a vessel with perforated base containing carbide. The vessel is guided at one side in such a manner that when it reaches the lower end of the pipe, which is submerged, it tips automatically, and the perforated base, through which the water reaches the carbide, is projected laterally so that the gas evolved does not escape up the pipe by which the vessel is introduced.—J. A. B.

Acetylene Apparatus. J. Brunschwyler and E. Pärli, both of Biel, Switzerland. Eng. Pat. 14,751, Aug. 17, 1900.

A closed generating vessel has arranged in its top a charging shaft which can be closed by two slide valves, which may be operated from outside, so that carbide can be first introduced on a dry slide valve, from which it is discharged into the generating vessel only after the top of the shaft has been closed. A valve at the base of the generating vessel, by which the muddy water can be discharged, is weighted to open at a slight rise in pressure, and so constitutes a safety valve.—J. A. B.

Acetylene Gas Generator. J. Predmerszký and G. Predmerszký, both of Buda-Pesth. Eng. Pat. 17,025, Sept. 25, 1900.

The bell of a gasholder, when it has descended nearly to its lowest position, operates a balanced pipe so that water is discharged from an annular reservoir on the top of the gasholder tank into a receptacle which, when full, tips the water into a shoot which leads to a carbide holder. A pawl and ratchet disc direct the water from the receptacle to each of several carbide holders in turn, and give a record of the number exhausted at any time. Some modifications of the apparatus are also described.—J. A. B.

Acetylene Gas Generators. E. L. H. Chauvin, Paris. Eng. Pat. 18,353, Oct. 15, 1900.

Carbide stored in the inclined pigeon-holes of a distributing device is discharged in predetermined quantities into an inclined and recurved shoot in a generating tank containing water, by mechanism operated by the movements of the gasholder into which the gas generated passes. A level indicator is provided.—J. A. B.

Acetylene Gas Apparatus. C. Walser and T. Cartier, both of Zürich. Eng. Pat. 18,502, Oct. 17, 1900.

Carbide in a generating vessel is supplied with water from a cistern through a pipe which traverses a receiver and is provided with a three-way tap, permitting the escape of gas in the event of excessive pressure in the generating vessel forcing back the water through the pipe and receiver. —J. A. B.

Acetylene Gas Generator. L. D. Railsback, Indianapolis, U.S.A. Eng. Pat. 19,016, Oct. 24, 1900.

Carbide is fed into the upper end of a holder situated in a generating chamber, which extends downwards into a water tank, closed at top, by means of a suitable charging chamber with closure.—J. A. B.

Acetylene Gas Generating Apparatus. D. McDonald, Yarraville, Victoria. Eng. Pat. 19,337, Oct. 29, 1900.

Carbide holders are introduced into or removed from a generator, through a door in its base provided with a relief valve. The gas evolved passes into a water-displacement gasholder, from which water is supplied to the generator as required. The gas reaches the service pipe through a bell on the top of the gasholder, having a valve-controlled inlet pipe.—J. A. B.

Mantles of Incandescent Lamps, and for the Covers of Tyres for Wheels of Bicycles, Carriages, Motors, and other Vehicles; Manufacture of Fabric for ——. D. E. Radclyffe, London. Eng. Pat. 3323, Feb. 20, 1900.

The fibres of Urtica or Bœhmeria (China Grass) are prepared, combed, spun and woven, either into mantles for incandescent lamps, or, more coarsely, into a fabric suitable for covering pneumatic tyres.—C. M.

Carbon [Electric Light Carbons]; Manufacture of ——. H. J. Haddan, London. From H. Wartenberg and A. M. Miller, Chicago, U.S.A. Eng. Pat. 19,432, Oct. 30, 1900.

For the production of this carbon, wood or other fibre is thoroughly impregnated with the following mixture:— 13½ oz. of water, 2 oz. of sulphuric acid, 6 oz. of saccharine matter, such as white syrup, 1 oz. of tartaric acid, and 1 oz. of carbonate of ammonia. The material is then dried and subjected to a high temperature whilst packed or imbedded in graphite.—D. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Fir Wood; Dry Distillation of ——. Irminger. Ingeniren, Copenhagen, 1899, 311—317. Proc. Inst. Civil Eng. 1900, **142**, [4], 49.

The author has tested fir, spruce, birch, beech, and oak wood in the model retorts and other apparatus used for testing coal in the gasworks; of the fir, wood which had been cut four years, fresh-cut wood, green brushwood, brushwood of a year's growth, and young and old cones were examined. The mode of conducting the tests is described, together with the apparatus employed; and the results are tabulated in two sets, according to the limit of temperature reached in the burning being about 600° C. (1,100° F.) in the course of two hours, or about 700° C. (1,300° F.) in the course of only one hour. The total weight of the products of distillation—gas, pyroligneous acid or wood-vinegar, tar, and charcoal—was within 4 per cent. of the weight of the wood charged into the retorts. With the higher temperature, the gas was more abundant and possessed a higher calorific power, but its specific gravity was lower, owing to the smaller proportion of carbon dioxide present. The amount of pyroligneous acid was about the same with both temperatures. The amount of tar was rather less with the higher temperature, except from the green brushwood, the cones, and the spruce; the amount of charcoal was considerably less. It is apparent, therefore, that the distillation should be effected at a low temperature, not above a dark-red heat, and this temperature should be attained slowly. Brushwood and cones can be utilised with advantage, except as regards their resulting charcoal, which is worthless. It is better, especially when tar is the chief product aimed at, to use wood which has been longer prepared for burning, since the formation of resin is constantly going on, and even continues in the stumps after the trees have been felled. In the distillates from fir, an appreciable quantity of turpentine was only obtained from particularly resinous wood, yielding a large amount of tar of lower specific gravity than the pyroligneous acid or wood-vinegar. The turpentine obtained, boils at about 180° C. (356° F.), but a considerable amount distils over at a lower temperature. Only traces of wood spirit are found in the distillates from fir; it is recovered only from leafy trees, particularly oak and beech. The yield of wood vinegar is highest, both in quantity and in strength, from oak, beech, and birch, particularly from the two last named. The crude gas evolved cannot be used direct as an illuminant, but can be used for lighting in conjunction with a Welsbach incandescent mantle; in this manner a light of about 36 candle-power is obtained with a consumption of 3 cb. ft. of gas per hour. If 1,000 lb. of the fir wood be introduced into a red-hot retort (at about 1,100° C. or 2,000° F.), there is obtained 7,600 cb. ft. of gas, having a calorific power of 460 thermal units (lb.-Fahr.) per cb. ft., but with this high yield of gas, the amounts of the other by-products are smaller. Experiments with a defective condensation apparatus showed that, in order to satisfactorily recover the distillates, sufficient condensing water should be used to cool them to about 20°—30° C. (68°—86° F.). A considerable economy can be effected by utilising the heating effect of the crude gas from the condenser for heating the wood-burning kilns.—A. S.

Charcoal; Half-Carbonised ——. C. Blacher. Chem. Ind. **23**, [23], 508—511.

Statements occur, in text-books by Bersch and others dealing with the distillation of wood, to the effect that carbonisation at low temperatures (about 270° C.) gives as high a yield of acetic acid as carbonisation at the customary higher temperatures, at which the black charcoal yielded amounts to only about half the amount of the half-burnt charcoal obtained at the low temperature. As the latter product forms a good fuel for many purposes, the author endeavoured to learn if the advantages which its manufacture should have, according to these statements, were anywhere realised in practice. He failed to find any practical confirmation of the statements, and therefore proceeded to investigate the matter. His first experiments, made with a large iron retort, were inconclusive, largely owing to the difficulty of maintaining uniform low temperatures, and he therefore made further researches in the laboratory with a vertical wrought-iron retort of $1\frac{1}{2}$ litres capacity, plunged in a bath of molten lead and tin. In this he carbonised, at temperatures ranging from 250° to 310°, pieces of fir, pine, and birch, of the shape and size of matches. The temperature in each trial was reached in two hours, and then maintained constant for two to three hours, when the retort was allowed to cool. The results showed that the maximum yield of acetic acid was attained below 300° C., though nearly up to that temperature the yield increased, while the residual wood (half-burnt charcoal) burnt with flame. Tar was formed only above that temperature, and most freely about 340°—350° C. The charcoal which remained after the tar had been driven off was ordinary black charcoal burning without flame. The half-burnt charcoal was friable, unless made at so low a temperature (below 260°), that only one-third to one-half the maximum yield of acetic acid was produced.

These results indicate that it should be feasible in practice, either to produce good firm half-burnt charcoal and about one-third the maximum yield of acetic acid by carbonising at a maximum temperature of 260°, or to produce a more friable residue, which, however, would be a very suitable fuel for many purposes, and about 80 per cent. of the maximum yield of acetic acid by carbonising below 300°. In either case, however, but especially in the first, great difficulty would be experienced in preventing the temperature from exceeding the limit, while the plant would necessarily be very costly and would need close supervision. It might prove most satisfactory to carbonise in a current of heated gas or steam, but the recovery of methyl alcohol would be rendered more troublesome by the consequent dilution of the products. It should, however, be remembered that wood-tar is often the most valuable product in charcoal manufacture, and as it is not obtained when half-burnt charcoal is produced, the prospects of the latter manufacture becoming remunerative are somewhat remote. On the whole, it would seem that the text-book statements concerning the production of half-burnt charcoal are far too optimistic.—J. A. B.

Waste Products [Naphthenic Acids] of the Mineral Oil Industry; Utilising ——. F. Ulzer. Zeits. angew. Chem. 1900, [50], 1273.

Wischin, in an article bearing upon this subject (see this Journal, 1900, 727), quoted the statement of Lidow (J. russ. phys. Ges. 1898, 224), that the naphthene acids from petroleum refining, when submitted to a treatment similar to that for the preparation of Turkey-red oil from fatty oils, yielded a product which gave very satisfactory results when subjected to dyeing tests. The author has made comparative dyeing tests with the proposed substitute, and with the best Turkey-red oil from castor oil, and finds that the results obtained with the former are not nearly so good as with the genuine Turkey-red oil.

With regard to the applicability of the naphthenic acids to the manufacture of soap, the author finds that, even with the pure acids, the soaps produced have a persistent, unpleasant odour.—A. S.

PATENTS.

Shale and like Minerals; Retorts for Distilling ——, and for dealing with the Burnt or Spent Shale. J. Beveridge, Linlithgow. Eng. Pat. 408, Jan. 8, 1900.

The construction of the retort so as to save fuel and labour in working is the subject of the first part, and the second part refers to a mechanical arrangement for intermittently discharging the spent shale from the bottom of the retort by means of a series of drawing shovels, one for each retort. The retort is made longer than usual, and is composed of four sections, the first or top section consisting of a large iron hopper and redistillation chamber, where a quantity of shale can be stored above the gas-outlet pipes leading to the gas main, so that spent shale can be drawn from the bottom of the retort, and the hopper filled up, as may be found convenient, without any loss of gas through the shale sinking below the outlet pipes; the second section consisting of an iron chamber fastened to the hopper, in which the oil is distilled from the shale; the third section consisting of a fire-brick chamber, in which the ammonia is taken from the shale, and the bottom section consisting of a fire-brick chamber, in which the spent shale is allowed to cool before it reaches the bottom outlet.—D. B.

Wood, Wood-refuse, Peat, or the like; Method of Charring ——, and Apparatus therefor. W. A. G. von Heidenstam, Skönvik, Sweden. Eng. Pat. 2292, Feb. 5, 1900.

The usual method of charring wood consists in pressing the raw material into briquettes of suitable dimensions, and heating in a retort under simultaneous compression effected by means of a plunger, which, during the entire operation, presses on the material with a constant pressure so as to give the density required to the charcoal. Owing to the fact that the charring material is in contact with the walls of the retort, which latter, on account of the friction, absorb a portion of the pressure, charred rods are obtained which are not uniform in density, but of a density decreasing with the distance of the plunger. This difficulty is overcome by the present invention, according to which the material is introduced into the retort without coming into contact with the walls. To avoid bending or fracture the material is divided into sections, and placed on special plates or discs loosely slipped on to one or more guides attached to the plunger, and passing through the retort and apertures at the end of the latter. The charging and emptying is quickly performed by the aid of the guides referred to, and a metal hood covering the whole, either while charring and cooling, or only while cooling, so that the incandescent charcoal is not brought in contact with the air until after cooling.
—D. B.

Petroleum; Product obtained by the Solution of Ozone in ——. M. Otto, Neuilly-sur-Seine, France. Eng. Pat. 4676, March 12, 1900.

The product in question is obtained by causing a current of ozone or ozonised air to pass into petroleum at 15° C. It may serve as an agent for the destruction of the parasites of vines and other plants, for bleaching and disinfecting purposes, for the treatment of certain skin diseases, and so forth.—D. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo Fermentation. M. W. Beijerinck. Bot. Zeit. 1900, [2], 188. Pharm. J. 1900, **65**, [1591], 723.

The substance from which Indigo is directly formed was found to be not identical in all indigo plants. In the "indican plants" (*Indigofera sp.*, *Polygonum tinctorium*, *Phajus grandiflorus*), the original substance is indican, the glucoside of indoxyl; whilst in the "indoxyl plants (*Isatis tinctoria*), it is indoxyl itself. In all cases the Indigo is formed, directly or indirectly, by the oxidation of indoxyl. In the indican plants the indican is found in the colourless protoplasm, whilst the indican enzyme is located in the chloroplasts. The indican is either decomposed by an enzyme, or is split up directly, without the intervention of an enzyme, through the activity of the protoplasm.—A. S.

Hydrosulphurous Acid; Application of the Reducing Action of ——. P. Goldberger. Oesterr. Chem. Zeit. **3**, 470. Chem. Centr. 1900, **2**, [19], 1014.

By the aid of nascent hydrosulphurous acid, that is, by the introduction of zinc dust into a bisulphite solution containing the substance to be reduced, a satisfactory reduction of nitro compounds containing acid or basic groups can be effected. The reaction fails with neutral nitro compounds, as mono- and dinitrobenzene. 5 grms. of *p*-nitrophenol dissolved in a little alcohol, then mixed with 48 or 40 per cent. bisulphite solution, the mixture treated with zinc dust, made alkaline with soda, filtered, evaporated, and neutralised with acetic acid, gave 2·8 grms., equal to 80 per cent. of the theoretical amount of *p*-amidophenol. In a similar manner, the author obtained 77 per cent. and 90 per cent. of the theoretical amounts of *p*-phenylenediamine and anthranilic acid, respectively, from *p*-nitraniline and *o*-nitrobenzoic acid.—A. S.

Nitrous Acid on α- and β-Naphthol; Action of ——.
J. Schmidt. Ber. **33**, [17], 3244—3246.

When nitrous acid (obtained from nitric acid and arsenious acid) is passed into an ice-cold solution of 10 grms. of α-naphthol in 100 c.c. of ether for about 20 minutes, a dark-yellow precipitate weighing about 8 grms., separates out. This consists of dinitro-α-naphthol, and crystallises from hot chloroform in transparent yellow prisms melting at 135° C. In a similar manner, β-naphthol gives about the same yield of dinitro-β-naphthol, which, after recrystallisation from chloroform, melts at 195° C.—T. A. L.

Sulphonic Acids; Separation of ——, by Distillation in Vacuo. F. Krafft and W. Wilke. Ber. **33**, [17], 3207—3209.

It has already been shown (Ber. **25**, 2255) that many sulphonic esters will distil without decomposition under diminished pressure. For example, α- and β-naphthalene sulphonic methyl esters boil at 214° and 224° C., respectively, under 15 mm. pressure. On working with a Torricellian vacuum, even more unstable substances can be easily rectified. Thus, with a vacuum at which the cathode light appears, α-naphthalene sulphonic ethyl ester boils, without decomposition, at 131° C., the vapour column being about 65 mm., whilst the isomeric β-ester, under similar conditions, boils at 134° C. The following table gives the melting and boiling points of certain sulphonic acids and their derivatives, compared with some corresponding carboxylic acids:—

Sulphonic Acids.	Melting Point.	Boiling Point, 0 mm.	Height of Column of Vapour.	Carboxylic Acids.	Melting Point.	Boiling Point, 760 mm.
	° C.	° C.	Mm.		° C.	° C.
Benzene sulphonic acid	66	135	90	Benzoic acid	121	250
p-Toluene sulphonic acid	35	147	65	*p*-Toluic acid	180	274
p-Xylene sulphonic acid	48	149	55	1.4.3 Isoxylylic acid	132	268
p-Chlorobenzene sulphonic acid	68	148	60	*p*-Chlorobenzoic acid	240	..
p-Bromobenzene sulphonic acid	103	155	60	*p*-Bromobenzoic acid	251	..

The differences between the aromatic sulphonic and carboxylic acids correspond with those between sulphuric and carbonic anhydride. The former is hygroscopic, unstable, and not very volatile, whilst carbonic anhydride does not combine readily with water, is very stable, and is volatile. When these radicles are combined with hydrocarbons they form, on the one hand, sulphonic acids, which are hygroscopic, readily soluble in water, and only distil *in vacuo*, whilst the carboxylic acids are sparingly soluble, but comparatively volatile.—T. A. L.

Canarine; New Formation of ——. Br. Pawlewski.
Ber. **33**, [17], 3164.

In addition to the many chemical and electrolytic reactions for the production of Canarine by the oxidation of sulphocyanic (thiocyanic) acid, it is now found that persulphuric acid can also be employed. A solution of ammonium sulphocyanate (thiocyanate) is treated with ammonium persulphate, when a yellow, flocculent precipitate separates. The reaction is as follows:—

$$3CN.SH + O = C_3N_3S_3H + H_2O.$$

The precipitate, after filtering off and washing with hot water, is pure Canarine, $C_3HN_3S_3$, but the yield is rather small. A skein of wool alternately impregnated with ammonium persulphate and immersed in ammonium sulphocyanate solution several times, becomes dyed with Canarine, the strength of the fibre remaining apparently unimpaired.
—T. A. L.

Anilines; Reactions of Substituted ——. O. de Coninck.
Comptes Rend. **131**, [23], 945—946.

The following reactions are given by alcoholic solutions of the bases with solutions of salts of copper, nickel, and cobalt:—

——	Methylaniline.	Dimethylaniline.	Ethylaniline.	Diethylaniline.
Dilute copper chloride	Bluish opalescence, darkening gradually. In time, slight bluish-white precipitate. Fleeting white fluorescence.	Bluish opalescence. In time, slight green precipitate.	Bluish opalescence; bluish-white fluorescence. In time, slight green precipitate.	Bluish-white opalescence. then slight green precipitate.
Concentrated copper chloride.	Turbidity, then greenish precipitate. Bluish-white fluorescence. Gradual change through grey, violet-grey, dark violet, to (after 12 days) carmine.	Bright green precipitate. The liquid gradually becomes turbid.	Abundant greenish-white precipitate.	Abundant green precipitate.
Dilute copper sulphate	No opalescence or fluorescence. Bluish-white precipitate.	Thick, flocculent, bluish-white precipitate.	Abundant bluish-white precipitate; flocculent.	Bluish opalescence. Then slight blue precipitate.
Concentrated copper sulphate.	Immediate green coloration. Then abundant green precipitate.	Immediate precipitate, abundant, bright blue.	Immediate greenish-white precipitate. Liquid slowly turns greenish-yellow.	Bright blue precipitate, fairly abundant.
Dilute copper acetate	Colorations: rose, dark rose, amber, dark amber, dark brown. Then dark brown precipitate.	Bluish tint, turning to lilac.	Brown coloration after a time.	Bluish opalescence. Then slight bluish precipitate.

——	Methylaniline.	Dimethylaniline.	Ethylaniline.	Diethylaniline.
Concentrated copper acetate.	Immediate emerald-green coloration, rapidly darkening to black. Then slight black precipitate.	Turbidity. Then green precipitate, which dissolves in strong alcohol to a bright blue liquid, becoming bright green, afterwards dark green.	Emerald-green coloration. Then bright green precipitate, soluble in strong alcohol. The solution, after 4 hours, turns dark green, and deposits the same precipitate.	Turbidity. Afterwards slight green precipitate.
Dilute cobalt chloride...	No coloration. In time, precipitate of cobalt hydroxide.	..	..	..
Concentrated cobalt chloride.	Violet-carmine coloration. After 4½ hours, turbidity, and deepening of the tint.	..	..	..
Dilute nickel chloride ..	Gradual turbidity, but no precipitate, even after a long time.	..	..	..
Concentrated nickel chloride.	After 6 hours, extremely slight green precipitate. Afterwards colour changes to dirty green, then to very dark brown.	..	..	..

—J. T. D.

Triphenylchloromethane ——. M. Gomberg. Ber. **33**, [17], 3144—3149.

The statement in text-books of organic chemistry, that carbon tetrachloride reacts with benzene and aluminium chloride to form triphenylmethane, is incorrect. The chief product of the reaction is triphenylchloromethane, which can be obtained with a yield of 70—90 per cent. of the theory. The aluminium chloride was obtained by passing chlorine over about 50 grms. of aluminium shavings in a tube connected with an iron receiver. The tube is heated at the end nearest the receiver, and the rapid current of gas attacks the cold metal and causes it to glow. The reaction takes about 1½ hours, and gives 190—200 grms. of aluminium chloride, or about 80 per cent. of the theoretical amount. For the preparation of the triphenylchloromethane $(C_6H_5)_3CCl$, it is essential that the carbon tetrachloride and benzene be carefully dried over calcium chloride and fractionated. About 1 part by weight of carbon tetrachloride and 3·5 parts of benzene are mixed in a round flask, connected with an upright condenser, and 1·25 parts of aluminium chloride in quantities of 10 grms. at a time are gradually added. A violent reaction takes place, and subsequently the mixture is heated for an hour on the water-bath. After cooling, the melt is poured in a thin stream on to ice, kept cool by a freezing mixture. Benzene is added from time to time, in order to keep the triphenylchloromethane in solution. The two layers are then separated, and the benzene solution is washed rapidly, once with very dilute hydrochloric acid and once with water. It is then dried with calcium chloride and evaporated on the water-bath, when about half the total yield of triphenylchloromethane separates in a pure state. The filtrate is evaporated *in vacuo*, and mixed with ether, which precipitates a fresh quantity of the chloro compound. A further quantity can be obtained by repeating this treatment. The last mother liquors contain triphenylcarbinol, but in no instance has any triphenylmethane been isolated. The yield of pure chloro compound amounts to 70 –85 per cent. of the theory, and taking into account the carbinol obtained, the total yield amounts to 90—95 per cent. of the theoretical. The product melts at 108°—112° C., and if required quite pure, can be crystallised from benzene or precipitated from a concentrated benzene solution by ether.—T. A. L.

Triphenylmethane Dyestuffs; Absorption Spectra of Aqueous Solutions of ——. C. Camichel. Comptes Rend. **131**, [24], 1001—1002.

The author states that the conclusion of Lemoult (this Journal, 1901, 33) had been arrived at, as the result of an investigation of eight members of the series of indophenols, by Bayrac and himself in 1896. He points out that the absorption band in the case of the indophenols is much sharper than in the case of the triphenylmethane derivatives; so much so, that the ethereal solution of an indophenol forms an excellent monochromatic screen.

—J. T. D.

Rosaniline Base. H. Weil. Ber. **33**, [17], 3141—3144. (See this Journal, 1901, 34.)

The author, in a previous paper (Ber. **29**, 2677; this Journal, 1897, 131), has already shown that the "red rosaniline base" obtained by v. Georgievics by precipitating cold dilute Magenta solution with the calculated amount of soda lye is nothing else than ordinary rosaniline base coloured with Magenta, which is precipitated unchanged. He now gives further analytical data in support of this, and points out also that it is doubtful whether there is any constitutional difference between freshly precipitated and ordinary rosaniline base, although according to v. Georgievics, the former dissolves to an orange and the latter to a colorless solution in organic solvents. This apparent difference is evidently due to the greater solubility of the freshly precipitated base. A further statement of v. Georgievics (Monatsh. **21**, 407; this Journal, 1901, 34), that the formation of triaminotriphenylcarbinol neutralises the soda lye, is hardly in accordance with the behaviour of this compound. If the carbinol were such a strong acid, rosaniline base could not exist in a colourless state, since it would at once be converted into rosaniline rosanilate. The author further seeks to confirm his previous statement that rosaniline carbonate reacts with salt, forming rosaniline hydrochloride and sodium carbonate. A rosaniline carbonate solution is stated to be almost decolorised by adding salt, and the solution, when concentrated at a low temperature (below 50° C.), in a current of carbonic acid gas, gives a blue reaction on red litmus paper.—T. A. L.

Cumaranone (Ketocumarane) and its Homologues from Phenoxyacetic Acids; Synthesis of ——. R. Stoermer and F. Bartsch. Ber. **33**, [17], 3175—3181.

Amongst the compounds which may be considered as oxygen analogues of indigo derivatives the cumarone has especial interest on account of the ease with which it reacts. It is obtainable from phenoxyacetic acid by the action of phosphorus pentoxide, and has the constitution—

$$C_6H_4\left\langle\begin{array}{c}O\\CO\end{array}\right\rangle CH_2,$$

gives a semicarbazone melting at 231° C., and an oxime melting at 159° C. The product reacts with salicylaldehyde and with p-hydroxybenzaldehyde, giving oxybenzalcumaranones which are yellow to brown mordant dyestuffs of no technical value. In the preparation of cumaranone, a reddish-brown dyestuff is obtained as a by-product. Its formation is probably due to a condensation between two cumaranone molecules, the reaction being possibly similar to that which takes place in the production of Indigo Red from indoxyl and isatin. Homologues of cumaranone are also obtainable from o-, m-, and p-cresoxy-acetic acids, and from as-m-xylene-oxyacetic acid.—T. A. L.

Diazobenzene on Phenol; Action of ——, and Synthesis of o-Hydroxyazobenzene. E. Bamberger. Ber. **33**, [17], 3188—3192.

The orange-red acid of the formula $C_{12}H_{10}N_2O$, obtained under certain conditions from nitrosobenzene and mentioned in a previous note (Ber. **33**, 1939; this Journal, 1900, 728), has been identified as o-hydroxyazobenzene. The same product is formed, together with p-hydroxyazobenzene as the chief product, when diazobenzene is combined with phenol, but only to about 1 per cent. of the aniline employed. That the substance has the constitution assigned to it is proved, not only by its giving on reduction, o-aminophenol and aniline, but also by its synthesis from nitrosobenzene and o-anisidine. This reaction produces o-methoxy-azobenzene, which on hydrolysis yields o-hydroxyazobenzene. In the preparation from diazotised aniline and phenol, the o-hydroxyazobenzene is separated from its isomeride by steam distillation when the p-compound remains behind. The product is finally purified by means of its tobacco-brown copper salt, which, when decomposed with dilute hydrochloric acid, yields o-hydroxyazobenzene melting at 83° C. In a similar manner p-diazotoluene, when combined with phenol, yields a very small amount of o-hydroxyphenylazo-p-toluene, together with the p-isomeride which is the chief product. The o-compound crystallises from boiling alcohol in silky golden-yellow plates, melts at 100° C., and is sparingly soluble in water. It can be separated from the p-compound by its volatility with steam and by treatment with acetate of copper, when it gives a sparingly soluble salt. On reduction with zinc dust and boiling water in presence of ammonium chloride it yields o-aminophenol and p-toluidine.—T. A. L.

Azoxybenzene; Transformation of ——. E. Bamberger. Ber. **33**, [17], 3192—3193.

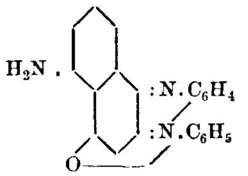
Azoxybenzene, according to Wallach and Belli (Ber. **13**, 525; *v.* also **14**, 2617), is converted by the action of warm concentrated sulphuric acid into p-hydroxyazobenzene. On repeating the experiment, the author finds that this product is accompanied by a small quantity of the isomeric o-compound, which can be isolated by reason of its greater volatility with steam and the insolubility of its copper salt in cold alcohol. This latter, when decomposed with hydrochloric acid, yields orange-red needles of the dyestuff melting at 83° C. Only 0·15 grm. of o-hydroxyazobenzene could be isolated from 25 grms. of azoxybenzene.

Isorosindulines and 5-Acetamino-β-naphthoquinone ——. F. Kehrmann and A. Denk. Ber. **33**, [17], 3295—3300.

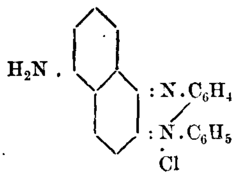
By the action of acetic anhydride at the ordinary temperature on 1.3′-aminonaphthol it is converted into the corresponding acetaminonaphthol, which reacts with nitrous acid yielding a quinone oxime. This on reduction gives 1.4′.2-aminoacetamino naphthol, which on oxidation yields 4′.1.2-acetamino-β-naphthoquinone, the fifth of the six possible derivatives of this formula. The product readily condenses with o-aminodiphenylamine hydrochloride forming as chief product the acetyl derivative of Isorosinduline No. 12 (*vide infra*), the isomeric compound, forming about 5 per cent. of the total yield, being identical with the acetyl derivative of the violet-blue Isorosinduline No. 9 (Ber. **32**, 2631; this Journal, 1899, 1116).—T. A. L.

Isorosinduline No. 9; Constitution of ——. F. Kehrmann and G. Steiner. Ber. **33**, [17], 3280—3284.

The 4′.2.1.4-aminohydroxynaphthoquinone obtained from naphthopicric acid (2.4.4′.1-trinitronaphthol) condenses with o-aminodiphenylamine, yielding aminorosindone of the formula—



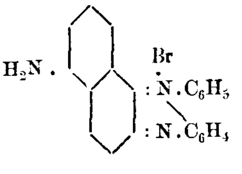
The same compound in the form of its "acetyl derivative" is obtained by the action of cold alcoholic soda lye on the blue Isorosinduline No. 9 already described (Ber. **32**, 2627; this Journal, 1899, 1116), from which it follows that Isorosinduline No. 9 has the formula—



A further proof of its constitution lies in the fact (*vide supra*) that it can be obtained by condensing 4′-acetamino-β-naphthoquinone with phenyl-o-phenylene diamine.—T. A. L.

Isorosinduline; 12th Isomeride of ——. F. Kehrmann and G. Steiner. Ber. **33**, [17], 3276—3279.

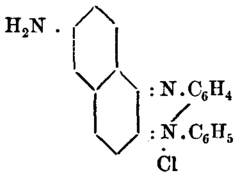
When phenylisonaphthophenazonium nitrate is treated with concentrated nitric acid, it yields two mononitro derivatives, one of which, on reduction, gives Isorosinduline No. 10 (Ber. **33**, 1543; this Journal, 1900, 654). The other, which is only obtained in admixture with the first, and not in a pure state, gives on reduction a new Isorosinduline, which is the twelfth known isomeride. The mother-liquors of both nitro compounds appear to contain a third isomeride, since on reduction there is formed a small quantity of a greenish-yellow dyestuff, which does not correspond with any of the Isorosindulines hitherto known. The mixture of nitro products is repeatedly extracted with alcohol, and the alcoholic solutions are precipitated with ether. The precipitate consists chiefly of the nitro compound, which on reduction yields the new Isorosinduline. The product is reduced with stannous chloride and hydrochloric acid, and the tin double salt is oxidised in alcoholic solution with ferric chloride. The precipitate is dissolved in water, treated with sodium acetate, and finally with sodium bromide. The bromide No. 10 is more soluble than the bromide of the new isomeride, and can be removed by dissolving the mixture in a small quantity of hot water, and adding a saturated solution of sodium bromide, when steely, almost black prisms of the bromide of the new Isorosinduline separate out. These are filtered from the yellowish-green mother-liquor, and dissolve to a bluish-green solution, which is again treated with sodium bromide. The new Isorosinduline bromide No. 12 has the formula—



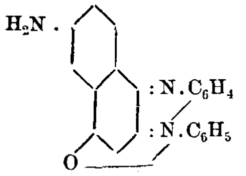
is sparingly soluble in cold, readily soluble in hot water and alcohol. It dissolves to a brownish-red solution in sulphuric acid, which turns orange-yellow on dilution, and dirty greenish-blue on neutralisation. The product can also be obtained by condensing 4′-acetamino-β-naphthoquinone with phenyl-o-phenylene diamine (*vide supra*).—T. A. L.

Rosinduline No. 13. F. Kehrmann and M. Silberstein. Ber. **33**, [17], 3300—3307.

The authors describe the method they employ for obtaining the Isorosinduline No. 13 of the formula—



When 4.3′.1.2-anilino-acetamino-β-naphthoquinone is condensed with phenyl-*o*-phenylene diamine, the chief product is 8-acetaminophenylrosinduline. This, on heating under pressure with dilute sulphuric acid, yields 8-aminorosindone—



the acetyl derivative of which is converted, by the action of dimethylsulphate in nitrobenzene solution, into 6-methoxy-8-acetaminophenylnaphthophenazonium. On treatment with alcoholic ammonia, this yields 8-acetaminorosinduline, from which the amino group can be removed by means of the diazo reaction, and the acetyl group subsequently by hydrolysis.—T. A. L.

Thionine Dyestuffs ——. F. Kehrmann and W. Schaposchnikoff. Ber. **33**, [17], 3291—3295.

It has been shown in Ger. Pat. 96,859 of 1897 that ammonia, fatty, and aromatic bases react readily with so-called imidothiodiphenylimide, or, according to more modern nomenclature (Ber. **32**, 2601; this Journal, 1899, 1115), 3-aminophenazthionium, which is to be considered as the parent substance of dyestuffs of the Thionine and Methylene Blue series. The substitution takes place in the non-substituted benzene ring para to the azine nitrogen. This reaction has been made use of for the preparation of some hitherto unknown substituted Thionines, and it is found that the introduction of a single phenyl group into the amino group has the same colorimetric effect as methyl groups. For instance, Phenylthionine (that is, phenylated Lauth's Violet) does not differ materially in shade from Methylene Blue; it is, however, a weak base, the salts of which are readily decomposed by ammonia, though not by water. The thionine derivatives are obtained by grinding together aminophenazthionium chloride with the corresponding amine, —*o*-toluidine, for example, giving *o*-tolylthionine (3-amino-3′-*o*-toluinophenazthionium), whilst dimethylamine yields dimethylthionine, identical with Gentianine. The aqueous and alcoholic solutions of this dyestuff are decomposed by alkalis and ammonia, the latter forming dimethylamine and thionine, and the former dimethylthionolin and finally thionol.—T. A. L.

Indigo; The Physical Condition of Two Commercial Preparations of Synthetical ——. A. Binz and F. Rung. Färber-Zeit. 1900, **11**, [23], 355 and 372—375.

The synthetical Indigo manufactured by the Badische Anilin und Soda Fabrik, in both the paste and powder forms, is reduced by sodium hydrosulphite (hyposulphite) at the same rate as the product manufactured by the Hoechst Farbwerke. By lime and zinc powder, however, the Indigo powder of the former is reduced faster than the similar product of the latter concern. Many experiments were made upon this point, the results varying; but in most of them, especially when the vats were heated, the result was as stated (compare Ullmann, this Journal, 1900, 526). The difference is due to the Indigo powder of the Hoechst Farbwerke being more crystalline than that of the Badische Anilin und Soda Fabrik. This was proved by the result of an experiment made with a small quantity of the latter product which had been crystallised from phthalic anhydride, and with the former product in the extremely divided state in which it is obtained when it is precipitated from a vat, the latter preparation being much the more readily reducible. The Indigo paste of the Badische Anilin und Soda Fabrik is acted on by lime and zinc powder much more easily than either of the powder products.—E. B.

Luteolin; Synthesis of ——. S. v. Kostanecki, A. Rozycki, and J. Tambor. Ber. 1900, **33**, 3410—3417. (See also this Journal, 1900, 41; 1896, 444.)

After the synthesis of chrysin (this Journal, 1899, 1009), parallel experiments were made with a view to the synthesis of luteolin. Phloracetophenone trimethyl ether and piperonylic ethyl ester were heated in xylene solution with sodium on the oil-bath for 10—12 hours; the resulting β-diketone, $(CH_3O)_3C_6H_2.CO.CH_2.CO.C_6H_3O_2:CH_2$, does not yield a product, by the action of hydriodic acid, from which the expected 1.3.3′.4′-tetrahydroxyflavone can be isolated. Veratric ethyl ester was then melted with phloracetophenone trimethyl ether, and granulated sodium introduced. After heating for 1—2 hours on an oil-bath (bath at 120° C.) the diketone was isolated. It showed the reactions of 2.4.6.3′.4′-pentamethoxybenzoylacetophenone. The finely powdered diketone was boiled with hydriodic acid (1·96 sp. gr.) for a long time, the product poured into sodium bisulphite solution, and the precipitate recrystallised from absolute alcohol. It then had the properties of luteolin, but was not quite pure. It was purified by conversion into tetra-acetyl-luteolin, which crystallised in fine white needles melting at 222°—224° C. (Perkin found 213°—215° C. for the compound of luteolin from weld, and Vongerichten 220°—222° for luteolin from parsley.) Luteolin was obtained from the acetyl compound by boiling with hydriodic acid. When air-dried the formula was $C_{15}H_{10}O_6 + H_2O$; it melted at 327° C. In all respects it was identical with natural luteolin.—A. C. W.

Tecomin: A Colouring Matter derived from "Bignonia tecoma." T. H. Lee. Proc. Chem. Soc. **17**, [231], 4.

The new colouring matter is a yellow crystalline substance, soluble in alcohol with an orange colour, insoluble or very slightly soluble in water; the solution becomes rose-red with alkalis and clear yellow with acids; 2 c.c. N/100 alkali or acid causes the colour change; it is not affected by any but the strong mineral acids, but the presence of organic acids renders the end reaction indistinct. The wood contains a reddish-brown resin, soluble in alcohol, from which it is difficult to free the tecomin; also a deep brown colouring matter which dissolves in aqueous alkalis and is precipitated by acids. It is used locally as a dye for cotton and as a stain for wood.

London Purple; Composition and Analysis of ——. J. K. Haywood.

See under XXIII., *page* 157.

Nitro Compounds; Electrolytic Reduction of ——. A. Rohde.

See under XI. A., *page* 132.

Benzidine; Electrolytic Reduction of ——. W. Löb.

See under XI. A., *page* 133.

PATENTS.

Indigo Paste; The Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 889, Jan. 15, 1900. (Second Edition.)

In preparing Indigo in the condition of paste, it is found to be difficult, with pure Indigo—for example, synthetical or refined natural Indigo—to obtain a paste containing from 20 to 40 per cent. of Indigotin, which is sufficiently liquid and which does not, on standing, deposit any sediment. The tendency of pure Indigo to form a froth when it is mixed with water, is also troublesome.

To overcome these difficulties a small quantity of certain thickening agents, namely "bone glue, skin glue, fish glue, silk gum, albumin, casein, gluten, gelatin, gum solution, starch, dextrin, and the like," is added to the paste, which should be neutral or alkaline. For example, a solution of 1 part of gum in 1,000 parts of water is added, along with 2·3 parts of caustic soda-lye (14 per cent. of NaOH), to 400 parts of Indigo powder, and the whole is ground. The Indigo soon becomes moist, and in a short time is converted into a smooth paste, which is brought to the desired strength by the addition of water.—E. B.

Azo Colouring Matters [Red, Brown, Blue-Black] therefrom, the Use of these Dyes in Dyeing, and their Treatment on the Fibre; Manufacture and Production of New ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 13,664, July 30, 1900.

Certain aromatic amines, when treated with sulphites, yield sulphurous acid esters of phenols, and, similarly, certain diamines under the same treatment are converted into sulphurous acid esters of aminophenolic compounds. These products, by the action of nitrous acid, yield diazo compounds, which will combine with suitable components to form new azo dyestuffs characterised by possessing a sulphurous acid phenolic ester group. The presence of this group renders the dyestuff more soluble in water than the corresponding products obtained from the aminophenolic compound itself; and, moreover, since the sulphurous acid residue can be split off after dyeing, the dyed fabric is then faster to milling and to soap. The agent most satisfactory for this purpose is cupric acetate, which appears to split off not only the sulphurous acid group, but also to cause the formation of a lake or some other change. The formation of these esters is referred to in Eng. Pat. 1387 of 1900 (this Journal, 1901, 36). The following is a typical example of the formation of a dyestuff. Dissolve 223 grms. of 1.1′-aminonaphthol sulphurous acid ester in 5 litres of water, cool with ice, add 250 grms. of hydrochloric acid (32 per cent. HCl), and run in 71 grms. of sodium nitrite (98 per cent. $NaNO_2$) dissolved in water. Run this diazo solution into a neutral solution of 261 grms. of the sodium salt of 1.1′.4-aminonaphthol sulphonic acid, and, when the formation of the azo dyestuff is complete, add sodium carbonate to form the sodium salt and sufficient water to give a solution. After adding about 250 grms. of sodium bicarbonate, run in the diazo solution, prepared in the usual manner from 93 grms. of aniline, and salt out the diazo dyestuff in the cold, filter-press, wash with dilute brine, and dry at about 50° C. The dyestuff dissolves to a bluish-violet solution, and gives bluish-black shades on wool from an acid bath. On treating the dyed goods with copper acetate, the shade is changed to a reddish-brown of increased fastness to washing.—T. A. L.

Coal-Tar Colours; Manufacture of Transformation Products of ——. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 1760, Jan. 27, 1900.

Aromatic bases containing one or more divalent groups —NH.CH_2— or —NR.CH_2— (R being an alkyl group) linked on both sides to benzene or to one of its homologues, react on a number of coal-tar dyestuffs containing primary or secondary amino or hydroxyl groups. Such bases are *o*-aminobenzylaniline, *p*-aminobenzylaniline, their homologues and nitrogen alkylated derivatives; anhydro-*p*-aminobenzylalcohol and anhydro-*p*-amino-*m*-tolyl alcohol; and, further, the products obtained by reacting with mineral acids on anhydroformaldehyde aniline and its homologues, or by the reaction of molecular proportions of formaldehyde and a primary or secondary aniline base in sulphuric or hydrochloric acid solution. The bases of this last group are generally considered as aminobenzyl alcohols or their anhydrides. The actions of the different bases are of various kinds. For instance, the basic dyestuffs, soluble in water, of the di- and triaminotriphenylmethane, safranine, and rhodamine groups are converted into new products, also soluble in water, but differing greatly in shade from the original dyestuffs. Thus, diaminotriphenyl carbinol (Benzal or Döbner's Violet) yields blue to bluish-green dyestuffs, whilst Magenta gives a violet, and Safranine and Rhodamine 6 G form reddish-violet dyestuffs. With dyestuffs of the fluoresceïn group, and with the so-called Congo colours, the transformation of the shade is more or less important, but the new products possess valuable properties compared with the original dyestuffs. They are, for instance, rendered insoluble, or nearly so, in water, and are also less sensitive to acids. The method consists in treating the dyestuffs with an aqueous solution of a salt (hydrochloride, sulphate, &c.) of one of the bases at a moderately elevated temperature. This operation may also be performed on the fibre. The specification contains a long table showing the change in shade and other properties of a number of dyestuffs after treatment according to the method described.—T. A. L.

Azo-Dyestuffs [Red, Violet] for Cotton; Manufacture or Production of New ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 2683, Feb. 10, 1900.

Dyestuffs for unmordanted cotton are obtained by combining diazo-α- or diazo-β-naphthalene with 2.4′.2′-aminonaphthol sulphonic acid, or with 2.4′.1.2′-aminonaphthol disulphonic acid. Furthermore by combining diazo compounds with certain derivatives of these acids having the general formula $C_{10}H_4.NHR.OH.SO_3H.X$, where R represents an alkyl or acidyl radicle such as CH_3, C_2H_5, C_6H_5, $CH_2C_6H_5$, COC_6H_5, $COCH_3$, CH_2CO_2H, or the like and X, is hydrogen atom or a sulphonic acid group. Moreover, secondary diazo dyestuffs containing these aminonaphthol sulphonic acids in the centre position will also dye unmordanted cotton. These products may be obtained either by diazotising the monazo dyestuffs produced by combining diazo compounds with the aminonaphthol sulphonic acids in an alkaline solution, and coupling the diazo-azo compounds thus obtained with dyestuff components, or else by first diazotising the aminonaphthol sulphonic acids, combining the resulting diazo compounds with an azo dyestuff component, and finally combining the monazo dyestuffs thus obtained with diazo compounds. For instance, the dyestuff prepared from 9·3 kilos. of aniline, diazotised and combined in an alkaline solution with 23·9 kilos. of 2.4.2′-aminonaphthol sulphonic acid is rediazotised in the usual manner with 7 kilos. of sodium nitrite and hydrochloric acid, the resulting diazo compound being stirred into a solution of 23·9 kilos. of the same acid made alkaline with sodium carbonate. When the reaction is finished the dyestuff formed is salted out, filter-pressed, and dried. It gives clear reddish-violet shades on unmordanted cotton, fast to light.—T. A. L.

Azo Colouring Matters [Yellow, Red, Violet] and of New Intermediate Products for the Production of such Colouring Matters; Manufacture or Production of New ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 3615, Feb. 23, 1900.

The new materials are urea or thiourea derivatives of the general formula $XC:(NHR)_2$, where X is either oxygen or sulphur, and R is a radicle of a naphthol or naphthol derivative. The urea derivatives are obtained by reacting with phosgene ($COCl_2$), in presence of a condensing agent, on such aminonaphthols, aminonaphthol sulphonic or carboxylic acids, or the like, as do not contain the amino and the hydroxyl group either in the ortho or the peri position. The corresponding thiourea derivatives can be produced by reacting in an analogous manner with thiophosgene ($CSCl_2$), or by the action of carbon bisulphide on a neutral or alkaline solution of the aminonaphthol compounds. The products obtained will react with one (in a slightly acid solution) or with two (in an alkaline solution) molecular proportions of a diazo compound, yielding new azo dyestuffs which dye unmordanted cotton. The following is an example of the method employed:— 23·9 kilos. of 2.4′.2′-aminonaphthol sulphonic acid and 24 kilos. of sodium carbonate are dissolved in 150 to 200 litres of water, and treated with about 11·5 to 12 kilos. of thiophosgene, with constant agitation. When no more

aminonaphthol sulphonic acid can be detected, the melt is acidulated with hydrochloric acid, and the new thiourea derivative is salted out. It is purified by redissolving it in water and again salting out. The pure sodium salt of the thiocarboxyldioxydinaphthylamine disulphonic acid crystallises from brine in white leaflets, soluble in cold, and readily soluble in hot water. For the preparation of a dyestuff, a solution of 52 kilos. of this product in water, with an excess of sodium carbonate, is mixed, with continuous stirring, with the diazo solution prepared from 21·4 kilos. of *p*-toluidine. After agitating for several hours, the mass is heated to 80° C., and the dyestuff is salted out, filter-pressed, and dried. It dyes unmordanted cotton bright red shades similar to Benzopurpurin 4 B.
—T. A. L.

Trisazo Colouring Matters [*Blue*]; *Manufacture or Production of New* ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 3673, Feb. 24, 1900.

The process consists in combining a diazo derivative with one molecular proportion of *a* naphthylamine 3′- or 2′-sulphonic acid (Cleve acid) rediazotising the resulting amino-azo compound, combining with a second molecular proportion of a Cleve acid, again diazotising, and combining the diazodisazo dyestuff with 2.4′.2′-aminonaphthol sulphonic acid, or with alkyl, alphyl, or acidyl derivatives thereof. When the first or last components themselves confer sufficient solubility on the finished product, as, for example, with aminosulphosalicylic acid, sulphanilic acid, or the glycine derivative of 2.4′.2′-aminonaphthol sulphonic acid, it is then possible to dispense with the employment of Cleve's acid, and *a*-naphthylamine may be used instead. The dyestuffs obtained according to this specification give blue shades on unmordanted cotton, which are distinguished for their fastness to light. The following is a typical example. The diazo solution, prepared in the ordinary manner from 15 kilos. of acetyl-*p*-phenylene diamine, 7 kilos. of sodium nitrite, and a suitable quantity of hydrochloric acid is run into an aqueous solution of 25 kilos. of the sodium salt of 1.2′-naphthylamine sulphonic acid and an excess of sodium acetate. After the conversion of the dyestuff so formed into the sodium salt by the addition of dilute soda lye or of sodium carbonate, the product is rediazotised with 7·5 kilos. of sodium nitrite and hydrochloric acid. The diazotisation is complete after stirring for several hours, and the diazo compound produced is combined in the usual way with 25 kilos. of the sodium salt of 1.2′-naphthylamine sulphonic acid, the whole being stirred for several hours, until the formation of the disazo dyestuff is complete. This product is then salted out. It is subsequently mixed with water and 7·25 kilos. of sodium nitrite, and carefully acidulated in the cold with hydrochloric acid, with constant agitation. The diazo compound formed is then added to a solution of 24 kilos. of 2.4′.2′-aminonaphthol sulphonic acid together with an excess of sodium carbonate. After salting out, the trisazo dyestuff so produced is filtered off, and, in order to split off the acetyl group, it is mixed with hot water and with about 60—70 kilos. of sodium hydroxide, and boiled for a short time. Finally, the alkali is neutralised with hydrochloric acid, and the new trisazo dyestuff produced is salted out, filter-pressed, dried, and powdered. It dyes unmordanted cotton clear blue shades which are fast to light.—T. A. L.

Dyestuffs [*Brown*] *deriving from* 2.2′-*Aminonaphthol-disulpho Acid; Production of* ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 3208, Feb. 17, 1900.

The aminonaphthol sulphonic acid R can be readily converted into a disulphonic acid, and, after diazotisation, combines with amines and phenols, yielding easily soluble azo dyestuffs, which, by the aid of chromates, can be fixed fast to milling. For instance, 32 kilos. of 2.2′-aminonaphthol disulphonic acid, 23 kilos. of soda-lye (40° B.), and 7 kilos. of sodium nitrite are dissolved in about 200 litres of water, cooled to 0° C., and allowed to run into 53 kilos. of hydrochloric acid (21° B.), and 200 kilos. of ice. In about 30 minutes the diazosulphonic acid formed is added to a solution of 11 kilos. of *m*-phenylene diamine and 42 kilos. of sodium acetate. When the reaction is complete the whole is made alkaline with sodium carbonate, heated to 60° C., and the dyestuff finally salted out. It gives brownish-orange shades on wool from an acid bath, changed by the action of chromates to a full dark-brown, perfectly fast to milling and very fast to light.—T. A. L.

Amines from the Corresponding Nitro Compounds; Production of ——. G. W. Johnson, London. From C. F. Boehringer und Soehne, Waldhof, Mannheim, Germany. Eng. Pat. 4175, March 5, 1900.

The patentees find that aromatic and fatty nitro compounds can be readily reduced, by means of an electric current, to the corresponding amines if suspended or dissolved in aqueous or dilute alcoholic hydrochloric acid, employing a a tin cathode. In place of tin, an indifferent cathode (platinum, lead, carbon, or nickel) may be employed if a small quantity of a tin salt be added to the cathode electrolyte. The following is the method given for the preparation of aniline:—The electrolytic cell, divided into an anode and a cathode compartment, is provided with an anode composed of some indifferent material in sulphuric acid. The cathode compartment contains a mixture of 150 volumes of alcohol, 50 volumes of fuming hydrochloric acid, and 25 volumes of nitrobenzene, or else 25 volumes of nitrobenzene, 50 volumes of water, and 50 volumes of fuming hydrochloric acid, and is provided with a tin cathode, a stirrer, and a cooling jacket. A current of 1,800 ampères per square metre density is passed through the cell, and reduction proceeds very vigorously and without evolution of hydrogen, until the reduction is complete, when a regular current of hydrogen is given off. The cathode liquid is then filtered from the tin sponge and evaporated, yielding aniline hydrochloride in almost theoretical yield. If a nickel wire netting cathode be used in place of the tin, it is necessary to add 2 parts by weight of stannous chloride to the cathode liquid, consisting of 12 volumes of nitrobenzene, 75 kilos. or fuming hydrochloric acid, and 50 volumes of water, the current density in this case being 1,000 ampères per square metre.—T. A. L.

Colouring Matters; Preparation of Intermediate Products for the Production of ——. A. G. Green, A. Meyenberg, and The Clayton Aniline Co., Ltd., Manchester. Eng. Pat. 4792, March 13, 1900.

The present invention relates to the production of mono- and dithiosulphonic acids ($RS.SO_3H$) of aromatic monamines or *m*-diamines by the action of sulphurous acid on the disulphides. These latter are usually readily obtained by the action of sulphur on the amines at not too high a temperature. In order to convert them into the thiosulphonic acids it is unnecessary to isolate them, as the whole reaction product may be treated directly in a suitable solvent with a current of sulphurous acid gas. For example, the moderate action of sulphur (3 atomic proportions) on aniline (2 molecular proportions) yields as chief product aniline o-disulphide—

$$H_2N.C_6H_4.S.S.C_6H_4.NH_2$$

(Hofmann, Ber. **12**, 2363), of which 100 kilos. of the hydrochloride are stirred to a paste with 300 to 500 litres of water and saturated cold with sulphurous acid. After standing some time the solution is heated to boiling, with continued stirring, the gas still being passed through, and is then filtered, when, on cooling, aniline *o*-thiosulphonic acid separates in long colourless needles. On boiling the product in alkaline or acid solution, it gives off sulphurous acid, reproducing the original disulphide. When treated with nitrous acid it yields a diazo sulphide, $C_6H_4N_2S$ (Jacobsen, Ber. **21**, 2304), which is incapable of combining with phenols. This property distinguishes it from the aniline *p*-thiosulphonic acid (obtained from aniline *p*-disulphide, Hofmann, Ber. **27**, 2413), the diazo compound of which will combine. The patentees have also obtained thiosulphonic acids by the action of sulphurous acid on dimethyl- and diethyl-aniline disulphide, and on the acid-soluble and acid-insoluble amorphous products formed by the action of sulphur on *m*-phenylene and on 1.2.4-tolylene diamine.—T. A. L.

Aromatic Sulphinic Acids; Manufacture of ——. O. Imray, London. From The Basle Chemical Works, Basle, Switzerland. Eng. Pat. 20,864, Nov. 19, 1900.

This specification describes a method for obtaining sulphinic acids from sulphazides (Eng. Pat. 12,872 of 1900; see below), and an improved method for obtaining sulphinic acids without the use of copper salts (Eng. Pat. 12,871 of 1900; this Journal, 1900, 893). The patentees find that the sulphazides are readily converted into sulphinic acids by treatment with an alcoholic solution of sulphurous acid in presence of a little copper salt. For instance, 10·7 kilos. of *o*-toluidine are diazotised in 30 kilos. of alcohol and 26 kilos. of hydrochloric acid (30 per cent. HCl) with 7 kilos. of sodium nitrite in 15 litres of water. The diazo solution is then mixed at 5°—10° C. with 35 kilos. of sodium bisulphite solution (34 per cent.) and 30 kilos. of an alcoholic solution of sulphurous acid (35 per cent. SO_2), with constant agitation, the mixture being allowed to stand finally for a few hours at 15°—20° C., until the evolution of nitrogen has almost ceased and the sulphazide has separated. An aqueous solution of 2·5 kilos. of copper sulphate in 10 litres of water is then added, and the stirring is continued until the sulphazide has dissolved and nitrogen is no longer evolved. The mixture is then heated to 40°—50° C., neutralised with sodium carbonate, the alcohol distilled off, and the sulphinic acid precipitated with hydrochloric acid. The patentees also find that aromatic sulphinic acids can be produced without the use of copper salts if the diazo salts be first combined with primary or secondary amines to form diazo-amino compounds, and then treated with an alcoholic solution of sulphurous anhydride. For example, 10 kilos. of diazo-aminobenzene are mixed with 30 kilos. of a 10 per cent. alcoholic solution of sulphurous anhydride, the temperature being kept at about 30° C., and allowed finally to rise to about 60° C. When the evolution of nitrogen has ceased, the mixture is neutralised with sodium carbonate solution, the alcohol is distilled off, the oily layer is separated from the aqueous solution, and the sulphinic acid is isolated from the latter.—T. A. L.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Cellulose; Method of Dissolving ——, *by Means of Ammonia and Copper.* — Thiele. Rev. Prod. Chim. **3**, [21], 325.

Cotton wool is mercerised by means of caustic soda, and, after being carefully drained of all excess of that reagent, is opened out and immersed in an ammoniacal solution of cupric oxide, which is said to dissolve it almost immediately at the ordinary temperature, whereas ordinary cellulose takes several days to dissolve in Schweizer's reagent. —C. S.

PATENTS.

Cuprammonia Solution; Manufacture of ——. J. Imray, London. From E. Bronnert, Niedermorschweiler, Alsace; M. Frémery and J. Urban, both of Dremmen, Regierungsbezirk Aachen, Germany. Eng. Pat. 1763, Jan. 27, 1900.

Copper strips are covered with ammonia solution of about 12 to 14 per cent. in a tall cylinder cooled externally, and cold compressed air is blown through, care being taken that the temperature does not rise above 5° C. The solution obtained contains from 4 to 5 per cent. of copper; but at a higher temperature than that of its production, copper hydroxide precipitates, leaving in solution from 2 to 2·5 per cent. of copper.—E. S.

Wools and Textile Materials; Process for Cleaning, Degreasing, or Scouring and Bleaching ——. A. Bourin, Paris, and F. Aymerie, Ivry, France. Eng. Pat. 2070, Feb. 1, 1900.

Ozone is used in this process as the bleaching and degreasing agent. Wool, either raw, opened, or woven, is placed in a chamber communicating with one where the ozone is produced. The wool chamber is exhausted, and the ozone, freshly made, is led into it, and produces the desired effect. —C. M.

Wool and other Animal or Vegetable Fibrous Materials [Removal of Fat]; Treatment of ——. A. J. Boult, London. From F. Wislicki, Tubize, Belgium. Eng. Pat. 10,438, June 7, 1900.

Wool or other material is digested with a volatile solvent, such as benzene, in an air-tight cylinder. After the necessary time, the benzene is forced out by forcing in sulphurous acid gas from a reservoir of the liquefied gas. A slight carbonisation takes place.

This operation is repeated until the whole of the fatty matters are dissolved.

The wool is then treated either with hot or cold water, to dissolve out any alkaline sulphites that may have formed. —C. M.

Wool and other Animal Fibres; Machines for Washing, Rinsing, or Chemically Treating ——. E. Maertens, Providence, Rhode Island, U.S.A. Eng. Pat. 11,055, June 18, 1900.

A machine in which wool is made to pass through several troughs situated one above the other, passing from one to another by means of chutes. The washing fluid is also kept circulating by means of a centrifugal pump, and arrangements are made so that the dirty washing fluid can be drained off, and the wool, while still traversing the machine, washed with clean water from a high-pressure main.—C. M.

Wool and other Animal Fibres; The Art of Cleaning, with Volatile Solvents ——. E. Maertens, Providence, Rhode Island, U.S.A. Eng. Pat. 20,066, Nov. 7, 1900.

Wool is treated in a closed digester with any suitable volatile solvent, either once or as many times as may be necessary. The solvent is drained off, a vacuum is produced in the digester, and then gaseous fluid admitted to remove any remaining solvent.

The solvent and water extracts are separated as completely as possible. The wool-fat is extracted from the volatile solvent, and the potash and any other salts from the aqueous extract.—C. M.

Fibrous Materials, from Grease, Mineral Oil, and other Impurities; Process and Apparatus for Purifying ——. A. Goldzweig, Lodz, Russia. Eng. Pat. 11,426, June 23, 1900.

Fibrous material is placed in an hermetically sealed vessel and heated at 100° C. until the pressure rises. When this is the case the fibres are compressed with a hydraulic ram, which squeezes out the melted grease. This grease is heated for two hours at 130° to 150° C., and continually stirred. It is then allowed to settle and the thin oil on the top separated from the greasy soap beneath. The latter is mixed with 5 per cent. of lime, diluted to a pulpy mass, and boiled for three hours. It is then separated, washed with water, and treated with 1 per cent. hydrochloric acid. The purified grease is then emulsified with 3 per cent. ammonia soda. The fibre, from which the greasy matters have been expressed or partially expressed, is then washed well with this emulsion until quite free from grease.—C. M.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

Rabbits Fur [Hat Making]; Dyeing Mixtures of ——. Deutsch. Färber-Zeit. Deutsch. Hutmach. Zeit. **32**, [3], 1.

The shade to be dyed depends largely on the process of mordanting to which the fur has been subjected. For white-mordanted goods, the following shades are recommended:—

Light grey: Patent Cyanol extra, 0·02 per cent.; orchil substitute N (powder), 0·04 per cent. *Greenish grey:* Cyanol extra, 0·03 per cent.; Naphthol Yellow, 0·03 per cent. *Light Beige:* Cyanol extra, 0·03 per cent.; Orange extra, 0·03 per cent. *Yellow Beaver:* Cyanol extra, 0·02 per cent.; Orange extra, 0·03 per cent. *Red Beaver:* Cyanol extra, 0·03 per cent.; Orange extra 0·05 per cent. *Pea green:* Cyanol extra, 0·4 per cent.; Indian Yellow G, 0·8 per cent. *Light blue:* Cyanol extra, 0·2 per cent. *Tegethoff Blue:* Cyanol extra, 5 per cent. *Blue:* Cyanol extra, 3 per cent.; Fast Blue G G, 2·4 per cent. *Cardinal:* Ponceau Red, 4 per cent.

For yellow-mordanted goods, the following shades, being fuller and covering better, are more adapted:—

Mode shade: Cyanol extra, 0·3 per cent.; Orange extra, 0·6 per cent. *Nutria:* Cyanol extra, 0·7 per cent.; Orange extra, 0·7 per cent.; Orchil substitute N (powder), 0·1 per cent. *Fawn:* Cyanol extra, 0·6 per cent.; Orange extra, 0·1 per cent. *Brown:* Cyanol extra, 0·14 per cent.; Orange extra, 0·2 per cent. *Moss Green:* Cyanol extra, 3 per cent.; Tropæoline O, 3 per cent.; Orchil substitute N (powder), 2 per cent. *Dark Green:* Cyanol extra, 4 per cent.; Indian Yellow G, 2 per cent. *Russian Green:* Cyanol extra, 6 per cent.; Indian Yellow G, 2 per cent.; Patent Anthracite Black B, 1 per cent. *Bordeaux:* Cyanol extra, 0·5 per cent.; Orange extra, 0·4 per cent.; Azo Red A, 0·4 per cent. *Black:* Naphthylamine Black 4 B, 10—14 per cent.; Indian Yellow G, 1·5—2·5 per cent.

For colours, the goods after being well steeped in hot water, are entered in a bath—preferably cold, or not exceeding 40° C.—containing 10 to 15 per cent. of sodium sulphate. Here they are worked for about 20 minutes, the temperature being then slowly raised to boiling point. After half an hour, 4—6 per cent. of sulphuric acid (previously diluted), is added, and boiling is continued till the bath is completely exhausted For black, the bath is prepared in the same way, acid being added as required. Light-weight goods should be chromed in advance with $1\frac{1}{2}$—2 per cent. of potassium bichromate for half an hour, since this preserves their strength; but excessive boiling should be avoided.—C. S.

Leather; Dyeing, Staining and Finishing of ——. M. C. Lamb. Leather Trades Rev. **33,** [769], 959. (See this Journal, 1901, 41.)

Dyeing and Finishing of Shoe Calf.—After the preliminary operations of sorting, soaking, shaving, scouring, &c., described in this Journal, 1901, 41, the skins should be drummed for two or three hours in a good sumac liquor, then washed in tepid water to remove any adhering sumac, and carefully set out on the grain. They are then dyed either in tray or paddle, the temperature of the dye-bath being kept as near 45° C. as possible during the operation. From three quarters of an hour to an hour is generally found sufficient time for the dyeing operation in order to get the full depth of shade. Either acid or basic dyestuffs are used; the former are to be preferred owing to their not showing up the defects of the grain so much as the latter.

After dyeing, the skins are well washed in cold water, hung over a trestle to drain, then set out on the flesh side, and oiled over with linseed or cod oil on the flesh. The goods are now laid in pile, flesh to flesh, over-night, and are then hung up until sufficiently dry for setting out. When set out, they are dried out. If the colour of the dyed skin is not as full as desired, it may be topped over, after dyeing, by brushing on the grain side of the skin a $\frac{1}{2}$ per cent. solution of the dyestuff used.

Finishing.—Every finisher has his own recipe, but, with modifications to suit individual requirements, the following will be found useful; 2 oz. of gelatin are dissolved in $2\frac{1}{2}$ galls. of water, 3 oz. of linseed, together with 16 oz. of carnauba wax and 12 oz. of white curd soap are added, and the whole boiled for two or three hours, with occasional stirring during the boiling until the wax has dissolved; the mixture is strained through muslin, and allowed to cool. The skins are given one coat of the above finish after setting out. When dry the goods are given a second coat. They may then be put on one side for a few minutes, and afterwards polished with a flannel.

Other mixtures may be used for seasoning calf, such as mixtures of gelatin and Iceland moss, linseed mucilage and starch, gum tragacanth, blood albumin, and milk. After seasoning, the skins are dried out, rolled on the grain if a bright finish is required, or they may be glassed on the table by hand, lightly perched to soften, and brushed over on the grain with a soft brush.—J. G. P.

Waste Products [Naphthenic Acids] of the Mineral Oil Industry; Utilising ——. F. Ulzer. Zeits. angew. Chem. 1900, [50], 1273.

See under III., *page* 112.

Milk; Coagulation of ——, *Spontaneously and by Rennet, Lactic Acid Ferment, and Rennet Ferment.* T. Bokorny.

See under XVIII. A., *page* 144.

Bleaching Apparatus; Electric ——, *of Haas and Oettel.* F. Oettel.

See under XI. A., *page* 130.

PATENTS.

Piece Goods in the Open State; Scouring, Bleaching, Dyeing, Mercerising, or otherwise Treating ——. C. L. Jackson and E. W. Hunt, Bolton. Eng. Pat. 5409, March 22, 1900.

The object of this invention is more effectually than hitherto to scour, dye, &c. in the open state, certain tissues, such as

Fig. 1.

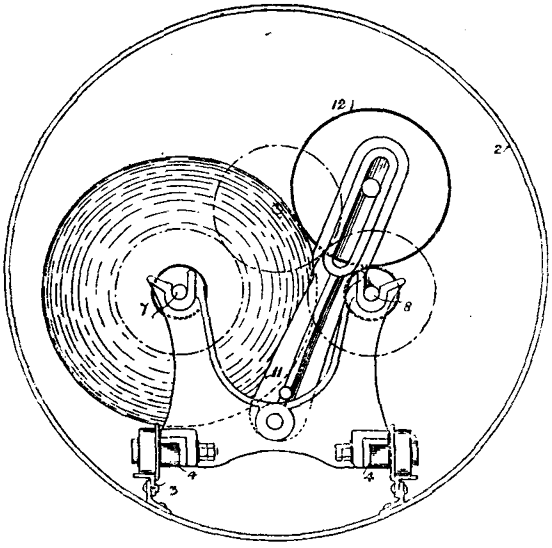
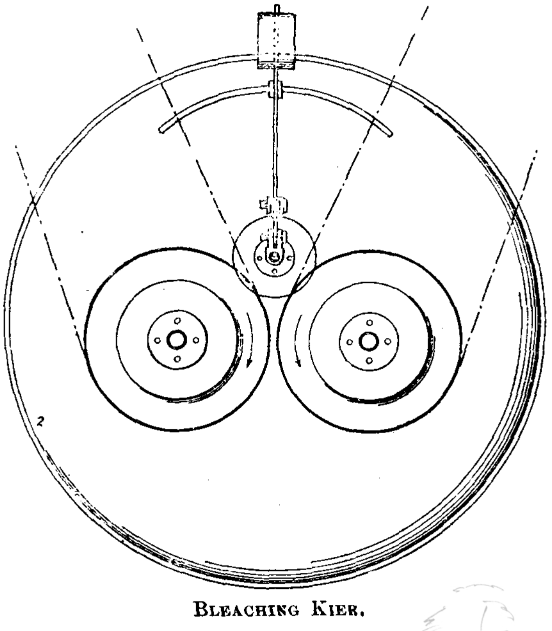


Fig. 2.



Bleaching Kier.

drills, sateens, and velvets, which tend to crease and to curl at the selvedges during such treatment.

The tissue to be treated is wound upon a batching roller, 7 or 8 (see figure), carried by a frame, 4, running upon rails, 3, inside and out of kier, 2. A large perforated drum, 12, is mounted between the rollers in such a manner as to remain in contact with the tissue as it passes from one roller to the other.

To use the apparatus, the frame containing a roll of tissue on one of the rollers is placed inside the kier, the door of which is then closed. The kier is charged with the scouring or other liquor, which is, if desired, heated by steam, and circulated by means of a pump, external pipe, and internal spreader plate. The tissue is wound backwards and forwards from one roller to the other, the direction of its course being changed either automatically by the mechanism shown in the figure or by hand.—E. B.

Colours upon Threads; Producing Repetitions of Long Suites of ——. O. Hoffmann, Neugersdorf, Germany. Eng. Pat. 379, Jan. 6, 1900.

A METHOD of colouring yarns in the form of hanks. These are dyed various colours in different parts. According to the manner of winding the yarns into hanks, before these are dyed, the colours are caused to succeed one another regularly or more or less irregularly throughout the length of the threads.—E. B.

Dyeing, Bleaching, or otherwise Treating Cops of Spun Yarn; Apparatus for ——. J. Major and T. J. Wood, Eccles. Eng. Pat. 509, Jan. 9, 1900.

THE capacity of the cop-dyeing machine, which forms the subject of Eng. Pat. 25,525 of 1898 (this Journal, 1898, 1122) is doubled, with little addition to the size and cost of the apparatus, by modifying the construction of the revolving spindles, &c. in this apparatus, and making each spindle carry two cops, one below the other, in place of one only as previously.—E. B.

Discharge Effects on Indigo-Dyed Silk and Woollen Goods. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 14,229, Aug. 8, 1900.

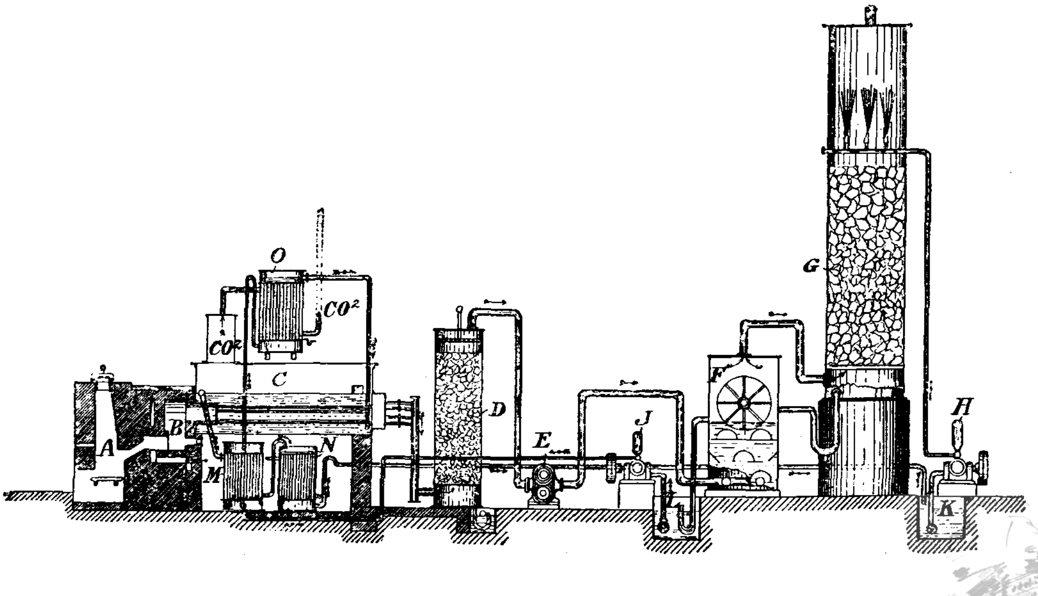
HITHERTO the white discharge effects upon Indigo-dyed woollen tissues, obtained by printing these with an alkali chromate discharging mixture and passing through a bath of sulphuric and oxalic acids, have been imperfect, and colour discharges do not appear to have been attempted upon Indigo-dyed fabrics composed of either wool or silk. According to the present invention, satisfactory white discharges upon Indigo-dyed woollen tissues and excellent colour discharges upon similarly dyed woollen and silk tissues are produced by treating the tissues in the manner described in Eng. Pat. 2689 of 1900 (this Journal, 1901, 41), namely, by printing with an alkali chromate discharging mixture, steaming for five minutes, passing through a bath of sulphuric and oxalic acids, and then clearing with sulphurous acid, hydrogen peroxide, or potassium percarbonate, afterwards washing and drying. The colour discharges are produced by adding suitable dyestuffs to the thickened solution of alkali chromate; for instance:—Induline Scarlet, Azoflavins 3 G extra and 3 R, "Rhodamine extra," Methylene Blues BGN and B. A white discharge is obtained upon Indigo-dyed wool with a mixture of 350 parts of gum tragacanth paste (6 per cent.), 400 parts of gum solution (1 : 1), 125 parts of water, 300 parts of sodium bichromate. After steaming, the tissue is passed for about 20 seconds into a bath containing 50 grms. of sulphuric acid and the same quantity of oxalic acid per litre, at a temperature of 55°—57° C. Then it is left for several hours in a bleaching bath composed, for example, of 500 parts of hydrogen peroxide solution (2—3 per cent. of H_2O_2), 500 parts of water, and 15 parts of ammonia solution (20 per cent. of NH_3). A mixture of 300 parts of gum tragacanth paste, 300 parts of gum solution, 610 parts of water, 300 parts of sodium bichromate, and 60 parts of Induline Scarlet, gives a red discharge by the same method.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Carbon Dioxide Manufacture. E. Schmatolla. Zeits. angew. Chem. 1900, 1284—1288.

CARBON dioxide is largely manufactured in Germany, though over-production has lowered prices to an almost unremunerative figure. The South German and Rhenish production is chiefly from natural sources, while the North German works use artificial means, especially the burning of coke and the heating of limestone or magnesite. The percentage of carbon dioxide in the gases from a good coke burner almost reaches the theoretical (20·8); and by passing the hot gases through kilns containing limestone or magnesite, this can be increased to about 28 per cent. The gas is almost always purified by absorbing the carbon dioxide from the washed gases by potash ley of about 1·14 sp. gr., and decomposing the bicarbonate formed, by heating to 100° C. The carbon dioxide is given off mixed with only water vapour, which is separated by cooling, and the gas is then liquefied by means of appropriate machinery.

The figure gives a diagrammatic view of a suitable plant for working the process. Coke is burnt in the generator A, and the combustion is completed by admitting hot air to the products as they pass into the combustion chamber B. The carbon monoxide, and more especially the hydrogen sulphide, are thus completely oxidised; the gases passing



out of the chamber contain about 18 per cent. of carbon dioxide. The hot gases then pass through a number of tubes contained in the vessel C, so that their heat is utilised in decomposing the bicarbonate liquor which is pumped into this vessel. Leaving the heater they pass through one or more wash-towers D containing limestone over which water trickles; here they are freed from dust and from sulphur dioxide. E is a blower or fan, which sucks the gases through the furnace and drives them through the absorbing apparatus. F is a rectangular vessel filled with potash ley to a height dependent on the power of the blower, and provided with a number of semi-circular baffle-plates, arranged, as shown in section, so that the gas accumulates under them successively, and thus remains exposed for a considerable time under the pressure of the column of fluid, to a large surface of liquid; an agitator at the surface throws the liquid into the upper portion of the vessel, and thus further helps the absorption. From F the gases pass into the tower G, where the absorption is as far as possible completed, and then leave the apparatus. The circulation of the potash ley may be looked on as starting from the tank K, whence it is pumped by H, through the Körting's jets, into the upper part of G, which is thus filled with fine spray. The siphon at the bottom of the tower delivers the partially saturated ley into F, which it leaves, practically saturated, by the overflow siphon, and accumulates in the tank L. From this it is driven by the pump J through the tubular vessels M and O, where it undergoes a preliminary heating (to about 60° and 90° C. respectively), into the heater C, where its temperature is raised to 100° C., and where the bicarbonate is completely decomposed. The hot "poor ley" passes, as shown, from O into M, where it gives up some of its heat to the saturated ley passing in the opposite direction through the tubes, and which it leaves at about 45° C., to pass through the similar vessel N, where it is further cooled by water, and back to the tank K. The hot carbon dioxide and steam pass out from C through O, where their surplus heat is used in heating the in-coming saturated ley, to a cooler, and ultimately to a gas-holder, from which the carbon dioxide is drawn as required for compression.

The points on which stress is laid are: (1) The mode of combustion by generator and subsidiary combustion chamber; (2) The arrangement for absorption, by which this is rendered as nearly complete as practicable, while yet requiring a minimum of expenditure on power for agitating, or on renewal of moving parts; and (3) The utilisation of as much as possible of the heat of combustion, both in the tubular vessels M and O, where the hot "poor ley" and the hot gases respectively warm the in-coming saturated ley, and in the heater C, where, by an arrangement of horizontal baffle-plates, the liquor is made to traverse the vessel backwards and forwards as it rises to the top, while the hot gases are similarly carried backwards and forwards in the opposite direction through the arrangement of tubes.—J. T. D.

Carbon Dioxide; Examination of Commercial Liquid ——. A. Lange. Chem. Ind. 1900, 23, [24], 530—541.

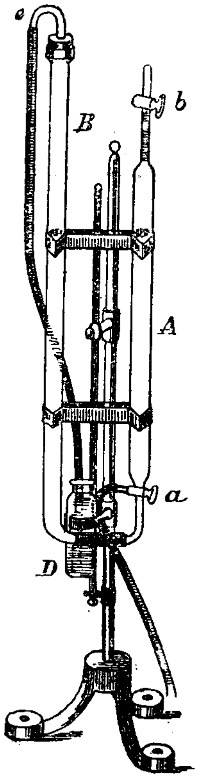
To determine the amount of air, *i.e.*, gases not dissolved by caustic potash, contained in commercial carbon dioxide, both gaseous and liquid, the author used a modified form of Winkler's burette shown in the illustration, which largely explains itself. The tube A has a volume of 100 c.c. between the taps *a* and *b*, the narrow portion containing about 5 c.c. and being graduated in 1/20 c.c., whilst the bottle D holds about 250 c.c. *a* is a three-way tap which allows the tube A to be filled either with potash solution from the other limb B, or with carbon dioxide through a rubber tube shown attached. To adjust the apparatus, the stopper with curved tube *e*, is removed from B, and sufficient potash solution (sp. gr. 1·297) is added to more than half fill both limbs when *a* is open; the stopper is then replaced. The column of liquid in A is now blown back by a tube attached to *b* until its level is at the tap *a*, which is then closed. This produces a continuous column of liquid from *a* to the bottle D which is then nearly filled with solution and adjusted on the stand so that the liquid level is in a line with the tap *a*. By this arrangement the potash falls automatically to the tap *a*, whenever *b* is opened after an experiment, and the large amount of it used permits of many successive analyses. To fill the limb A with gaseous carbon dioxide, the valve of the cylinder standing erect, is opened and regulated until a gentle stream of gas escapes; it is then connected to the tap *a* so that gas flows into A and escapes through *b* driving the air before it. After one minute, *b* is shut off, the leading tube is slipped from *a* so that the sample, being momentarily free to the air assumes the atmospheric pressure, and this tap is then rotated through 90° allowing the ingress of potash. Absorption is accelerated by inclining the tube A and completed by shaking it; the levels in D and A are adjusted by lifting D and the height then read. D is then returned to its original position. By means of a correction table this movement of D may be obviated.

To obtain a sample of liquid carbon dioxide, the cylinder is placed horizontally on a support with its valve pointing upward; by opening it gradually a slow stream of liquid is released. This may be difficult to effect with some valves and a second reducing valve may be required, which must be carefully washed out with the liquid before the sample is taken.

With this apparatus, under various conditions of temperature and pressure and modes of release, the relation between the amount of air contained in the gas space (if any) of a cylinder and the amount dissolved in the liquid itself was examined, the author's conclusions being as follows:—

(1) Cylinders filled with carbon dioxide in accordance with railway regulations, are entirely full of liquid between the temperatures 22° and 24° C. No precautions in transport are necessary, because liquid CO_2 admits of great compression and its pressure only very gradually increases with rising temperature.

(2) There is also no gas space at temperatures above 22° C. and a sample (gaseous) taken from a standing cylinder represents liquid CO_2. Tests rapidly following one another, may show suddenly elevated results, owing to the cooling action produced by drawing off the samples whereupon a gas with increased air-content would fill up the gas space so produced.



(3) No separation between air and carbon dioxide occurs in the gas-space of a cylinder, but the space is filled with a homogeneous mixture. Nothing is gained, therefore, by allowing the cylinder to blow off for a short time when taking a sample (*cf.* Holste, Zeits. ges. Kohlensäureindustrie, 1897, 461).

(4) The air-content of liquid CO_2 in an upright cylinder, at a temperature not exceeding 22° C., and filled in the usual manner, does not suddenly change when allowed to blow off, but falls gradually.

(5) The air dissolved in the liquid CO_2 escapes with the gas in such a manner that after the blowing off of a part, not always the same, of the cylinder's contents, an air-free residue remains.

(6) The amount of air present in the gas-space of a cylinder increases with rise of temperature, but is also greater at 0° C. than at 15° C.

(7) No definite relation exists between the amount of air present in the gas-space and in the liquid carbon dioxide, so that an increased air-content in the gas-space does not necessarily

betoken a larger amount of air in the liquid. It would seem impossible for the air-content of the gas- space to be less than twice that of the liquid.

(8) The composition of the gas contained in a cylinder gives no important criterion of the amount of air present in pure carbon dioxide. The average air-content of liquid CO_2 is very closely ascertained by estimating the amount of air in the liquid. The air-content of the gas-space need only be determined for the comparison of experiments when a very exact determination of the average air-content is desired. In such cases Holste's calculation (*loc. cit.*) and its modification must be applied.

(9) Generally speaking, two analyses of the carbon dioxide present in the gas-space are sufficient to determine the air-content of the gas taken from a cylinder. This air-content is practically the arithmetical mean of the two analyses, unless indeed the carbon dioxide, after removal of the first sample, is already air-free. For experimental results and the method of applying Holste's calculation, the original paper should be consulted.—R. L. J.

Caustic Soda and Chlorine; Manufacture of ——, by the Electrolysis of Sodium Chloride. Cohn and Geisenberger. Rev. Prod. Chim. **3**, [18], 277.

To dispense with the use of short-lived diaphragms, and to separate the sodium hydroxide from the solution of chloride, the authors propose to conduct operations in the cold, which causes the former compound to solidify and separate out; and they employ an apparatus consisting of a cylinder to hold the sodium chloride solution, this cylinder being mounted on an axis so as to be capable of rotation, and being also immersed in a refrigerator. The electrodes at which the chlorine is liberated are supported in a cell made of stoneware, glass, ebonite, or other insulating material capable of resisting the action of chlorine; and another cell receives the crystals of sodium hydroxide. The cells may be charged with light liquids inert towards the products formed therein. The electrodes, of material able to resist chlorine, are supported by cross pieces, and the entire apparatus is placed in an insulated case.—C. S.

Hydrochloric Acid; Preparation of Chemically Pure ——. — Haën. Rev. Prod. Chim. **3**, [21], 325.

The crude acid, freed from arsenic, is introduced by degrees into a bath of boiling sulphuric acid, diluted to such a degree that its boiling-point is only some 10° C. higher than that of hydrochloric acid. The distillation thus produced, is rendered continuous by replacing the vaporised HCl by more crude acid; and the product is of the same degree of concentration as the original acid. Leaden stills are used, and the sulphuric acid-bath is heated by a leaden coil containing steam, under a pressure of about three atmospheres; the condenser for the distilled acid is of earthenware. A still holding half a cb. metre, with four condensing coils, will produce 2,000 kilos. of chemically pure acid per 24 hours. The internal surface of the still soon becomes covered with a layer of lead chloride, which preserves the metal from further corrosion.—C. S.

Iodic Acid; the Preparation of ——. A. Scott and W. Arbuckle. Proc. Chem. Soc. **17**$_3$ [231], 2.

The usual method of preparing iodic acid, by gently boiling iodine with nitric acid in a flask with a long neck, is tedious when any quantity is required, and liable to great loss of iodine unless the source of heat is very carefully regulated. By using, first, the ordinary form, and, later, a modified form, of Soxhlet's fat extraction apparatus to contain the iodine, almost theoretical yields of iodic acid were obtained after a very short treatment with the boiling nitric acid. The liability, however, of the siphon tube to become choked with crystals of iodic acid, led to the abandonment of this type of apparatus. After many trials with various forms of apparatus, the authors recommend the use of a round-bottomed flask having a ground-in neck carrying two tubes, to one of which is sealed a reflux condenser, and through the other is fitted a tube by means of which a current of oxygen is passed through the boiling liquid. With this apparatus, finely powdered iodine boiled with ten times its weight of fuming nitric acid may be completely oxidised in 20—30 minutes.

Chromic Acid; The Electrolytic Regeneration of ——, and the Manufacture of Acid-proof Diaphragms. M. Le Blanc.

See under XI. A., *page* 132.

PATENTS.

Solutions [Sugar, &c.]; Treatment of ——, to Precipitate Matter contained in them. S. M. Lillie. Eng. Pat. 17,924, Oct. 9, 1900.

See under XVI., *page* 140.

Acetic Acid; Manufacture of ——. P. Boessneck, Glauchau, Saxony. Eng. Pat. 25,077, Dec. 18, 1899.

A "continuous-column still" is described as the most suitable for a continuous process of producing acetic acid, as is here claimed. A mixture of pyrolignite of lime and hydrochloric acid (preferably) is fed into the still, and superheated steam is used for heating it. The calcium chloride solution flowing off is said to contain only traces of acetic acid.—E. S.

Salt from Solutions; Vacuum Apparatus for Separating ——, especially from Brine. G. N. Vis, Schweizerhalle, near Basle, Switzerland. Eng. Pat. 25,640, Dec. 28, 1899.

An improvement on Eng. Pat. 16,738, 1899 (this Journal, 1900, 1111), in respect to the pipe descending from each boiler from above the normal level of the brine to the brine reservoir, for the purpose of keeping constant the level of the brine in other boilers of the series whilst the salt is being periodically discharged. It has been found that these "equalising pipes," owing to frequent passages of air through them, are liable to obstruction from incrustations. To prevent this, under the present invention, the pipe is led to dip into a relatively small vessel containing a non-incrusting liquid (such as water, glycerin, oil, mercury, or the like), open to the atmosphere; and near the upper end of the pipe is a still smaller box or cavity, provided with baffle plates, the size and length of the pipe, and the size of the box and lower vessel being so adjusted that the box, at the most, may be filled with liquid to about half its height. A liquid seal is thus constituted. A pipe for periodically supplying the boiler from above the heating system with fresh brine, to remove incrustations, is also shown.—E. S.

Salts; The Crystallisation of ——. L. Kaufmann, Aix-la-Chapelle, Germany. Eng. Pat. 20,144, Nov. 8, 1900.

The saline solution is passed into a trough supported on a pivot, having a removable tight-fitting cover and a removable end piece provided with a slot for passage of air. The other end, receiving a pipe for admission of an air current or blast, has two apertures, closed during the working by a sliding valve. By means of a rod and lever keyed on to the pivoting axle a steady oscillatory movement is maintained, whereby the liquid is kept in agitation while the air current passes over its surface. When the crystals formed are ready for removal, the trough is tilted by means of one of a pair of oppositely placed levers below, so that the mother-liquor may be run out; by means of the other lever the trough is then inclined the opposite way, and the cover being removed, the crystals are discharged.—E. S.

Sulphuretted Hydrogen; Improved Means applicable for Use in the Desulphurisation of ——. J. Dewrance and J. H. Paul. Eng. Pat. 2146.

See under II., *page* 110.

VIII.—GLASS, POTTERY, ENAMELS.

Kaolin; Levigated ——. F. Ulzer. Mitt. des k.k. Techn. Gewerbe-Museums in Wien, 1900, **10**, [9, 10, and 11], 190—191.

The industrial value of this sample was investigated in the following manner. The kaolin was pure white, save for a few yellow streaks, was of non-adhesive nature, passed almost entirely through a sieve with 1,200 meshes per square metre, and contained 2·95 per cent. of iron oxide. 1 kilo. absorbed 560 grms. of water and formed a plastic mass, portions of which lost 6, 9, and 12 per cent. in volume at the respective temperatures, 950° C., 1,150° C., and 1,270° C. (approx.). Each test-piece was porous, and broke with an earthy fracture, the last being slightly yellow in colour. A porcelain mixture of the composition, kaolin, 340; sand, 360, and felspar, 300 parts by weight, was fired at similar temperatures. At 950° C. and 1,150° C. the tests remained earthy and porous; at 1,270° C. these characteristics were lost, the test assumed a yellow tint and was translucent in its thinnest portions. An alkaline glaze (K_2O, 0·3; CaO, 0·7; Al_2O_3, 0·5; SiO_2, 5·0) was successfully applied at a somewhat higher temperature. This kaolin could be employed in the manufacture of cream-coloured porcelain or fancy articles; also for filling paper. The amount of iron present makes it unsuitable for white porcelain or the preparation of ultramarine.—R. L. J.

Glass; Coloration of ——, *by Iron and Manganese.* Chr. Dralle. Chem. Zeit. 1900, **24**, [103], 1132—1136.

For the purposes of this investigation a glass was prepared from the following materials:—(1) sand, such as is used at Frede for making mirror glass, of the percentage composition, $SiO_2 = 99·786$, $Fe_2O_3 = 0·032$, $Al_2O_3 = 0·103$, $MgO = 0·005$, $CaO = 0·027$; (2) calcspar of the composition, $CaCO_3 = 98·44$, $MgCO_3 = 0·24$, $Fe_2O_3 = 0·09$; (3) pure sodium sulphate, calcined in a leaden pan; (4) pure sodium nitrate; and (5) wood charcoal. A mixture which would result in a trisilicate was first tried, but proved too viscid and otherwise unsuitable. The two following mixtures, one of a strongly oxidising nature, the other strongly reducing, and both yielding the same amount of glass, which, as analysis showed, agreed closely with the dimetasilicate $(NaO.SiO.O.SiO.O)_2Ca$, answered all requirements, and were used throughout the experiments.

Mixture I. (Oxidising).

	Parts.
Sand	685
Calcspar	285
Na_2CO_3	260
$NaNo_3$	65

Mixture II. (Reducing).

Sand	685
Calcspar	285
Na_2SO_4	400
Charcoal	20

318 grm. lots of I. and 350 grms. lots of II., each resulting in about 250 grms. of glass, were fused in fireclay crucibles together with gradually increased quantities of iron, added either as pure crystallised ferrous sulphate or ignited ferric oxide. The crucibles were heated around the edge of a large crucible of bottle glass where the temperature was between 1,550° and 1,650° C., and the fusions poured into a hot iron cylinder.

Two blank experiments showed that the raw materials were not quite as free from iron as supposed; the known amount being insufficient to produce the observed results, it was concluded that a further small quantity dissolved out from the substance of the crucibles.

The results of 23 experiments (including the blanks) are tabulated, and may be summarised as follows:—

i. The characteristic tint due to ferric oxide is yellow-green, that due to ferrous oxide, blue-green.

ii. Mixture I. always produced a ferric-oxide tint and mixture II. a ferrous-oxide tint, no matter which of the two iron compounds was added.

iii. In the formula, 100 parts of glass + x parts of iron, for all values of x up to 0·7 the iron has a greater colouring power in the ferric than in the ferrous condition; *i.e.*, the tint in the case of all experiments made with mixture I. was slightly deeper than the tint in the corresponding experiment with mixture II. When x exceeds 0·7 this relation is reversed.

In consequence of ii., the addition of iron as ferrous sulphate was abandoned in the later experiments, and only ferric oxide was employed. By the addition of 7·8 grms. of iron, both glasses were opaque, so the experiments ceased at this point.

The conclusions as to the action of manganese, are as follows:—

Manganese added in quantities from 0·05 to 0·8 part per 100 of glass has a greater colouring power as peroxide than as suboxide. In quantities from 0·4 to 0·6 the peroxide produces a violet tint, the suboxide a grey.

When 0·7 to 2·0 parts as MnO_2 are added to mixture I., a red colour appears and increases to deep violet; with 3·0 parts Mn the glass is opaque, and only transparent at the edges. Corresponding amounts of suboxide produce a tint that is first wine-yellow, and lastly amber-yellow, similar to that known in the industry as "gold-yellow."

As more than 3·0 parts of Mn added per 100 of mixture I. gave opaque products, the addition of MnO_2 was continued with mixture II. 4·5 and 5·6 parts of Mn (as MnO_2) produced much slag (fused sulphate); this was limited by using sufficient charcoal, and finally a green glass was obtained. To determine the reason of this, two lots of glass, mixture II., were melted; one with 5·8 grms. of pyrolusite, the other with 22·0 grms. of manganous sulphate. Both were amber-yellow with a brownish tint.

It seems apparent that in commercial glass, coloured gold, red-yellow, and brown, or (when iron is also used) light and dark greenish yellow to coffee-brown, the manganese is present as MnO. A small quantity of Mn_2O_3 may be also present, but any considerable amount renders the glass opaque. Also, the general opinion that the suboxide produces a rose tint is not supported by these experiments, in which 0·1—0·3, 0·4—1·0, 1·5—5·0 parts of Mn added as manganese sulphate give respectively pale green, yellow with grey undertone, and amber or gold-yellow coloration. To find the effect of still larger quantities of MnO, a glass was prepared of the composition—

$$\left.\begin{array}{l} 5SiO_2 \\ 1B_2O_3 \end{array}\right\rangle MnO : Na_2O,$$

in which all the lime was displaced. This was clear brown in colour, transparent in thin pieces, and opaque in thicker layers. As there was no reason to suppose that manganic oxide could be present, the coloration produced by the suboxide in quantity appears to be brown. In view of his results, the author rejects the usual theories on the decolorising of green-tinted (iron) glass by the use of manganese, but is unable to offer a substitute.—R. L. J.

PATENTS.

Glass; Manufacture of Sheet ——. P. T. Sievert, Dresden, Germany. Eng. Pat. 25,139, Dec. 19, 1899.

In the manufacture of sheet glass the spreading of the liquid glass over the casting table is usually carried out by means of rollers. The inventor's method consists in giving the table a shaking motion in all directions; moistened fibrous material forms the covering of the table, and a cover of non-conducting material may be used to aid in the formation of the sheet.—J. W. H.

Glass; Machines for Blowing ——. P. T. Sievert, Dresden, Germany. Eng. Pat. 18,449, Oct. 16, 1900.

A machine is claimed in which a sheet of glass is formed as described in the preceding abstract. While the sheet of glass is still molten, a mould plate is brought down upon it, when the disengaged steam from the moistened fibrous cover of the table, or compressed air or steam supplied through perforations in the table, blows the glass into the several moulds of the mould plate, cutters fixed to the edges of the moulds simultaneously separating the articles formed; the articles are then shaken out of the mould plate and annealed.—J. W. H.

Glass; Pressing or Moulding ——. A. Froyck, Sweden. Eng. Pat. 25,739, Dec. 30, 1899.

The objects are formed by pressing them out of the warm mass of glass against a soft or elastic bedding. Asbestos board, charcoal, and clay are mentioned as suitable materials for the bedding, which may, however, be faced with thin sheet metal.—J. W. H.

Glass; Manufacture of Prism ——, and Apparatus for that Purpose. F. L. O. Wadsworth, Alleghany, U.S.A. Eng. Pat. 17,686, Oct. 5, 1900.

The glass in a plastic condition is first rolled out into a plate of suitable thickness, and then pressed by means of dies to form the prismatic ridges. The glass obtained is free from strain, and may be cut with ordinary glass-cutting tools. Machinery for the manufacture is described.
J. W. H.

Glass-Blowing Machines. The Automatic Glass-Blowing Patents Syndicate, Ltd., West Bromwich. From H. J. Colburn, Toledo, U.S.A. Eng. Pat. 16,617, Sept. 18, 1900.

The moulds in this machine, after removal of the article made, are rocked about a horizontal spindle into a water-trough for cooling, and returned into position again for further service. The mould itself can be revolved and stopped automatically after a certain number of revolutions; the blow-pipe and the base of the mould are also capable of rotation in a direction opposite to that of the mould.
—J. W. H.

Glass-Blowing Machines. The Automatic Glass Blowing Patents Syndicate, Ltd., West Bromwich. From W. E. Bock, Toledo, U.S.A. Eng. Pat. 16,623, Sept. 18, 1900.

The invention relates to glass-blowing machines, in which the blow-pipes and moulds are carried in a circular path, the operations being performed during the circuit. The moulds are opened and closed during their travel round the machine by an air cylinder, the piston valve of which is actuated by the track on which the moulds (on rollers) move; devices are also described for controlling the action of the blow-pipes, regulating the air-supply, &c.—J. W. H.

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

Mortars; Tests of ——. T. Behrmann. Rigaer Ind. Zeit. 1900, **26**, 233; through Chem. Zeit. Rep. 1900, **24**, [104], 386.

Results are given of measurements of crushing stress carried out at intervals during a period of two years on mortars made from lime, Roman cement, Portland cement, and various mixtures of Roman and Portland cements, the test cubes being kept in the air but out of contact with water. In all cases a continuous and considerable increase in strength took place throughout the whole of the two years. Similar hardening may well occur in mortars in the interior of structures.—T. H. P.

Portland Cement ——. F. Ulzer. Mitt. des k.k. Techn. Gewerbe Museums in Wien, 1900, **10**, [9, 10, and 11], 189—190.

The following table shows the composition of a limestone and a marl suitable for the manufacture of Portland cement, and also the (calculated) composition of two cements made therefrom, by burning them together in the proportions: [I.] 56·12 limestone with 43·87 marl; [II.] 65·74 limestone with 52·14 marl:—

—	Limestone.	Marl.	Cement I.	Cement II.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
SiO_2	4·58	36·75	27·76	23·73
Fe_2O_3	3·37	3·41	5·02	5·13
Al_2O_3	1·29	11·42	8·51	7·24
MnO	None	A trace	..	..
CaO	50·86	22·70	57·19	62·71
MgO	A trace	1·25	0·81	0·64
Alkalis	A trace	1·15	0·74	0·59
SO_3	0·04	0·04	0·05	0·02
CO_2	39·96	..	..	..
Loss when heated	40·03	23·28	..	..

A Perlmoos Portland cement had the percentage composition:—SiO_2, and part insoluble in HCl, 21·83; Fe_2O_3, 2·92; Al_2O_3, 7·34; CaO, 58·69; $CaSO_4$, 4·86; MgO, 2·86; loss when heated, 1·59.—R. L. J.

Cement Blocks; Hollow ——, for Building Purposes. Ingeniren, Copenhagen, 1899, 325. Proc. Inst. Civil Eng. 1900, **142**, [4], 65.

Hollow blocks of cement instead of bricks have been used for building purposes at various places in Denmark. The cross section of the blocks is either 13½ × 13½ ins. or 9 × 13½ ins., according as they are intended for 13½-in. or 9-in. walls; they are 29¾ ins. long, and hollow from end to end, with the sides about 2¼ ins. thick, and the top and bottom about 1¾ ins. The mixture of sand and slow-setting cement is rammed dry in moulds in the usual way; after six weeks' hardening, the blocks are many times stronger than needed for two-storey houses, whilst after a year's hardening, they will bear about 2,000 lb. per sq. in. of the wall's horizontal section. A large block, 13½ × 13½ ins. cross section, weighs 150 lb. Corner stones and other blocks of special shape are moulded separately, and are made with inlaid strip iron. It is claimed that houses built with these blocks are fit for occupation immediately after building, and that the inside of the walls requires neither cleaning nor preparation, but is ready for papering or oil-painting at once.—A. S.

Plaster of Paris; Determination of Underburnt and Overburnt Portions of ——. L. Périn.

See under XXIII., *page* 156.

PATENTS.

Cement; Manufacture of ——. J. C. Gostling, J. H. Fraser, and R. Booth, London. Eng. Pat. 22,549, Nov. 11, 1899.

The slurry from which the cement is made is dried and burnt whilst passing through a short inclined roasting cylinder, the heating flame and hot gases passing in the opposite direction; the air used for combustion is pre-heated by being made to pass through metal pipes or boxes, which come into direct contact with the recently burnt and cooling cement.—J. W. H.

Stone, Artificial, and Cement for Building, Paving, Railway Sleepers, and other Purposes, &c.; Manufacture of ——. P. Timofeeff, St. Petersburg. Eng. Pat. 25,734, Dec. 30, 1899.

Rocks and other materials are powdered and mixed in such proportions that the mass may be fused and cast into blocks for building purposes. The blocks are cemented together with a mixture of quicklime with 5 to 15 per cent. of silicate of lime.—J. W. H.

Stone, Artificial, &c.; Process for Chemically Agglomerating Powdered Materials for the Manufacture of ——. A. Denaeyer, Brussels. Eng. Pat. 4114, March 3, 1900.

The powdered rocks or other materials are mixed with colloidal silicate of lime and pressed into blocks.—J. W. H.

Stone Building Blocks; Manufacture of Artificial ——. G. E. Güssow, Hanover, Germany. Eng. Pat. 13,491, July 26, 1900.

To a mixture, in about equal proportions, of clay and siliceous sinter, a small amount of asbestos fibre, magnesite, or bauxite, and some finely divided organic matter, such as peat or straw, is added; after intimate mixture, a small amount of water being used to form a paste, the mass is moulded into blocks and burnt in a brick kiln.—J. W. H.

Sandstones; Hardening Calcareous ——, by Steam Heating under Pressure. C. Rensing, Lichtenberg, Germany. Eng. Pat. 18,860, Oct. 22, 1900.

For bringing about certain chemical reactions for hardening sandstones, &c., air is first forced into the hardening or other vessel until the desired pressure is reached, and steam then admitted; steam alone is generally used.—J. W. H.

Bricks; Manufacture of Glazed ——. M. F. Solon, Cobridge, Stafford. Eng. Pat. 225, Jan. 4, 1900.

A process is claimed for producing a glazed brick, by first placing a quantity of marl in a die or mould, then adding finely divided clay, subjecting the substances to pressure, and then removing and firing them in a kiln. Glaze is again applied and firing repeated. But the powdered glaze may be applied without removing the marl and clay from the die, all three substances being fired simultaneously.—J. W. H.

Glass, Metal, Earthenware, Porcelain, &c., having a Surface capable of Adhering to Plaster or Cement; Manufacture of Plates or Tablets of ——. J. H. Storey and W. E. McCalla, both of Lancaster. Eng. Pat. 3611, Feb. 23, 1900.

Tablets of glass, metal, or earthenware are provided with a honeycombed surface on the side which is to adhere to plaster or cement, by firing after having applied a coating formed of enamel or similar substance mixed with combustible matter.—J. W. H.

Paving Roads; Composition for ——. C. A. C. Candemberg, Nice, France. Eng. Pat. 1915, Jan. 30, 1900.

Asphalt in fine powder is intimately mixed with a solution of rubber prepared with a volatile solvent, such as petroleum spirit; the mass spread over dry lime, concrete, or cement, and compressed by ramming and rolling, forms an efficient paving.—J. W. H.

Burning Kilns of the kind known as "Dutch" or "Scotch" Kilns; Method of and Means for Utilising the Waste Heat generated in Brick or Tile or the like ——. J. W. Briggs, Barton-upon-Humber. Eng. Pat. 3584, Feb. 23, 1900.

The kilns are so arranged with flues that those recently filled may be heated by hot air derived from those cooling down.—J. W. H.

Fireproof Coating for Walls, Floors, &c. A. Gabrielli, Novara, Italy. Eng. Pat. 15,960, Sept. 7, 1900.

The coating consists of two layers: asbestos, wood, cork, cloth, or similar material, rendered fireproof and perforated with a number of small holes, forming the first layer; a paint, the solid ingredients of which on being heated generate a gas "antagonistic to combustion," is then applied to form the second layer. Calcium and lead carbonates are mentioned as suitable substances. The coating is especially suited for covering the metal flooring and walls of the cabins of ships. —J. W. H.

Wood [Fireproofing] and other Combustible Substances; The Treatment of ——, *to render them Fireproof, and for other Purposes.* H. H. Lake, London. From The American Wood Fireproofing Company, Ltd. Eng. Pat. 3262, Feb. 19, 1900.

A sample of the timber to be fireproofed is first tested to determine the moisture it is capable of absorbing, by heating to about 110° F. in a tank in which a vacuum is maintained, then filling the tank with water, and after a time applying a pressure of from 100 to 150 lb. per. sq. in. If the proportion of water absorbed, should not prove satisfactory, the wood is then steamed. In conducting the actual process, the wood is subjected to a vacuum in the tank, and ammonia is admitted, and "after a time the vacuum is broken by drawing air through the water containing ammonia and having a temperature of about 130° F., thus charging the inrushing air with both moisture and ammonia." The temperature of the tank is then slowly raised to 120°—140° F. at atmospheric pressure, and, when shown by the previous test to be necessary, steam is introduced, and before using the impregnating solution, a vacuum is again made. The impregnating solution contains ammonium sulphate and phosphate, and also, preferably, smaller proportions of sodium borate, phosphate, and sulphate, and free ammonia. A casein solution, made by dissolving in water, casein and borax, is then added, sufficient to cause cloudiness. A small proportion of an oil emulsion, such as a mixture of cotton-seed oil with lard, is preferably also added. The use also of a potash soap is claimed. When the solution is introduced, pressure as before described is applied for many hours. After drying, the wood is subjected in the vacuous tank to the action of formaldehyde gas, which renders the casein insoluble; or of carbonic acid or other acid gas, which coagulates the casein, thus "sealing" the salts introduced within the substance of the wood.—E. S.

Wood Fire-proof and Rot-proof; Improved Process and Preparation for Rendering ——. G. F. Lebioda, Boulogne-sur-Seine, France. Eng. Pat. 19,515, Oct. 31, 1900.

About 6 parts of boric acid, 10 parts of borax, and 40 parts of ammonium sulphate are dissolved in hot water, and the solution is used while hot in any convenient way to impregnate the wood which is to be rendered proof against burning and rot.—E. S.

Furnaces for the Treatment of Lime, Cement, Dolomite, or the like ——. E. Gobbe. Eng. Pat. 552.

See under I., *page* 105.

X.—METALLURGY.

Calcium Carbide; Reductions effected by ——. F. v. Kügelgen. Chem. Zeit. 1900, **24**, [97], 1060—1061.

The author confirms, in the main, the results of Neumann (this Journal, 1901, 46), but points out that calcium carbide had already been shown to reduce other metallic compounds (this Journal, 1899, 1061; 1900, 475). From his experiments he concludes that the gas produced is not carbon monoxide, as Neumann asserts, but carbon dioxide, and he gives the following formula as representing the process in the reduction of metallic oxides—

$$5M_2'O + CaC_2 = CaO + 5M_2' + 2CO_2$$

instead of that given by Neumann—

$$3M_2'O + CaC_2 = CaO + 3M_2' + 2CO.$$

He states that the yields of metal obtained, agree with his formula, and concludes that Neumann must have used a large excess of carbide in his experiments, in which case carbon monoxide can be detected in addition to carbon dioxide in the liberated gases.—C. A. M.

Pig-Iron; Irregular Distribution of Sulphur in ——. R. Bolling. J. Amer. Chem. Soc. 1900, **22**, 798—799.

To test the distribution of sulphur in cast-iron, 1-lb. samples were collected at intervals from the runner while a cast was being made, and when 10 lb. had thus been collected the metal was run into a sand mould about a foot long. After cooling, the bar was drilled transversely at eight points at regular intervals of 1⅝ in. These samples, taken in succession, commencing at the top of the bar and proceeding downwards, showed the following percentages of sulphur respectively:—0·036, 0·036, 0·036, 0·036, 0·036, 0·032, 0·030, 0·023. It will be seen that the difference between the upper and lower surface amounts to 0·013. Hence, to obtain a true representative assay for sulphur, the bar should be drilled through from top to bottom, and the drillings should then be well mixed. —W. G. M.

Iron; Determination of ——, *in Magnetite Ores by the Specific Gravity Test.* J. W. Richards. J. Amer. Chem. Soc. 1900, **22**, 797—798.

In the many cases of ores which are simply mixtures of magnetite and quartz, a specific gravity test may be as accurate as an analysis. Samples of from 1 to 50 lb. in weight should be tested, according to the nature of the balance available. The results should be accurate to 0·1, and may be so to from 0·02 to 0·03 per cent., which is equivalent to a maximum error of 1 to 3 per cent. on the iron content. The following table gives the percentage of Fe (and of

Fe_3O_4 and SiO_2) corresponding to various specific gravities, the specific gravity of the magnetite and silica used being 5·18 and 2·66 respectively :—

Fe.	Fe_3O_4.	SiO_2.	Sp. Gr.	Fe.	Fe_3O_4.	SiO_2.	Sp. Gr.
%	%	%	%	%	%	%	%
0	0·0	100·0	2·66	37	51·0	49·0	3·54
1	1·4	98·6	2·67	38	52·4	47·6	3·57
2	2·8	97·2	2·69	39	53·8	46·2	3·60
3	4·1	95·9	2·71	49	55·2	44·8	3·64
4	5·5	94·5	2·73	41	56·6	43·4	3·67
5	6·9	93·1	2·75	42	58·0	42·0	3·70
6	8·3	91·7	2·77	43	59·4	40·6	3·74
7	9·7	90·3	2·79	44	60·8	39·2	3·77
8	11·0	89·0	2·81	45	62·1	37·9	3·81
9	12·4	87·6	2·83	46	63·5	36·5	3·85
10	13·8	86·2	2·85	47	64·9	35·1	3·89
11	15·2	84·8	2·87	48	66·3	33·7	3·93
12	16·6	83·4	2·89	49	67·7	32·3	3·97
13	18·0	82·0	2·92	50	69·1	30·9	4·01
14	19·3	80·7	2·94	51	70·5	29·5	4·05
15	20·7	79·3	2·96	52	71·8	28·2	4·09
16	22·1	77·9	2·98	53	73·2	26·8	4·13
17	23·5	76·5	3·00	54	74·6	25·4	4·17
18	24·8	75·2	3·03	55	76·0	24·0	4·22
19	26·2	73·8	3·05	56	77·4	22·6	4·26
20	27·6	72·4	3·07	57	78·8	21·2	4·31
21	29·0	71·0	3·09	58	80·1	19·9	4·36
22	30·4	69·6	3·12	59	81·5	18·5	4·41
23	31·3	68·2	3·14	60	82·9	17·1	4·46
24	33·2	66·8	3·17	61	84·2	15·8	4·51
25	34·5	65·5	3·20	62	85·6	14·4	4·56
26	35·9	64·1	3·22	63	87·0	13·0	4·61
27	37·3	62·7	3·25	64	88·4	11·6	4·66
28	38·7	61·3	3·27	65	89·8	10·2	4·72
29	40·0	60·0	3·30	66	91·2	8·8	4·78
30	41·4	58·6	3·33	67	92·6	7·4	4·84
31	42·8	57·2	3·36	68	94·0	6·0	4·90
32	44·2	55·8	3·39	69	95·3	4·7	4·96
33	45·6	54·4	3·42	70	96·7	3·4	5·02
34	47·0	53·0	3·45	71	98·0	2·0	5·09
35	48·3	51·7	3·48	72	99·4	0·6	5·16
36	49·7	50·3	3·51	72·4	100·0	0·0	5·18

—W. G. M.

Steel and Wrought Iron; Influence of Copper in Retarding Corrosion of Soft ——. F. H. Williams. Eng. and Mining J. 1900, **70**, [23], 667.

The author refers to a recent communication by H. M· Howe (this Journal, 1900, 905) on the relative corrosion of wrought iron, soft steel, and nickel steel, and then describes experiments he made as to the influence of copper in retarding corrosion. In one set of tests, four samples of steel were examined: A, an ordinary soft Bessemer steel; B, C and D soft Bessemer steels containing respectively 0·078, 0·145, and 0·263 per cent. of copper. In a second set of tests, there were examined one soft steel and four samples of wrought iron, one of which contained 0·393 per cent. of copper. Small pieces of each were cut and filed to the same dimensions, weighed, and suspended from a frame, so that all could be dipped simultaneously into water and then left to hang in the air till dry. This treatment was repeated for about a month, and then, when the oxide formed had a tendency to scale off, the pieces were thoroughly cleaned and again weighed. The following results were obtained :—

Loss from Atmospheric Corrosion.

	Loss Per Cent.
A. Soft Bessemer steel	1·85
B. „ „ „ 0·078 per cent. Cu	0·89
C. „ „ „ 0·145 „ Cu	0·75
D. „ „ „ 0·263 „ Cu	0·74
Soft Bessemer steel	1·65
Wrought iron, 1	0·76
„ „ 2	0·80
„ „ 3	0·87
„ „ 4 (0·393 per cent. Cu)	0·53

The results appear to indicate a solution of the problem of making soft Bessemer steel as capable of resisting corrosion as wrought iron, and the author states that the introduction of the requisite small amount of copper into steel, where it is not already present in sufficient quantity, could be easily effected by the use of copper-bearing iron ore in the blast furnace.—A. S.

Alloys of Iron and Nickel. Rudeloff. Verhandl. des Vereins zur Beförderung des Gewerbefleisses, Sitzungsber. 1900, 38. Proc. Inst. Civil Eng. 1900, **142**, [4], 42.

Statements have already been issued by the committee on iron-nickel alloys appointed by the "Verein zur Beförderung des Gewerbefleisses" (see this Journal, 1894, 955; 1896, 905; 1899, 48). It was found that in the preparation of ingots, the best results were obtained by adding 20 grms. of aluminium in the case of alloys rich in iron, and 10 grms. of magnesium with alloys rich in nickel, in both cases, to 20 kilos. of the material.

The present communication deals with the effect of carbon on nickel alloys. The fine-grained structure of iron free from nickel is transformed by the addition of carbon into a radiated crystalline appearance, whilst the addition of 3 per cent. of nickel caused the carbon to separate out in the form of graphite. In a series of tests, the proportion of carbon was kept constant, and the quantity of nickel varied from 0·3 to 60 per cent. With from 0·3 to 0·5 per cent. of carbon, the pure iron showed the lowest, and the 3 per cent. nickel the highest elastic limit and yield point, whilst the tensile strength and shearing strength were greatest for the alloy containing 60 per cent. of nickel. When the amount of carbon was greater than 0·5 per cent. the 3 per cent. nickel alloy was superior in all respects to the 60 per cent. alloy.—A. S.

Tinned-Iron; The Rusting of ——. F. Ulzer. Mitt. des k. k. Techn. Gewerbe-Museums in Wien, 1900, **10**, [9, 10, and 11], 203.

The author's experiments confirm the general view that tinned-iron goods rust owing to the presence of minute crevices in the surface of the iron-plate, which are not effectually sealed by the molten tin in the process of dipping. Oxidation begins at these points, and rusting extends under the tin coating, causing it to separate.—R. L. J.

Gold; Grollet's Method for the Recovery of ——. Griveau. Oesterr. Zeit. Berg-Hütt. **48**, 567. Chem. Centr. 1900, **2**, [24], 1217.

It is stated that by this process, which is being worked at Harfleur, France, the gold can be recovered from ores and by-products, which contain the metal in the free state, or combined with sulphur, arsenic sulphide, antimony sulphide, &c. The method consists in subjecting the material to the simultaneous action of chlorine and bromine, treating the solution of chloride and bromide of gold with sulphur dioxide for the removal of excess of the halogens, and precipitating the gold by sulphuretted hydrogen. As an example it is claimed that one ton of ore treated with 14 kilos. of sulphuric acid, 12 kilos. of chloride of lime, and 0·1 kilo. of bromine, yielded, after four hours' action in a revolving barrel, 86·21 per cent. of gold; after eight hours, 89·66 per cent.; and after 12 hours, 93·11 per cent. of gold.—A. S.

Cyanide Tailings; Treatment of ——. H. M. Crowther. Eng. and Mining J. 1900, **70**, [25], 732.

Tailings from cyanide treatment usually contain too small a quantity of gold to allow of a profitable re-treatment by a chemical process. The author points out, however, that the limited amount of wash water used in the cyanide process does not completely displace the solution in the charge of ore, and thus, in general, the tailings contain at least ¼ lb. of cyanide and a somewhat larger quantity of free alkali—caustic soda or lime—per ton; and, on subsequent exposure to air and sunlight in the dump, it is stated that the cyanide acquires greater activity and effects solution of the gold present, so long as the mass remains alkaline. After sufficient exposure, these dissolved values may be recovered in solution by a simple washing with water. The author made some tests on tailings from the immense dumps at Mercur, Utah, which had been exposed to the weather from three months to one year. The tailings, as they came from the mill, contained about 0·4 lb. of cyanide, 0·6 lb. of caustic soda, and 8 c. per ton in dissolved gold, with a moisture content of 20 per cent., and an average assay value of about 1 dol. in gold. In six tests, the average amount of water present was 13·2 per cent., and of gold, 1·05 dols. per ton. By simply percolating $\frac{1}{3}$ ton of water through each ton of tailings, an average extraction of 53·3 per cent. of the total gold value was obtained.

In order that the chemical condition of the tailings, at the time of placing on the dump, be such that the otherwise waste cyanide contained in them is preserved for the longest possible period, the author recommmends that the final wash-water contain sufficient caustic alkali to leave from one to several pounds of free alkali per ton of tailings in the associated moisture which adheres to them.—A. S.

Silver; Union of ——, with Oxygen. Berthelot. Comptes Rend. **131,** [26], 1159–1167.

Silver combines very slowly with oxygen (whether heated with it at atmospheric pressure or with air) at a temperature of 200° C., and the rate of combination increases, as the temperature rises, up to 500°—550° C. The amount of oxide formed, and persisting after cooling, is always very small, and appears to be about the same whether oxygen or air be used; the presence of moisture, or of a substance capable of combining with the silver oxide (such as glass), tends to increase the amount of oxide formed. At the same time, a portion of the silver much greater than that oxidised, suffers disaggregation, and forms a sort of woolly powder, as though there had existed a state of mobile equilibrium, similar to that between a liquid and its vapour in a confined space. That this is not an effect of heat is shown by the fact that no such alteration of the silver occurs when it is heated in nitrogen, carbon dioxide, or water vapour.—J. T. D.

Silver and Hydrogen. Berthelot. Comptes Rend. **131,** [26], 1169—1170.

Silver, heated in sealed tubes to 500°—550° C. with hydrogen, undergoes to a slight extent the same sort of change as in oxygen or carbon monoxide. This is possibly due to the formation and decomposition of a hydride—a supposition which would also explain the slight apparent permeability of silver to hydrogen, which certain of the author's experiments have established. The possible formation and decomposition of such compounds has an important bearing on the explanation of many chemical reactions (inflammation of hydrogen gas by platinum, effect of traces of water in determining reactions, &c.), and the author is pursuing his experiments with other metals besides silver.—J. T. D.

Silver and Carbon Monoxide. Berthelot. Comptes Rend. **131,** [26], 1167—1169.

When silver is heated in carbon monoxide at 550° C. (and to a less extent at lower temperatures down to 300° C.), it becomes partially converted into a woolly powder, as when heated in oxygen. At the same time small quantities of a black deposit are formed locally, and when the silver is dissolved in acid a flocculent carbonaceous residue is left. Carbon dioxide, corresponding to about 3 per cent. of the original volume of the monoxide, is contained in the gas after the operation. The author suggests that a silver carbonyl is formed and dissociated, furnishing in the first place carbon and silver oxide, the latter of which then reacts with carbon monoxide, forming carbon dioxide and silver.—J. T. D.

Cupreous Pyrites; Extraction of the Copper of ——, by Conversion into Chloride. J. Delplace. Monit. Scient. 1900, [4], **14,** 806—808.

The employment of pyrites or other sulphide ores containing recoverable quantities of copper or other valuable metals, has now become a general rule in the manufacture of sulphuric acid. The most convenient method of extracting these metals from the roasted ore is by their conversion into chlorides. This is effected by driving off the sulphuric acid and sulphur trioxide from the ferric and ferrous sulphates, causing the acid products to react with the proper quantity of sodium chloride and liberating hydrochloric acid and chlorine, which then convert the copper or other metals into soluble chlorides, which can be washed away from the oxides of iron. Naturally, this reaction is mainly dependent on the temperature employed. The author has designed a furnace which works continuously in a very simple manner. The mixture is fed in at the top and falls on to a series of shelves; as it travels it reaches a maximum temperature by conducting the flames horizontally in a closed space between the second and third shelf; the gases of combustion are then caused to heat the sides of the upper parts of the furnace where the conversion into chloride commences. The advantages of this furnace are that the stoking is kept constant and there is no necessity to intensify or moderate the heat at certain stages; moreover, the mineral is kept all the time in a chlorinating atmosphere.—J. F. B.

Pyritic Smelting and Hot Blast. S. E. Bretherton. Eng. and Mining J. 1900, **70,** [26], 760.

The author enumerates the advantages of pyritic smelting with hot blast, over ordinary lead smelting, and then discusses the question of the automatic heating of the blast by the waste heat of the furnace and furnace products. Most of the inventions in this direction are based on the utilisation of the heat escaping from the fumes of the furnace, by means of coils of pipes, placed at some distance above the feed floor of the furnace. The author points out, however, that if a furnace be properly fed and operated so as to prevent volatilisation of the precious metals, there should be very little heat above the feed floor. Attempts have also been made to utilise the waste heat of the molten slag, but the methods which have been proposed suffer from the defect that the fumes from the slag are driven back into the furnace again, with the result that an impure blast enters the furnace, with a great portion of the free oxygen already removed. The author claims that he has solved the problem of heating the air blast to a sufficient degree to prevent chilling, without any additional cost for operation, by means of the Bretherton hot-blast apparatus (see this Journal, 1900, 51 and 539). It is stated that by the most recent arrangement of this apparatus, there is utilised not only the small amount of heat which can be saved practically, above the feed floor, but also the waste heat from a large enclosed settler for the matte.—A. S.

Rhodium Alloys. Roessler. Eng. and Mining J. 1900, **70,** [24], 696.

The author states that rhodium appears, in some cases, to have been confused with iridium. Neither of these metals forms a real alloy with silver. If 5 mgrms. of rhodium are fused with 1 grm. of silver, melted in lead, the regulus resulting from cupellation is not bright as with silver, but dim grey. On dissolving the grain in nitric acid, the grey film disintegrates and separates from the solution in the form of glittering scales, which consist of hexagonal crystals of pure rhodium. With larger proportions of rhodium, the latter is afterwards re-obtained in the amorphous state. Iridium behaves in a similar manner. Platinum appears to form a compound with silver, and when an alloy containing only a small proportion of platinum is treated with nitric acid, some of the platinum passes into solution with the excess. Also, the platinum residue is found to have become oxidised and soluble in hydrochloric acid. Rhodium and gold appear to form a true alloy, which dissolves in *aqua regia* with a darker colour than gold alone would give. The author also prepared alloys of rhodium with bismuth, tin, and antimony, by heating the metals for some time above their melting points. Bismuth takes up a maximum of 5 per cent. of rhodium. When the excess of bismuth is removed by cold nitric acid, crystals of $RhBi_4$ remain behind, which are themselves soluble in boiling nitric acid.—A. S.

Crude Zinc; Theory of the Method for removing Lead from ——. E. Heyn. Berg- u. Hüttenm. Zeit. **59,** 559; through Chem. Zeit. Rep. 1900, **24,** [104], 381.

Zinc and lead, when melted together, form two distinct layers, the composition of which varies with the temperature. Thus at 600° C. the lower layer contains 15 per cent. of zinc and 85 of lead, while in the upper the proportions of zinc and lead are 95 and 5 respectively; as the temperature falls the two layers approach more and more nearly to pure lead and pure zinc, until at 420°, which is just above the melting point, the upper layer contains only 1·5 per cent. of lead and the lower only 6·5 per cent. of zinc. So that, by allowing zinc containing 4 per cent. of lead to stand for a time at a temperature of 420° C. it is possible to reduce the proportion of lead to 1·5 per cent., which is the utmost limit of purification by this method. In practice the conditions are rather more complicated owing to the presence of iron, which causes the formation of a third layer.—T. H. P.

Solid Solutions of Mixtures of Three Substances. G. Bruni.

See under XXIV., *page* 160.

Steel; Rapid Determination of Carbon in ——. R. Job and C. T. Davies.

See under XXIII., *page* 156.

Blast-Furnace Gases; Use of ——, *in Gas Engines.* T. W. Richards.

See under II., *page* 108.

Bismuth; Volumetric Determination of ——. G. Frerichs.

See under XXIII., *page* 156.

Copper; Determination of Oxygen in Commercial ——. M. Lucas.

See under XXIII., *page* 157.

PATENTS.

Steel; Manufacture of Tool ——, *and the Tools therefrom.* O. Imray, London. From J. S. Hay, Homestead, Pa., U.S.A. Eng. Pat. 13,260, July 23, 1900.

The claim is for treating self-hardening steel by heating it to a temperature between 1,050° and 1,150° C., for the purpose of providing it with greater durability and enabling it to withstand the heat of cutting as a tool, according to the following method:—The steel, of approximately the form of the tool or projectile, which may contain manganese and tungsten or molybdenum or tin, chromium, nickel, &c., is heated, with exclusion of air by placing it in a muffle or covering it with lime, &c., to about 1,110° C., for a period sufficiently long to get uniformly heated, and is allowed to cool or is plunged into an oil bath. It is then tempered, if desired, and ground.—A. W.

Iron; Process of Puddling ——. J. P. Roe, Pottstown, U.S.A. Eng. Pat. 18,425, Oct. 16, 1900.

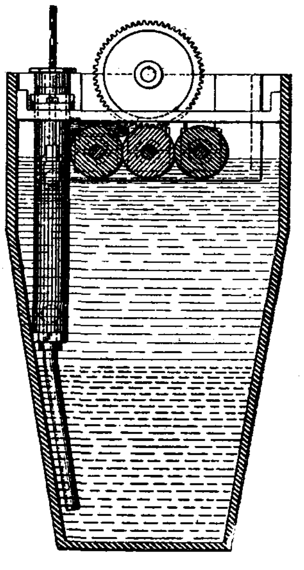
The mixed charge of molten cast iron and cinder is made to flow backwards and forwards in the presence of hot gases, and the flow arrested abruptly before each change of direction until the "iron comes to nature," the operation being repeated until the particles of purified iron are "compressed and solidified in a mass." This is accomplished on a hearth suitably mounted on trunions, with walls, roof, and a chimney and discharge door at both ends, the whole being oscillated by any suitable mechanism. The hot gases are supplied through the trunions from fire chambers at each side.—A. W.

Gold and Silver; Apparatus for Precipitating ——, *from their Solutions.* A. James, London. Eng. Pat. 3421, Feb. 21, 1900.

The apparatus is an enamelled iron vessel containing a series of compartments, each fitted with means of inflow and outflow by partition walls and false bottoms, so that the solution rises up through the precipitating agent in each compartment and overflows down spaces between them to the bottom of each in turn. The interior of the vessel may be completely enamelled or only partially so, *i.e.*, at the parts which come into contact with the precipitating metal or agent. (This Journal, 1900, 541.) —A. W.

Tin Plate; Manufacture of ——, *and Apparatus therefor.* O. Imray, London. From W. H. Rogers, Wheeling, and J. A. Beaver, Bellefonte, both in U.S.A. Eng. Pat. 1221, Jan. 19, 1900.

(1) In the rolling of the bars into black plate, the combination is claimed of a roughing train and a finishing train of rolls, a heated car for transferring the plates between them, and a heating furnace into which the car is run if necessary, the plates being piled on a bed of coke in the car, to which an air-blast is admitted, whereby they are kept at a cherry-red heat and protected from oxidation. (2) The combination of a finishing train, a carrier to receive the packs, which consists of an endless chain conveyor, and a re-heating furnace, through which the carrier passes with the packs over a body of hot coke. (3) The apparatus for cleaning, oiling, and tinning the plates. The cleaning apparatus consists of a drum horizontally revolving on a central shaft, to which is fixed radial arms with vanes or wings so arranged as to form the interior of the drum into segmental chambers or compartments. The lower half is enclosed in a semi-cylindrical vessel. As the drum slowly revolves, the sheets are fed into the upper compartments, supplied with an abrading powder, so that, by rubbing one over the other with the powder while travelling down and up again, they are cleared of loose scale. The oiling apparatus is of similar construction, but the lower half of the drum dips into oil contained in the outer vessel, the remainder of the scale being hereby rubbed off. The plates are passed from this to a similar rotary tinning apparatus, with suitable gearing for rotation, wherein they rapidly receive their first coating. (4) Tho process of rolling the plates, pressing the pack of plates by a hydraulic press, and shearing into the right lengths previous to placing in the cleaner. (5) The method of cleaning the plates by rubbing them together with an abrading material, such as magnetic oxide, emery, &c. in the manner described. (6) and (7) In the second and final coatings of tin, the pot of molten tin with rollers arranged side by side within the pot, rubbers above and below in line with their passes, and a spring-supported tray below the rollers for receiving the sheets and lifting them up to the rollers again for withdrawal after they are released from the downward bite. Also, the final grease pot provided with rollers near the top, and with a pump arranged to raise molten tin from under the grease, in the lower part of the pot, and pour it over the rollers, if desired, to remedy any imperfection in a sheet during the greasing operation.



The accompanying drawing illustrates this part of the apparatus. The valves of the pump are ball valves, not affected by molten tin, and the metal is returned to the rollers through the spout indicated.—A. W.

Sulphide Ores containing Lead and Zinc; Treatment of Mixed ——. G. E. Davis and A. R. Davis, both of Manchester. Eng. Pat. 2089, Feb. 1, 1900.

The following operations are claimed in combination as the process for treating the mixed sulphide ores. Dissolving the ores in hydrochloric acid; saturating any residual free acid in the liquor therefrom with oxide of zinc; oxidising any iron therein to the ferric state; precipitating ferric hydrate with oxide of zinc; precipitating silver from the solution as iodide by the Claudet process; removing the lead by means of oxide of zinc and carbonic acid gas (this Journal, 1901, 47); concentrating the residual solution of chloride of zinc, for use as such, or precipitating the zinc therefrom for use as oxide; the treatment of the residue from the first operation with acid by dissolving out the lead chloride therein with hot water and recovering it as such or as carbonate, extracting the silver with ammonia or thiosulphate of sodium, re-roasting the residue to convert the remaining zinc sulphide into oxide, which is then used for saturating the free acid in the original solution from the first ore treatment; and finally utilising the sulphuretted hydrogen, evolved during the dissolving of the ore, for vitriol making or sulphur recovery by Claus's method.

The modification of this process is also claimed which consists of dissolving about three-fourths of the sulphide of the ore in hydrochloric acid, the lead sulphide being more readily attacked than the zinc, and of roasting the remaining one-fourth into a crude oxide of zinc, which may be used for the purpose of saturating the free acid already mentioned.—A. W.

Sulphide Ores [Zinc, Lead]; Treatment of Complex ——. H. F. Kirkpatrick-Picard, London. Eng. Pat. 2151, Feb. 2, 1900.

The finely-ground ore is roasted into the form of oxides, with a minimum amount of sulphates, by mixing in a little coal slack at the end of the first roasting; it is then mixed with charcoal or carbonaceous material, together with a binding agent, and the zinc distilled off, the lead being also reduced and left in the residual carbon sponge. The roasted ore may be mixed with a suitable carbonaceous material which will itself coke into coherent masses or into briquettes, to be afterwards treated in a distilling furnace. —A. W.

Aluminium or its Alloys; Coating of ——. H. H. Lake, London. From A. G. Betts, Lansingburgh, U.S.A. Eng. Pat. 20,142, Nov. 8, 1900.

The surface of the aluminium or other metal to be coated is treated with a fused salt of the coating metal, whereby the film of alumina is removed and perfect contact of the metals obtained. The coating may be effected by sprinkling a layer of a dry fusible salt, such as, for instance, cuprous chloride, on the aluminium surface, and heating the whole until the coating is evenly deposited, or by dipping the metal into the fused salt, &c. The coating can be re-inforced by the electro-deposition of a further quantity of metal, which becomes firmly adherent. Extra claims are made for a body of aluminium having a finely adherent copper coating chemically deposited as described, and for the same result with a subsequent coating of metal electro-deposited on the first coating.—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Water; Electrolysis of ——, *on the Large Scale.* O. Schmidt. Zeits. für Electrochem. 1900, 7, [20], 295—298.

The author describes an apparatus for the electrolysis of water on the large scale. In appearance the apparatus is very much like a filter-press. It consists of single double-pole iron electrodes arranged in series. Between these are placed sheets of asbestos cloth in order to prevent the two gases from mixing. Rubber solution is applied to the edges of the cloths for insulation and to keep the press tight when screwed up. The electrolyte, consisting of a solution of potassium carbonate (as free as possible from chlorides and sulphates, since these would cause corrosion of the iron) is supplied through a channel at the bottom of the chambers and completely fills them. The gases, oxygen and hydrogen, which are liberated on electrolysis, rise to the top of the chambers, and are carried off through separate channels provided in the top corners of the plates. The evolution of the gases causes a circulation of the electrolyte, and since the apparatus is completely filled with the electrolyte, a collection of the gases in the chambers and the danger of mixing is thereby avoided.

The E.M.F. required per cell is about 2·5 volts instead of 1·44 according to Thomson's theorem. The ampère-hour yield is nearly 100 per cent., and in practice each kilowatt-hour produces 168 litres of hydrogen and 84 litres of oxygen. This corresponds to about 54 per cent. of the theoretical yield.

As regards the purity of the gases obtained, the hydrogen generally contains about 1 per cent. of oxygen, and the oxygen about 2 per cent. of hydrogen.

If the gases are not for immediate use they are conducted to gas holders, and are then compressed into steel cylinders. The power required to compress the gases up to 150 atmospheres is about 5 per cent. of that required for their generation. The weight of the cylinders averages about 10 kilos. per cubic metre of gas. The question of freight, therefore, becomes a serious item when the gases have to be sent any distance.

Electrolytic gas is already used in some accumulator works for soldering purposes.

The author is of opinion that hydrogen, if burned in a modified form of Welsbach burner, may compete with acetylene as an illuminant. According to his calculations, one normal candle hour costs 0·059 centime in the case of acetylene, and 0·025 centime in the case of the hydrogen light. The great disadvantage appears to be the weight of the steel cylinders. Compressed hydrogen sufficient to produce one normal candle hour weighs about seven or nine times as much as the equivalent of calcium carbide.

Originally the author employed hydrogen burners which worked with hydrogen under very low pressure, and which consumed a large quantity of the gas. In an improved burner the pressure is half an atmosphere, giving 100 normal candle power for 25 litres of hydrogen per hour. If this is confirmed, the hydrogen light will also compete with Nernst's new incandescent lamp. One kilowatt-hour gives, in the case of the Nernst lamp, 666 candle-hours (at 1·5 watts per candle), and in the case of the electrolytic hydrogen apparatus, 168 litres of hydrogen corresponding to 672 candle-hours.

For ordinary lighting purposes it is improbable that this method of lighting will come into general use, but it may with advantage be used in electrolytic works where large quantities of hydrogen are generated.—J. S.

Bleaching Apparatus; Electrical ——, *of Haas and Oettel.* F. Oettel. Zeits. für Elektrochem. 1900, 7, [21], 315—320.

Two modifications are described. The first and older form of electrolyser consisted of a rectangular box (mounted on trunions for convenience of emptying and cleaning), divided into the required number of cells by means of double-pole electrodes. All the electrodes, with the exception of the terminal negative electrode, are built up of prepared carbon plates, which are inserted into vertical slots cut in the sides of the box. The negative electrode consists of a lead plate. The size of the electrodes in any apparatus is so arranged that the current density will be 1,000 ampères per square metre. Each of the intermediate electrodes rests on a low non-conducting diaphragm, and is also prolonged above the level of the electrolyte by a similar diaphragm, so that the whole of the carbon electrodes are submerged in the salt solution. The salt solution, which must be as free as possible from lime, enters the cell at one end of the electrolyser, flows into the second cell through a passage provided near the bottom of the diaphragm separating these two cells, thence into the top of the third cell, and so on.

The second form of electrolyser is constructed of a series of cells similar to the above. The box containing the cells, however, is placed inside a larger box, and no provision is made for the flow of the electrolyte through each of the cells successively. Instead, the electrolyte, which is contained in the larger box, is made to flow into the bottom of each cell simultaneously and to overflow at the top. This is accomplished simply, and without any mechanism, by making a channel between the bottom of each cell and the outside containing box. The hydrogen which is evolved in the narrow cells produces the required circulation of the electrolyte. The salt solution in each cell is thus carried upwards, and overflows into the outer chamber, whilst fresh or less highly electrolysed salt solution is drawn in through the channel at the bottom.

The first of these cells was designed to produce three cubic metres of bleaching liquor in 10 hours, the liquor to contain 3 grms. of active chlorine per litre. The electric energy required was 45—50 ampères at 110 volts. Each kilo. of bleaching chlorine thus required 7·5—8·3 horse-power-hours; the density of the salt solution being 4°—6° Bé. In practical working no special cooling is required, the rate of flow of the salt solution through the electrolyser being controlled by means of two thermometers, one placed at the inlet and the other at the outlet.

The second form of electrolyser was designed to meet the demand for a bleaching liquor containing 5, 8, or even 10 grms. of active chlorine per litre. In this case a stronger salt solution is employed, and a cooling system is arranged in the outer chamber containing the bulk of the electrolyte.

The following table gives the results of a test made on the second form of electrolyser in operation at the bleaching works of S. Wolle, in Aue, Saxony:—

Constants of the Electrolyser.

Number of cells	28	Volume of liquor	840 litres.
Current	60 ampères.	Density of liquor	15° B.
Voltage	115 volts.		

Time in Hours.	Temperature, Centigrade.	Current.	Voltage.	Horse-power-Hours.	Active Chlorine.		Percentage Current Yield.	Horse-power-Hours per Kilo. of Active Cl.
					Grms. per Litre.	Total Quantity in Kilos.		
	°							
1	17	61	116	9·6	2·55	2·14	95·0	4·48
2	22	63	116	19·5	4·59	3·85	82·4	5·07
3	23	62	115	29·2	5·90	4·95	72·1	5·90
4	23	61·5	116	38·9	7·41	6·22	68·2	6·26
5	23	62	117	48·8	8·82	7·41	64·8	6·60
6	23	61	117	58·5	10·50	8·82	61·9	6·64
7	23	62	117	68·4	11·22	9·43	59·1	7·25
8	23	61	117	78·1	12·30	10·32	56·7	7·56
9	23	61	117	87·8	13·35	11·21	54·8	7·82
10	23	61	117	97·5	14·31	12·00	52·8	8·11

This table clearly shows that the cost of production of the active chlorine increases as the concentration of the active chlorine rises. In other words, the same quantity of active chlorine can be more cheaply produced if a strength of 3 grms. per litre will suffice than if the strength must be increased to 6 or 10 grms. per litre.

The author is unable to give any general figure which would represent the cost of producing 1 kilo. of bleaching chlorine, since the price of salt and electric energy vary considerably in different localities. He points out, however, that the cost of the above plant is 2,500 marks, and that scarcely any labour is required.—J. S.

Bleaching Apparatus; Electrical ——. V. Engelhardt. Zeits. für Elektrochem. 1901, 7, [27], 390—396.

Oettel (see preceding abstract) compared the above table with a similar one representing a test on a Kellner bleaching apparatus, and stated that, independent of the lower initial cost, the Haas and Oettel electrolyser worked more efficiently than the Kellner electrolyser, both as regards current yield and energy yield, and that the greater consumption of salt in the Haas and Oettel apparatus was more than balanced by the lower consumption of energy.

The author takes exception to this statement, and maintains that on every point the Kellner apparatus is superior to the Haas and Oettel apparatus, and that the two series of tests are not comparable. The electric energy consumed in an electrolyser depends on the concentration of the salt solution employed, and whilst the concentration in the test of the Haas and Oettel apparatus was 18·65 per cent., that in the Kellner test referred to was only 10 per cent. At the latter concentration more electric energy was required per kilo. of active chlorine, but Oettel's statement that the greater consumption of salt was more than balanced by the lower consumption of energy is entirely misleading.

In order to obtain a bleaching liquor containing approximately 1 per cent. of active chlorine, the cost per kilo. of the active chlorine in the two plants can easily be calculated for different prices of salt and electric energy. For this purpose, it is necessary to select from the tests the figures corresponding to a bleaching liquor containing as nearly as possible one and the same amount of bleaching chlorine. For a 1 per cent. solution the corresponding figures are:—

Haas and Oettel.—18·65 per cent. NaCl; 10·50 grms. Cl per litre and 6·64 h.p.-hours per kilo. Cl.

Kellner.—10 per cent. NaCl; 10·44 grms. Cl per litre, and 9·95 h.p.-hours per kilo. Cl.

If different prices be assumed for salt and electric energy, corresponding to different localities, the cost of 1 kilo. of active chlorine works out as follows:—

——	Haas and Oettel.		Kellner.	
		Pfennige.		Pfennige.
Average prices of salt and energy	18.65 kilos. NaCl at 1.6 pf.	29.84	10.00 kilos. NaCl at 1.6 pf.	16.00
	6.64 H.P.H. at 2 pf.	13.28	9.95 H.P.H. at 2 pf.	19.90
	Total	43.12	Total	35.90
Expensive salt and expensive energy	18.65 kilos. NaCl at 3 pf.	55.95	10.00 kilos. NaCl at 3 pf.	30.00
	6.64 H.P.H. at 5 pf.	33.20	9.95 H.P.H. at 5 pf.	49.75
	Total	89.15	Total	79.75
Cheap salt and cheap energy	18.65 kilos. NaCl at 1.6 pf.	29.84	10.00 kilos. NaCl at 1.6 pf.	16.00
	6.64 H.P.H. at 1 pf.	6.64	9.95 H.P.H. at 1 pf.	9·95
	Total	36.48	Total	29.95
Cheap salt and expensive energy	18.65 kilos. NaCl at 1.6 pf.	29.84	10.00 kilos. NaCl at 1.6 pf.	16.00
	6.64 H.P.H. at 5 pf.	33.20	9.95 H.P.H. at 5 pf.	49.75
	Total	63.04	Total	65.75

In all the instances except the last, the cost of 1 kilo. of active chlorine is cheapest in the case of the Kellner plant. The author points out that in the last instance the prices are abnormal, and that even in this instance the Kellner plant would again work more economically by slightly increasing the concentration of the salt solution, which would at the same time, just as is the case with the Haas and Oettel plant, reduce the amount of electric energy required.

Owing to the fact that the Kellner apparatus works with a current density about ten times as great as in the Haas and Oettel apparatus, the author maintains that for large installations the Kellner apparatus is cheaper than the other, and that even for small plants there is no important difference in the original cost of the plant, although platinum is used in its construction.—J. S.

Chromic Acid; The Electrolytic Regeneration of ——, and the Manufacture of Acid-proof Diaphragms. M. Le Blanc. Zeits. für Elektrochem. 1900, **7**, [20], 290—295.

THE author refers to the electrolytic regeneration of chromic acid (this Journal, 1899, 685 and 1124), and points out that the chief difficulty which was encountered, before this process could be worked on a large scale, was the manufacture of large diaphragms capable of resisting the combined action of sulphuric and chromic acids. This has now been accomplished. The diaphragms, after firing, contain about 25 per cent. of Al_2O_3 and 75 per cent. of SiO_2. Up to the present the largest plates which have been made measure 72·5 × 97·5 cm. whilst cylindrical diaphragms measure 75 cm. in length and 31 cm. in internal diameter. The thickness of the diaphragms varies according to the size, but is usually between 4—7 mm. The resistance of these diaphragms is very low. If a divided cell be constructed with a diaphragm 5 mm. in thickness, and with electrodes of the same size as the diaphragm, then it will, when charged with 10 per cent. sulphuric acid at 20° C., cause a drop of only 0·15 volt with a current density of 200 ampères per square metre. No increase of resistance was noted after a diaphragm had been continuously in use for two years.
—J. S.

Lead Persulphate. K. Elbs and F. Fischer. Zeits. für Elektrochem. 1900, **7**, [22], 343—347.

A FAIRLY large glass vessel and an earthenware cell suspended in it are filled with pure sulphuric acid of sp. gr. 1·7—1·8. In the outer vessel are placed two bright lead plates to act as anodes, whilst the cathode consists of a spiral of lead tubing placed in the inner pot. A stream of water is passed through the spiral from time to time, in order to prevent the temperature in the outer or anode compartment from rising above 30° C. During the electrolysis the current density should be from 2 to 6 ampères per square decimetre. As a rule a white turbidity of crude lead persulphate, $Pb(SO_4)_2$, appears in the anode compartment, and gradually settles on the bottom, whilst the acid becomes of a pale greenish-yellow colour, due to the presence of dissolved persulphate. When the lead persulphate is being formed properly, the anodes remain perfectly bright, and if brown spots of peroxide appear on them they must be withdrawn, washed with an acidified sodium nitrite solution, rubbed dry with sand, and again replaced. After some hours the porous pot and the electrodes are removed. The anode liquor, together with the deposited mud, are then poured into a bottle and tightly stoppered up. After some days most of the lead persulphate will have settled out on the bottom. Sometimes the walls and the surface are covered with considerable quantities of the salt in a granular form. The current yield averages about 60 per cent. of the theoretical. The salt, dried in the desiccator on porous plates, usually contains 60—85 per cent. of the persulphate, the remainder being lead sulphate. The granular crusts formed on the sides and surface sometimes contain 85—99 per cent. of the persulphate.

Lead persulphate is a white or faintly greenish-yellow powder, apparently crystalline, and slightly soluble in concentrated sulphuric acid or pyro-sulphuric acid, to which it imparts a pale greenish-yellow colour. At 30° C. 100 c.c. of concentrated sulphuric acid dissolve about 0·345 grm. lead persulphate, together with 0·030 grm. lead sulphate. The solution, however, may not contain the persulphate as such, but the compound $H_2Pb(SO_4)_3$, corresponding to the salt potassium lead persulphate (potassium plumbisulphate), $K_2Pb(SO_4)_3$.

Water instantly decomposes the persulphate into sulphuric acid and peroxide of lead or its hydrate. Dilute sulphuric acid also decomposes it, but more slowly. Sulphuric acid of sp. gr. 1·80 has no action on it at the ordinary temperature, but at 100° C., oxygen is evolved according to the equation $Pb(SO_4)_2 = PbSO_4 + SO_3 + O$.

Concentrated hydrochloric acid dissolves the salt, forming a yellow solution containing lead tetrachloride. Addition of potassium or ammonium chloride to this solution produces yellow crystals of potassium or ammonium plumbichloride. Glacial acetic acid also acts on the salt, giving lead acetate.

Lead persulphate is a powerful oxidising agent. It dissolves in 20 per cent. caustic soda, and is reprecipitated on neutralisation as a reddish brown voluminous precipitate. On exposure to the air this precipitate is finally converted into peroxide of lead.

The potassium, ammonium, rubidium, and caesium plumbisulphates (persulphates) have been prepared. They are pure yellow salts scarcely soluble in sulphuric acid of sp. gr. 1·7, more soluble in stronger acid, and fairly readily soluble in fuming acid.

The aniline, dimethylaniline, and diethylaniline plumbisulphates have also been prepared.

The existence of lead persulphate may possibly have an important bearing on secondary batteries. If the active mass of the plate be not sufficiently porous, or if too high a charging current be employed, the specific gravity of the acid in the interior of the positive plate may exceed 1·65. When this happens the lead persulphate is stable, and will go into solution as if a soluble anode were employed. Lead persulphate acts on lead thus :—

$$Pb(SO_4)_2 + Pb = 2PbSO_4;$$

but it also acts on the more dilute acid which gradually diffuses towards it, liberating peroxide of lead in a gelatinous condition. The result of these two reactions would be a corrosion of the lead framework and a rapid destruction of the positive plates.—J. S.

Nitro - Compounds; Electrolytic Reduction of ——. A. Rohde. Zeits. für Elektrochem. 1900, **7**, 328—332 and 338—341.

ELBS and others (this Journal, 1898, 1137 and 1138) described a method for the electrolytic reduction of nitro-compounds and some typical examples. The author gives the results which he obtained on reducing certain nitro-bodies.

I. *m*-Nitro-dimethylaniline gave 93 per cent. of the theoretical yield of tetramethyl-*m*-diamidoazobenzene. On further reduction this gave the corresponding hydrazo-compound.

II. Dimethyl-*m*-nitro-*o*-toluidine gave 86 per cent. of the theoretical yield of tetramethyl-*m*-diamido-*p*-azotoluene, and the corresponding hydrazo-compound on further reduction.

III. *m*-Nitro-monomethylaniline gave up to 85 per cent. of the theoretical yield of dimethyl-*m*-diamidoazobenzene, and the corresponding hydrazo-compound on further reduction.

IV. *p*-Nitro-dimethylaniline did not yield an azo-compound. Löb (this Journal, 1899, 486) states that 40 per cent. of the azo-compound was obtained from this substance. The chief product obtained by the author was *p*-amidodimethylaniline.

V. Benzoyl-*p*-nitro-diphenylamine gave *p*-azoxybenzoyldiphenylamine when ammonium acetate was added to the cathode electrolyte instead of the usual sodium acetate, and when the sodium carbonate solution round the anode was replaced by amonium carbonate. At a higher temperature in a strongly alcoholic solution benzoyl-*p*-azodiphenylamine was obtained.

VI. *p*-Nitro-diphenylamine gave 70 per cent. of the theoretical yield of *p*-amidodiphenylamine sulphate instead of an azo-compound.

VII. *p*-Nitraniline gave 86 per cent. of the theoretical yield of *p*-phenylenediamine, whilst the *o*-compound gave a 70 per cent. yield of the corresponding *o*-phenylenediamine.

VIII. α-Nitro-β-naphthyl-ethoxide, reduced in the usual manner gave α-amido-β-naphthyl-ethoxide, whilst when ammonium acetate was substituted for sodium acetate a compound was obtained which the author considers to be α-azoxy-β-naphthyl-ethoxide.—J. S.

Benzidine; Electrolytic Production of ——. W. Löb. Zeits. für Elektrochem. 1900, **7**, [20], 300—304; [21], 320—328; and [22], 333—338.

Benzidine is best prepared by the electrolysis of an acid solution of azobenzene or azoxybenzene.

Starting from azobenzene the best results were obtained under the following conditions:—

$$\text{Electrolyte}\begin{cases}\text{8 grms. azobenzene.}\\ \text{150 c.c. alcohol.}\\ \text{20 grms. sulphuric acid.}\end{cases}$$

Cathode, nickel-wire gauze, 5 × 10 cm.
Current density, 0·9 ampère per 100 sq. cm.
Ampère hours, 7 (instead of 2·21 theoretically necessary.
Temperature, 23° C.
Platinum anode employed.

The yield was as follows:—

9·9 grms. benzidine sulphate = 80 per cent. of the theoretical.
Traces of unchanged azobenzene.
0·3 grm. aniline.
0·25 grm. diphenyline.

Azobenzene is formed during the electrolysis of an alkaline solution of nitrobenzene in alcohol under the conditions given by Elbs (this Journal, 1898, 1137), so that it is possible to start from nitrobenzene and electrolyse until the maximum quantity of azobenzene is formed. After acidifying this solution with sulphuric acid benzidine sulphate may then be obtained as above.

Azoxybenzene may be obtained from nitrobenzene in a similar manner. The author electrolyses 10 grms. of nitrobenzene suspended in 80 c.c. of a 2—4 per cent. alkali or alkali-salt solution in a divided cell, using a mercury or nickel cathode. A platinum anode is employed, the anode compartment being charged with a dilute solution of sodium sulphate. Seven ampère-hours are sufficient for the reduction of above quantity of nitrobenzene, instead of 6·57 theoretically necessary. The oily cathode liquor furnishes azoxybenzene corresponding to a 90 per cent. yield.

Benzidine sulphate is obtained from azoxybenzene in the same way as from azobenzene, except that twice as much current is required. On electrolysing a solution containing 9 grms. of azoxybenzene, 150 c.c. alcohol, and 20 grms. of concentrated sulphuric acid, 80—82 per cent. of the theoretical yield of benzidine is obtained.

The results are summarised as follows:—

1. During the electrolytic production of benzidine in acid solution the velocity of the intramolecular change of the intermediate product, hydrazobenzene, can be brought into a definite proportion to the velocity of reduction. It is thus possible to ascertain the conditions under which hydrazobenzene, immediately after its formation and therefore in very dilute solution, is converted into benzidine and the production of diphenyline reduced to a minimum.

2. In attempting to obtain benzidine by the reduction of nitrobenzene direct in acid solution the yield is very largely lowered, owing to the intermediate phases and their products, chiefly phenylhydroxylamine.

3. Azo- or azoxybenzene must therefore be selected as the starting point for the reduction in acid solution. A good yield of both of these substances can be obtained by the electrolysis of an alkaline or alkali-salt solution, and this, on further reduction in acid solution, gives about 80 per cent. of the theoretical yield of benzidine.

4. During all these electrolytic operations the best results were obtained by the use of mercury cathodes. Another important condition for the success of the experiment, especially as regards the current yield, is the efficiency of the stirring arrangement.—J. S.

Caustic Soda and Chlorine; Manufacture of ——, by the Electrolysis of Sodium Chloride. Cohn and Greisenberger.

See under VII., *page* 123.

Chloroform; Electrolytic Preparation of ——. Rev. Prod. Chim. **3**, [20], 309.

See under XX., *page* 149.

Calcium Carbide; Manufacture of ——. J. B. C. Kershaw.

See under II., *page* 108.

PATENTS.

Electric Primary and Secondary Batteries. A. de Castro and H. W. Schlomann, Berlin, Germany. Eng. Pat. 3192, Feb. 17, 1900.

To render batteries as light as possible they are mainly composed of suitable material impregnated by a process described in Eng. Pat. 2703, Feb. 10, 1900. The outer receptacle of the battery is formed of sailcloth or other suitable material, impregnated with copper or other active substance to form the negative pole, and there is an inner receptacle made of the same material, and impregnated with zinc or other active substance, which forms the positive pole. Different forms of cell and methods of arranging them are shown.—G. H. R.

Anodes in Electrolytic Apparatus; Impts. in Features for the ——. W. P. Thompson, London. From H. Becker, Paris, France. Eng. Pat. 3524, Feb. 22, 1900.

The anode container and connecting device comprise a case with perforated non-conducting sides, enclosing the scrap metal to be electrolysed, to which a current is led by means of conductors of suitable form (bars, plates, gratings, or the like), so as to distribute current throughout the scrap metal on which it is intended to act. Current-distributing conductors consisting of metal bars bear other vertical bars which are inserted among the scrap metal, or the conductor may consist of two bars sliding on each other, and bearing other vertical bars which are inserted among the scrap metal, and press it between them.—G. H. R.

Insulating Material; Application of Steatite to Electrical Purposes as an ——. F. de Mare and E. Frémy, Brussels, Belgium. Eng. Pat. 3762, Feb. 27, 1900.

Steatite may be used to make electrical insulators, the pieces being either formed from the solid, or, when large dimensions are necessary, they may be made in moulds, the steatite being very finely powdered, and brought by a process of compression and baking into a suitable condition for the purpose. An arrangement is claimed for insulating pieces made of steatite, combined for the purpose of protecting by electrical insulation a conductor having to carry a current of very high tension (such as one produced by induction coils) through metallic substances at either high or low pressure. Two pieces of steatite are screwed together like a sheath, within which is placed a tube of thin glass or steatite, to prevent loss by flaws, and to increase in every case the electrical power.—G. H. R.

Amines from the Corresponding Nitro-Compounds; Production of ——. G. W. Johnson, London. Eng. Pat. 4175, March 5, 1900.

See under IV., *page* 118.

(*B.*)—ELECTRO-METALLURGY.

Aluminium as an Electrical Conductor, with New Observations upon the Durability of Aluminium and other Metals under Atmospheric Exposure. J. B. C. Kershaw, Inst. of Elect. Eng. 1901; through Electrician, 1901, **46**, [13], 464—466.

Taking the relative specific gravities of aluminium and copper as 2·68 and 8·93, the conductivities as 59 and 100, and the prices as 224*l.* and 91*l.* per ton, the relative values of the two metals for conductivity purposes is Al:Cu = 1,000 : 798; but with aluminium at 135*l.* per ton, for which the metal has been sold for large orders in America, the ratio is 1,000 : 1,325; so that aluminium is the cheaper. It is noted that 170*l.* per ton has been quoted for large orders of the wire in this country. Bare aluminium transmission lines have been and are used in many places (named) in America, but in no case is it proposed to use it for insulation-covered conductors. Soldered joints have been made in one or two places, but usually mechanical jointing is relied upon. The author has exposed to the atmosphere two sets of wires, stretched horizontally and separately (2 ft. long) on glass supports in a wooden frame; one of these sets was at St. Helens, the other at Waterloo, near Liverpool. Each set consisted of an aluminium, a galvanised iron, a plain copper, and a tinned copper wire; and was exposed for 10 months (October 1899 to August 1900). At the end of this period the Waterloo set showed the following results:—Aluminium was pitted, especially where water-drops had collected on the under side, and had *gained* 0 to 0·55 per cent. in weight; galvanised iron showed no change in appearance and had *lost* 0·15 per cent. in weight; copper, plain and tinned, had oxidised on the surface, but not corroded; the weight was unaltered.

The St. Helens set were as follows:—Aluminium was badly pitted and very dirty, had gained 0·27 to 0·83 per cent. in weight; galvanised iron was badly corroded with zinc, partly eaten away, had lost 1·4 to 2·1 per cent. in weight; copper, plain or tinned, was quite black, and had lost 1·3 to 1·6 in weight. The conductivity of the aluminium wires fell, in the case of the St. Helens samples, from 51·3 to 46·6, whilst in the Waterloo specimens it was practically unchanged; the tensile strength also had fallen from 13 to 11·15 (St. Helens) and 12·06 (Waterloo) tons per sq. in. It is noteworthy that the original conductivity of the aluminium was said by the vendors to vary in two different wires supplied from 62 to 65, whilst it was actually found to be 51 and 54 per cent. It is therefore probable that the vendors' numbers were based on surmise and not on actual test. As the result of these observations it appears that aluminium is not suitable for overhead wires (especially for trolley lines) in any large town where much coal is burnt, either for domestic or for manufacturing purposes. Even in country districts or in small towns, where all the metals tried appeared to be fairly durable, the slight pitting of the aluminium might prove serious, owing to the opportunity thus afforded for the lodgment of small particles of foreign matter, which in time might lead to the disintegration of the whole.—W. G. M.

Tungsten and Molybdenum Alloys; Production of ——, in the Electric Furnace. C. L. Sargent. J. Amer. Chem. Soc. 1900, **22**, 783—791.

Mixtures of oxides with carbon were heated in scorifier-shaped crucibles of graphite, in some cases lined with magnesia, the voltage used ranging in different experiments between 65 and 100, and the ampèreage between 90 and 190, whilst the duration of the experiment varied between one and five minutes. The proportion of carbon employed, had a greater effect upon the character of the resulting metal than the current conditions adopted had. An attempt was made to decarburise the impure alloy by heating it in magnesia-lined crucibles, but the metal was converted into trioxide, whilst magnesium was volatilised. The conditions of each experiment made, are given, and the analyses and some of the physical characteristics of the alloys produced are quoted. It was not possible by co-reduction of oxides to prepare alloys of tungsten with metals of low boiling-point, as the metal was apparently volatilised before the tungstic oxide was reduced. Bismuth and manganese, each would alloy to some extent with molybdenum, but not with tungsten; copper, on the other hand, alloyed with tungsten, but not with molybdenum; whilst tin would not alloy with either. Cobalt, chromium, and nickel each alloyed with the greatest ease either with tungsten or molybdenum; and the resulting products, in the case of cobalt and nickel, may prove to possess a technical value if prepared in large quantities.—W. G. M.

PATENT.

Electroplating Pins and other Small Objects; Apparatus for ——. E. Morrison, Latchford. Eng. Pat. 2159, Feb. 2, 1900.

A tube of conducting material in electrical connection with an external insulated conductor is mounted on the axle of a perforated revoluble drum, from which it is insulated, and which has a case or guard of non-conducting material arranged round it so as to prevent its contents, such as pins or the like, from dropping or protruding through the perforations, and without interfering with the free passage of the solution through them. Radiating conducting strips or pins for making electrical contact with the articles within the drum are mounted on the tube, so that they or other parts of the apparatus do not themselves become plated.
—G. H. R.

XII.—FATS, OILS, AND SOAP.

Oil of Akee; Notes on the ——. E. M. Holmes. Pharm. J. 1900, **65**, [1590], 691.

The author gives a description of the akee tree, which is a native of the coast of Guinea, in West Africa, but has been cultivated for a considerable length of time in the island of Jamaica. The oil is said to be obtained from the arillus of the fruit, that is, the white or cream-coloured fleshy substance surrounding the seeds. For a description of the characters of the oil, see following abstract.—A. S.

Oil of Akee; Characters of the ——. W. Garsed. Pharm. J. 1900, **65**, [1590], 691.

The sample of oil of akee examined consisted of a yellow, non-drying, butter-like fat at ordinary temperatures; it had a peculiar odour and an oily, somewhat unpleasant taste.

Akee Oil.

Specific gravity (water at 15·5° C. = 1)	0·857 at 99°—100° C.
Melting point	25°—35° C.
Solidifying point	20° C.
Hehner value	93
Saponification value	194·6
Reichert value	0·9
Hübl's iodine value	49·1
Acid value	20·1

Mixed Fatty Acids.

Specific gravity (water at 15·5° C. = 1)	0·8365 at 99°—100° C.
Melting point	42°—46° C.
Solidifying point	40°—38° C.
Saponification value	207·7
Iodine value	58·4

The mixed fatty acids distil unchanged at 220°—225° C. under 13 mm. pressure.

The oil-cake, consisting of the pressed seeds, still contains 25 per cent. of oil, which can be extracted by solvents.—A. S.

Alcohol for the Toilet Soap Industry; Denaturing ——. R. Hirsch. Chem. Ind. **23**, [23], 511—512.

On Oct. 1, 1900, the use of alcohol, to which 1 part of castor oil and 0·4 part of solution of caustic soda had been added per 100 parts, was sanctioned [in Germany] for use in the manufacture of transparent soaps. This concession is undoubtedly of great service to the toilet soap makers, but it seems doubtful if the denaturing is adequate to prevent misuse of the alcohol so treated. A second innovation, however, is the following:—Makers of perfumes for export, who recover duty on the spirit they export, are not allowed to use denatured alcohol in their factories. As, however, with few exceptions, all the German factories where perfumes are made for export are also toilet soap factories, it is evident that the new regulation places them under a serious disadvantage.—J. A. B.

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

(*A.*)—PIGMENTS, PAINTS.

White Lead; New Process for the Manufacture of ——. R. Hitchcock. Eng. and Mining J. 1900, **70**, [23], 668.

By a new process for the manufacture of white lead, invented by J. W. Bailey, and now in operation in Jersey City, U.S.A., metallic lead is melted in a receptacle, elevated about 10 ft. above the floor, and is run into a second, smaller vessel placed over an independent fire, the object of which is to enable the metal to be maintained at a fairly constant temperature. At the bottom of the smaller vessel is a short horizontal nozzle about $2\frac{1}{2}$ in. in diameter, terminating in a thin plate of steel, which is perforated with about 150 or 200 minute holes, 0·009 to 0·010 in. in diameter. The melted lead is forced by the hydrostatic pressure of its own mass through the minute perforations, and, as it falls through the air, becomes immediately solidified into fine metallic fibres about 0·01 in. in diameter. The fibrous lead collects on an iron plate, from which it is transferred to trays, which are made of wood, with slats at the bottom, in order to allow of free circulation through them. The trays, when filled with the fibrous lead, are immersed momentarily in an 8 per cent. solution of (No. 26) acetic acid, then allowed to drain for a few minutes on an inclined platform, and immediately piled in stacks of 15 or 20 over openings in the floor, through which carbon dioxide gas enters. The carbon dioxide is used moist, but it is important that the humidity should be maintained within proper limits. The stacks of trays are kept at a uniform temperature of about 100° F. The corrosion is stated to be nearly uniform throughout each stack, and is complete in three days, at the end of which period the contents of the trays are thrown into water, where complete disintegration takes place. The white lead "cream," which is in such a fine and uniform state of subdivision that no grinding is necessary, is passed through a revolving wire screen, partly submerged in water, and the pure white lead thoroughly washed and dried. The residual unchanged lead with some white lead attached, which remains on the screen, amounts to about 8 per cent. of the lead used, and is in a finely divided condition suitable for the manufacture of lead acetate and for other purposes. It is claimed that the white lead is equal in colour and body to the well-known Cremnitz product, whilst the size of the individual particles is stated to be smaller and more uniform than is the case with the white lead obtained by the Dutch process.

The total cost of manufacture is less than 5 dols. per ton of dry product, whilst by the Dutch process it cannot be less than 18 dols.

Two samples of white lead manufactured by the Bailey process gave the following figures on analysis :—

——	I.	II.
	Per Cent.	Per Cent.
CO_2	11·76	11·71
PbO	85·90	85·98
Water	2·34	2·49

—A. S.

(*B.*)—RESINS, VARNISHES.

Resin resembling Shellac; New Brazilian ——. G. Thenius. Oesterr. Chem. u. Techn. Zeit. **18**, [22], 5.

A sample of a new resin, of Brazilian origin, examined by the author was found to be of a yellowish-brown (liver) colour, transparent in thin layers (though slightly turbid from contained water), and plastic on immersion in boiling water. Broken in the cold, it shows a highly lustrous fracture; at 12°—15° C. it bends easily, without breaking; and when melted by heat it first froths up, with liberation of acid vapours, and afterwards fuses to a clear, pale yellow-brown liquid, which resembles shellac on recooling. Cold strong alcohol dissolves it readily, forming a quick-drying solution, which leaves behind a lustrous varnish coating. It therefore appears suitable for replacing shellac and copal, and also as an adjunct to colophony for making sealing-wax. It is insoluble in oil of turpentine and other ethereal oils, even when hot.

At temperatures above melting point, the resin gives off gas and leaves a dense black residue of carbon. On distillation it froths up and yields an acid aqueous distillate, but no ethereal oil, and is finally decomposed into gas and carbon. It is soluble in a boiling solution of borax, the product behaving like a varnish on glass, leather, and wood. The solubility in caustic soda is less considerable, and a portion of the resin is deposited again on cooling.—C. S.

PATENTS.

Linoleum or the Like; Manufacture of Coating Material for ——. J. S. Ammundsen and E. A. Rasmussen, Copenhagen. Eng. Pat. 11,526, June 25, 1900.

$36\frac{2}{3}$ parts of resin are melted with $18\frac{1}{3}$ parts of vegetable oil (drying or non-drying), mixed with about 45 parts of casein containing a certain proportion of lime, and incorporated with cork powder or the like. The resulting mass is formed into sheets and dried. The proportion of lime to casein varies from 8 per cent. for a very elastic product to 30 per cent. for a hard one; and either drying or non-drying oils are employed, according to the time available for finishing the material. The advantage claimed is the avoidance of linseed oil, which is expensive, and very slow in hardening. Eng. Pat. 4235, 1899, is referred to.

—F. H. L.

India-Rubber; Manufacture of Substances similar to ——. C. A. R. Steenstrup, Copenhagen. Eng. Pat. 17,475, Oct. 2, 1900.

4 to 8 parts of oil or oil refuse (preferably linseed oil) are melted in an open vessel, with constant agitation, with 1 part of rubber (old rubber cuttings, with or without bits of cloth), and the hot mass is strained or allowed to clarify by subsidence. It is then heated to 350° C. and stirred constantly for 4 to 12 hours, till it coagulates, when the bulk is taken out and cooled. It is suitable for insulating purposes, as a paint for iron, and as an ingredient in linoleum manufacture, &c.—F. H. L.

(*C.*)—INDIA-RUBBER, &c.

Caoutchouc; Togo ——. K. Schumann. Notizbl. d. kgl. botan. Gart. u. Mus. 1900, **3**, 78; through Chem. Zeit. Rep. 1900, **24**, [100], 367.

Togo-caoutchouc is probably derived from a species of *Landolphia*, but the point is at present uncertain, owing to lack of material for identification. The natives remove strips of bark 5 cm. long and 2 cm. wide at distances of 40 cm., being careful to leave the cambium ring of the tree unharmed. The sap is collected and sprinkled with lemon juice or with salt water, to hasten its coagulation.—R. L. J.

"Root"-Caoutchouc in the Kunene District ——. Tropenpflanzer, 1900, **10**; through Gummi-Zeit. 1900, **15**, [13], 207—209.

H. Baum, of the German Kunene-Zambesi Expedition, gives an account of this product in his journal, from which it appears that the Kaffirs of Longa, Quiriri, and Kampuluvé are entirely dependent on it for barter with the Portuguese merchants and other natives, any grain which they cultivate being chiefly used for the manufacture of beer. The plant is found on the large, sandy plains, surrounded by forests, situated on the high lands between the water sheds, and though it may penetrate some distance into the woods, never grows in the immediate vicinity of water. Its distribution is rather wide, occurring from above the mouth of the Lazingua river up to Longa, Quiriri, Kampuluvé, and Kuito, and still further to Kuando. Formerly plentiful at Kutsi and Kubango near Massaca, it has now almost disappeared, but is said to exist in the Cuninghama district. As the stolons are furnished with but little root, they easily perish. The caoutchouc is gathered in the following manner:—The " roots," tied in stout bundles about two metres high, are soaked in water to free the bast and then dried in the sun. They are then cut, one by one, into lengths of 20—40 cm., and the small lumps of gum which exude from the ends, are collected to form the special or light " manga."

The sticks are beaten on a board until the wood is got rid of, and the pieces of bark are further beaten until they gradually form a cake of rubber. Boiling in water and further beating are employed to separate the exhausted bark. This cake is cut into rectangular strips, and these are softened in water and kneaded whilst hot, into round, finger-shaped strands, forty of which constitute a heavy manga. The manga is the unit of quantity and value (the heavy kind merely contains sand and other impurities); it is estimated by spanning with the hand, weighs approximately 1 kilo., and has an exchange value of 8 yards of cloth. A still lighter manga, with fibrous structure and other specific characters, is said to be manufactured from another plant, but it is not often met with.—R. L. J.

India-Rubber on Iron; The Fixing of ——. Gummi-Zeit. 1900, **15**, [13], 205—206.

To ensure the permanent adherence of rubber to any iron surface, the latter must be effectively roughened by hammer and chisel or other means, thoroughly cleansed from oil, grease, and all impurities, and then painted several times with a coat of rubber solution. A layer of hard rubber, also smeared with solution, is placed on this, and soft rubber built thereon to the required extent. The whole is secured by cloth wrappings and placed in the vulcaniser, where an intimate combination ensues between the iron and rubber layers. The wrappings are taken off, and the now solid rubber is trimmed to the desired shape. As any paint on the article is ruined in the heat of the vulcaniser, it should be removed previously.

Some goods cannot be heated in a vulcaniser, a tempered steel band-saw, for instance. These are made as hot as the hand can bear, and the rubber, cut somewhat smaller than the surface to be covered, is cemented on with bone-glue, being stretched meanwhile to the required size. Excess of cement is squeezed out and removed, and the adhesive allowed to set for at least 24 hours.

The use of a hard cement requires special experience.
—R. L. J.

India-Rubber; Caustic Alkaline Bath used in the Manufacture of ——. Gummi-Zeit. **15**, [11], 1900, 177.

In spite of the general use of alkaline baths for the removal of the free sulphur from rubber goods there is very little unanimity amongst manufacturers as to the best manner of their employment, although they appear to be fairly agreed that for economical reasons caustic soda is the best alkali to be used. Various alkaline solvents for sulphur have recently been proposed and enjoyed a passing popularity. Potassium carbonate has been recommended on account of the soft surface it imparts to the goods, but its high price proved objectionable. Caustic potash is used in some French factories together with potassium carbonate. Hancock operated with a strong solution of sodium or potassium sulphate at 200° F. Also common soda crystals are to some extent employed. Opinions differ regarding the strength of caustic soda to use; it is, however, probable that different qualities of rubber goods require solutions of different strengths according to the proportions of resinous or saponifiable matters which they contain.—C. O. W.

India-Rubber for Rubber Shoes. Gummi-Zeit. **15**, [3], 1900, [4], [5], 35, 52, 69.

An entirely uniform blackness of the rubber mixings is essential for the production of good shoes. For this purpose all the mixings contain lamp black or tar. The tar used for this purpose is heated with addition of resin or wax, until the mixture after cooling forms a tough mass. The use of this preparation, however, requires great care, as too great a proportion of it is apt to render the rubber too soft for working or vulcanising. For " mixings " of Para rubber, or similar qualities, it is therefore preferable to use neither tar nor lamp black, but litharge, or some similar lead compound.

The foundation of the shoe is the sole, and it should be made of a tough and firm rubber. These soles are rolled in calenders in which they are at the same time suitably embossed. For this calendering operation, the mixings should be used very warm so that the sheets are obtained perfectly homogeneous and free from air bubbles. As the sheets leave the calender they are run upon cloth-covered frames the size of which is determined by the size of the cutting tables or machines. Before cutting the soles from these sheets, the latter are immersed for about 10 minutes in boiling water. The shrinking of the rubber is thus reduced during vulcanisation to a minimum, and the distortion of the shoe upon the last is obviated. The " sole-mixings " contain comparatively little, but always good qualities of rubber, such as Congo, Madagascar, Accra strips, Rio sheet, to the amount of about 25 per cent. This quantity can be reduced to 18 per cent. by using Ceara or Negro-heads, together with from 8 to 10 per cent. of " recovered rubber." The dark grey colour of the soles is produced by the addition of from 0·5 to 0·75 per cent. of lamp black, together with from 12 to 15 per cent. of barytes, or lithophone. The quantity of sulphur employed should be at least 9 per cent. of the amount of india-rubber contained in the mixing.

The uppers are made of much thinner material, rarely exceeding 0·02 in. in thickness. The mixing is generally the same for all the qualities of shoes of a factory. The sheets for this purpose are run on an ordinary calender, which must, however, be free from vibration, to prevent streaks and other irregularities from appearing. Owing to the presence of tar in these mixings, the sheets obtained are very soft and sticky, they can therefore not be rolled up, but are cut into two or three yard lengths which are deposited upon the already mentioned cloth-covered frames. From these sheets the uppers are cut by hand, the cut parts, until further required, being kept between cloths arranged in book fashion. The mixtures for the uppers contain not less than 25 per cent. of rubber, generally Ceara twist. Of thickened tar, containing a little resin or wax, and sometimes even asphaltum, usually from 3 to 5 per cent. is used, together with about 0·5 per cent. of lamp black. Of sulphur, 8 per cent. of the amount of rubber present is employed. The filling materials in the mixing consist altogether of 50 per cent. of either " barytes," or lithophone, or zinc-white and chalk, with 10 per cent. of litharge, and frequently also up to 5 per cent. of iron oxide (Venetian Red). Sometimes also magnesium carbonate appears to be added.

The insertions ("foxing") between the sole and uppers consist of more or less strongly rubber-coated cloths of every description. The rubber coating is applied either with a friction calender, or upon the spreading machine. The mixings employed for this purpose are very cheap, containing rarely above 10 per cent. of rubber (Cameroon), together with about 15 per cent. of regenerated rubber, and 10 per cent. of "black substitute." For colouring purposes about 0·25 per cent. of lamp black, 1 per cent. of tar, up to 5 per cent. of ground dark waterproof cuttings, and about 12 per cent. of litharge are used. Such a mixing requires about 3 per cent. of sulphur. All the different parts representing the " foxing," are cut by machinery.

The shoes being put together from their various parts, are ready for varnishing. The varnish used for this purpose is considered the greatest mystery of a rubber shoe factory, and it is extremely difficult to produce the dead black, elastic and non-cracking article required. It consists essentially of a linseed-oil lead-soap with addition of turpentine and sulphur. The shoes are varnished with a dilute solution of this preparation in benzene. As a rare exception scarlet or yellow varnish is used. This consists of an india-rubber solution containing the necessary quantity of sulphur, to which either vermilion or cadmium yellow have been added.

The vulcanisation of the rubber shoes is carried out in steam-heated chambers large enough to receive the whole of a day's production. The walls of the chamber must be sufficiently thick to reduce the loss of heat by radiation to a minimum, and to allow of the strict maintenance of the required temperature. Owing to the great heat capacity of these large chambers the time required for vulcanisation is not less than 10 hours. The temperature is slowly carried up to 135° C., at which it is maintained for at least two hours. This temperature should not be exceeded owing to the detrimental action of higher degrees of heat both upon the textile portions of the shoes, and upon the brilliancy of the varnish. The progress of the vulcanisation is checked by means of long thermometers and also by withdrawing from time to time one of the shoes through specially provided openings in the stove. Before emptying the hot chamber, the noxious vapours in it are drawn off by means of an exhauster.—C. O. W.

Rubber Industry; Notes on Materials Used in the ——. Gummi-Zeit. 1900, **15**, [13], 206—207. (Compare this Journal, 1899, **18**, [2], 166.)

Caseïn occurs naturally in the milk of mammals as a soluble alkaline albuminate, and, in the vegetable kingdom, as a constituent of leguminous and other plants. Fresh cows' milk is diluted with four parts of water, acetic acid (0·1 per cent.) is added, and the precipitated caseïn is washed with water and pressed. The cake is pulverised in water, redissolved with dilute soda-lye, and again precipitated, this process being repeated several times. It is finally washed with ether-alcohol, pressed, dried, and powdered.

Castilloa Caoutchouc, of Central American origin, and now obtained from Nicaragua, West Indies, Honduras, Mexico, Guatemala, Panama, and Peru, is sold in blocks, slabs, and sticky black scraps, and has a medium value usually two-thirds that of the best Para. It is supplied by the *Castilloa Elastica* (*Artocarpaceæ*), which grows wild from South Mexico to Ecuador, and with special vigour in the southern provinces on both Atlantic and Pacific slopes, and possesses various local names, such as Hule (Nicaragua), Ule and Aquoquitl (Mexico), Heve or Jeve (Ecuador), and Caucho (Panama). The tree grows about 20 metres high, has a smooth yellow stem 16—120 cm. thick, is branching and umbellate, and the wood is rather weak. The leaves, 15—20 cm. long, are entire, glossy bright green in colour, hairy on the under surface and fall in the dry season, at which period also the tree is in bloom. The flat, broad fruits, 3—5 cm. wide, ripen in 4—5 months, and consist of small cone-shaped clusters, joined together at the base; they contain flat elliptical seeds, distributed by the agency of monkeys and parrots, which feed on the fleshy fruit coat. *Castilloa tuum* (*tuum* being the native name) is another variety, growing in British Honduras, and yields a kind of balata intermediate in character to caoutchouc and guttapercha. The milk is coagulated by heat, hardens in cold and softens in warm water, so that it can be moulded, but is not elastic. *Castilloa Markhamiana* gives an inferior product. The caoutchouc obtained from genuine *C. elastica* tree varies somewhat according to locality.

Collection of the Juice.—Ring, spiral, or cross-shaped incisions are made in the bark, and the milk collected in vessels. Sometimes the whole stem is sliced lengthwise or even felled, a practice which has greatly reduced the number of trees. 30 years ago one tree in every five was a castilloa, and seven cwt. of caoutchouc could be gathered in a fortnight. Now the "Huleros" must wander long distances to find a suitable specimen. Coagulation of the juice by smoking or drying in the sun is less satisfactory than the use of salt or sodium bicarbonate solutions, mixed with infusions of certain climbing plants (liane and convolvulus).

Castilloa caoutchouc is sold in London, Hamburg, and New York; the Nicaraguan, in slabs weighing 5—10 kilos., and scraps, is the chief variety; one also finds the black viscous kind from Carthagena and large clear pieces from Guayaquil. Inferior brands exude a dark offensive fluid and are very porous.—R. L. J.

India-Rubber Pigments; Cadmium Compounds for ——. Gummi-Zeit. **15**, [8], 1900, 123.

Cadmium sulphide, or cadmium yellow, is an excellent pigment for high-class india-rubber articles. In covering power and brilliancy of shade it is equal, if not superior, to most of the other yellow pigments. For india-rubber articles it is especially valuable on account of its indifference to sulphur compounds, as well as to organic reducing substances, weak acids, and alkalis. It neither affects the elasticity nor the durability of rubber goods, and is even supposed to assist the process of vulcanisation. Commercial Cadmium yellow generally contains traces of zinc sulphate, and low qualities are mostly adulterated with clay, gypsum, or barytes. Addition of tin sulphide scarcely affects the beauty of the colour, and such mixtures may be advantageously employed where the high price of the pure article might be prohibitive.—C. O. W.

Camphor and Camphor Oil. Gummi-Zeit. **15**, [8], 1900, 124.

Camphor is one of the most important materials of the celluloid industry, and is also supposed to be used as a solvent for vulcanised india-rubber waste.

Camphor oil, which forms the by-product of this process, on fractional distillation yields "light" camphor oil of sp. gr. 0·89 to 0·92, and "heavy" camphor oil of sp. gr. 0·96 to 0·97. The latter boils at from 240° to 270° C. Camphor oil is an excellent solvent for resins; it represents chemically a solution of camphor in a terpene, $C_{10}H_{16}$, which, on exposure to the air, or on treatment with dilute nitric acid, is readily oxidised into camphor.—C. O. W.

PATENT.

India-Rubber; Manufacture of Substances similar to ——. C. A. R. Steenstrup. Eng. Pat. 17,475.

See under XIII. B., *page* 135.

XIV.—TANNING, LEATHER, GLUE, SIZE.

Tannase. A. Fernbach. Comptes Rend. **131**, [26], 1214—1215.

Aspergillus niger from nut-galls was cultivated in Raulin's liquid, using, however, tannin in place of the sugar. The product was macerated in water, the maceration concentrated at a low temperature *in vacuo*, the liquid precipitated by alcohol, and the precipitate treated exactly as in Lintner's method for the preparation of amylase. The grey powder thus obtained, when dissolved in water, acts rapidly upon tannin at about 50° C., converting it into gallic acid. The solution of *tannase*, filtered through a Chamberland filter into a sterilised solution of tannin, acts just as effectually, so that we have here a true diastatic action, not a fermentation through the agency of organised cells.—J. T. D.

Tannase; A Diastase Hydrolysing Digallic Acid ——. H. Poltevin. Comptes Rend. **131**, [26], 1215—1217.

By a process precisely similar to that of Fernbach (see preceding abstract), but independently of him, the author has prepared a solution of tannase which hydrolyses tannin. Along with the gallic acid formed there is also, in the case of commercial tannins, a variable amount of glucose; but the author considers these commercial tannins as mixtures, and has obtained, from a purified tannin, gallic acid corresponding to 98·5 per cent. of pure tannin. The fact that tannase also hydrolyses phenyl and methyl salicylates lends support to Schiff's formula, $C_6H_2(OH)_3.CO.O.C_6H_2(OH)_2CO_2H$, for tannin. In nature tannin is often accompanied by gallic acid; no doubt the latter is formed by the action of tannase, which the author has found to exist in sumac leaves, and which, no doubt, occurs in other substances containing tannin.—J. T. D.

Dung-Bate; The Action of ——. J. T. Wood. Wisstechn. Beil. Ledermarkt. 1899—1900, **1**, 43, 49; through Chem. Zeit. Rep. 1900, **24**, [100], 370.

The bateing action of dog's excrement on hide is the effect of a combination of amines (hydrochlorides) and erosive enzymes secreted by actively multiplying bacteria. The latter, which are not liquefying organisms, may be best cultivated in a broth made as follows :—10 grms. of gelatin, 5 grms. of dry lactic acid, and 100 c.c. of water are digested for three hours in a closed vessel on the water-bath ; the liquid, which consists chiefly of glutopeptone lactates, protopeptone and simple nitrogen compounds, is neutralised with sodium carbonate, and potassium phosphate is added. It is then inoculated from a mixed culture, which gives better results than if only one kind of bacterium is present. This forms a perfect artificial bate when the required amino-compounds have been added, and it is only the comparative costliness that hinders its extensive use.

Filtering impairs the value of dog dung as a bate, the finely divided solids appearing to act mechanically as a carrier for the enzymes.—R. L. J.

Erodin; The Use of ——, in Tanning. H. Becker. Wiss.-techn. Beil. Ledermarkt. 1899—1900, **1**, 39 ; through Chem. Zeit. Rep. 1900, **24**, [100], 370.

Erodin is an artificial bate or puering agent made by cultivating, in a suitable nutrient medium, the active bacteria of dog's dung, its effect being due to the formation of enzymes and the loosening action of organic acid and amino compounds (compare preceding abstract). The hide is rapidly acted on, remains quite white, the grain being smooth and even and the flesh-side dry ; the resulting leather is supple but tough and strong. 10 grms. of the preparation suffice for 1 kilo. of hide.—R. L. J.

Leather Manufacture; Contribution to the Study of ——. Ch. and Etienne Bruel. Monit. Scient. **15**, [709], Jan. 1901, 29—33.

In a previous article (*ibid.* April 1900, 223) the authors have studied the histology and chemistry of the dermis (corium), the essential part of the skin for the tanner. They now pass to the wet work, consisting of soaking, liming, sweating, unhairing, fleshing, and scudding. The quality and appearance of the finished product depends entirely on these operations. For each kind of leather there is an "optimum" condition in the wet state which will give a maximum absorption of tannin.

The phenomenon of swelling enters into the explanation of every stage of the tanning process. The authors cite Körner's summary (Beiträge z. Kentniss d. wissenschaftlichen Grundlagen d. Gerberei, 1898–9), in which he considers three types of swelling: 1. Capillary attraction ; 2. Endosmose ; 3. Molecular imbibing.

The last is of the greatest importance in tanning. Körner (see preceding reference) enumerates certain principles governing molecular swelling.

1. A body capable of swelling, when put into water, absorbs a *definite* quantity of the water up to a maximum, which cannot be exceeded. (C. Ludwig.)

2. The maximum of swelling depends upon the chemical composition of the body, on its cohesion and elasticity, and on the temperature and interior pressure of the liquid. (C. Ludwig.)

3. Power of resistance to swelling increases from the exterior to the interior, according to a parabolic law ; *i.e.*, the external layers of the body attain the maximum swelling sooner than the internal portions. (L. Mathiessen and A. Schwarz.)

4. The volume of the swollen body is smaller than its original volume, plus that of the liquid absorbed. (Quincke.)

5. Swelling is accompanied by development of heat. (Duvernoy, E. Wiedemann, and Lüdeking. Wied. Ann. **25**, 1885, 145.)

The production of heat is simply due to the contraction, and not to any chemical phenomenon, such as hydration. (Rodewald, Thermodynamik der Quellung, Zeit. f. Phys. Chem. **24**, 1897, 193.) This explains a fact well known to tanners, *viz.*, that skins swell in cold water and "fall" in warm water. Riecke (Zur Lehre von d. Quellung, Wied. Ann. **53**, 1894, 564) concludes that the degree of swelling, $\frac{m_2}{M}$ (where m_2 = mass of water absorbed, M = mass of the body swollen), in a space filled with aqueous vapour, unsaturated, is a function of the pressure and temperature.

The velocity of swelling (Pascheles) may be expressed by the formula—

$$\frac{dQ}{dt} = (M - Q)K$$

where M = maximum of swelling, Q = amount of swelling in the time t, and K = a constant.

The differential quotient $\frac{dQ}{dt}$ gives the velocity for each moment, and it will be seen that the swelling becomes slower and slower as the maximum is approached. Thus the law of the velocity of swelling is identical with that of the velocity of inversion of cane sugar, itself an application of the law of masses.

For every process of swelling the constant K must be determined experimentally from observation of M, and it may be shown that—

$$K = \frac{1}{t} \log. \frac{M}{M - Q}$$

whence the value of K may be calculated for each series of determinations.

On the manner in which water is held in swollen colloid bodies, Körner (see above) cites three opinions :—

1. The hypothesis that colloids have a structure in the form of a honeycomb. (Bütschli.)

2. The water is absorbed at the surface of colloids in a specially condensed form. (Wilhelmy, Pogg. Ann. **119**, 121, 122.)

3. The water forms with the swollen body a "solid solution." (Nägeli.)

The latter view is the one taken by Procter (this Journal, 1899, 1034 and 1136). In a "solid solution," as in an ordinary solution, for each temperature given, the liquid and the body dissolved are in a state of equilibrium.

In the soaking of salted skins, the salt solution causes a greater swelling than pure water. Phenomena of dissociation and osmotic pressure come into play here (see Procter Cantor Lectures, 1899, 19).

In practice a few hours' soaking in running water is enough for fresh skins. For salted skins 3—5 days are required, according to the length of time the skins have been salted.

Dry skins require still longer, the problem being to soak them sufficiently without losing skin substance through putrefaction. Various additions to the soak have been proposed ; amongst others, sulphurous acid, 1 per 1,000, and borax, 1 per cent. ; the authors prefer caustic soda, 100 grms. per 1,000 litres of water. Such a solution hastens the swelling, and actually dissolves less skin substance than pure water. "Stocking" or "tumbling" the goods is not to be recommended. The best plan for salted and dry-salted skins is, after two days, in a feeble current of clean water, to draw up the skins, and work them over on a beam, "breaking over" (écraminage). They are then returned to clean running water for 2—3 days, or until properly soaked. After soaking, the skins are allowed to drain for several hours, and are then taken to the sweating store or to the lime-pits. Skins which are insufficiently soaked so as to bring them to their natural supple condition behave badly in the subsequent processes, and hence will never tan.

—J. T. W.

Tan-yard Liquors; Determining Quickly and Approximately Tanning Substance in certain ——. A. N. Palmer. Leather Trades' Rev. **33**, [769], 958.

The following process can only be applied to any liquor containing not more than fifteen-hundredths of a per cent. of tanning matter. If the liquor be stronger, it must be diluted until of suitable strength. A glass cylinder, 1 inch in diameter, and graduated at 12·5, 25·0, 37·5, and 50 c.c., is the only instrument required.

One such cylinder is filled up to the 12·5 c.c. mark with the cold tanning liquor to be tested ; distilled water is then added up to the 25 c.c. mark, and clear saturated lime-water to 50 c.c. The whole is well shaken and allowed to stand, and examined every few minutes. If before the lapse of 15 minutes, no precipitate be deposited, the contents of the cylinder must be thrown away, and a similar test applied to a new liquor made by diluting the above. If this be of correct strength, there will be a separation or precipitate in the cylinder, and by observing the volume of the deposit one can determine with fair approximation the strength of the diluted liquor by comparing it against a liquor of known tested strength.

The cylinders used must not be narrower than 1 inch; the lime-water must always be saturated, and the accuracy of the process depends on the practice and skill of the manipulator.

The author has only used this process with the liquor from one tanyard; he therefore does not claim that it would work similarly with tanning liquors of other composition, but special experience will be required in each factory.
—J. G. P.

Shoe Butts; Currying of Waxed ——. Leather Trades' Rev. **33**, [769], 956.

Good bark-tanned hides are preferable for this purpose, and must be well flayed. They are first rounded, then soaked, and brought into condition for shaving. After shaving they are stoned and hung up to sammy previous to "flatting." They are then scoured, flesh and grain, with brush and slicker, the grain being generally scoured by machine. If after this treatment the colour be not satisfactory, the hides may be bleached with warm sumac. They are then ready for stuffing, which may be done either by hand or in the drum. For hand work good results are obtained with a stuffing grease made of cod oil and tallow mixed together while warm. After stuffing, the hides are hung up in the stove to dry. When dry they are tallowed on the grain with warm tallow, and laid in pile for a few weeks, after which they are ready for finishing and waxing. This process is commenced by freeing the butts from surface grease on both sides, whitening with the slicker, and then cleaning and sizing the grain, after which they are hung up to dry, and are then boarded in three ways. They are now coloured with a composition made of vegetable black and cod oil, which is applied to the leather with a brush, one brush being used to apply the composition and the other to brush it well in. They are then sized twice with a gelatin size, well glassed, next hung up to dry for an hour or two, re-sized, and smoothed off with a pad on the soft part of the arm. When re-dried, they are re-glassed, and are then "oiled off."—J. G. P.

Chrome Liquors; Recovery of Useful Products from Partly Spent ——. Leather Trades' Rev. **33**, [769], 956.

With the one-bath chrome process the weak or partly spent liquors are generally thrown away. These, however, frequently contain 30 per cent. of the bichromate originally employed, and the chrome salts may be recovered by the addition of soda ash. The precipitated chromic hydrate is collected on a filter of coarse sacking, and re-used.

In the two-bath system, after chroming the skins, lime may be added to the spent liquor and the almost insoluble calcium chromate recovered. Treated with a little sulphuric acid, the calcium chromate is converted into calcium bichromate and gypsum. By treating this with potassium carbonate, calcium carbonate is precipitated, and bichromate of potash remains in solution. It is also possible to treat the liquor with lead acetate and recover the lead chromate.

The second bath of the two-bath process is generally of a strength of from 10°—12° B. The partly spent liquor may be evaporated to dryness in a small copper, and the residue covered with about one-third of its weight of water. The dissolved portion may be used in the next reducing bath. The residual salts consist chiefly of sodium chloride, which might be used for salting "green" hides.

In the case of a first bath of a normal constitution, which consists of bichromate, chrome alum, and hydrochloric acid, it is advisable to mix it with the second bath, and then allow the liquid to settle; the potassium bichromate is reduced, and a solution of chromic hydrate is obtained, which may be recovered by the help of soda-ash.—J. G. P.

Paste-Glue from Bone-Glue; Preparation of ——. H. Bornträger. Oesterr. Chem. Zeit. **3**, 515. Chem. Centr. 1900, **2**, [24], 1218.

Two hundred and fifty grms. of joiners' glue are dissolved in 1,000 grms. of hot water, and a mixture of 10 grms. of barium dioxide, 5 grms. of sulphuric acid (66° B.), and 15 grms. of water added, and the whole heated on the water-bath for about 48 hours at 80° C. A considerable quantity of sulphur dioxide is evolved, and the glue loses its power of gelatinising; it acquires a pleasant odour, and does not become mouldy even after standing for a month exposed to the air. It is strongly adhesive and reacts faintly acid. When dried in the form of thin plates, it greatly resembles gum arabic, and is claimed to be a superior substitute for the latter. 1 kilo. of this paste-glue costs about 25 pf., or a bottle containing 50 c.c. would cost about 1.25 pf.—A. S.

Glue; Determination of the Viscosity of ——. J. Fels. Chem. Zeit. 1901, **25**, [3], 23.

In extending the application of his viscosity test (this Journal, 1897, **16**, 264) the author has met with a sample of glue which, at the prescribed temperature of 30° C., had a viscosity of 6·24, whereas the highest limit permissible is 4. He therefore recommends that the viscosity test should be made with a 15 per cent. solution at 35°, instead of 30° C., as at the higher temperature all samples tested show viscosities below 4. Moreover, as the time taken in heating the glue and the temperature applied when making the solution (after the material has been soaked well in cold water) affect the ultimate viscosity (the viscosity being lower when the temperature was higher or the time of melting was prolonged), it is now recommended that, after soaking the glue, the 15 per cent. solution should always be heated for 30 minutes to the temperature of boiling water before making the viscosity test.—W. G. M.

Tanning Liquids and Extracts; Determination of Tannin, Gallic Acid, other Organic Acids, and Mineral Acids in ——. F. Jean.

See under XXIII., *page* 159.

Tanning Determination, with Results of Hide Powder Method; Comparison of Volumetric Methods of ——. A. Turnbull.

See under XXIII., *page* 159.

Leather; Dyeing, Staining, and Finishing of ——. M. C. Lamb.

See under VI., *page* 120.

PATENTS.

Leather; Manufacture and Treatment of ——. G. A. Clowse, Needham Market, Suffolk. Eng. Pat. 1809, Jan. 29, 1900.

Manufacture and treatment of leather by a product obtained from brewers', distillers', and vinegar-makers' yeast, and the substitution of such products for such nitrogenous substances as yolk of egg, blood albumin, egg albumin, &c., which are now largely used for filling, swelling, stuffing and dressing of hides. The process may be carried out in the following manner:—

Ordinary thick yeast is placed in suitable vessels and submitted to a temperature, by preference 80° to 100° F., for a sufficient time to reduce the paste to a liquid condition; this operation generally requiring from 8 to 10 hours; if desired, the pressed yeast may be mixed with an equal quantity of boiling water, and allowed to remain in this liquid condition for half an hour. The product is then filtered, and the filtrate neutralised with a suitable alkali, and then, for purposes of transport or convenience, the filtrate may be concentrated, either *in vacuo* or in open pans, to a syrup.

This product, when mixed with suitable oil or fat, is employed in the manufacture and treatment of leather in a similar way and in like proportions to those used when employing the ordinary nitrogenous substances, such as yolk of egg, albumin, &c.—M. C. L.

Gelatin; Process of and Apparatus for Making ——. E. R. Edson, Ohio, U.S.A. Eng. Pat. 21,467, Nov. 27, 1900.

The primary object of this invention is to obtain isinglass or gelatin from fish scales and other oil-less parts of fish, and to avoid the destruction of the gelatinising property of any of the material undergoing treatment. The material to be treated may be crushed to a finely divided state, and, after cleaning and washing, is treated with pure water at from 180° to 200° F.; the mass must not be boiled. After sufficient digestion the gelatin solution is drawn off, and filtered from solid matter. This liquid is now allowed to congeal, at a temperature between 33° and 50° F. After some time this sets to a jelly, which may be cut into slices and dried by any well-known process.

There is also described a special apparatus for carrying out the above-described process, for which patent is also claimed.—M. C. L.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Juices; Influence of the Alkalinity after the Second Saturation on the Solution of Magnesia by ——. K. Andrlik. Zeits. für Zuckerind. in Böhmen, 1900, **25,** [3], 148—152.

It is not advisable to neutralise the alkalinity of the juice in the second saturation to too great an extent, since a low alkalinity causes a large proportion of magnesia to be dissolved in the third defecation. A case is quoted of a sugar factory in which the first vessel of the evaporator became so rapidly incrusted that it had to be cleaned with acid every two or three days. The juice of this factory was brought to an alkalinity of 0·03—0·04 per cent. as CaO after the second saturation, and 0·005—0·01 per cent. after the third saturation. Analysis of the juices showed that the proportion of magnesia in solution increased after each saturation; the mud from the filter also consisted largely of magnesium carbonate. Hence the conclusion was drawn that the incrustations were due to dissolved magnesia. It appeared that in this particular juice an alkalinity equivalent to 0·035 per cent. of CaO corresponded to a complete precipitation of the free lime, and consequently the most favourable conditions for solution of magnesia existed after the second saturation. The remedy for the incrustations was satisfactorily found by only carrying the second saturation down to an alkalinity equivalent to 0·05—0·06 per cent. CaO. Experiments with sugar solutions fully confirmed the above explanation, for when solutions of raw sugar were heated with a mixture of lime and magnesia, and then saturated to varying extents, it was found that when the saturation was not carried below 0·05 per cent. as CaO no magnesia was dissolved, but that when the alkalinity was less than 0·05 per cent. the proportion of dissolved magnesia steadily increased.—J. F. B.

Sugar Liquors; Disappearance during Evaporation and Boiling of the Alkalinity of ——. K. Andrlik. Zeits. für Zuckerind. in Böhmen, 1900, **25,** [3], 143—148.

From a study of the composition of the massecuites of two campaigns the author concludes that saturated juices cannot be permanently alkaline if the ratio of the non-volatile inorganic bases (calculated as K_2O), which remain over for the saturation of the amido-acids, to the nitrogen of these acids is below 3·3, since in that case, K_2O: N being as 3·3: 1, the fixed bases are not even sufficient for the saturation of the amido-acids. In such juices an alkalinity can, at the most, only be due to ammonia, and must disappear either completely or largely during the evaporation. The analyses of the diffusion juices and massecuites of the campaign 1898-99, in which this loss of alkalinity was observed, showed the above ratio as averaging 2·3, and those massecuites which reacted distinctly acid towards phenolpthalein showed a still lower ratio. In the massecuites of the 1899—1900 campaign, in which the alkalinity was preserved during boiling, the ratio above mentioned rose to an average of 3·8.—J. F. B.

Saturation Mud; Oxalic Acid in ——. K. Andrlik. Zeits. für Zuckerind. in Böhmen, 1900, **25,** [3], 139—142.

The author finds that oxalic acid is present in saturation mud in varying proportions, and can be extracted either by exhaustion with ether after acidification, or by conversion into the soluble alkali salt by boiling the mud with an alkali carbonate. The quantity of oxalic acid obtained by the author from the mud of the first saturation varied from 1·07 to 2·56 per cent., with an average of 1·98 per cent. on the dry substance of the mud. As a rule, the quantity of oxalic acid recovered from the mud was the same as that present in the diffusion juice, showing that it is completely precipitated by the process of saturation.

In some cases, however, a larger quantity of oxalic acid was obtained from the mud than was originally present in the juice; this would seem to indicate that oxalic acid is produced by the action of the lime and heat upon some of the constituents of the juice.

The quantity of oxalic acid in the mud decreases when the latter is kept for some time.—J. F. B.

Glucose; Method of Producing ——, by the Aid of Mucedinæ. Calmette. Rev. Prod. Chim. **3,** [22], 340.

Crushed maize, or decorticated rice, is mixed with twice its weight of water and 0·5 per cent. of hydrochloric acid, and is heated to 100° C. for the first hour, 110° C. for a second hour, and 120° C. for an hour longer. The consumption of acid may be reduced by adding it by degrees during the operation. The whole of the starch having been converted into dextrose, maltose, and dextrin, the wort is diluted to 25 per cent. strength, and forced by steam pressure into a saccharifying vessel, or "glucogene," where it is treated with sufficient sodium carbonate to reduce the acidity to 25 per cent., expressed as H_2SO_4. It is then sterilised by means of a current of steam for a period of 20 minutes; the vessel is then at once closed, and compressed sterilised air is admitted, to aërate the wort and force it up into a funnel, which conveys it to an emulsifier. Since the latter works continuously, and at a temperature of 35°—38° C., the conversion of the maltose and dextrin into dextrose will be complete in 24 hours when a culture of *mucedinæ* is used, or 36 hours without. After being again nearly neutralised with sodium carbonate, the wort is put through a filter-press, to separate the skin and insoluble matters of the grain, together with the mycelia of the *mucedinæ.* The pale straw-yellow filtrate of dissolved glucose is decolorised with animal charcoal or by electrolysis.
—C. S.

Sugar Factories in Russia; Purification of Waste Waters of ——. J. Slasski.

See under XVIII. B., *page* 146.

PATENTS.

Solutions [Sugar, &c.]; Treatment of ——, to Precipitate Matter contained in them. S. M. Lillie, Philadelphia, U.S.A. Eng. Pat. 17,924, Oct. 9, 1900.

The solutions, especially those of sugar, are heated under pressure in a series of closed vessels; the pressure is then reduced, in order to develop steam from the heated liquor, the steam being utilised for the preliminary heating of fresh quantities of the solution. The sugar solution may be passed through a series of vessels in succession, equal in number to the number of steam pressures employed, and subjected to direct contact with steam under successively increased pressures. Besides the apparatus necessary for carrying out the above treatment, means are claimed for automatically controlling the flow of the solution from the vessel of highest pressure to the pressure-reducing tank, and conducting the steam there developed back to the apparatus, or other place, where it may be utilised; also for regulating the action of the pump which circulates the liquor.—J. F. B.

Paste; An Improved Liquid ——. W. Häckel, A. Heinrich, and C. Gumpricht, Breslau. Eng. Pat. 20,528, Nov. 14, 1900.

A composition is claimed, consisting of water-glass (sp. gr. 1·37), 100; borax, 4; "natron" (sp. gr. 1·33), 2; talc, 2; whitening, 2; boric acid, 2; siccative, 2; dextrin, 8; to be used for sticking purposes, in substitution for glue, which it is said to equal in adhesive properties.—M. C. L.

XVII.—BREWING, WINES, SPIRITS, Etc.

Barley; The Proteolytic Enzyme of Germinating ——. F. Weis. Zeits. physiol. Chem. 1900, **31**, [1 and 2], 79; through Woch. für Brau. 1900, **17**, [50], 748—750.

The investigations of the author confirm, on the whole, the recent work of Windisch and Schellorn, Fernbach and Hubert, Petit and Labourasse, on the same subject (see this Journal, 1900, 838 and 916).

The author digested filtered infusions of green malt with solutions of wheat gluten, in presence of lactic acid. The quantity of gluten digested was determined after two hours, by precipitating the unaltered albuminoids with tannic acid, and estimating the nitrogen in the filtrates by Kjeldahl's method, correcting the results by blank determinations.

The enzyme of barley produces under similar conditions more unprecipitable nitrogenous matter than does pepsin. It is pointed out that all quantitative measurements of these digestions are only comparable when the same precipitant is used; thus Kjeldahl, using copper sulphate, found that the action of the malt enzyme was most intense at a temperature of 50°—55° C., whilst the author found the greatest effect towards the tannic acid precipitant at 47°—48° C. The enzyme acts best in presence of small quantities of weak acids; with lactic acid the maximum effect was obtained with 5 parts per 1,000. The author obtained no action in neutral or alkaline media, using caustic soda as a neutralising agent. The nitrogenous matter digested increases with increase of the concentration of the gluten solutions up to 3 per cent. With kilned malt the author also finds a certain proportionality between the enzymatic action and the nitrogenous matter in the extract. The proteolytic enzyme is not destroyed by the evaporation of the infusions to dryness *in vacuo* at a temperature of 30°—50° C. The only essential point of difference between the author's observations and those of Windisch and Schellhorn lies in the fact that Weis considers that the enzyme is capable of attacking not only dissolved proteids, but also undissolved and insoluble proteins.—J. F. B.

Barley; Treatment of ——, *with Lime in the Steeping Water.* Kajmar. Allgem. Zeits. Bierbrau. und Malzfab. 1900, [20]; through Woch. für Brau. 1900, **17**, [51], 762.

To prevent the subsequent development of moulds on the germinating grain, Windisch recommended the addition of lime to the first steeping water. The author prefers to add the lime to the second steep water. He considers that the barley, after having been soaked in the first water, is more readily disinfected by the lime, and it is sufficient to leave the grain in the lime water for two hours instead of eight hours, as in Windisch's process.

Windisch strongly advises the application of the lime to the steep water in the form of clear saturated lime water, and not as milk of lime. If added as milk of lime, the calcium carbonate adhering to the grain drys up in the kiln and is injurious to the workmen.—J. F. B.

Wheat-Malt; *Manufacture of* ——. B. Rudolph. Woch. für Brau. 1901, **18**, [1], 1—2.

The best malting wheats come from Silesia. They should be small-corned, smooth varieties, grown on not too rich a soil. The author has worked with a wheat of a steely appearance, which indicates a high proportion of nitrogen. This kind gives good malt if care be taken to prevent heating.

In malting wheat, a steeping space of 0·12 cb. metre, a floor surface of 1·6 sq. metre, and a kilning surface of 0·9—1 sq. metre are allowed per cwt. of grain. Steeping occupies about 48 hours, or 52 hours in cold weather, changing the water every 9—10 hours and allowing from 36—40 hours' immersion. The addition of a lime and bleaching-powder solution to the last steeping water is beneficial. The germination on the floor should be started, if possible, at 10° C. with a thin "couch." The grain should be turned occasionally until it begins to sprout, that is, for the first two days. The temperature when felting takes place should not exceed 20° C., and must be kept down by loosening if necessary. The grain requires from 4—5 days on the floor; when the modification is complete, the length of the acrospire, which, in the case of wheat, grows externally, should be three-quarters the length of the corn. Kilning, with a double-floor kiln, takes 24 hours, the final temperature on the lower floor being 85° C., measured in the malt. On the upper floor the malt should be turned once every three hours, to avoid breaking off the shoots, which would prevent the formation of air channels; on the lower floor it should be turned every hour. The malt must not contain excess of moisture when it arrives at the lower floor, and the aëration must be sufficient, or the malt will readily become brown or "foxy," and its flavour will be spoilt for the preparation of good "Weissbier." The loss of weight during the malting of wheat is estimated at from 23—25 per cent.—J. F. B.

Yeast and Sugars, Various; Fermentation Experiments with ——. P. Lindner. Woch. für Brau. 1900, **17**, [48—51], 713—716, 733—735, 746—748, and 762—765.

The author has developed his simple method of identification and classification of fermentation organisms by their behaviour towards various sugars and allied carbohydrates (this Journal, 1900, 761). The present paper consists essentially of records of some 3,000 experiments with over 200 organisms and 21 different sugars, including some of the rare and synthetical sugars. The results are classified according to the type of yeast, and are arranged in tabular form. The groups comprise various yeasts and yeast-like fungi (monilia, torula, mucor, and yeast from special beers), schizosaccharomyces, milk-sugar yeasts, mould yeasts, anomalus yeasts, wine, distillery, pressed, top and bottom beer yeasts, wild yeasts, &c.

The most important tests of the commoner yeasts are those which relate to the fermentation or non-fermentation of dextrin, since this largely determines their industrial type. Some species ferment maltose but not cane sugar, a few others ferment raffinose but not cane sugar, whilst others, again, act conversely. Logos yeast ferments raffinose only slightly, cane sugar and melibiose strongly. Several discrepancies occur when these experiments are compared with those of Kalanthar (this Journal, 1899, 60), in the behaviour of some of the species towards polysaccharides. Kalanthar's work was performed with dried yeasts, and the conditions were rather different. Some fungi produce acids which may have a secondary action in the inversion of polysaccharides.

The typical top-fermentation distillery yeast "Race II," ferments dextrin; but although the distillery yeasts are of the same origin as the pressed yeasts, they are mostly without action upon dextrin, whilst the pressed yeasts nearly all ferment it. This must be due to differences in conditions of growth. Although, as a general rule, melibiose is not fermented by top-fermentation yeasts, this is by no means universal, and there are a few notable exceptions. No sharp line can be drawn between the top and bottom fermentation yeasts in this respect; melibiase is probably a very readily alterable enzyme; the test proposed by Bau for detecting the presence of bottom-fermentation yeast in top yeast is, therefore, not infallible. Nearly all the wine yeasts were without action on melibiose; the author detected at least three different races of Champagne yeast, differing in their behaviour towards the sugars. Porter yeast was found to contain three races, one of which did not ferment dextrin; some "Weissbier" yeasts fermented dextrin.

The existence of mixed industrial yeasts differing in their action towards dextrin has a bearing in connection with secondary fermentation. The wild yeasts were also resolved into dextrin-fermenting, or Frohberg types and non-fermenting Saaz types. In judging the results of tests of this kind, allowance must be made for the great possibilities of physiological variations. This test is also one for the presence of zymase. "Orange yeast," for instance, contains invertase, but no zymase; it does not ferment any sugar, but if mixed with *S. apiculatus* it enables the latter to ferment cane sugar, which it would not do alone. "Red yeasts" of the torula class often contain no zymase, but they contain enzymes which enable them to assimilate all the sugar in a wort without a trace of fermentation. Some races of "Red yeast," however, do set up fermentation of glucose, fructose, and cane sugar.—J. F. B.

Yeast Moulds; Is the Formation of Enzyme in —— a Characteristic Means of Differentiation? Zeits. für Spiritusind. 1901, **24,** 2.

Dubourg (this Journal, 1899, 288) has shown that yeasts which do not invert or ferment cane sugar become acclimatised when grown in highly nitrogenous media containing 5 per cent. of glucose and 5 per cent. of cane sugar. When the culture medium was washed away, the yeast was able to ferment cane sugar in the absence of glucose. He was also able by similar means of acclimatisation to ferment other sugars which in the ordinary way are not affected by yeast. Lactose, however, was an exception, and *Mucor alternans* could not be induced to ferment any of the sugars unfermentable by it in the ordinary way.

Klöcker has repeated Dubourg's work with three species of yeasts, *S. apiculatus*, a new *saccharomyces* from the stomach of a bee, and *S. marxianus*, and failed to acclimatise the first two mentioned yeasts to cane sugar, whilst *S. Marxianus* could not be induced to ferment maltose. This author concludes that Dubourg's statements (*loc. cit.*) are incorrect; consequently Duclaux's opinion, that the behaviour of the yeasts to the sugars cannot be used as a means of differentiation, being based on Dubourg's work, is not tenable. Klöcker asserts that the enzyme formation of the alcohol fermentation yeasts is one of their most persistent characteristics.—J. L. B.

Malt Worts; Analysis of Saccharified ——. P. Petit. Monit. Scient. 1900, (4), **14,** [708], 797—806.

In the analysis of malt worts, whether by simple acid hydrolysis or by the aid of auxiliary diastatic hydrolysis, the presence of the ready-formed sugars of the malt is a source of trouble. The author determines these sugars by repeated extraction of the malt with boiling alcohol. They consist mainly of saccharose, with smaller proportions of glucose and fructose. In normal malt the fructose exists in much greater quantity than the glucose; maltose is absent. In analysis of the worts, the ready-formed reducing sugars increase the apparent quantity of maltose, and consequently tend to lower the dextrin value; on the other hand, the saccharose is inverted together with the dextrin, and tends to increase the dextrin value. The use of diastase does not afford much assistance, since the diastase of some malts, especially of green or low-kilned malts, inverts saccharose and even maltose to a partial and variable extent. In the analysis of fermented worts (that is, brewery worts) which have been boiled before fermentation, the ordinary method of acid hydrolysis (Elion's method with hydrochloric acid), after correcting for the reducing power of unfermented maltose, generally gives the proportion of dextrin originally present in the wort with sufficient accuracy. The author concludes that the employment of precipitated diastase in the analysis of saccharified worts is not likely to lead to any useful result, on account of the indefinite, variable, and unstable nature of such preparations; the use of cold-water malt infusions is still more unsatisfactory. According to the nature and the age of the diastatic preparations, the products of the action of diastase on the dextrins of starch or malt worts may be either maltose alone, or a mixture of maltose and glucose.

To correct for the presence of the ready-formed sugars, the author first removes the glucose and fructose by a fermentation with *S. apiculatus.* He has previously determined that the saccharose in the wort can be estimated with accuracy by inversion by Clerget's method, provided the quantity present exceeds 0·4 grm. per 100 c.c.; he has also found that after prolonged acid hydrolysis (Elion's method), the saccharose present yields 89 per cent. of glucose as modified invert sugar. Consequently, the true maltose having been found by the direct cupric reducing power after fermentation with *S. apiculatus*, the true dextrin is determined by subtracting from the total glucose equivalent, according to Elion's method, the saccharose × 0·89 and the maltose × 1·05, and multiplying the remainder by 0·9 to obtain the dextrin. This corrected dextrin, however, includes all non-reducing carbohydrates, other than saccharose, which yield reducing sugars by acid hydrolysis, and consequently includes pentosans, &c. from the husks. These husk constituents may attain large proportions if raw grain be employed in mashing. Their presence may be demonstrated by hydrolysing the worts to the maximum limit by the prolonged action of diastase and then fermenting. The unfermentable residue then consists largely, if not entirely, of the non-dextrin carbohydrates derived from the husks. The author proposes, as a scheme of analysis for practical purposes, that the "apparent" maltose and dextrin be determined in the ordinary way, not only in the original wort, but also after fermentation for four days at 27° C., with a high-attenuating industrial yeast, always employing the same race of yeast. When a new batch of malt is taken into use, a fully corrected analysis on the lines indicated above should be made, in order to check the "apparent" or "crude" results obtained by the ordinary methods.—J. F. B.

Alcohol in Distilleries during 1900; *Causes of Poor Attenuations and Deficient Yields of ——.* G. Heinzelmann. Zeits. Spiritusind. 1900, **23,** [50], 458—459.

A frequent cause of bad yields in the distillery is the insufficient provision of malting floor-space; consequently the malt is generally used too young; in fact, often after only 6—8 days' germination, whereas 16—18 days on the floor should be allowed. If sufficient malting floor-space cannot be afforded, there should at least be a storage floor, to allow of a longer ripening of the malt after it leaves the floor. The employment of a longer-germinated malt allows the quantity used to be considerably curtailed.

Another point which requires attention is the maceration of the green malt; the malt must be macerated as finely as possible, and passed three times through the crusher, otherwise a considerable proportion of the grains will remain behind when the peels of the potatoes are removed, and diastase and yeast-nutrient will be lost. The malt-crushing machine should be set as closely as possible, in order to obtain a fine maceration. The method and time of removing the peels have an effect upon the efficiency of the malt. Some distillers remove the peels as soon as the potatoes are blown out, and at the same time remove a large proportion of the malt along with them. Since the removal of the peels from the mash only takes about half an hour, it is safest to leave them in as long as possible, that is, until the end of the cooling process, so as to allow sufficient time for the complete exhaustion of the malt grains. The practice of reserving part of the malt, and not adding it to the mash until after the peels have been removed, has been employed with satisfactory results.

In some distilleries the old-fashioned green-malt yeast mashes, poor in sugar, are still employed instead of concentrated mashes which yield stable and vigorous yeast. Further, some distilleries use bakers' pressed yeast or other unsuitable type, instead of the selected distillery yeast known as Berlin Race II. It has been said that the latter gives frothing fermentations, but if the instructions are properly followed these will not occur, especially in the concentrated mashes obtainable with this year's potatoes. In the acidification of the seed-yeast mash with lactic bacteria, mistakes are frequently made; sterilisation at 75° C. after acidification is very often omitted; sometimes the acid mash employed for infecting the next batch is sterilised, and consequently almost useless; the acidification is then very slow, and excessive further quantities are added. The lactic acid thus introduced destroys the diastase too soon, and the attenuations are deficient. The infecting acid mash should be taken out before the bulk is sterilised; not more than 1—2 litres should be employed, and it should not be added until saccharification is complete. The author has met with very few cases this year where the acidity of the fermented mash has been abnormally high, owing to want of cleanliness.—J. F. B.

Beer; Nature of the Carbonic Acid in ——. Hantke. Amerik. Bierbrauer, 1900, 563; through Woch. für Brau. 1900, **17**, [52], 782.

The author suggests that gaseous carbonic anhydride is not the primary product of fermentation, but that the hydrated acid H_2CO_3 is first formed and then dissociates into carbon dioxide and water. He argues by analogy that since the action of other enzymes is characterised by hydrolysis, the equation for the splitting up of glucose by zymase ought to provide for the addition of water.

This question may not be of much importance for primary fermentation at the ordinary pressure, but for secondary fermentation under excess pressure, the assumption would probably explain the peculiar, gradual, and continuous evolution of gas which characterises the foaming of beer when poured out.

There is evidence to show that hydrated carbonic acid, which is stable under pressure, reacts with the secondary phosphates yielding primary phosphates and bicarbonates; also that it forms unstable esters with the alcohols of secondary fermentation, imparting an aroma to the beer, which disappears after standing in the air; it also probably combines with the amines, and the dissociation of these loose combinations contribute to the permanent character of the head. According to Hantke, the total of this loosely "combined" carbonic acid should amount to 0·2 per cent., which is higher than the solubility of carbon dioxide in a mixture of water and alcohol of the same strength. It would appear that the same delicate effects cannot be obtained by the mere "gassing" of the beer, and that these are more rationally explained by the combination of hydrated carbonic acid, produced *in situ*, with the constituents of the beer during cellarage.—J. F. B.

Molasses Distilleries; Continuous Fermentation in ——. A. Sorel. Bull. de l'Assoc. Chim. Sucr. Dist. 1900, **18**, [5 and 6], 302—303.

The author gives a short sketch of a process for continuous fermentation, as deduced from certain experiments in the laboratory.

On the large scale there would be required a closed seed-yeast vat of 60 hectolitres, three fermentation vats of 200 hectolitres each, all closed, and an open collecting vat of 600 hectolitres. The seed-yeast is made up in a sterilised medium and brought into active fermentation. It is then passed into the first fermenting vat, into which diluted molasses are fed direct from the boiling pan, after being cooled in absence of air. The vat is filled in 5 or 6 hours, and the liquor is then passed to the second vat, and so on, until it arrives in the collecting vat with a density of 2·5°—3° B. Fermentation is complete in 3—5 hours after the vat is full. When the cycle is started, the last vat is filled in 20 hours. The temperature in the first vat is kept at 21°—23° C., in the second at 23°—25° C., in the third at 26°—28° C., and in the last at 30°—31° C.

The molasses may be diluted with water or with spent wash, in which case allowance must be made for the density of the same. Nutrients and sterilised air may be supplied at intervals to the first fermenting vat when required.

—J. F. B.

Rum; Non-existence of Methyl Alcohol in ——. H. Quantin. J. Pharm. Chim. **12**, [11], 505—507.

Having to redistil 8,500 litres of rum, the author examined it carefully for methyl alcohol or its derivatives. In the first distillation, with a Savalle's column which did not allow of temperature determinations, the receiver was changed, first, when the distillate ceased to colour rosaniline bisulphite; and second, when the distillate began to darken on heating to 100° C., with its own volume of strong sulphuric acid. The first fraction contained 250 litres, the second 4,500, the whole of the remaining liquid going into the third. The first fraction boiled at 72° C., and must, therefore, have contained any methyl alcohol, aldehyde, formate, or acetate in the rum. Ten litres of this were heated slowly to 50° C. while a slow stream of carbon dioxide was passed through. The vapours coming away below 25° C. were caught in cooled alcohol; the liquid was tested for formaldehyde. The second fraction, up to 35° C., was saponified and redistilled, and the distillate tested for methyl alcohol. The third portion, coming over on further heating to 64°—72° C., was also tested for this alcohol both before and after saponification. The results were in all cases negative. This large-scale examination, then, has confirmed, as far as this particular sample is concerned, Trillat's conclusion that rum contains no methyl derivatives.

—J. T. D.

Malt; Determination of the Available Extract of ——. L. Briant.

See under XXIII., *page* 160.

Beer; Detection of Arsenic in ——. C. Estcourt.

See under XXIII., *page* 158.

Beer, Sugar, &c.; Detection of Arsenic in ——. B. H. Paul and A. J. Cownley.

See under XXIII., *page* 158.

Beer; Detection and Determination of Arsenic in ——. W. Kirkby.

See under XXIII., *page* 158.

Beer; Detection of Arsenic in ——. A. H. Allen.

See under XXIII., *page* 158.

Glucose; Determination of Value of Liquid Commercial ——.

See under XXIII., *page* 160.

Wines; Cause of Error in the Detection of Salicylic Acid in ——. H. Pellet.

See under XXIII., *page* 158.

Wine; Detection of Alum in ——. F. Lopresti.

See under XXIII., *page* 158.

Spirits; Detection of Foreign Colouring Matter in ——. C. A. Crampton and F. D. Simons.

See under XXIII., *page* 158.

PATENTS.

Casks, Milk Churns, and like Receptacles; Treating and Preserving ——. H. C. Williams, London. Eng. Pat. 25,084, Dec. 18, 1899.

The cask is first pickled with hot, weak, soda or salt solution, in order to remove surface dirt, rinsed out, and allowed to drain. A small quantity of strong ammonia solution having been poured into the cask, air, heated to 150° F., at first, and afterwards to 300° F., is introduced under a pressure of 10 lb. per square inch, the pressure being afterwards raised to 20 lb. During this process the cask is rotated or agitated, and the ammonia and water are forced into the pores of the wood, and through to the outside of the cask. Steam may be used instead of hot air. The pressure having been relieved, an antiseptic is introduced into the cask and the process repeated. Such antiseptic may consist of a mixture of carnauba wax with a little salicylic acid and petroleum, which leaves the interior surface of the cask hard, smooth, and not sticky.—L. A.

Rectification and Distilling Apparatus. C. Crépelle-Fontaine, Le Madeleine-lez-Lille, France. Eng. Pat. 24,846, Dec. 14, 1899.

The claims relate to a type of apparatus for the continuous rectification of alcohol, comprising "a purifier, provided with a condenser and cooling apparatus, a rectifier proper, provided with condenser and cooling apparatus, between which the purifier is arranged and to which it is connected; a phlegm purifier, provided with condenser and cooling apparatus, and connected to the rectifier; means for controlling the operation of the condensing and cooling apparatus by a suitable flow-controller and a float pressure-controller, acting upon the admission of steam into the rectifier and phlegm purifier, to control the pressure within the apparatus." The form of pressure regulator claimed comprises a receptacle divided into a lower and upper compartment, connected by means of a central tube, a suitable connection between the lower compartment and the apparatus, of which the pressure is to be controlled, a float in the upper compartment, a rod on the float, connected with a lever operating the inlet cock of the steam pipe.—J. F. B.

Yeast; Manufacture of Bakers' ——. M. P. Hatschek, Putney. Eng. Pat. 25,418, Dec. 22, 1899.

Brewers' yeast is washed and suspended in water, heated to 180° F., and afterwards digested at 150°—130° F. for a sufficient time to allow of the diffusion of the cell contents of the yeast through the cell walls, whilst leaving the latter more or less intact; the liquid is then filtered in such a way that the yeast cells pass through into the filtrate. To obtain still better results the yeast, after digesting at the above temperatures, may be heated to the boiling point, or boiled under a pressure of two atmospheres. In this case the yeast cells are burst, and the cell-wall residues are then filtered off through a close filter. The yeast extract prepared in either of the above manners is then mixed with saccharine matter to form a highly nitrogenous wort, in which a suitable seed yeast of the bakers' yeast type may be grown.—J. F. B.

Hopped Wort; Production of a Concentrated ——. H. A. Hobson, London. Eng. Pat. 48, Jan. 1, 1900.

The process consists essentially in first digesting hops in hot water, and then mashing the malt in the hop extract so obtained, straining and concentrating. Since the tannin constituents of the hops have a retarding influence upon the action of the diastase, and since the aromatic principles are more or less volatile during boiling, the following mode of operation is further claimed:—The lupulin of the hops is first removed mechanically; the residue of the hops is then infused with hot water, and the extract digested or boiled with some substance containing albumin, such as spent or fresh malt, in order to fix the tannin. The extract is then used as mashing liquor for preparing the wort, which is strained and concentrated. Shortly before the final degree of concentration is attained, the lupulin previously abstracted is added to the boiling liquor.
—J. F. B.

Distilleries; Treating Waste Products from ——. A. A. Ferguson, Glasgow. Eng. Pat. 356, Jan. 6, 1900.

The process claimed for dealing with the spent wash, or "pot ale" of distilleries, and obtaining therefrom a valuable by-product consists in running the hot wash through filters, where the solid constituents are deposited, and evaporating the liquid portion in vacuum pans to a brown, syrupy fluid. Or else the evaporation may only be carried to such an extent as to cause the deposition of the whole or the greater part of the dissolved solids in the form of a sediment at the bottom of the pan. The clear liquid may be run off, and is stated to be sufficiently pure to be passed into rivers. The sediment, when treated with starch, glucose, dextrin, or the like, forms a gelatinous mass suitable for stiffening or sizing purposes. The brown, syrupy fluid also has a considerable feeding value.—J. F. B.

Beer; Sterilising ——, in Transport Casks. E. Berliner and A. Herbert, Berlin. Eng. Pat. 20,656, Nov. 15, 1900.

The beer is sterilised by heating in transport casks of special construction. The cask, which is preferably made of metal, has an opening closed by a valve or tap on to which may be fitted an air vessel, or expansion chamber which takes up the expansion of the beer during the operation of heating. The air vessel is brought into connection with the interior of the cask either by turning on the tap or by opening the valve by means of a key passed through an air-tight stuffing box in the top of the globe. When pasteurisation is complete, the beer is cooled and the air vessel removed, after closing the tap or valve; naturally, air is excluded during the whole series of operations. The ends of the cylindrical transport cask are stiffened by plates bolted together from end to end, and the socket intended to receive the valve may be provided with a flange secured to the inside of the cask.
—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Milk; Coagulation of ——, Spontaneously, and by Rennet, Lactic Acid Ferment, and Rennet Ferment. T. Bokorny. Chem. Zeit. 1901, **25**, [1], 3—4.

The addition of acids or of salts with acid reaction to milk brings about the coagulation of the caseïn, either instantaneously or after standing, according to the quantity and nature of the acid added. The coagulating properties of rennet have frequently been attributed to the presence of lactic acid in the ferment. But the author shows that this cannot be the case; the quantity of acid present in the small proportion of rennet necessary to produce coagulation would not be sufficient. Moreover, the addition of ferment poisons, such as formaldehyde, mercuric chloride, or sodium fluoride, hinders or prevents, according to the quantity, the action of the rennet. The spontaneous coagulation of milk is undoubtedly due to lactic acid produced by lactic bacteria, but the rapidity of the action of rennet (a few minutes) precludes the explanation of bacterial production of lactic acid in this case. It is also generally agreed that the nature of the coagulates is somewhat different. There can, therefore, be no doubt that the coagulating agent present in rennet is a specific unorganised ferment, probably of a proteïd nature.

The author has made a series of comparative experiments on the retarding or inhibitive influence of various antiseptics upon the coagulating powers of lactic acid bacteria and of the rennet ferment, at the most favourable temperature of 30° C. The conclusion which follows is, that both ferments are susceptible to the action of the poisons, but that the unorganised ferment of rennet is affected to a far less degree by the same proportion of antiseptic than the organisms. This is specially noticeable in the case of chloroform, a saturated solution of which entirely inhibits the activity of the bacteria, whilst the coagulation by rennet is only delayed by about a quarter of an hour.—J. F. B.

PATENTS.

Meat and other Extracts; Apparatus for Preparing —— J. Y. Johnson, London. From The Actien Maschinenbau-Anstalt vormals Venuleth and Ellenberger, Darmstadt, Germany. Eng. Pat. 3817, Feb. 27, 1900.

The meat or other substance from which the extract is to be obtained is placed between two endless cloth aprons or bands, which travel in an upward zigzag path over guide rollers. The substance is compressed as it passes over the guide rollers by adjustable pressure rollers mounted on sliding bearings. The extracting fluid is admitted on to the band at the top of the apparatus. The extract which is expressed at each pair of rollers runs into a receptacle which has a partition reaching nearly to the bottom. The extract passes under this partition, and runs on to the next lower band, and so on. Any fat which is extracted floats on the surface, and so does not pass under the partition. It is run off through a pipe supplied for the purpose. The rollers may be hollow, to allow them to be heated. When volatile extracting fluids are used, the whole apparatus may be enclosed in an air-tight case. Fractional extraction may be carried out by admitting the solvent at different levels and keeping the expressed liquids separate.—W. P. S.

Blood Preparations; Production of ——. Max Dietrich, Friedrichsberg, Germany, and A. Langer, Berlin. Eng. Pat. 19,141, Oct. 25, 1900.

The process claimed is one for the production of a blood albumin, insoluble in water, and containing a large quantity of iron. 0·5 to 2 kilos. of calcium oxide, roughly powdered, are poured into 100 kilos. of ox blood and stirred up until the mixture becomes thick. The mixture is then allowed to stand, when any unused calcium oxide settles out. The clear material is removed and dried under reduced pressure at 60° C., until ready for grinding. The ground preparation is washed with water. Instead of oxide, calcium carbonate, phosphate, &c. may be used in equivalent proportions. The finished product is odourless and tasteless.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Water; Lead in Potable ——. P. Cables. J. Pharm. Chim. **12**, [11], 517—520.

Pure lead is attacked by waters less readily than alloys, and the ease and rapidity of the attack increase not only with the amount, but also with the number, of the foreign metals. The author's experiments with long lengths (30 m.) of lead piping confirm the usual view, that nitrites in the water increase its corrosive action on lead, while most other salts diminish it. Free carbon dioxide, as a solvent of lead carbonate, also increases the activity of a water; but the addition of dissolved calcium carbonate, especially in conjunction with calcium sulphate, greatly lessens it. Lead in a water is best detected and its amount determined by hydrogen sulphide; but care must be taken to have enough acid to dissolve any carbonate present, yet to avoid unnecessary excess, as the coloration produced by a given quantity of lead is considerably lessened by even a small amount of acid in excess. In very few cases is lead in water a serious danger; in a domestic supply, filtration, especially if a weekly spoonful of animal charcoal be added to the filter, will usually remove the lead, but in the case of public drinking fountains, lead pipes ought to be avoided altogether, and cast-iron pipes used.—J. T. D.

Water; Need of Uniformity in the Bacterial Analysis of ——. F. Abba. Zeits. für Hyg. 1900, **33**, 372. Proc. Inst. Civil Eng. 1900, **142**, [4], 46.

The results of different bacteriological analyses cannot, in many cases, be satisfactorily compared, owing to the diversity in the practice of the various experimenters. The results cannot be uniform if the temperature at which the cultures are carried out, the period of incubation, and the alkalinity or the composition of the gelatin medium, vary. The following data, which were proposed by the author for general acceptance, were discussed at the Como Hygienic Congress, and a resolution was passed in favour of uniformity in procedure. For the nutritive gelatin, a substance composed of concentrated bouillon from Liebig's Extract of Meat, 6 grms.; fish glue (gelatin), 150 grms.; distilled water, 1,000 grms.; is recommended. The addition of salt, peptone, and other similar ingredients is unnecessary. Carbonate of soda in the proportion of 0·5 per 1,000 is proposed for the standard of alkalinity, after the addition of sufficient alkali to give the characteristic rose tint with 3 per cent. alcoholic phenolphthalein solution. The Esmarch method is not recommended for cultures, but that of Koch, with Fischer's modification of Petri's process. The temperature for incubation should, in all cases, be constant at 18°—19° C., and the period of incubation should be as prolonged as possible—15 days is suggested. The number of colonies should always be stated as those present in 1 c.c. of water. No investigation of water of unknown origin should be undertaken, nor of samples procured by unreliable observers.—A. S.

Water; The Linde and Hess Process for the Removal of Iron from ——. Gesundheits-Ing. 1900, 105. Proc. Inst. Civil Eng. 1900, **142**, [4], 47.

The water is treated in a filtering vessel filled with wood shavings, free from turpentine, and impregnated with oxide of tin. Air is excluded, so that the oxygen required for combination with the iron is apparently derived from the water itself. The hydrated oxide of iron formed, is retained by the shavings, in the form of a brownish-red deposit. The filters are washed out every 12 hours, air and steam being blown through them in a reverse direction, whilst the shavings are changed and cleansed about every two months. The cost of a considerable amount of pumping is saved by this process, as there is no need of mechanical admixture of the water with the atmosphere. In some works at Gladbach, the total cost of the plant was 2,500*l.*, and the annual expense of filtering 165 million gallons of water, for labour, materials, and interest on capital, was 389*l.*—A. S.

Contaminated Waters; Reaction of Sodium p-Benzenesulphonate on Iron Cystinate contained in ——. H. Causse. Comptes Rend. **131**, [26], 1220—1222.

Molinié has stated that all acid waters, even distilled water, give a reaction with sodium *p*-benzene sulphonate, and that this reaction is consequently not characteristic of cystine. The author points out that he has all along regarded this reaction as indicating a CSH group, rather than a particular substance, and that certain phenols also give similar though individual tints with the reagent; moreover, it is the iron compound of cystine, not cystine itself, that gives the reaction. Two portions of a water giving the reaction were treated, one with baryta, one with lead acetate; the first, after filtration, gave no reaction, while the second, after filtration and removal of the lead from the filtrate by sodium sulphate, still gave the reaction. If traces of iron be removed from the phenols above mentioned, by precipitation with baryta water, they no longer give the reaction; but the tints are at once brought out by adding minute quantities of ferrous sulphate. Molinié's distilled water no doubt contained traces of cystine compounds of iron.—J. T. D.

Refuse; Disposal of the Berlin House ——. Gesundheits-Ing. 1900, 140. Proc. Inst. Civil Eng. 1900, **142**, [4], 47.

The municipal authorities at Berlin have carried out experiments with the Wegener process, in which the ashes and domestic refuse are fused in a species of cupola furnace, but although the results were, upon the whole, satisfactory, it is stated they have decided to discard this system of treatment in favour of the Buda-Pesth plan, according to which, the refuse is first sorted, and the valueless residue alone consumed. It has been shown from previous experiments that Berlin refuse cannot be consumed alone in furnaces of the ordinary kind, owing to its high percentage of ash. It is pointed out that the question is not solely that of the profitable disposal of the refuse, but is intimately connected with sanitary considerations, and it is doubtful whether the sorting system as now practised is free from objections from the hygienic point of view. In Hamburg, where a similar sorting process was employed, this plan has been given up since the cholera epidemic, and the house refuse is now burnt unsorted.

Wegener claims that the cost of treatment by his process can be greatly reduced, by arranging the furnaces in connection with a series of boilers, in which the surplus heat would be utilised. The furnaces will melt 25 tons of refuse per diem, with the addition of 30 per cent. of coal dust, the total amount of clinker produced being 8 per cent. of the whole bulk dealt with.—A. S.

Sewage; Treatment of London ——. F. Clowes. J Soc. of Arts, 1900, **49**, [2508], 45—50.

The treatment which the sewage of London at present undergoes is as follows:—The coarser solid matters are screened off, and the sewage is mixed with solutions of lime and sulphate of iron; the precipitate thus produced is then allowed to settle, together with the finer particles in the sewage, by sending the sewage slowly through parallel channels on its way to the river. The screenings are disposed of by being dug into the ground; the settled matter or sludge is sent in tank steamers to be discharged out at sea beyond the river's mouth; and the fairly clear effluent passes constantly into the river at Barking and

Crossness in two streams which jointly deliver over 200 million gallons every 24 hours.

The clarified sewage produced by this treatment contains a large amount of dissolved putrescible matter, which causes no nuisance when there is an ample flow of river water to dilute the effluent and carry it rapidly out to sea; but in warm and dry seasons, the condition of the lower reaches of the river frequently becomes almost offensive, and this state of things is likely to become worse as population increases and the volume of water taken from the river by the water companies becomes greater. Experiments in bacterial purification were therefore commenced in 1893 by Mr. Dibdin, and have been continued by the author with the co-operation of Dr. Houston. The results have been published in the form of reports to the London County Council (see this Journal, 1899, 862 and 1148).

In the process adopted, the sewage was allowed to flow into large tanks, which contained fragments of coke about the size of walnuts. As soon as the level of the liquid had reached the upper surface of the coke-bed, its further inflow was stopped, and it was allowed to remain in contact with the coke surface for 2 to 3 hours. It was then allowed to flow slowly away from the bottom of the coke-bed. After an interval of from 3 to 7 hours, the processes of filling and emptying the coke-bed were repeated with fresh sewage. The coke-bed was at first filled in this way twice in every 24 hours, but later it was filled three or four times in 24 hours.

A considerable purification has been effected by the coke-bed, owing to the agency of the bacteria contained in the sewage itself, the number of bacteria in raw London sewage averaging from about 3,500,000 in February to April to 6,140,000 in May to August. The maintenance of the purifying action is due to the presence of bacteria or their enzymes upon the coke surfaces, and to the adequate aeration of these surfaces by frequently exposing them to the oxygen of the air. That the aeration of even the lowest portions of a deep coke-bed seems to be satisfactory in the above method of working is shown by the fact that the gases present in the interstices of the coke between two fillings with sewage usually contain as much as 75 per cent. of the amount of oxygen contained in the air. Samples of gases drawn from the coke-bed at 13 ft. from the surface, and at varying intervals after drawing off the effluent, gave, on analysis, the following results:—

Date, 1899.	Depth in Feet from Surface of Coke-Bed.	Number of Hours since Effluent was Drawn off.	Oxygen, per Cent., in the Gases.	Carbon Dioxide, per Cent., in the Gases.
Oct. 30	13	2	19·1	0·8
„	13	48	14·2	3·5
„	13	104	18·6	0·2
Nov. 13	13	4	19·0	0·8
„	13	5	19·0	1·0

Raw sewage, screened through coarse gratings, lost practically the whole of its suspended matter by remaining in such a coke-bed for 2—3 hours. The suspended particles of fæcal matter apparently underwent liquefaction by the bacteria, since they did not collect upon the surface of the coke. The sand, grit, and finer mud (road detritus), however, were deposited, and gradually reduced the capacity of the bed. Hair, fibrous matter, woody fibre from the wood pavements, and particles of chaff and straw, mainly derived from the dejecta of horses, were also deposited upon the coke surfaces, and gradually choked the bed. These substances, consisting mainly of cellulose, appear to be acted upon by bacteria with extreme slowness under the above conditions. They arrive, however, in a water-logged condition, and rapidly settle out if the rate of flow of the sewage be reduced. Therefore, in dealing with the sewage of the Metropolis, it seems best to submit the roughly-strained sewage to a somewhat rapid process of sedimentation before passing it on to the coke beds; the small amount of suspended matter which then remains, and the dissolved organic matter, are readily dealt with by the bacteria of the coke-beds, and no choking of the beds occurs.

The effluent which is thus obtained from the coke-beds is entirely free from offensive odour, and remains so, even if kept for a month at summer temperature in closed or open vessels. It is clear, except when a turbidity is produced by fine mud particles washed down by heavy rain. Many pond and river fish have been kept in the constantly renewed effluent for a month, and have been found to be perfectly healthy at the end of that period. Coke-beds, varying in depth from 4 to 6 ft., remove, on the average, 51·3 per cent. of the dissolved matter of the original sewage, which is oxidisable by permanganate, the portion removed evidently being that which would rapidly become offensive and would rapidly lead to a de-aeration of the river water if it were allowed to pass into the river. A coke-bed 13 ft. in depth has proved more efficient, and has for some time produced a purification of 64 per cent., whilst an old bed, 6 ft. in depth, gave a purification of 86 per cent. By passing the effluent from the coke-bed through a second coke-bed, an additional purification of 19·3 per cent. has been effected, making a total purification of 70·6 per cent.

Relative Impurity as Estimated by Permanganate.

——	—	Percentage Purification calculated on the Clear Raw Sewage.
Raw sewage deprived of its suspended matter.	3·696	..
Effluent from chemical treatment.	3·070	16·9
Effluent from single bacterial treatment.	1·799	51·3
Effluent from double bacterial treatment.	1·137	69·2
River water (high tide)	0·550	..
„ „ (low tide)	0·429	..

The above purification is reckoned on the *dissolved* impurity of the sewage; the suspended impurity is not taken into account. No difficulty has been experienced in maintaining the bacterial purification.

The bacteriological condition of the effluent corresponds in the main with that of the raw sewage. The total number of bacteria undergoes some reduction in the coke-beds, but the different kinds of bacteria which were present in the sewage are still represented in the effluent (see this Journal, 1899, 1149). The introduction of such a sewage effluent into the lower Thames is unobjectionable. The river water at the points where the effluent is discharged is uniformly muddy; it is always brackish, and frequently salt to taste, owing to the presence of tidal sea water. It is, therefore, not capable of being used for drinking purposes. The effluent would certainly cause no deposit upon the river bed, and would ordinarily tend to render the muddy river water more clear by mixing with it. No offensive smell would be emitted by the effluent as discharged, and although it would contain more organic matter than the river water, the bacteria which it contains would slowly and inoffensively remove this organic matter from the effluent after it had been discharged into the river. The effluent would be suitable for the maintenance of healthy fish life.

—L. A.

Waste Waters of Sugar Factories in Russia; Purification of ——. J. Slasski. Bull. de l'Assoc. Chim. Sucr. Dist. 1900, **18**, [5 and 6], 303—304.

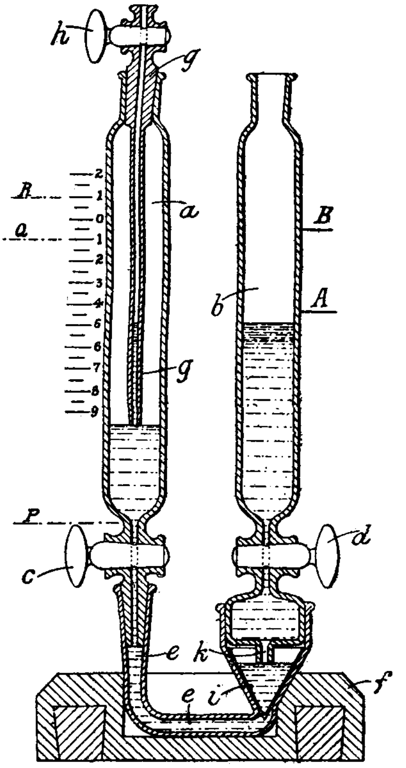
The first attempts to arrive at a general purification of the waste waters of sugar factories in Russia date from the year 1880. But only in 1894, as the result of a commission of inquiry, was the matter put on a satisfactory basis. The waste waters are divided into harmful and non-harmful. To the former class belong those which contain dissolved saccharine matter, &c., and the water used for washing the carbonic acid gas. These waters, failing any satisfactory chemical process of purification, must be purified in irrigation fields, which must be at the disposal of all sugar factories. The uncontaminated waters may be discharged into the rivers; the condensing waters must first be cooled to 25° C., and the beet-washing waters must be clarified by sedimentation.—J. F. B.

PATENTS.

Water for Steam Generators; Determining the Condition of ——, with respect to the Amount of Chemicals required for Softening it, Apparatus for ——. F. R. K. Erfmann, Rotterdam, Holland. Eng. Pat. 1166, Jan. 18, 1900.

The object of the invention is to afford a ready means of determining the proportion of soda (for instance) that should be added to the feed-water of boilers in order to soften it, so as to prevent the formation of a hard crust on the boiler-plate, the method being usable by ordinary workmen. "A definite quantity of boiler-water is caused to react on a definite quantity of a basic solution of definite strength so that a precipitate is formed. This mixture is filtered, and it is then determined how much of the basic solution still remains in the filtered liquid. For this purpose the base is coloured yellow by Methyl Orange." On neutralising the base by an acid, the change of colour indicates the completion of the reaction.

Three flasks, not shown, are used: (1) containing the coloured base; (2) the acid; and (3) the water to be tested. The water is poured into the vessel *b* (the cock being closed) up to the mark A. From flask (1) the basic solution is added up to the mark B. A precipitate forms, and, on opening all the cocks, the liquid flows through the filter *i* into the vessel *a* until it touches the end of the pipette. The cock *h* is then closed, and the liquid rises in the pipette only until it reaches the same level as in vessel *b*. All the cocks are now closed, the pipette is removed, and acid is added from flask (2) until the alkali is neutralised. The division reached by the liquid shows the quantity of acid added, the equivalent of which in soda is known by previous titration, and may be read off at once as kilos. of soda to be added to each ton of boiler-water. It will be noticed that the construction of the vessel containing the filter is such as to prevent, by compression of air, overflow of the filter.—E. S.



Ice Manufacturers; Treatment of Water for ——. M. Otto, Neuilly, France. Eng. Pat. 2991, Feb. 14, 1900.

The water is first sterilised by passing through it a current of ozone. It is then de-aërated by agitation under reduced pressure.—L. A.

Refuse Material, Garbage, and Night Soil; Furnaces for Burning ——. J. F. Lester, Atlanta, U.S.A., and L. A. Dean, Rome, U.S.A. Eng. Pat. 17,071, Sept. 25, 1900.

The furnace consists of one combustion chamber or a number of preliminary combustion chambers, each with a series of inter-communicating furnaces below. The refuse is charged into a combustion chamber through an opening in the top, and is delivered through openings in the floor into the furnaces below, the floor of the chamber forming the perforated arched roofs of the furnaces. As the refuse falls, it passes through the path of the escaping products of combustion. At the rear of the combustion chamber is a wall having therein a series of restricted openings. Each vertical series of these openings communicates by a vertical flue with a common horizontal flue arranged beneath the furnace. This latter flue leads the gases towards the end walls, and thence through an opening to a parallel flue running along the centre of the furnace. Within this flue is arranged a coke fire to consume the smoke. The gases then pass to the chimney. The chimney at its lower part is cooled by air channels, and is constructed internally in the form of two truncated cones, so as to assist the draught.—R. S.

(C.)—DISINFECTANTS.

PATENTS.

Antiseptic Preparation for the Destruction of the Microbes of Furuncles, Anthrax, Phlegmons, Abscesses, and other Cutaneous Affections. F. F. Bourdil, Paris. Eng. Pat. 1814, Jan. 24, 1900.

A solution of iodine in acetone.—L. A.

Disinfecting, and Apparatus therefor. E. Fournier, Paris. Eng. Pat. 13,566, July 27, 1900.

The improved method consists in injecting into the air of the chamber any suitable disinfecting vapour, whilst maintaining the air of the chamber at a minimum temperature of 30°—40° C. Complete portable apparatus is described for carrying out the necessary operations, consisting of a stove for heating the air and for vaporising the disinfectant; a fan for agitating and mixing the air and vapour; a door for closing the chamber, which is fixed in place of the ordinary door, and is provided with the necessary openings, connections, and tubes for the apparatus for heating, injecting, and agitating the air, as well as for the reception of a thermometer, and with inspection holes and ventilation orifices; and two injectors, one a spray device for distributing the disinfectant, and the other is constituted by a system of perforated tubes, enclosing non-perforated tubes, for the circulation of heated air, and terminating in a tube extending through the lower part of the door, and a tap for removing the products of condensation.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Manufacture; Increased Cost of Wood for ——, and Process for Utilising Cheaper Woods. F. A. Bühler. Papier-Zeit. 1900, **25**, [94], 3526—3527.

The author alludes to the increasing price of wood suitable for the manufacture of sulphite cellulose and calls attention to his process (Eng. Pat. 6651, 1898; this Journal, 1898, 944) for the employment of phenolic tar oils in the preparation of cellulose from wood. It is based on the fact that the phenols are solvents, not only for lignone, but also for resinous bodies, and consequently resinous and knotty woods, branches, and tops unsuitable for the sulphite process, can be employed. Wood can be heated to a much higher temperature without decomposition in presence of phenol than alone, or with other liquids. A temperature of 200° C. is quite safe, decomposition only begins at 230° C. No acetic acid is produced in the process; the dark colour of the cellulose is not due to decomposition, but to colouring matters from the oil, and readily yields to bleaching. Pure phenol gives a white pulp. The time of boiling is 3—4 hours for wood-meal, 5 hours for straw, 8—10 hours for soft trunk-wood, and 10—12 hours for dense, resinous wood; no pressure is required. Experiments on branches and knots showed that the whole of the incrusting matters are dissolved; naturally, the fibres obtained from these are not so long as those of the trunk-wood. By boiling at 5 atmospheres pressure for 60 hours, the whole of the cellulose is dissolved. Experiments showed that the solvent action of the phenols was still preserved when the dilution was 3 parts of phenol to 7 of hydrocarbon; further dilution increased the time required for boiling. Commercial phenolic oils from wood-tar, with 50—60 per cent. of phenols should therefore be perfectly applicable. Iron vessels are considerably attacked by the phenols and copper is the most suitable metal for the pans. The pulp can be pressed to 70 per cent. of dry fibre, the rest of the oil must be extracted, preferably by "crude benzole." On recovering the phenols by distillation, the incrusting matters and resinified oils are obtained as a pitchy mass of high calorific value, equal in weight to the cellulose produced. The yield of cellulose amounts to 48—50 per cent. of the dry weight of the wood. The quantity of oil employed is four times the weight of the wood and the copper boilers are heated by fire or superheated steam. Water and light oils come off first, the heavy oils are condensed and returned; the temperature of boiling is about 150° C. for 10 hours. The cellulose in the unbleached state does not felt very readily, but after bleaching it is equal to sulphite cellulose. This process has not yet been adopted on the large scale, but it should prove of good service in the future, especially for goods which need not be quite white.—J. F. B.

Straw-Paper. Papier Zeit. 1900, **25**, [98], 3679.

There is generally reckoned a loss of 30—35 per cent. of fibre substance from the dry straw to the finished paper. With boards, the loss is rather less because straw boards usually contain 10—15 per cent. of moisture, and straw-paper only 5—7 per cent. Straw-paper should always leave the machine with a certain amount of moisture, in order to preserve its flexibility. The degree of moisture can be regulated by taking care that as the paper leaves the delivery roller of the drying cylinder, it still steams considerably; it should neither cling to nor spring away from the cylinder. It makes a great difference whether the straw is bought at harvest time or some months later; the loss of weight from harvest to Christmas amounts to almost 25 per cent. In making purchases this loss should be taken into account.

Good rye-straw grown on poor sandy soils has a much lower specific gravity than that grown on heavy clay or mixed soils. Differences are caused by variations in the weather at harvest time. The greatest amount of moisture is nearly always found in pressed straw bales, these also often contain moist sweepings, refuse, and sand in the interior of the bale. On opening these bales steaming is often observed; it is caused by fermentation. The driest straw is that which has been stored till Christmas in barns; straw ricks in the open are always rather damp.

So-called "uneven" wheat straw, grown on mixed soils manured with potash, often contains hard knots which are not softened even by severe boiling, and give rough boards which will not take a smooth surface. These straws must be boiled with alkali or, better, with the waste liquors from straw cellulose factories for a long time.—J. F. B.

Linoleum; New Method of Manufacturing ——. Ammundsen, Rasmussen, and Hrün. Rev. Prod. Chim. **3**, [22], 341.

Two parts of resin and one part of a vegetable oil are melted together and 55 parts of this mixture are incorporated with 45 parts of a mixture of lime and casein. When the mass is homogeneous it is mixed with ground cork, the product being spread out in the form of plates and dried. The advantage claimed over ordinary linoleum is that drying is complete in a few days; and owing to the presence of an excess of lime along with the casein, a soap is formed with the oil present, and the linoleum is thereby maintained in a pliable condition. Glycerin has been tried, to prevent the hardening of the casein, but it gave unsatisfactory results, even when used in proportions up to 30 or 40 per cent.—C. S.

Kaolin; Levigated ——. F. Ulzer.
See under VIII., *page* 123.

Camphor and Camphor Oil. Gummi-Zeit. **15**, [8], 124.
See under XIII. C., *page* 137.

PATENTS.

Manifold Paper. [*Single or Double "Carbon" Paper.*] F. W. Weeks, Chicago, U.S.A. Eng. Pat. 9451, May 22, 1900; under Intern. Conv., Oct. 23, 1899.

The ordinary kinds of carbon paper have a soft layer of pigment, which is injured when touched, and also soils the hands of the user. To overcome this defect, a mixture of equal parts of wax, tallow, and either lampblack or Prussian blue is prepared, melted, and cast into sticks. It is then applied to, and spread uniformly over, the paper by suitable mechanism; and finally the whole is given a firm hard surface by finishing with rapidly rotating wing polishers.
—F. H. L.

Drawing Rolls used in Spinning [*Cotton*]; *Coverings suitable for the* ——. W. F. Reid, Addlestone, Surrey, and "The Velvril Co., Ltd.," London. Eng. Pat. 1609, Jan. 25, 1900.

The rolls are covered with tubes, preferably seamless, made of a mixture of one part of nitro-cellulose with two parts of nitro-linoleïn or nitro-ricinoleïn, as described in Eng. Pat. 21,995, 1895; this Journal, 1896, 910. The method of preparing the tubes is given in Eng. Pat. 11,209, 1900.
—F. H. L.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Rare Earth Group; Separation of the Members of ——. Verneuil and Wyrouboff. Rev. Scient. **13**, 518—520; 616—622. Le Mois Scient. et Ind. **2**, [2], 250—252.

Separation of Members of the Rare Earth Group.—The existing methods give defective results, and the authors prefer to treat the calcined oxides with sufficient nitric acid to form neutral salts with ceroso-ceric oxide and the oxides of lanthanum and didymium present. On boiling the solution, the first-named oxide polymerises to a meta-compound, which may be precipitated as a pure sulphate by adding an alkali sulphate, leaving the other oxides behind. Thoria, if present, comes down with the cerium, but can be extracted by treating the neutral nitrates with an excess of hydrogen peroxide.—C. S.

Hydrogen Peroxide; Reduction of Mercury Salts by ——. A. Kolb. Chem. Zeit. 1901, **25**, [3], 21.

Mercury salts, in the presence of alkali, or in ammoniacal solution, are reduced to the metallic state by hydrogen peroxide, whilst in neutral or acid solution, they are unaffected by it, although in neutral solutions, mercuric salts are reduced to the mercurous condition in the presence of a neutral tartrate, such as Rochelle salt. Thus, on warming an aqueous solution of mercuric chloride or nitrate, to which a little alkali has been added, with a few drops of a 3 per cent. solution of hydrogen peroxide, the yellowish-red precipitate is rapidly reduced to the metallic state. Similarly, a mercury salt mixed with an ammonium salt and an excess of ammonia may remain clear, but on mixing with the hydrogen peroxide, will deposit mercury; but in this case the precipitation is not complete, even in the presence of an excess of the peroxide. If, however, a little tartaric acid, and then an excess of strong ammonia, be added to the clear solution, the whole of the mercury can be precipitated as such after warming for half an hour with the peroxide. Neutral mercuric chloride, mixed with Rochelle salt and warmed with the peroxide, gives a reduction to mercurous chloride (not to metallic mercury) in from 5 to 10 minutes. The precipitate of calomel is large-grained, and both filters and washes well; the reduction appears, moreover, to be quantitative. If the reaction has been effected in strong solutions, the liquid deposits crystals of potassium bitartrate on cooling. Vanino and Treubert (this Journal, 1897, 1043; and 1898, 72) add hydrogen peroxide at the end of their process, in which mercuric salts are reduced by phosphorous acid, but the peroxide here plays an oxidising part. Mercuric cyanide also, when warmed with a little potash and hydrogen peroxide, is completely reduced in from 15 to 30 minutes. If ammonia be substituted for potash, the reduction is not complete.—W. G. M.

Calcium Iodate; Preparation of ——. W. Mackie. Lancet, 1900, [4035], 1867. Chem. and Druggist, Jan. 5, 1901.

An aqueous solution of iodine in potassium iodide is prepared of such strength that it will just transmit light through a depth of 3 ins. A filtered solution of bleaching powder is run into the iodine solution, with occasional stirring. If the crystalline precipitate which forms after some time be not perfectly white, a further quantity of potassium iodide solution is added, the mixture stirred, and again decolorised with the bleaching powder solution. A small quantity of very dilute hydrochloric acid is now added to dissolve any calcium carbonate which may have been formed, the precipitate is collected on a filter, washed once or twice with cold water, and dried on blotting paper or at a temperature not much exceeding 100° C. The potassium iodide should be kept in excess during the precipitation. The product corresponds to the formula $Ca(IO_3)_2 + 6H_2O$; it is odourless and tasteless and is soluble in about 380 parts of water at 11·5° C.; it is said to be a satisfactory substitute for iodoform. The salt has been known in Elgin under the name of "Calcinol."—A. S.

Bismuth; Hydrated Oxide of ——. P. Thibault. J. Pharm. Chim. **12**, [12], 559—561.

The author confirms the previously recorded fact that the hydrated bismuth oxide obtained by precipitating acid solutions of salts of the metal by means of alkali, invariably contains a notable quantity of oxysalt of the acid present, however the manipulative details of the process may be varied. He finds, however, that by precipitating the oxide from an alkaline medium with an acid, this impurity may be avoided; the resulting gelatinous precipitate affords a granular white powder, which, when dried at ordinary temperatures over H_2SO_4 responds to the formula $Bi_2O_3H_2O$. 20 grms. of crystalline bismuth nitrate are mixed intimately with 30 grms. of glycerin (sp. gr. 1·264), and 100 grms. of water added gradually with constant agitation. When solution is complete, the liquid is gradually added to excess of solution of potash. When all the hydrated oxide has again entered into solution, the excess of alkali is cautiously neutralised by the addition of dilute sulphuric acid, until the liquid is only faintly alkaline, or at the most, neutral; excess of acid being carefully avoided. The resultant gelatinous precipitate is washed free from sulphate by decantation in the usual manner. From the pure hydrated oxide thus obtained, the organic salts of bismuth such as the gallate, salicylate, benzoate, perfectly free from contamination with salts of mineral acids, may be prepared, which is not the case with those prepared from the oxide obtained by the usual method of precipitation.—J. O. B.

Bismuth Subnitrate; Commercial ——. F. A. Upsher Smith. Pharm. J. 1900, **65**, [1590], 692—696.

The author draws the following conclusions from the results of his experiments. Commercial English bismuth subnitrate is uniform in composition as regards Bi_2O_3 but varies slightly in acidity and in the proportion of moisture present. English samples contain less Bi_2O_3 than some American samples examined by Curtman and Kebler, and they are "more basic and slightly more acid" than the B.P. formula demands. For purposes of calculation, a formula corresponding to 80 per cent. of Bi_2O_3 should be taken instead of the B.P. formula.

The following modifications of the pharmacopœial characters and tests are recommended:—Bismuth subnitrate, containing not less than 80 per cent. of Bi_2O_3, and from 17·5 to 19·5 per cent. of N_2O_5, should form a heavy, white, inodorous powder, consisting of minute crystals, with an acid reaction to litmus. If 1 grm. be just dissolved in nitric acid, and the liquid mixed with 5 c.c. of an aqueous solution containing 2 grms. of citric acid, and sufficient ammonia to give a decided *alkaline reaction*, no precipitate or opalescence should be formed on boiling (absence of calcium phosphate). 1 grm. of substance, on ignition at red heat, should leave a residue of from 0·79 to 0·81 grm. (corresponding to 79—81 per cent. of bismuth oxide). If 2 grms. be heated with 5 c.c. of water and 10 c.c. of normal potassium hydroxide solution for half an hour on the water-bath, with occasional stirring, then the liquid filtered, and the residue washed, the filtrate should require from 34·75 to 27·3 c.c. of decinormal hydrochloric acid for neutralisation, with phenolphthalein as indicator (corresponding to 17·5—19·5 per cent. of N_2O_5). Heated at 120° C., the salt should lose from 2 to 3 per cent. of its weight.—A. S.

Chloroform; Electrolytic Preparation of ——. Rev. Prod. Chim. **3**, [20], 309.

A 20 per cent. solution of sodium chloride is heated at 100° C. in a leaden still, and kept stirred by means of carbon spatulas, which, at the same time, serve as anodes for the (5—6 ampère) current. Acetone is introduced into the bottom of the still, and combines with the liberated chlorine to form acetone trichloride, which, in presence of the sodium hydroxide, is decomposed with formation of sodium acetate and chloroform. The latter is conveyed through a condenser, and collected in a suitable receiver. The yield is said to be 180 parts out of 210 theoretically possible.
—C. S.

Cacodylic Acid and Cacodylates. W. H. Martindale. Pharm. J. 1900, **65**, [1591], 724.

In the commercial preparation of cacodylic acid, equal parts of potassium acetate and arsenious acid are subjected to dry distillation, yielding Cadet's fluid, which consists of a mixture of cacodyl oxide, $[As(CH_3)_2]_2O$, with some cacodyl, $As_2(CH_3)_4$. This is redistilled in a current of hydrogen, and treated under cold water with mercuric oxide in small quantities at a time. The supernatant liquid containing the cacodylic acid and a small quantity of mercury cacodylate (which is removed by adding a few drops of cacodyl) is decanted off, evaporated to dryness, and the acid extracted by hot alcohol. Cacodylic acid, $AsO(CH_3)_2OH$, is a monobasic acid, reacting acid to phenolphthaleïn and litmus, but neutral to Methyl Orange; it crystallises in the form of anhydrous, colourless, odourless, rhombic prisms, easily soluble in water, but less in alcohol; it is deliquescent, and alters in composition in moist air; melts at 200° C., but rapidly decomposes at higher temperatures. Cacodylic acid should be free from chlorides, sulphates, oxalates, and arsenious or arsenic acid.

Sodium cacodylate, $AsO(CH_3)_2ONa + nH_2O$, forms very deliquescent, prismatic crystals, easily soluble in water and alcohol. It is prepared by exactly neutralising cacodylic acid with sodium hydroxide. The crystals contain varying proportions of water, according to the temperature at which crystallisation took place and the nature of the solvent used. The salt of commerce, which usually contains 2 to 3 mols. of water, should be tested for the impurities mentioned under cacodylic acid. For the determination of sodium cacodylate in the commercial salt, which frequently contains free cacodylic acid, Imbert and Astruc have proposed the following method:—A decinormal solution of the salt is prepared by dissolving 1·6 grms. in 100 c.c. of water. 10 c.c. of this solution are neutralised with decinormal caustic soda in presence of phenolphthaleïn, then a few drops of Methyl Orange added, and the liquid titrated with decinormal acid; the number of c.c. of acid used, multiplied by 10, will give the percentage of pure dry, sodium cacodylate. The author states that the method is satisfactory, except that with samples containing appreciable quantities of free cacodylic acid, the number of c.c. of soda consumed in neutralising this free acid should be deducted from the number of c.c. of acid used.

Other Cacodylates.—Potassium cacodylate is more deliquescent than the sodium salt, and crystallises with 1 mol. of H_2O; the lithium salt is soluble in water and alcohol; the calcium salt has 9 mols. of H_2O; the magnesium salt is soluble, and crystallises with difficulty; the silver salt withstands the action of light when dry, but blackens when moist. The iron salt is of variable composition, in fact the commercial article is said to frequently consist of a mixture of oxides of iron with cacodylic acid. Mercury cacodylate gives prismatic crystals from alcohol; it is soluble in cold water, but the solution is decomposed on heating. Other compounds are guaiacol cacodylate of uncertain composition; alkaloïdal cacodylates; and cinnamylcacodylic acid, which is stated to contain a molecule of each of the component acids, and to be crystallisable.—A. S.

Cinchona Alkaloids; Formation of the ——. J. P. Lotsy. Bull. Inst. Bot. Buitenzorg. 1900, **3**. Pharm. J. 1900, **65**, [1590], 689.

The author communicates the results of an investigation as to the place of formation of the alkaloids in *Cinchona succirubra* and *ledgeriana*. He concludes that they are formed in the leaves, whence they pass to the stem, and are there stored up, either in their original form or after transformation into some other alkaloid. The alkaloids are not formed as products of decomposition of proteids, but by direct synthesis, as the results of the action of cinchonic acid on ammonia, or a compound of ammonia, and subsequent condensation.—A. S.

Camphene. F. W. Semmler. Ber. 1900, **33**, [18], 3420—3432.

The transformations from the pinene to the camphene type are of great significance for the constitution of both terpenes.

Pinene dibromide, obtained by the method given by Wallach (Annalen, **264**, 1), was converted into hydrocamphene, $C_{10}H_{18}$, which was identical with the hydrocarbon obtained from artificial camphor, $C_{10}H_{17}Cl$. Bromocamphene, when reduced by sodium and alcohol, yields camphene identical with the original substance. The same camphene dibromide is found in the residue, after the steam distillation of the product of the action of bromine upon camphene, which is obtained by the action of bromine upon camphene dissolved in glacial acetic acid. It crystallises from alcohol, melts at 90° C., and distils undecomposed at 153°—155° C. under 15 mm. pressure. On distillation with quinoline, the above bromocamphene is obtained. The dibromide is unaltered by alcoholic potash; when reduced by sodium and alcohol, the above hydrocamphene, $C_{10}H_{18}$, is formed. Camphene hydrobromide is obtained by the action of hydrobromic acid gas upon camphene dissolved in absolute alcohol. When separated from its solutions by cooling, it forms fine crystals which melt at 133° C. Alcoholic potash at once regenerates camphene, which was also the sole product of the action of sodium and alcohol, though camphene hydrochloride on reduction gives camphene and hydrocamphene.

Camphene Ethyl Ether, $C_{10}H_{17}OC_2H_5$, is obtained by boiling camphene and absolute alcohol with sulphuric acid. It is a fluid oil, boiling at 200° C., and is not decomposed by distillation over sodium. A similar reaction occurs with other pseudo-terpenes, with nopinene and sabinene, but the yield is small; limonene is polymerised almost entirely.

Camphor is obtained in small quantity by the oxidation of isoborneol with potassium bichromate and sulphuric acid. The yield is much greater if the isoborneol be dissolved in glacial acetic acid, and the calculated quantity of powdered permanganate added.—A. C. W.

Santalol; Preparation of ——. Heine and Co. Ger. Pat. 116,815, an addition to Ger. Pat. 110,485, of Jan. 4, 1898. Zeits. angew. Chem. 1901, **14**, [1], 15.

The crude santalol obtained by saponification of sandalwood oil, according to Ger. Pat. 110,485, 1898 (this Journal, 1900, 555), is purified by fractional distillation with superheated steam.—A. S.

Adonidin. N. A. Waljaschko. Farmaz. Westn. 1900, **4**, 551; through Chem. Zeit. Rep. 1900, **24**, [100], 366.

Merck's adonidin, obtained by precipitating an aqueous extract of the plant with tannin, is a brown hygroscopic substance which deliquesces at once in the air to a brownish-yellow turpentine-like mass, with microcrystalline structure and odour of the dried plant. It contains (1) a colourless constituent of bitter taste and peculiar odour, which crystallises in needles and dissolves easily in organic solvents, but with difficulty in water; (2) a dark brown substance soluble in alcohol and insoluble in water; (3) a similar body easily soluble in water, precipitated by lead hydrate and dissolved with difficulty by alcohol; (4) a colourless, bitter principle which crystallises in octahedra, dissolves easily in water and very slightly in alcohol; (5) white amorphous adonidin, recognised by its colour reaction with sulphuric acid, bitter taste, and insoluble tannin compound.

Adonidin is almost insoluble in petroleum spirit, ether, toluene, and benzene, somewhat soluble in acetone, chloroform, acetic and amylic ethers, aniline and pyridine, easily soluble in phenol, glacial acetic acid, water, and methyl alcohol, and also in the higher alcohols (ethyl, propyl, isobutyl, and isoamyl) with gradually increasing difficulty.

The commercial sample was repeatedly extracted with isobutyl alcohol to eliminate substances 3 and 4. From the solution the fairly pure substance was precipitated by tannin, recrystallised several times from isobutyl alcohol, and evaporated in a vacuous desiccator over calcium chloride. The resulting pure white substance dissolves in 120 parts of cold or 90 parts of hot isobutyl alcohol, is extremely hygroscopic, deliquesces rapidly, probably owing to the formation of hydrates, and must be recrystallised several times before it recovers this comparatively permanent state.

When dried *in vacuo* at 60°—110° C., alcohol and moisture are lost, and the substance appears to be less hygroscopic. In the purest state it is pale yellow in colour, forms a clear solution, and has no definite melting point, but undergoes change at 120°—130° C. The percentage composition is C = 57·97, H = 6·49, ash = 6—7. Adonidin does not reduce Fehling's solution, and yields, when decomposed with hydrochloric or sulphuric acid, (1) a white soluble substance, slightly soluble in alcohol; (2) a very bitter principle with characteristic odour that crystallises in needles and dissolves in ether, chloroform, acetone, and alcohol; (3) a resin easily soluble in alcohol and soluble with difficulty in ether or water. This resin is probably formed by the further action of the acid on the preceding substance.—R. L. J.

Peru Balsam in Central America. P. Preuss. D. Pharm. Ges. Ber. 1900, **10**, 306; through Chem. Zeit. Rep. 1900, **24**, [100], 367.

This balsam is exclusively obtained from the small Republic of San Salvador, and derives its name from the fact that during the Spanish occupation, the drug was first taken to the seaport town Callao in Peru and thence shipped to Europe. The tree that yields it (*Myroxylon Pereiræ*) grows, either singly or in small groups, to a height of 15—20 metres, and is tapped when the trunk measures 60 cm. in circumference, the juice being collected throughout the year, but chiefly during the dry period from December to April. Rags are employed to soak up the balsam, and its flow is increased by the application of fire. When saturated, the rags are squeezed and boiled with water; the bark is removed when the incisions cease to yield, pounded up, and extracted in a similar manner. The "rag-balsam" is then mixed with that obtained from the bark.—R. L. J.

Ionone from Cyclo-Citral and Acetone; Preparation of ——. Haarmann and Reimer. Ger. Pat. 116,637, Sept. 11, 1898. Zeits. angew. Chem. 1901, **14**, [1], 15.

The claim is for the preparation of ionone from cyclocitral and acetone by condensing these substances in presence of an alkaline reagent.—A. S.

Ethereal Oil from "Orchis militaris L." E. Crouzel. Répert. Pharm. 1900, [3], **12**, 529; through Chem. Zeit. Rep. 1900, **24**, [104], 384.

This oil can be extracted by means of 90 per cent. alcohol, or better, by ether, as in this case the pleasant smell of the dry plant is retained. The oil is yellowish, and has a pleasant penetrating smell. If the dry plants are distilled with water, the oil suffers partial decomposition and loses its characteristic odour.—T. H. P.

Peppermint Oil from Russian and other Sources; Examination of ——. J. Lifschitz. Farmaz. Westn. 1900, **4,** 575; through Chem. Zeit. Rep. 1900, **24,** [100], 366.

Cuttings *of black and white peppermint were obtained* from Mitcham some years ago for the Botanical Gardens at St. Petersburg. A portion of the white variety was transferred in 1895 to the Ljubens plantations in the Poltava district, and two years later the leaves, flowers, and thin twigs of this crop were distilled for oil. The following table shows the composition and properties of three Russian oils and of six other samples from recognised sources examined *in the pharmaceutical laboratory of the university of* Kharkoff:—

Description.	Specific Gravity at 17·5° C.	Rotation at 20·5° C. in 100 mm. Tube.	Solidifying Point.	Boiling Point.	Maumené Reaction.	Acid No.	Etherification No.	Saponification No.	Iodine No.
Peppermint oil:		° ′	° C.	° C.	°				
White	0·9136	− 21 21	− 12	160	20 5	1·68	48·72	50·4	65·10
Black	0·9098	− 21 29	− 11·5	165·5	20	1·12	49·28	50·4	76·49
"Agricolla" Co.'s oil, Kiev.	0·9115	− 24 10	− 14	180·5	16·5	1·12	54·88	56·0	79·51
Peppermint oil:									
German	0·9045	− 26 24	− 14·5	183	18·5	0·56	66·64	67·2	61·38
English (Mitcham)	0·9024	− 24 11	− 13	198	18	0·56	21·84	22·4	66·64
English	0·9109	− 25 20	− 13·5	194	19	1·68	26·32	28·0	46·92
American (Hotchkiss)	0·9154	− 29 17	− 13	154	17·25	2·24	36·96	39·2	61·84
American (Fritzsche)	0·9097	− 26 10	− 13	156	18	1·12	21·28	22·4	63·24
Japanese	0·9454	− 21 40	below − 20	124	20·5	16·8	28·0	44·8	61·61

Description.	Vols. of Oil and Alcohol (90 per Cent.) respectively, which form a Clear Solution.	Menthol Content.			Menthone Content.
		Fixed.	Free.	Total.	
Peppermint oil:		Per Cent.	Per Cent.	Per Cent.	Per Cent.
White	1:1·8, cloudy with more alcohol	13·57	43·14	56·71	36·07
Black	1:1·8, „ „	13·72	40·63	54·35	39·03
"Agricolla" Co.'s oil, Kiev.	1:1·4, „ „	15·23	40·34	55·62	34·00
Peppermint oil:					
German	1:2·3, „ „ weaker	20·12	34·23	54·35	31·84
English (Mitcham)	1:4·5, more alcohol gives faint opalescence	6·08	46·44	52·52	39·29
English	1:4·0, „ „ „	7·33	44·14	51·47	37·24
American (Hotchkiss)	1:1·7, cloudy with more alcohol	10·29	47·04	57·33	20·58
American (Fritzsche)	1:1·3, „ „	5·92	50·44	56·36	23·81
Japanese	All proportions	7·80	26·72	34·52	49·40

The Japanese oil was evidently deprived of a portion of its free menthol. The "Agricolla" was somewhat inferior to the English in taste and odour, but superior to the German. The markedly superior odour of the Russian samples (first three in the list) is in harmony with their high percentage of combined menthol.—R. L. J.

I. Osmophorous [Scent-forming] Groups. II. Diazoimides (Triazo-compounds). H. Rupe and K. von Majewski. Ber. 1900, **33,** [18], 3401—3410.

Certain groups impart to the compounds they enter a characteristic and pleasant odour. These groups are styled "osmophorous" by the authors; in particular they are OH, O:, CHO, CO.CH$_3$, O.CH$_3$, NO$_2$, CN, N$_3$. Certain groups may replace others without altering the character of the odour; thus we have the series $C_6H_5.CHO$, $C_6H_5.NO_2$, $C_6H_5.CN$, $C_6H_5.N_3$. Similarly *p*-nitroguaiacol has a slight, and *p*-cyanoguaiacol a distinct odour of vanilla. In artificial musk the nitro group has been replaced by CN and by N$_3$ without perceptible change of smell.

Derivatives of pyrocatechol methylene ether were prepared. Piperonylic nitrile, $CN.C_6H_3O_2{:}CH_2$ resembles piperonal in odour, but has, at the same time, a nitrile smell. Triazopyrocatechol methylene ether, $N_3.C_6H_3O_2:CH_2$, has an odour similar to piperonal but weaker, at the same time it has the anise odour characteristic of the diazo-imide group.

As regards the combination of several osmophorus groups, the following observations were made: *p*-triazo-benzoic-methyl ester has a strong sweet odour, recalling fruit and anise, whilst *p*-cyanobenzoic methyl ester has a strong, not unpleasant odour, very similar to that of the last-named compound, but also characteristic of nitriles, and not far removed from the fruity smell of *p*-bromo- and chlorobenzoic methyl esters. In the *p*-, *m*-, and *o*-triazobenzoic methyl esters there is a decrease in smell from *p*- to *o*-. *p*-Triazomethoxybenzene has the strong anise odour typical of diazo-imides, whilst the *o*-compound is similar to *m*- and *o*-triazobenzoic methyl esters. *p*-Triazobenzaldehyde has a strong smell, tolerably pleasant, recalling anise and anisaldehyde; the corresponding nitrile has a feeble smell.

p-Methoxyacetophenone has a very pleasant odour; Tahara (Ber. **25,** 1308) describes the *o*-compound as an oil of aromatic odour; the *m*-compound was now prepared and found to possess only a very slight smell of acetophenone. *m*-cyanacetophenone is also almost without smell, whilst acetophenone-*m*-carboxylic methyl ester is quite odourless and *m*-triazo-acetophenone is almost odourless. Thus in the derivatives of acetophenone, the *m*-position is the least favourable for osmophorous groups.

Diazo-imides.—The methods for the preparation of diazo-imides through the perbromides and by means of hydroxylamine are not suitable for working on a large scale. Good results were obtained by using potassium hydroxylamine mono- or disulphonate in place of the base *itself; the method is, however, restricted to diazo-compounds containing a negative group in the nucleus.* The potassium hydroxylamine sulphonate was obtained by the process of Raschig (Annalen, **241,** 183); for use it was dissolved in 40 parts of water by gentle heating. As an example, *p*-nitraniline may be taken: the base was diazotised by means of 4 mols. of hydrochloric acid and 1 mol. of nitrite, a solution of 2½ mols. of the hydroxylamine sulphonate was then added. The diazo-imide separates in a few minutes; the yield is almost quantitative, and the crude product melts at 70° C. instead of 72° C.—A. C. W.

Morphine; Determination of——, by Reduction with Silver Nitrate. C. Reichard.

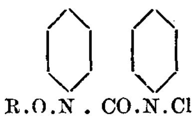
See under XXIII., *page* 160.

PATENTS.

Chlorocarbonic Acid Ethers, and Compounds therefrom; Manufacture or Production of ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 530, Jan. 9, 1900.

These esters may be profitably obtained by allowing phosgene COCl$_2$, perchlormethylformiate OC(O.CCl$_3$)Cl, or hexachlorodimethylcarbonate OC(O.CCl$_3$)$_2$ to act on alcohols, phenols, or derivatives of bodies containing free hydroxyl groups, in the presence of tertiary bases, such as antipyrine, quinoline, dimethylaniline, and their homologues or analogues (the bases of the pyridine series being excepted). The following are examples :—Chlorocarbonic acid ethylic ester, b. pt. 93° C., is obtained when phosgene (990 parts) is led into a mixture of absolute alcohol (460 parts) and dimethylaniline, (1,210 parts), the last being diluted with an equal volume of pure ether. If other alcohols or tertiary bases are employed, intermediate products may be formed and isolated, which then act upon the alcohol, phenol, &c. Thus chlorocarbonylicdimethylphenylpyrazolone $OC(OC_{11}H_{12}N_2Cl)_2$ is produced as a white crystalline mass, when a solution of phosgene (99 parts) in benzene is added to antipyrine, (376 parts), also dissolved in benzene, and analogous products when other homologues are used. This product may be employed to produce normal propylchlorocarbonic ester C_3H_7OCOCl, if to 475 parts dissolved in benzene, propylic alcohol (60 parts) are added with continuous stirring and careful cooling. Other alcohols, phenols, &c., behave in an analogous manner with other double intermediate compounds.

These complex esters form derivatives with bases of the pyridene series, one molecule of the ester combining with two molecules of the base to form compounds such as—



R.O.N . CO.N.Cl

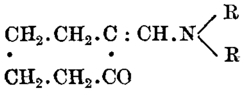
These products are all characterised by forming, when treated with water, alcohols, or phenols or their homologues, neutral carbonates of the general type $(R.O)_2CO$. If water is used, the same radicle (R) enter the molecule twice, whilst by the use of alcohols and phenols, the carbonate may be of a mixed type, such as $R'O.CO.R''O$, where R′ and R″ are different radicles. For example, $CO(CH_3.O)_2$ results when the double compound (100 parts) prepared from the methyl ester of chlorocarbonic acid is mixed with xylene, water added, and, after removal of pyridine by dilute hydrochloric acid, the xylene solution is fractionated. The dimethyl carbonate so obtained boils at 91° C. On the other hand, if 2,665 parts of the double compound prepared from pyridine and chlorocarbonic acid ethylic ester are mixed with benzene, 1,080 parts of benzylic alcohol in benzene are slowly added, and the product is similarly purified, ethylbenzyl carbonate $OC(OC_2H_5)OC_6H_5.CH_2$ is obtained as an oil which boils at 242°—243° C. and possesses an agreeable odour, resembling that of pears.

Again, if the double compound obtained by the interaction of pyridine and the chlorocarbonic ester of salol, is mixed with toluene, and a solution of salol in toluene is added, salol carbonate, $OC(O.C_6H_4.CO.OPh)_2$, remains as a solid, after removal of the toluene. It separates as a white crystalline powder from alcohol, melts at 132° C. and gives no coloration with ferric chloride. In this case, if ethylic alcohol is employed instead of salol, the mixed carbonate, salolethyl carbonate, $OC(OC_2H_5)O.C_6H_4.COOC_6H_5$, is produced. This compound forms rhombic prisms, melts at 75° C., and is readily soluble in the usual solvents.

Analogous substances are obtained when other chlorocarboxyl derivatives or other phenolic agents are employed.
—R. L. J.

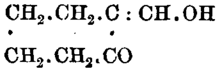
Oxybenzylamine, Hydrogenised, and Hydrogenised Benzylamine Bases, and Transformation of the latter into Hydrogenised Cyclic Aldehydes or Terpenealdehydes; Manufacture of ——. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/M., Germany. Eng. Pat. 1094, Jan. 17, 1900.

AMINOMETHYLENECYCLOKETONES of the general formula—



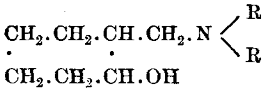
$$\begin{array}{l}\mathrm{CH_2.CH_2.C:CH.N}\!\left\langle\begin{array}{l}\mathrm{R}\\ \mathrm{R}\end{array}\right.\\ \mathrm{CH_2.CH_2.CO}\end{array}$$

(where R represents hydrogen or a fatty or aromatic radicle), obtained by the action of ammonia, or primary or secondary fatty or aromatic amines on formyl- or oxymethylenecycloketones of the general type—



$$\begin{array}{l}\mathrm{CH_2.CH_2.C:CH.OH}\\ \mathrm{CH_2.CH_2.CO}\end{array}$$

are converted by the action of reducing agents (*e.g.*, sodium and alcohol) into hydrogenised oxybenzylamines of the configuration—

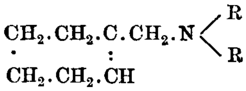


$$\begin{array}{l}\mathrm{CH_2.CH_2.CH.CH_2.N}\!\left\langle\begin{array}{l}\mathrm{R}\\ \mathrm{R}\end{array}\right.\\ \mathrm{CH_2.CH_2.CH.OH}\end{array}$$

Thus anilinomethylenementhone becomes isopropylmethyloxyhexahydrobenzylaniline, ethylamino-methylenementhone forms isopropyl-methyl-oxyhexahydrobenzylethylamine and anilinomethylenedihydroisophorone yields trimethyloxyhexahydrobenzylaniline.

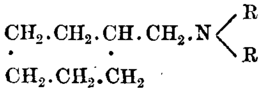
By further reduction or elimination of water, such bases become hydrogenised benzylamine bases of the types—

I.



$$\begin{array}{l}\mathrm{CH_2.CH_2.C.CH_2.N}\!\left\langle\begin{array}{l}\mathrm{R}\\ \mathrm{R}\end{array}\right.\\ \mathrm{CH_2.CH_2.CH}\end{array}$$

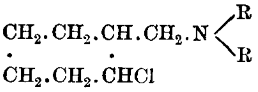
II.



$$\begin{array}{l}\mathrm{CH_2.CH_2.CH.CH_2.N}\!\left\langle\begin{array}{l}\mathrm{R}\\ \mathrm{R}\end{array}\right.\\ \mathrm{CH_2.CH_2.CH_2}\end{array}$$

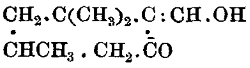
Thus, isopropyl-methyl-oxyhexahydrobenzylaniline gives isopropyl-methyl-tetrahydrobenzylaniline and isopropylmethyl-hexahydrobenzylaniline; whilst trimethyl-oxyhexahydrobenzylaniline forms trimethyl-tetrahydrobenzylaniline and trimethyl-hexahydrobenzylaniline (*vide infra*).

The elimination of water from hydrogenised oxybenzylamines is best effected when chlorine is first substituted for hydroxyl by the agency of phosphorus pentachloride, these intermediate chlorohydrobenzylamines being of the type—



$$\begin{array}{l}\mathrm{CH_2.CH_2.CH.CH_2.N}\!\left\langle\begin{array}{l}\mathrm{R}\\ \mathrm{R}\end{array}\right.\\ \mathrm{CH_2.CH_2.CHCl}\end{array}$$

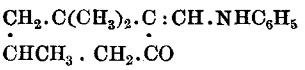
Oxymethylenedihydroisophorone—



$$\begin{array}{l}\mathrm{CH_2.C(CH_3)_2.C:CH.OH}\\ \mathrm{CHCH_3\,.\,CH_2.CO}\end{array}$$

is prepared by adding together dihydroisophorone (97 parts), methyl formate (84 parts), sodium ethylate (48·1 parts), and ether (300 parts) in a flask fitted with a reflux condenser, moderating the action by cooling, as required. A solid crystalline mass of the sodium derivative results in 15 minutes, which, after standing 12 hours, is treated with water (500 parts); the ethereal solution is then separated and the aqueous layer extracted with ether. Addition of dilute acetic acid separates a still further quantity as a yellowish layer, which is taken up with ether, washed and dried. After distilling off the ether, the base remains as a yellow oil which boils at 124° C., under 27 mm. pressure, without decomposition.

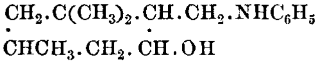
110 parts of this oil dissolved in methyl alcohol (300 parts) and treated with aniline (65 parts) dissolved in acetic acid yields *anilinomethylenedihydroisophorone*—



$$\begin{array}{l}\mathrm{CH_2.C(CH_3)_2.C:CH.NHC_6H_5}\\ \mathrm{CHCH_3\,.\,CH_2.CO}\end{array}$$

a yellow crystalline substance soluble in the usual solvents. This is reduced as follows :—To the thoroughly dry anilinobase (1 kilo.) dissolved in absolute alcohol (15 kilos.) dried by sodium, 1 kilo. of sodium is gradually added. When solution is complete, the alcohol and some dihydroisophoronyl, alcohol and aniline are removed by steam-distillation. The new base, which remains as a viscous oil, is purified by conversion to the *hydrochloride* in ethereal solution, excess of HCl gas being avoided.

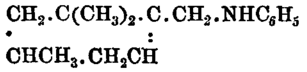
Trimethyl-oxyhexahydrobenzylaniline—



$$\begin{array}{l}\mathrm{CH_2.C(CH_3)_2.CH.CH_2.NHC_6H_5}\\ \mathrm{CHCH_3.CH_2.CH.OH}\end{array}$$

obtained by neutralising the colourless crystalline hydrochloride crystallises from hot petroleum spirit in needles, melts at 70°—86° C., and boils without decomposition at 224° C., under 15 mm. pressure.

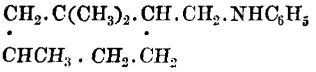
It is converted to the *trimethyl-chlorohexahydrobenzylaniline* by dissolving the oxybase (610 parts) in benzene (4,500 parts) and saturating with HCl gas. The solution remains clear, and phosphorus pentachloride (53 parts) is added thereto, the reaction being completed by warming on the water-bath. Water and excess of sodium carbonate are added, and the benzene solution of the chlorinated base is removed, dried, and distilled *in vacuo* leaving the chloro-base as a yellowish oil. This oil (1 part) when heated on the oil-bath with powdered KOH (10 parts) and alcohol (5 parts), for 4—5 days, diluted with water and steam-distilled, gives *trimethyl-tetrahydrobenzylaniline*—



$$\begin{array}{l}\mathrm{CH_2.C(CH_3)_2.C.CH_2.NHC_6H_5}\\ \mathrm{CHCH_3.CH_2CH}\end{array}$$

as an odourless oil, which after solution in ether and drying, boils at 187° C. under 19 mm. without decomposition.

The still further reduced base *trimethyl-hexahydrobenzylaniline*—



$$\begin{array}{l}\mathrm{CH_2.C(CH_3)_2.CH.CH_2.NHC_6H_5}\\ \mathrm{CHCH_3\ .\ CH_2.CH_2}\end{array}$$

is obtained from this tetrahydro-base or from the abovementioned chloro-base by dissolving 1 part of either in absolute alcohol (20 parts), heating and adding sodium (2 parts). It is a colourless odourless oil which boils at 190° C. (15 mm. pressure) without decomposition.

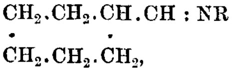
In a similar manner are obtained the three corresponding bases derived from each of the following:—

Anilinomethylene-camphor,
Anilinomethylene-menthone,
Aminomethylene-menthone,
Dimethylaminomethylene-menthone,
Ethylaminomethylene-menthone,
Oxymethylenemethylcyclo-hexanone,
Oxymethylene-phenyl-methylcyclo-hexanone,

of which all but the first are new substances.

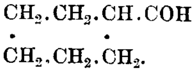
The properties of most are described in the specification.

The above hydrogenised benzylamine bases are oxidised into hydrobenzylidene derivatives of the general type—



$$\begin{array}{l}\mathrm{CH_2.CH_2.CH.CH : NR}\\ \mathrm{CH_2.CH_2.CH_2,}\end{array}$$

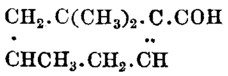
which, when heated with dilute mineral acids, form the bases H_2NR and hydrogenised cyclic aldehydes (terpene aldehydes) of the type—



$$\begin{array}{l}\mathrm{CH_2.CH_2.CH.COH}\\ \mathrm{CH_2.CH_2.CH_2.}\end{array}$$

If R, in the hydrogenised benzylamine base, represents an aromatic radicle, acid oxidising agents can be used, and the cyclic aldehyde results at once; if it represents a fatty radicle, neutral or alkaline oxidants should be employed, acids being used later to complete the process. The cyclic aldehydes obtained in either way are colourless oils, with a strong aromatic odour when concentrated; when dilute, the lower members of the series have the odour of benzaldehyde, the higher, a more or less pronounced odour of plants or blossoms.

Trimethyltetrahydrobenzaldehyde—



$$\begin{array}{l}\mathrm{CH_2.C(CH_3)_2.C.COH}\\ \mathrm{CHCH_3.CH_2.CH}\end{array}$$

is obtained when trimethyltetrahydrobenzylamine (5 parts), water (300 parts), and H_2SO_4 (60 parts) are steam-distilled, a solution of potassium bichromate (45 parts) in dilute sulphuric acid being meanwhile added. The aldehyde distils over as an oil, is extracted with ether, dried, and the ether is then removed. The bisulphite compound, made in the usual manner, is decomposed by cold water containing excess of sodium carbonate, and the freed aldehyde, when separated and dried, appears as a colourless oil, and boils at 90°—91° C. under 18 mm. pressure. It is isomeric with cyclocitral, and has a distinct odour of violets when largely diluted, and of cedar wood in quantity. Two similar aldehydes are also described.

The claim is for the various stages of these processes and for the manufactured products.—R. L. J.

XXI.—PHOTOGRAPHY.

Reducer, Photographic; Potassium Permanganate as a ——. H. Hands. Brit. Jour. Phot. 1900, **17**, [2120], 810.

The behaviour of a solution of potassium permanganate varies with the degree of dilution; a wet negative is reduced evenly with a dilute solution, whilst the same solution applied to a dry negative has an excess of action on the denser parts.—J. W. H.

Reducers; Photographic ——. Lumière and Seyewetz. Brit. Journ. Phot. 1900, **47**, [2120], 805.

Some reducers act uniformly on the image, others attack the most opaque parts to the greatest extent. Ammonium persulphate, hydrogen peroxide, and potassium permanganate are among the latter. The primary action of ammonium persulphate is to produce a double sulphate of ammonium and silver; hydrogen peroxide and potassium permanganate, in a weak sulphuric acid solution, also produce silver sulphate. The peculiar action which reduces the dense parts of the negative more rapidly than the thin is attributed by the authors, to a certain extent, to secondary reducing actions taking place near the surface of the film, owing to the presence of an excess of the reagent. The authors have examined a large number of bodies which might be presumed to behave in a similar fashion, generally, with negative results. They conclude that the number of these substances (the persulphates, hydrogen peroxide, and potassium permanganate) is small, and that they only act in an acid solution.—J. W. H.

Toning and Fixing Bath. R. E. Liesegang. Brit. Jour. Phot. 1900, **47**, [2120], 807.

Thiosinamine may with advantage replace ammonium sulphocyanide in the combined toning and fixing bath; it has little effect on the gelatin film, and, except in hot weather, does not require the addition of alum. 5 to 10 per cent. of a saturated aqueous solution of thiosinamine added to a bath consisting of sodium thiosulphate, 150 grms.; gold chloride, ½ grm.; water, 1 litre; works well. Potassium citrate in saturated solution behaves like alum in hardening gelatin films, and also favours toning; a bath consisting of gold chloride, ½ grm.; sodium thiosulphate, 120 grms.; 50 per cent. solution of potassium citrate, 200 c.c.; water, 1 litre, toned a print to a black in 10 minutes, whilst the same bath without the addition of potassium citrate had but little action in that time.

—J. W. H.

Printing Process; Photographic ——. Brit. Jour. Phot. 1900, **47**, [2121], 820.

The paper is coated with a solution of soft gelatin, 6 parts; ammonium bichromate, 16—20 parts; water, 100 parts; and is then dried in the dark. After exposure in the ordinary way, the paper is washed thoroughly, the last washings being made with water acidulated with 0·1 per cent. of sulphuric acid. Development is carried out with a solution of 1—2 parts of sodium sulphite in 600 parts of water to which is added 1 part of such compounds as *p*-phenylenediamine, *p*-amido-phenol, pyrogallol, &c., substances which are converted into colouring matters by the chromium dioxide of the image.—J. W. H.

Printing Process, New Photographic; Iron ——. Brit. Jour. Phot. 1900, **47,** [2121], 820.

A. AND L. Lumière find that iron sucrate is sensitive to light, and has good keeping qualities. Gelatin-coated paper is painted with a solution of the salt (formed by adding in molecular proportion, barium sucrate solution to one of ferric sulphate) dried, exposed in the usual manner, and developed with potassium ferro- or ferricyanide, or other salts.—J. W. H.

Toned Bromide Prints; The Permanence of ——. Joh. Gaedicke. Phot. Alm. 1901, **21,** 37; through Chem. Zeit. Rep. 1900, **24,** [100], 372.

THE author considers that the permanence of bromide prints toned by the formation of metallic ferrocyanides, is a matter of considerable doubt. Red and blue tones resulting from the use of uranium nitrate and ferric oxalate respectively, are most to be distrusted. Also, the reduced silver of the print forms insoluble silver ferrocyanide in the ferricyanide bath. This remains in the paper, and experiment shows it to be sensitive to light.—R. L. J.

Palladium Toning. Brit. Jour. Phot. 1900, **47,** [2120], 804.

J. Joé recommends the following formula for toning silver prints with palladium: potassium palladio-chloride, 1 grm.; sodium chloride, 10 grms.; citric acid, 10 grms.; water, 2 litres. After printing, immerse the paper in a bath of common salt and wash thoroughly before toning. A bath to give chocolate brown tones is made by substituting for the sodium chloride an equal weight of ammonium molybdate, and increasing the amount of water to 2½ litres.—J. W. H.

Intensification, Photographic ——. W. Thomas. Brit. Jour. Phot. 1900, **47,** [2121], 827.

WHEN a plate has been underdeveloped, printing density of a temporary character is best obtained by the uranium intensifier. The plate, washed free from the fixing salt, is immersed in a solution of potassium ferricyanide, 1 part; uranium nitrate, 1 part; glacial acetic acid, 10 parts; water 100 parts; until sufficient density is obtained; after removal from the bath, washing is carried out first with dilute acetic acid, and then for a short time with water; if unsatisfactory, a weak solution of ammonia restores the negative to its original condition. Bleaching in a weak hydrochloric acid solution of mercuric chloride, followed by the ferrous oxalate developer, is recommended for permanent work, or a solution of copper sulphate, 1 part; ammonium bromide, 2 parts; water, 40 parts; may be used for the preliminary bleaching, any developer serving to again blacken the image. A method of intensification based on the action of light on bichromated gelatin is often useful. The plate is soaked in a weak solution (3 per cent.) of potassium bichromate, dried in the dark, exposed through the glass for a few minutes to daylight, and, after washing, thoroughly immersed in a solution of a red or yellow dyestuff (which is selectively absorbed by the image), and again dried.

—J. W. H.

Ozotype. G. F. Blackmore. Brit. Jour. Phot. 1900, **47,** [2118], 777.

THIS process is operated as follows:—For sizing unsized papers, a solution of Lepage's fish-glue, 1 part in 9 parts of water, may be used, two coats being necessary for very absorbent papers; after drying, the sensitising solution may be applied by the aid of a little artificial light; when sensitized and dried, the paper may be kept, if due care be taken, for weeks; printing is carried on until the finest detail is just visible; at this stage the prints, after washing and drying, may be kept indefinitely before "pigmenting." The pigment tissue is applied to the face of the print while immersed in the acetic acid solution warmed to 65°—70° F. Three hours after the pigment tissue has been applied, development may be carried out with hot water, or the prints may be kept for the opportunity of doing so; before development the prints are soaked well in cold water, transferred to the warm bath (105° F.), and the paper backing of the pigment plaster stripped with uniform action, either wholly out of the water, or quite in it; marks appear if this operation is badly done; after development, the prints may be hardened in a cold alum bath, washed and dried, or, to allow of slight local development, dried first. The pigment plaster may not adhere evenly to rough papers, and Manly recommends soaking the washed and dried prints in a glycerin or sugar solution (glycerin, 1 part; water, 2 parts; or loaf sugar, 1 part; water, 4 parts); for Whatman's hot pressed or best cartridge papers, the washed prints may be coated with a solution of fish glue, 2 drachms; glycerin, 1 oz; water, 6 oz., and put into the "acetic" bath without drying; the preliminary sizing may also be omitted.

—J. W. H.

Sensitive Linen, Silk, and other Fabrics; Preparation of ——. Zap. imp. russk. techn. obschtsch. 1900, **34,** 106; through Chem. Zeit. Rep. 1900, **24,** [104], 388.

ACCORDING to H. J. Junk's process, this is carried out as follows:—Hot solutions of silver nitrate, potassium bromide containing a small quantity of the iodide, and gelatin are mixed, and the whole added to a cooled solution of arrowroot (or starch), the emulsion thus obtained being used for coating the linen, silk, or other fabric. Photographs taken on such surfaces can be afterwards painted.—T. H. P.

Lippmann's Colour Process; Sensitisation of Gelatin Plates for ——. R. Neuhauss. Phot. Rundschau, 1900, **14,** 225 and 241; through Chem. Zeit. Rep. 1900, **24,** [104], 388.

THE author has examined a large number of dyestuffs, which have been recommended from time to time as sensitisers of silver bromide-gelatin, to determine how far they can be used to sensitise the plates used in Lippmann's colour process. He finds that Kinzelberger's Glycin Red combined with Cyanin and Erythrosin gives the best results. With this mixture, a nearly perfectly regular band is obtained between the lines C and G, whilst the too powerful light action from G to N can be remedied by the use of a yellow screen. The general sensitiveness, which is very small for Lippmann plates, is not impaired by Glycin Red; it may be increased (1) by employing a preliminary silver nitrate bath, which, however, imparts bad keeping properties to the plates; (2) by exposing the plates to the vapours of resin before placing them in the mercury chamber.—T. H. P.

PATENT.

Photographic Plates, Films, and the like; Protecting Paint for Preventing Halation. P. Plagwitz and F. Freund, Berlin. Eng. Pat. 3605, Feb. 23, 1900.

THIS material is a spirit varnish composed of sandarach, shellac, &c., dissolved "in any suitable kind of ether," tinted with Eosine, Aurantia, and the like, mixed with the oil of cassia, clove, or aniseed, and incorporated with some substance insoluble in alcohol, such as potato starch, gum tragacanth, or gum arabic. The object of the starch or gum is to increase the consistency of the composition, and make it easier to remove; the idea of the essential oil is to increase the optical dispersing and refracting power of the coating. It is applied to the non-sensitised surface of a dry plate or film; and is claimed to prevent the common defect known as "halation."—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

Smokeless Powder; New ——. Bernadou. Rev. Prod. Chim. **3,** [22], 341–342.

THE author finds that when soluble nitrocellulose is immersed in ethylic ether, and exposed to a temperature near to or below the freezing point of water, it passes into solution or forms a colloid jelly and does not afterwards return to its cellular form. The product may, when dried, be used alone or as a binding material for other ingredients in the preparation of powder.

The soluble nitrocellulose may be prepared by nitrating hydrocellulose, or by the hot nitration of ordinary cellulose.
—C. S.

Safety Explosive ; Composition of a ——. F. Ulzer. Mitt. des k. k. Techn. Gewerbe-Museums in Wien, 1900, **10**, [9, 10, and 11], 204.

This preparation bore the name " Wetter-Dynammon " and had the percentage composition :—Ammonium nitrate, 93·83 ; potassium nitrate, 1·98 ; charcoal, 3·77 ; moisture, 0·42. The charcoal grains measured 1–6 μ. and showed no structure under the microscope.—R. L. J.

PATENTS.

Explosives ; Manufacture of ——. A. C. Girard, Paris. Eng. Pat. 214, Jan. 3, 1900.

In order to thicken oil sufficiently to enable suitable mixtures of oil and chlorate to be used without risk of exudation, about 10 to 15 per cent. of soap that has been well dried at 120°—130° C. is stirred into and heated with the oil for two or three hours at 150°—170° C. ; the mixture is then filtered from the excess of soap at 105°—115° C. (or at some suitable temperature above the melting-point), and, when cold, should have a consistency between that of vaseline and that of paraffin. The chlorate or other oxidising agent is incorporated in the solidified oil at 80° C. Nitrates and nitro-derivatives may be added, but acids or acid derivatives must not be used because they cause fluidity by decomposing the soap. Thus picrates, but not picric acid, may be employed. The following proportions are quoted by way of example :—(*a*) potassium chlorate or ammonium perchlorate, 80 ; solidified oil, 20. (*b*) Potassium chlorate, 80 ; solidified oil, 14 ; nitro-naphthalene, 6. (*c*) Potassium perchlorate, 75 ; solidified oil, 16 ; nitro-naphthalene, 4 ; potassium picrate, 2. (*d*) Potassium chlorate, 80 ; solidified oil, 16 ; nitrobenzene, 4 ; potassium picrate, 2.—W. G. M.

Explosive Materials ; Building of Sheds for the Manufacture or Storing of ——. G. A. Nahnsen, Hamburg. Eng. Pat. 15,057, Aug. 23, 1900.

In order to lessen the distance through which semi-manufactured nitroglycerin (or other explosive) is carried, and so to minimise the risk in handling it, the sheds used in the different stages of manufacture are now often isolated, not by a considerable open space, but by stout walls somewhat higher than the buildings themselves, and at a short distance from them. There remains the risk of damage to adjoining sheds by the downward blow, and consequent vibration of the earth, at the moment of explosion. To lessen this, the sheds are to be built over cellars, the shape and capacity of which depends on the quantity of explosive to be stored or treated in the sheds, but rarely more than 9 ft. deep. These cellars are preferably made with walls sloping somewhat inwards from top to bottom, and with a more or less concave floor. The walls may, with advantage, be double, so that the force of the explosion may be spent in breaking down the inner walls, thus leaving the outer walls sufficiently strong to resist collapse. When very large quantities of explosive are to be handled, the roof of the cellar may be vaulted with a somewhat similar object. The cellar should be filled either with a light fine material such as coal ashes or infusorial earth, or, better, with water, so that the force of the explosion may be used up in scattering this material instead of in wrecking the cellar. Water is preferred because it serves to extinguish ignited materials whilst in flight.—W. G. M.

Matches and Striking Compositions, and the Substances and Processes employed therein ; Manufacture and Production of ——. F. Bale, Droitwich. Eng. Pat. 1323, Jan. 22, 1900.

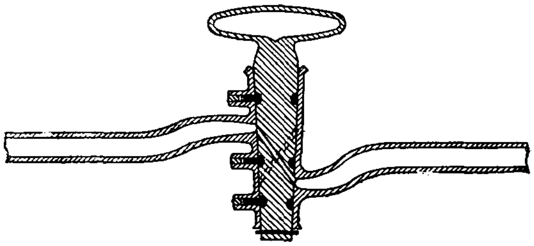
Chromium trioxide, or other oxide intermediate between that and the monoxide, is used in the match composition, the dioxide CrO_2 having been found the best for special safety matches. The use of phosphorus may then be dispensed with. A match composition containing potassium chlorate with sulphide of antimony and sulphur (or with sulphur alone) is stirred into a solution of four parts of glue and one of chromic anhydride in 14 parts of water until the right consistency is reached ; and the prepared splints are then, as usual, dipped into the resulting paste. The use of a prepared rubber is recommended ; it may be made either (1) from the aqueous solution of glue and chromic oxide above referred to (or from a weaker one) ; (2) from such a solution to which sulphide of antimony has been added ; or (3) from a solution of glue mixed with sulphide of antimony. It is stated that the glue protects the chromic oxide from deliquescence, so that the match composition remains dry.—W. G. M.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Glass Tap with Universal Mercury Seal. H. Göckel. Zeits. angew. Chem. 1900, [49], 1238—1239.

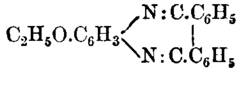
This tap, as the figure shows, is furnished with three grooves filled with mercury, which prevent the slightest leakage of air between the tap and the surrounding glass, even when the tap is connected with an evacuated vessel. In the smallest size in which the tap can be made, the length of the glass barrel is 5 cm.—T. H. P.



" *Luteol.*" [*New Indicator.*] P. Glæss and R. Bernard. Monit Scient. 1900, [4], **14**, 809. (See this Journal, 1896, 216.)

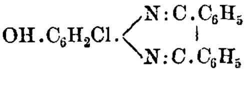
The authors describe the various operations necessary for the preparation of " luteol," hydroxychlorodiphenyl quinoxaline, which has been described as a very sensitive indicator for alkalimetry.

The starting point for its preparation is phenacetin, $C_2H_5O.C_6H_4.NH.CO.CH_3$. When this is boiled for a very short time with 10—12 per cent. nitric acid, it yields a solution which, on cooling, deposits yellow needles of mono-*o*-nitrophenacetin. This body is then saponified by boiling alcoholic potash, with the production of *o*-nitrophenetidine as ruby-coloured needles melting at 113° C. On reduction with zinc dust in alkaline alcoholic solution, this nitro-compound yields the corresponding diamine, *m*-ethoxy-*o*-phenylenediamine. This base condenses with benzil when the two are heated in alcoholic solution, the condensation product being *m*-ethoxydiphenyl quinoxaline—



$$C_2H_5O.C_6H_3\left<\begin{array}{l}N:C.C_6H_5\\ \quad\;\;|\\ N:C.C_6H_5\end{array}\right.$$

When this is heated with phosphorus pentachloride, reaction sets in at a temperature of 70°—90° C., with the entry of an atom of chlorine into the original benzene nucleus, ortho to the ethoxy group. Finally the chloro-compound is saponified by heating with hydrochloric acid in a sealed tube at 180° C. for an hour, and the free phenol, luteol



$$OH.C_6H_2Cl.\left<\begin{array}{l}N:C.C_6H_5\\ \quad\;\;|\\ N:C.C_6H_5\end{array}\right.$$

is obtained. Luteol is purified by crystallisation from dilute alcohol until three or four drops of a solution (1:500) on filter paper are coloured distinctly yellow by one drop of decinormal soda and completely decolorised by two drops of decinormal acid.—J. F. B.

INORGANIC CHEMISTRY.—QUALITATIVE.

Nickel in Presence of Cobalt; Detection of ——. P. E. Browning and J. B. Hartwell. Amer. J. Science, 1900, **10**.

A QUANTITY of the substance to be tested, containing not more than 0·1 grm. of the salts of the two elements, is dissolved in about 5 c.c. of water, a few drops of a saturated solution of alum added, any free mineral acid present neutralised with ammonia and the solution made faintly acid with acetic acid. About 0·5 grm. of potassium ferricyanide is then added, and the liquid agitated to effect the solution of the ferricyanide and the complete precipitation of the cobalt and nickel. The nickel is rendered soluble by the addition of about 5 c.c. of strong ammonia, the liquid is filtered, and the filtrate, which should have no reddish colour, is boiled with a piece of sodium or potassium hydroxide about the size of a pea. The presence of nickel is indicated by the formation of a black precipitate; if the quantity of nickel present be very small, only a dark coloration is produced at first.—A. S.

INORGANIC CHEMISTRY.—QUANTITATIVE.

Saltpetre; Determination of Nitrogen in ——. O. Böttcher. J. f. Landw. **48**, 287—289. Chem. Centr. 1900, **2**, [22], 1161.

VON Wissell has stated (this Journal, 1900, 853) that the Möckern method gives low results. The author, however, obtained quite satisfactory numbers in a series of trials. When pure reagents were used, he did not obtain the positive values, varying up to 0·25 c.c., found by von Wissell in blank determinations, and he suspects that such differences point either to defective apparatus or inaccurate work.

Zinc dust can be satisfactorily freed from ammonia by treatment with water, but caustic soda sometimes contains nitrates or nitrites, which can only be removed with difficulty. —A. S.

Saltpetre; Determination of Nitrogen in ——. L. von Wissell. J. f. Landw. **48**, 291. Chem. Centr. 1900, **2**, [22], 1161.

REPLYING to Böttcher (see preceding abstract), the author remarks that his apparatus gave satisfactory results when used for blank determinations without reducing metal, or by Devarda's method. He believes that he worked according to the prescribed directions, and states that similar results have been obtained by other chemists. The differences obtained in the blank determinations are attributed to the presence in the zinc dust of nitrogen compounds which are not completely removed by treatment with water and dilute sulphuric acid. The author reiterates his opinion that Devarda's method is preferable to the Möckern one.—A. S.

Nitrites; Determination of ——, *either Alone or in Presence of Nitrates.* H. Pellet. Ann. Chim. anal. appl. **5**, 361—365. Chem. Centr. 1900, **2**, [20], 1089.

THE author published in 1879, in the Bull. Soc. Ind. du Nord de la France, a method for the determination of nitrates, which, however, has become so little known, that he again describes it. It is based upon the fact that both nitrates and nitrites in hydrochloric acid solution are decomposed by ferrous salts with formation of nitric oxide, whilst in acetic acid solution, nitrites alone are decomposed. —A. S.

Nitrites; Determination of ——, *and their Separation from Nitrates.* L. L. de Koninck. Ann. Chim. anal. appl. **5**, 365—368. Chem. Centr. 1900, **2**, [20], 1089.

THE author has examined Pellet's method (see preceding abstract), using the same arrangement of apparatus as is customary for Schloesing's process. Potassium nitrate, boiled with 10 per cent. solution of Mohr's salt, gave not the slightest evolution of gas, even after the addition of 10—20 c.c. of glacial acetic acid. The evolution of gas was scarcely perceptible after the addition of 5 c.c. of fuming hydrochloric acid, but in presence of 30—40 c.c. of this acid, the decomposition was rapid and complete. Nitrites are quickly and completely decomposed by boiling with Mohr's salt; addition of acetic acid accelerates the decomposition. In presence of ammonium chloride, the reaction proceeds according to the equation—

$$NH_4Cl + NaNO_2 = NaCl + 2H_2O + N_2.$$

This, however, makes no difference in the gasometric determination, as the volume of gas evolved remains the same.—A. S.

Plaster of Paris; Determination of Underburnt and Overburnt Portions of ——. L. Périn. Comptes Rend. **131**, [23], 950—952.

THE author looks upon plaster of Paris as a mixture of—1. Active matter, consisting of $CaSO_4.nH_2O$, where n has for different portions of the substance, a varying value between 0 and 2; for purposes of analytical calculation, it is assumed that the average value of n is 1. 2. Unburnt gypsum, $CaSO_4$ $2H_2O$. 3. Overburnt gypsum, anhydrous $CaSO_4$. 4. Heterogeneous substances, which may be looked on as inert impurities (silica, alumina, ferric oxide, &c.), tending to just the same extent as the underburnt and overburnt portions, to lower the strength of the set plaster.

The substances under 4 can be determined by the ordinary methods; for the determination of those under 1, 2, and 3, the author uses the following methods:—The sample is ground in an agate mortar, dried for two hours at 60° C., and cooled in the desiccator. About 5 grms. are weighed into a porcelain or platinum basin, excess of water added, and the surplus water evaporated at 60° C. The increase of weight is the water needed for the formation from the "active plaster" of $CaSO_4.2H_2O$; if this increase be n grms., the amount of active plaster present (assumed to be $CaSO_4.H_2O$) is $\frac{154}{18}n$, or $8·56\,n$. The sample is now heated to redness, which drives off all the water; suppose the loss of weight to be m grms. Of this, $2n$ grms. came from the hydrated active plaster; hence $m-2n$ grms. came from the unburnt gypsum, and the amount of this unburnt gypsum must be $\frac{172}{36}(m-2n)$ or $4·8\,(m-2n)$ grms. The total SO_4 in the sample is now determined; from this is subtracted the sum of the amounts corresponding to the active plaster and the unburnt gypsum; the remainder is the amount corresponding to the overburnt $CaSO_4$, the amount of which is of course $\frac{136}{96}$ or 1·41 times the weight of that remainder. —J. T. D.

Steel; Rapid Determination of Carbon in ——. R. Job and C. T. Davies. J. Amer. Chem. Soc. 1900, **22**, 791—797.

THIS is a modification of Sargent's recently described process, with continuous heating arrangement, simplified as far as possible. A combustion requires $19\frac{1}{2}$ minutes, for the first seven minutes of which, oxygen, and for the remaining time, air is used. Without cooling the furnace, a second boat is then introduced, and another combustion effected with fresh potash bulbs, and so forth. A full description of the arrangement and of the method of using it is given. —W. G. M.

Bismuth; Volumetric Determination of ——. G. Frerichs. Apoth. Zeit. 1900, **15**, 859; through Chem. Zeit. Rep. 1900, **24**, [44], 383.

THIS method depends on the quantitative reaction which takes place between freshly precipitated bismuth sulphide and silver nitrate with the formation of silver sulphide and bismuth nitrate. The freshly precipitated bismuth sulphide is vigorously shaken for a short time, with a measured quantity of N/10 silver nitrate solution, the liquid made up with water to a definite volume, and the excess of silver in an aliquot part determined by means of N/10 ammonium sulphocyanide solution, iron-ammonium alum being employed as indicator. 1 c.c. N/10 silver nitrate solution corresponds to 0·00693 grm. bismuth or 0·00773 grm. bismuth oxide.—T. H. P.

Copper; Determination of Oxygen in Commercial ——.

M. Lucas. Bull. Soc. Chim. **23**, [24], 900—904.

The copper is fused with tin in an electric furnace in a current of carbon monoxide, and the carbon dioxide formed collected and weighed.

The carbon monoxide from oxalic acid is collected in acid cuprous chloride solution; it is then evolved by heating the solution, washed by potash, heated to redness in a porcelain tube, again washed by potash, and collected in a gas-holder of 25 litres capacity; it is now practically free from oxygen and carbon dioxide. In the process of analysis, the gas from the gas-holder is washed by potash and sulphuric acid and passed over dry potash, through a tube containing platinum black, again over dry potash, and finally over sulphuric acid pumice; it then enters the porcelain combustion tube, which passes through a Charpy's electric furnace, and at the other end of which are the usual potash bulbs and drying tube. The tin is heated in carbon monoxide till its weight is constant. The copper is in the form of a single block of 10 to 20 grms. weight; its surfaces are cleaned by the file immediately before weighing. It is weighed in a porcelain boat; enough tin is added to form an alloy of about 20 per cent., and the boat is again accurately weighed. The boat is placed in the tube, the current of gas kept up for a quarter of an hour, the potash bulbs are attached, the furnace is heated, and the tube pushed through so that the boat is in the hot part: the temperature (determined by a Le Chatelier thermocouple) is kept at 900° C. for an hour. Then the bulbs are detached and weighed (after displacement of the carbon monoxide they contain by dry air), and the boat is gradually cooled and finally weighed. From the gain of weight of the potash bulbs, the oxygen can be calculated; while the loss of weight of the boat represents, besides this oxygen, the volatile bodies, such as arsenic and antimony.

Experiments have shown that all the foreign substances except silica are reduced—nickel, antimony, lead, iron, zinc, manganese, to the metallic state; sulphur, phosphorus, arsenic, to sulphide, phosphide, or arsenide of copper. The volatilised substances condense in the cold parts of the tube; sulphur and nickel may give rise to carbonyl sulphide and nickel carbonyl, but the effects are negligible unless the sulphur rises beyond 0·2, or the nickel beyond 1·0 per cent.

The results agree with those obtained by reduction in hydrogen, or by solution in silver nitrate. The apparatus once set up can be used conveniently for a series of determinations.—J. T. D.

Copper as Oxalate; Volumetric Determination of ——.

C. A. Peters. Eng. and Mining J. 1900, **70**, [23], 666.

The author differs from those chemists who deny the accuracy of Bournemann's method for separating copper from cadmium, by precipitating the copper as oxalate in the presence of nitric acid, filtering hot, and, after ignition, determining the copper by gravimetric methods. He states that amounts of copper equivalent to at least 0·0128 grm. of the oxide, can be completely precipitated, even in presence of a moderate proportion of strong nitric acid, by the addition of a sufficient quantity of oxalic acid.

Moderate quantities of copper may also be quantitatively determined by precipitation with oxalic acid, and titration of the precipitate by potassium permanganate. Copper can be separated from cadmium, arsenic, iron, and small amounts of tin, when precipitated by oxalic acid in 50 c.c. of solution containing 5 c.c. of strong nitric acid. The method cannot be used for the separation of copper from zinc, bismuth, and antimony; and it should be noted that the copper is not precipitated completely if the amount present be less than that equivalent to 0·0128 grm. of oxide per 50 c.c. of solution.—A. S.

London Purple; Composition and Analysis of ——.

J. K. Haywood. J. Amer. Chem. Soc. 1900, **22**, 800—809.

"London purple" consists mainly of calcium arseniate and arsenite, with an organic dye residue. The water, determined by drying at 100° C. for 12 to 15 hours, ranged, in four samples, from 1·87 to 4·07 per cent. Several methods were tried for estimating arsenic; but the most satisfactory process consisted in dissolving 2 grms. of the sample in dilute hydrochloric acid at 60°—70° C. (20 c.c. HCl + 80 c.c. H_2O) filtering, washing till the filtrate amounted to 300 c.c., drawing off 100 c.c., and adding to it sodium bicarbonate in excess in a 500 c.c. flask, making up to the mark with water, adding a few drops of ether to destroy bubbles, filtering off 250 c.c., adding to this starch, and titrating with standard iodine solution. From this was found the As_2O_3 in 50 c.c. of the original solution. 50 c.c. of the original solution was then heated to 80° C. on the water-bath, and removed for the purpose of adding 50 c.c. of HCl and 3 grms. of KI. After standing for 15 mins. to allow the arsenic acid to be reduced to arsenious acid, with evolution of iodine, decinormal sodium thiosulphate solution was added drop by drop exactly to remove free iodine (a process, difficult at first, owing to the colour of the solution, but becoming easy with practice), the solution was then rendered alkaline with solid sodium carbonate, and then made slightly acid with hydrochloric acid, and finally alkaline with sodium bicarbonate. Titration was then effected as before, with decinormal iodine solution, using starch as the indicator, whereby the total arsenic in the original material was found. In the four samples examined, the percentages of arsenious oxide ranged from 6·4 to 17·3, and of arsenic oxide from 35·5 to 26·5 per cent., the total arsenic, reckoned as As_2O_3, varying between 37 and 40 per cent. Of this, the soluble arsenious oxide (extracted by water) was 2·4, 13·4, 3·9 and 1·4 per cent. (and the soluble arsenic oxide, 15·8, 7·1, 12·5 and 19·5 per cent.) in the four samples respectively. The calcium oxide ranged from 23·5 to 25 per cent., of which from 6·6 to 10·8 per cent. was soluble. Other inorganic matters, chiefly sand, amounted to from 2·5 to 3·5 per cent. Out of the above four samples, and one other, examined, three closely approximated the formulæ $Ca_3(AsO_3)_2$ and $Ca_3(AsO_4)_2$, whilst the other two appeared to consist of compounds in which the amount of lime is less in proportion to the oxides of arsenic than in the above formulæ—as in $CaHAsO_4$ and $Ca_2As_2O_5$.

—W. G. M.

Arsenic; Determination of ——, as Ammonio-Magnesium Arsenate.

O. Ducru. Bull. Soc. Chim. **23**, [24], 904—910.

The conversion of precipitated ammonio-magnesium arsenate into magnesium pyroarsenate is inexact; if the muffle only be employed, the conversion is incomplete and the results are too high, while if the blowpipe be employed to finish the operation, sensible amounts of arsenic are volatilised. On the other hand, the drying of the precipitate to constant weight requires care; the author has found an ordinary steam oven, where the internal temperature is about 98° C., to be very suitable for the purpose, but about 20 hours' drying is needed.

The author has investigated the solubility of the precipitate in the mother liquor and in the ammoniacal washings (1) by several times dissolving, reprecipitating, washing, drying, and reweighing a known initial amount of the precipitate, noting each time the volumes of the first filtrate and of the wash-waters; (2) by making several precipitations, and each time determining the arsenic in filtrate and in wash-water by reduction with sulphurous acid, precipitation as sulphide, solution of the washed sulphide in ammonia, evaporation of the solution, and weighing the residue; (3) by a similar process, omitting the reduction by sulphurous acid. The results show considerable irregularities; but they indicate that the correction suggested by Fresenius is too low, and the author proposes as the nearest possible approximation, to add to the weight of the dried precipitate, 1 mgrm. for each 50 c.c. of the total volume of filtrate and wash-waters.

—J. T. D.

ORGANIC CHEMISTRY.—QUALITATIVE.

Arsenic in Beer ; Detection of ——. W. Kirkby. Chem. and Druggist, 1900, **57,** [1090], 968.

For the detection and determination of traces of arsenic in beer, the following method of working is recommended. The beer should always be concentrated to an extent sufficient to dissipate the sulphites and allied compounds which have been used as preservatives. The author's practice is to acidify, evaporate to dryness on the water bath, and dissolve the residue in distilled water. It is also advisable to boil the concentrated beer with a little sulphurous acid, in order to ensure complete reduction of the arsenic compounds present, but any excess of sulphurous acid must be driven off by boiling; the treatment with sulphurous acid appears, in some cases, to cause the production of a darker stain by the arsenic compounds present. 9 c.c. of the prepared beer (reduced) is diluted with distilled water to 15 c.c. and made up to 20 c.c. with hydrochloric acid (sp. gr. 1·16) free from arsenic. The liquid is equally divided between three similar test-tubes. Another 6 c.c. of the prepared beer, which has not been boiled with sulphurous acid, is diluted with water to 10 c.c., and made up to 13·3 c.c. with hydrochloric acid, and the mixture divided between two test tubes. Four discs of pure white filter paper of close texture are each moistened with one drop of mercuric chloride solution (1 in 20); and one disc with one drop of a solution of lead subacetate; the mercuric test papers are used dry, but the lead-paper in the moist condition. A piece of arsenic-free zinc rod is introduced into each test-tube, the mouths of the tubes loosely stopped with cotton-wool plugs, and two mercuric papers and the lead paper placed as caps on the first three tubes, and two mercuric papers on the others. When the rate of evolution of gas is too slow in any individual tube, it may be accelerated by very gentle warmth. In the absence of arsenic and an excessive quantity of sulphur compounds, the mercuric papers remain unstained, but a brown stain is generally produced on the lead paper. The presence of arsenic in the proportion of 0·01 grain of arsenious acid per gallon will cause the formation in one hour of a faint yellow stain on the mercuric paper. When testing the zinc and reagents, however, the process should be continued for three or four hours. To determine the amount of arsenic present, standard tests should be carried out in an exactly similar manner, with arsenic-free beer (not with water), to which has been added varying known proportions of arsenious acid. It is preferable to prepare fresh standards for each set of experiments, as the colour of the stains is, to a certain extent, affected by light.—A. S.

Arsenic in Beer ; Detection of ——. A. H. Allen. Chem. Trade J. 1900, **27,** [710], 522.

The author proposes the following modification of Reinsch's test. Any sulphites present in the solution under examination, are oxidised by means of bromine water before boiling with the copper, and then a small quantity of a solution of cuprous chloride in hydrochloric acid is added to the liquid, to reduce the arsenic to the arsenious condition. In this manner, it is stated that the prejudical influence of sulphites is overcome, and the deposition of the arsenic on the copper occurs promptly and completely.—A. S.

Arsenic in Beer, Sugar, &c. ; Detection of ——. B. H. Paul and A. J. Cownley. Pharm. J. 1900, **65,** [1590], 690.

The authors point out that in the detection of very small quantities of arsenic in manufactured articles, apparently positive indications by the Gutzeit test cannot be relied upon, owing to the disturbing influence of certain compounds which may be present, such as sulphurous acid or sulphites. The addition of iodine, and the use of slips of bibulous paper saturated with lead acetate, have been recommended for the elimination of the error due to the presence of sulphur compounds reducible to sulphuretted hydrogen by nascent hydrogen, but the authors consider that the advantage of these contrivances is more imaginary than real.

The Marsh test, also, according to the authors, is unreliable for the detection of very small quantities of arsenic in beer. They remark that, operating with one pint of beer, this test is incapable of showing the presence of arsenic, if the proportion be much less than 0·1 grain per gallon.—A. S.

Arsenic in Beer ; Detection of ——. C. Estcourt. Chem. News, 1900, **82,** [2142], 287.

Attention is drawn to the fact that the presence of bisulphites in beer will prevent the detection of small amounts of arsenic by the Marsh test or by the Reinsch test. The presence of organic matter does not appear to have such a prejudicial influence, as on mixing a beer, which had been proved to be absolutely free from arsenic, with a known quantity of arsenious acid, it was found that practically the whole of the arsenic could be recovered by the Marsh test. On mixing another portion of the same beer with an amount of arsenic sufficient to give a large deposit in the heated tube, then adding a small quantity of calcium bisulphite, and submitting the product to the Marsh test, no deposit of arsenic was obtained in the heated tube, but it could be detected by means of a porcelain plate held above the flame at the end of the tube.

The author states that the Marsh test will work satisfactorily if the beer be subjected to a preliminary treatment. For this purpose, not less than 100 c.c. of the sample should be treated with acid, charred only to intumescence, the residue mixed with water, filtered, and the filtrate evaporated. The evaporation of the filtrate is important in order to expel any sulphurous acid which may have been formed by the interaction of the sulphuric acid and carbonaceous matter.
—A. S.

Salicylic Acid in Wines ; Cause of Error in the Detection of ——. H. Pellet. Bull. de l'Assoc. Chim. Sucr. Dist. 1900, **18,** [5 and 6], 305.

Referring to the note by J. F. da Silva (this Journal, 1900, 918), in which it is pointed out that the method in use in Brazil causes some pure wines to be condemned as containing salicylic acid, the author admits that this may be the case. When Pellet and Grobert worked out the method in question, they were more concerned with the quantitative estimation than with the correct detection of the salicylic acid. The author therefore concurs with the proposal to adopt the German method (extraction with ether and petroleum spirit) in the preliminary stages of estimations made by this method.—J. F. B.

Wine ; Detection of Alum in ——. F. Lopresti. Staz. speriment. agrar. ital. 1900, **33,** 373 ; through Chem. Zeit. Rep. 1900, **24,** [100], 365.

The logwood test for the presence of alum in flour may be applied to wine in the following manner: A measured quantity (50 c.c.) of wine is evaporated to one-third of its volume in a porcelain dish, decolorised with animal charcoal, filtered, exactly neutralised, together with the washings, by dilute caustic alkali (indicator, litmus) and then diluted to the original bulk with distilled water. 3 c.c. of this solution are treated with 1 c.c. of alcohol (90—95 per cent.) and 5—6 drops of a fresh logwood solution made from 5 grms. of the wood and 100 c.c. of ordinary alcohol. If alum be present, a blue or violet colour is produced ; if absent, the liquid is orange yellow. Exact neutrality of the prepared wine is important; if acid, the blue tint may fail to appear, and if alkaline, a blue colour is no proof of the presence of alum. The phosphates naturally present in wine, varying in amount from 0·04 to 0·9 grm. per litre, are precipitated by alum so that if a positive result is obtained by this test, the addition of at least 0·19 grm. alum per litre (equivalent to 0·04 grm. phosphate) is indicated.—R. L. J.

Spirits ; Detection of Foreign Colouring Matter in ——. C. A. Crampton and F. D. Simons. J. Amer. Chem. Soc. 1900, **22,** 810—813.

The method is based upon the insolubility in ether of the colouring matter of caramel and prune-juice, the only foreign colouring materials known to the authors as being used for the artificial colouring of spirits. The colouring matter of oak wood (chiefly flavescin) is soluble in ether. 50 c.c. of the sample are measured at a standard (room) temperature, and evaporated nearly to dryness on a water bath; the residue is washed into a 50 c.c. glass-stoppered flask, 25 c.c. of absolute alcohol are added, and the solution, after cooling to standard temperature, is made up to the mark with water. 25 c.c. are then, after mixing, transferred to a special separator, and treated for half an hour (with shaking at intervals) with 50 c.c. of ether; the lower layer is then made up with water to 25 c.c., and, after shaking and separation, the aqueous portion is drawn off, and its colour examined with the aid of a tintometer. A similar colorimetric reading is taken with the 25 c.c. of the spirit not treated with ether, and the amount of colouring matter extracted is thus found by difference. The separator recommended for this test consists of a bulbed pipette of which the lower tube is capillary and is provided with a stop-cock, whilst the upper tube is extended beyond the graduation mark and is then expanded into a wide pear-shaped bulb contracted to a neck, and provided with a glass stopper above. In introducing the water at the end of the operation, it is proposed to run it from a cistern at a higher level through an india-rubber tube joined up to the capillary tube below the stop-cock, which is of course opened for the purpose. Two sets of samples known to be artificially coloured showed from 36·4 to 51·1 and from 0 to 2 per cent. respectively of their colouring matters to be *soluble*.—W. G. M.

ORGANIC CHEMISTRY—QUANTITATIVE.

***Peat; Analysis of* ——.** H. Bornträger. Zeits. anal. Chem. 1900, **34**, [11], 694—698.

Peat of recent formation is light in colour and of low density, and differs greatly from the dark heavy peat, which frequently is many centuries old. Both contain the same constituents, but in very different proportions. For instance, there will be in 100 parts dried at 100°.

—	Fibre.	Humic Acid.	Nitrogen.
In light peat..........	95—90	5—10	0·5—1·0
In heavy peat..........	58—48	40—50	2·0—2·5

The light peat absorbs water freely, heavy peat scarcely at all. The French methods of analysis do not differentiate between the fibre and the humic acid, and the author thinks it important to determine these constituents separately in cases where the peat is required in agriculture or for distillation. In an analysis of peat for such purposes, he determines: (1) Moisture: A finely divided portion is dried at 100° until the weight is constant. The amount ranges from 10 to 40 per cent. (2) Mineral wax: The dried peat is extracted with anhydrous ether. The amount is between 0·5 and 1·0 per cent. (3) Nitrogen: By Kjeldahl's method. From 0·5 to 2·5 per cent. is usually present. About half is usually in the form of ammonia, which may be estimated by boiling a portion of the peat with strong solution of caustic soda, and receiving the ammonia evolved in standard acid. (4) Humic acid and fibre: 1 to 2 grms. are thrice extracted by boiling for one hour with 5 grms. of soda and 200 grms. of water, and the extracts filtered through a weighed filter. The residue, after washing, is dried at 105° C., and represents the fibre. The alkaline filtrate, which contains the humic acid, is acidified with hydrochloric acid, boiled vigorously as long as carbonic acid is evolved, and the humic acid is then collected on a weighed filter (or asbestos tube), which is dried at 105° C. and weighed. (5) Ash: About 1 grm. is incinerated with the aid of ammonium nitrate in an open platinum dish. The amount ranges from 2 to 10 per cent. French analyses state the chief constituents of the ash, *viz.*, insoluble matter, lime, magnesia, potash, and phosphoric acid, but the author considers this information of little value. He refers also to a rapid method for the estimation of the humic acid only, previously described by him and also by Tacke (Chem. Zeit. 1896, 223, and 1897, 174). A weighed portion of the peat is boiled with powdered whiting and water, the carbonic acid evolved is determined, and thence the amount of humic acid is found by calculation. The following are results of typical analyses made by the author's method :—

—	Light Peat. Near Hanover.		Heavy Peat. Oldenburg.	
	1.	2.	3.	4.
Water	30·0	29·0	20·0	20·0
Ash	3·0	3·1	2·8	3·0
Fibre	55·0	54·9	49·0	47·0
Humic acid..............	12·0	13·0	38·0	30·0
Total	100·0	100·0	109·8	100·0
Nitrogen, *total*..........	1·1	1·3	1·8	2·0
„ as ammonia ..	0·3	0·4	0·6	0·7

Peat for use as fuel must, of course, be valued according to its calorific power.—J. A. B.

Tanning Liquids and Extracts; Determination of Tannin, Gallic Acid, other Organic Acids, and Mineral Acids in ——. F. Jean. Rev. de Chim. Ind. 1900, **11**, [132], 349—350.

A. Determination of Total Acidity.—This is determined by titration with N or N/20 sodium carbonate solution, turmeric paper being used as indicator. The soluble indicators give bad results in the presence of tannin and gallic acids, with the exception of Trillat's reagent, a sulphonic derivative of dinitrobenzene-azodihydroxynaphthalene.

B. Total Acidity, less Tannin.—A second portion of the original liquid is exactly neutralised with N/10 sodium carbonate solution, and treated with about 15 c.c. of a 2 per cent. solution of albumin. The precipitate is filtered off and washed with hot water, the filtrate heated to the boiling point, after the addition of sufficient N/10 sodium carbonate solution to bring the total amount used to, say, 20 c.c., and the excess of alkali in the boiling liquid titrated with N/10 sulphuric acid, with Trillat's reagent as indicator.

C. Organic and Mineral Acidity, less Tannin and Gallic Acid.—A third portion of the original solution is boiled with a slight excess of zinc oxide, and filtered, and the precipitate washed with hot water. The filtrate is boiled with 20 c.c. of N/10 sodium carbonate solution, the zinc carbonate filtered off, and washed with hot water, and the filtrate brought to the boiling point, and titrated with N/10 sulphuric acid, with turmeric as indicator.

D. Mineral Acidity.—A fourth part of the sample is evaporated to dryness in a platinum basin, with 20 c.c. of N/10 sodium carbonate solution; and the residue calcined, and dissolved in boiling water. The solution is filtered, and the filtrate and washings titrated with N/10 sulphuric acid, with turmeric as indicator. This is the method devised by O. Hehner for the determination of mineral acid in vinegar.

The results, in terms of H_2SO_4, obtained by the author in the analysis of a test mixture of known composition, were very satisfactory.—C. A. M.

Tannin Estimation Results with Hide-powder Method; Comparison of Volumetric Methods ——. A. Turnbull. Paper read before the Paris Conference, 1900. Leather Trades' Rev. **33**, [769], 959.

The Jean method was tested with regard to its reliability in the determination of tannin in tanning materials containing sulphites. The sulphites were removed by titrating in an acid solution with iodine, and the tannin was estimated in the usual way in a solution containing an excess of sodium bicarbonate. It was found that in presence of sulphites, low results for tannin are obtained, and that the greater the amount of sulphites present, the lower the results. Thus a solution of pure tannic acid, which required

9 c.c. of iodine solution, required only 8·6 c.c. when a small quantity of sulphite had been present; a mixed solution of tannic and gallic acids, requiring 11 c.c. of iodine solution, after the addition of much sulphite, required only 8·4 c.c. by titration.

The Jean method appears about equal to the Loewenthal method, but it has the disadvantage that it is only possible to work with very small quantities of the tanning material, and both processes require some experience in manipulation. The results obtained by the Jean method are lower than those obtained by the Loewenthal method, and much below those obtained by the hide-powder method, and there is no constant ratio between the results of the three methods.—J. G. P.

Malt; Determination of the Available Extract of ——. L. Briant. Analyst, 1901, **26**, 2—5.

The author reviews and discusses the methods at present in use for determining the brewers' extract in malts, and then suggests the use of the following modified process:—50 grms. of ground malt are placed in a boiling flask of about 550 c.c. capacity, and to it is added as rapidly as possible a bulk of water at 160° F., which shall be equal in volume to 400 c.c. if measured at 60° F. The measurement of this volume of water is made in a flask graduated at the point occupied at 160° F. by 400 c.c. of water at 60° F. The contents of the flask are thoroughly mixed, the flask loosely corked to prevent evaporation, placed in a water bath maintained at a temperature of 150° F., and allowed to stand for two hours. At the end of this time, the mash is cooled to 60° F., 100 c.c. of water at 60° F. added, shaken, filtered, and the specific gravity taken. In order to obtain the true extract per quarter of 336 lb., the excess gravity over 1,000 is multiplied by the factor 3·51.—J. L. B.

Glucose; Determination of Value of Liquid Commercial ——. H. S. Coupland. Pharm. J. 1900, **65**, [1592], 764.

The author suggests that in view of the uncertain composition of liquid commercial glucose, the following tests should be introduced into the Pharmacopœia. It should have a cupric reducing power corresponding to at least 65 per cent. of dextrose; it should give no decided reaction for sulphite when tested with zinc, hydrochloric acid, and lead paper, and no reaction for arsenic when tested in a similar manner with mercuric chloride paper; it should not yield more than 1 per cent. of ash.—A. S.

Albumin; Determination of ——. F. Barnstein. Landw. Vers.-Stat. **54**, 327—336. Chem. Centr. 1900, **2**, [19], 1037.

The author gives the following modification of the method proposed by Ritthausen: 1—2 grms. of the substance are boiled with 50 c.c. of water, or, if starch flour be present, heated for 10 minutes on the water bath, then 25 c.c. of copper sulphate solution (60 grms. per litre) added, and finally, with stirring, 25 c.c. of caustic soda solution (12·5 grms. per litre). The precipitate is filtered off, washed with warm water, and its percentage of nitrogen determined. The advantages of this method over that of Stutzer are that the solutions are stable and readily prepared, the addition of alum solution and potassium phosphate is avoided, and the precipitates, which settle well, can be easily filtered and washed. The results obtained in the examination of fodder materials correspond well with those obtained by Stutzer's method; they are usually slightly higher (on the average, 0·016 per cent. N), this being probably due to the more intimate contact with the material attained by reason of the precipitant being present in solution. Greater differences (up to 0·2 per cent. N.) occur with substances which contain alkaloids or basic nitrogen compounds. Attempts to apply the method to the precipitation of peptones, showed that vegetable and egg albumin, brought into solution by means of gastric juice, were not completely precipitated, but higher results were obtained than by Stutzer's method.—A. S.

Morphine; Determination of ——, *by Reduction with Silver Nitrate.* C. Reichard. Chem. Zeit. 1900, **24**, [97], 1061—1062.

On adding a solution of silver nitrate to a not too dilute aqueous solution of a morphine salt (other than those of halogen acids) the following reaction occurs—

$$C_{17}H_{17}NO\left\langle{}^{OH}_{OH}\right. + 2AgNO_3 = C_{17}H_{17}NO_3 + 2Ag + 2HNO_3.$$

The separated silver is collected on a filter, washed with boiling water, rapidly dried at 130°—150° C., ignited, and weighed, together with the ash of the ignited filter, in a porcelain crucible.

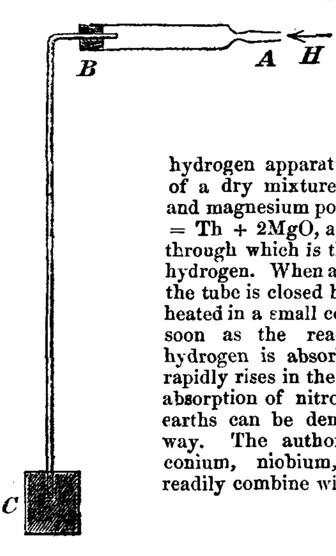
This method is not directly applicable when the morphine is in combination with an acid which forms an insoluble silver compound, but in certain cases slight modifications can be used. Thus, in the case of morphine hydrochloride, the silver may be freed from the silver chloride by washing on the filter with ammonium hydroxide. Similarly in the case of hydrobromide a solution of sodium thiosulphate may be used, or of potassium iodide in the case of morphine hydriodide. Since only a limited number of alkaloids reduce silver nitrate, this method can often be used as a rapid means of determining morphine in the presence of other organic substances. In conclusion the author shows that in practice it is necessary to employ heat to obtain a complete precipitation of the silver in a short time, and gives a series of test analyses in which the results are in close agreement with the theoretical amounts.—C. A. M.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Solid Solutions of Mixtures of Three Substances. G. Bruni. Atti. R. Accad. dei Lincei Roma, **9**, [5], 232—241. Chem. Centr. 1900, **2**, [23], 1173.

The author discusses, from the standpoint of the phase rule, the melting-point curves relating to mixtures of three components. According as the three components are completely or incompletely isomorphous, or give addition compounds with one another, or are neither isomorphous nor give addition compounds, or two of them belong to one of these three types, whilst the third, in relation to the other two, may be classed under another type, six types of ternary mixtures are discussed and illustrated by curves. A seventh case occurs when two constitutents give an addition compound which is isomorphous with the third component. The phenomena in mixtures of three substances are of importance in studying the behaviour of ternary alloys.
—A. S.

Hydrogen and Nitrogen; Absorption of ——, *by Metals of the Rare Earths. Lecture Experiment.* C. Matignon. Chem. Zeit. 1900, **24**, [97], 1062.



A tube, A B, of Jena glass, 20 cm. in length, is connected with a manometer tube and with a hydrogen apparatus. From 2 to 3 grms. of a dry mixture of the required oxide and magnesium powder, *e.g.*, $ThO_2 + 2Mg = Th + 2MgO$, are placed in the tube, through which is then passed a current of hydrogen. When all air has been expelled, the tube is closed by fusing at A, and then heated in a small combustion furnace. As soon as the reaction commences, the hydrogen is absorbed, and the mercury rapidly rises in the manometer tube. The absorption of nitrogen by metals of rare earths can be demonstrated in the same way. The author has found that zirconium, niobium, and vanadium also readily combine with nitrogen.
—C. A. M.

Copper Selenides. Fonzes-Diacon. Comptes Rend. **131,** [26], 1206—1208.

Cupric Selenide, CuSe, is formed by the action of hydrogen selenide on anhydrous cupric chloride at a temperature of 200° C. or above, as a bluish-black substance, either retaining the form of the cupric chloride crystals or partially fused, according to the temperature.

Cuprous Selenide, Cu_2Se, is formed as an olive-green precipitate by passing hydrogen selenide through an acid solution of cuprous chloride, or as small dark green crystals by passing hydrogen selenide diluted with hydrogen over anhydrous cuprous or cupric chloride at a red heat. The same compound is formed when cupric selenide is reduced by hydrogen at a red heat, and when copper selenate is heated with charcoal.—J. T. D.

Molybdenum and its Oxides; Action of Water Vapour, alone and mixed with Hydrogen, on ——. M. Guichard. Comptes Rend. **131,** [24], 998—1001.

While hydrogen, at and above 600° C., reduces the oxides of molybdenum to metal, water-vapour oxidises the metal to dioxide only at and above 700° C. Below 700° C., then, the reducing action of hydrogen is not interfered with by admixture, with the hydrogen of water vapour. Above 700° C., if a mixture of molybdenum and its dioxide be heated in a closed vessel with limited amounts of hydrogen and water vapour, oxidation or reduction will occur till a definite ratio, depending on the temperature, is reached between the pressures of the hydrogen and the water vapour; but if an unlimited supply of hydrogen and water vapour in definite proportions be passed over the mixture of metal and oxide in a tube, then, unless the proportions of the gases be those for equilibrium, oxidation or reduction should go on till only oxide or metal, as the case may be, remains. The author has verified this experimentally: at a temperature of 800° C., and at a total pressure of 760 mm., there is complete reduction or oxidation, according as the pressure of water vapour in the mixture is below or above 350 mm.—J. T. D.

Aldehydes and Ketones; Acidimetry of ——. A. Astruc and H. Murco. Comptes Rend. **131,** [23], 943—945.

A study of the behaviour of these substances towards Helianthine A, Phenolphthaleïn, and Poirrier's Blue. *Monaldehydes* (formic, acetic, propionic, valeric, benzoic, and cuminic) are neutral to all of these indicators. *Dialdehydes* (glyoxal only studied) affect the indicators very slowly, but behave to phenolphthaleïn and Poirrier's Blue as monobasic acids. *Halogen-substituted Aldehydes* (chloral hydrate and alcoholate and bromal) are monobasic to Poirrier's Blue. *Alcoholic and Phenolic Aldehydes:* Hydroxybutyric aldehyde, aldol, and the aldoses are neutral to all three indicators; salicylic and parahydroxybenzoic aldehydes, vanillin and piperonal, are neutral to Helianthine, monobasic to the other two. *Monoketones* (acetone, diethylacetone, methyl ethylacetone, acetophenone, benzophenone) are without action on any of the indicators. *Diketones:* the β-series seem to function as monobasic acids, though the indicator changes when less than a molecule of alkali has been added per molecule of the aldehyde; the α series are probably neutral; the same is the case for the γ-series, as far as they are represented by acetonyl-acetone. *Halogen-substituted Ketones:* monochloracetone and monobromacetophenone are neutral to Helianthine, monobasic to the other two. *Ketonic Acids* (pyruvic, levulinic) are exactly monobasic to phenolphthaleïn and Poirrier's Blue; but with Helianthine a smaller amount of alkali suffices for the change—less with levulinic than with pyruvic acid; no doubt because of the separation of the ketonic and carboxylic groups by two CH_2 groups. These alkalimetric results agree with the deductions from heats of neutralisation, where these have been determined.—J. T. D.

Dimethyl Sulphate; Injurious Action of ——, *on Respiratory Organs.* Actiengesellschaft für Anilinfabrikation. Berlin. Chem. Ind. 1900, **23,** [24], 559.

Attention is called to the dangerous nature of dimethyl sulphate, the vapour of which strongly attacks the mucous membrane and respiratory organs. The vapour is tasteless, almost odourless, and apparently has an anæsthetic action, so that much injury may arise before the ill effects become evident. Similar observations by other investigators of this class of compound may well be communicated, in the public interest.—R. L. J.

Lichens, and their Characteristic Constituents. O. Hesse J. prakt. Chem. 1900, **62,** [21, 22], 430—480. (See also this Journal, 1898, 807; 1901, 77.)

The lichens were examined by extracting with ether under a reflux condenser, washing the ethereal extract with potassium bicarbonate solution, and concentrating. Thus the extracted matter is divided into the fractions B (acids) and C (indifferent substances). Fraction A comprises the substances which separated from the ether during extraction.

Usnea, from Japanese cinchona bark, consisting of *U. plicata L. Ach.* with a small quantity of *U. barbata* (*L.*), was found to contain *d*-usninic, usnaric, and plicatic acids, together with usnarin. On boiling with alcoholic potash or baryta water, usnaric acid yields carbonic acid and a brown amorphous compound. Plicatic acid,—

$$CH_3O.C_{18}H_{31}O_4(CO_2H)_2,$$

forms white leaflets, which melt at 133° C.

Usnea barbata (*L.*) *var. dasypoga* (*Ach.*) *Fr.* contains *d*-usninic, usnaric, and alectoric acids. Usnaric acid is separated from alectoric acid by means of the action of potassium bicarbonate, potassium alectorate being insoluble in a solution of the reagent.

Alectoria jubata (*L.*) *Ach., var. implexa* (*Hoffm.*), was found by Zopf to contain salazinic acid alone (Annalen, **297,** 295). The author was unable to find this acid, but discovered a new acid—alectoric—which separates in quantity during the extraction. It is a dibasic acid of the formula $C_{28}H_{24}O_{15}$, and melts at 186° C.; on boiling with baryta it is converted into another acid, melting at about 220° C.

Evernia divaricata (*L.*) *Ach.*—The author finds divaricatic acid only, in this lichen.

Ramalina cuspidata Nyl. contains a new acid, cuspidatic acid, which is readily soluble in alcohol, acetone, and ether, and melts at 218° C.

Thamnolia vermicularis (*Sw.*).—From this lichen thamnolic acid, $C_{19}H_{15}O_{10}.OCH_3$. is obtained by extraction with ether and repeated crystallisation from hot acetic acid. When boiled with baryta, barium carbonate is formed, together with thamnolinic acid, $C_{16}H_{20}O_7$, which melts at 163° C.

Stereocaulon coralloides, Fr.—The author finds that fractions A and C consist essentially of atranorin, but fraction B of an unidentified acid, which was not parellic acid.

Stereocaulon alpinum, Laurer, contains atranorin and usnetinic (Zopf's stereocaulic) acid.

Stereocaulon salazinum, Bory.—In this lichen were found atranorin and salazinic acid. The latter crystallises from hot alcohol. Its taste is biting, but not bitter. The acid gives a brick-red coloration with caustic potash.

Cladonia Floerkeana Fr. contains coccellic acid and a small quantity of thamnolic acid. Coccellic acid, $C_{20}H_{22}O_7$, is decomposed by hydriodic acid with the production of rhizoninic acid, $C_{10}H_{12}O_4$, and coccellinic acid, also $C_{10}H_{12}O_4$. Coccellinic acid forms fine white needles which melt at 176°—177° C.; it gives an intense bluish-violet coloration with ferric chloride.

Cladonia fimbriata (*L.*) *Fr.* ϵ-*chordalis Ach.*—Fraction B contains a single acid, which was found to be protocetraric acid, $C_{30}H_{22}O_{15}$.

Cladonia uncinata (*Hoffm.*).—From fractions A and B a new acid, uncinatic acid, was obtained; it is a white crystalline powder, melting at 212° C.

Cladonia squamosa (*Hoffm.*) α-*ventricosa* (*Schaer.*).—From fractions A and B, a new acid, squamatic acid, was isolated. It is homologous with uncinatic acid, and contains one methoxyl group. It melts at 215° C. with decomposition.

Parmelia tiliacea (*Hoffm.*) = *Imbricaria tiliacea Körber.* The parmelianic acid, found by Zopf (Annalen, **295,** 278) in this lichen, is lecanoric acid.

Parmelia sorediata (*Ach.*) *Th. Fr.* contains lecanoric acid.

Parmelia perlata Nyl., from Java, contains considerable quantities of atranorin, but only traces of lecanoric acid.

Parmelia perforata Nyl., from Java, cinchona bark, contains atranorin and small quantities of lecanoric acid. This lichen, when moistened with very weak alkali solution, soon becomes rust-coloured.

Parmelia olivetorum Nyl., also contains atranorin together with a large proportion of lecanoric acid.

Parmelia tinctorum Despreaux, Nyl. contains atranorin and 23·6 per cent. of lecanoric acid.

Parmelia saxatilis var. sulcata and *var. panniformis*, yielded atranorin and protocetraric acid, $C_{30}H_{22}O_{15}$. The fraction B of the latter lichen contains also usnetinic acid, which was extracted by warm acetone. Usnetinic acid, $C_{23}H_{23}O_7.OCH_3$, melts at 192° C. when quite pure.

Parmelia acetabulum (Neck.) Dub. contains atranorin and salazinic acid, as previously found by Zopf.

Umbilicaria pustulata (L.) Hoffm. gives a large yield of gyrophoric acid. It is obtained crystalline from ether or dilute alcohol, melts at 200°—202° C., contains no alkoxyl group, and is optically inactive. The formula is $C_{16}H_{14}O_7$. When boiled with acetic acid it is completely converted into orsellinic acid; when boiled with absolute alcohol it yields orsellinic ester and orsellinic acid.

Placodium saxicolum var. compactum, Körber, yields atranorin and an acid which does not appear to be identical with any hitherto found in the lichens.

Placodium gypsaceum (Sm.) Kbr.—Zopf had found usninic and squamaric acids, the latter of which the author has previously shown to be identical with parellic acid. Lichens obtained from two separate places were now found to yield parellic acid alone, unaccompanied by usninic acid.

Placodium circinatum Pers. Kbr. contains parellic acid.

Blastenia arenaria (Pers.) var. teicholytum Ach.—Atranorin and gyrophoric acid were obtained.

Hämatomma ventosum (L.) Mass.—The author finds *d*-usninic and divaricatic acids, together with smaller quantities of another acid, soluble in ether with difficulty and melting about 190° C. with decomposition.

Lecanora subfusca (L.) Ach., collected from cinchona bark, contains atranorin as the only characteristic constituent.

Aspicilia calcarea (L.) Kbr.—The variety examined most nearly resembled *farinosa*. Fraction C contains colourless crystals, which were extracted by hot alcohol. This substance, aspicilin, after recrystallisation, yields fine white prisms which melt at 178·5° C. The alcoholic solution is neutral, and gives no coloration with ferric chloride; the compound sublimes undecomposed. Fraction B yields erythric acid, $C_{20}H_{22}O_{10}$. Erythric acid is to be regarded as erythrolecanoric acid. This lichen also contains calcium oxalate.

Urceolaria scruposa var. arenaria Schaer., yielded a small quantity of lecanoric acid.

Lecidea grisella, Flörke.—Fraction B consists of gyrophoric acid.

Graphis scripta (L.) Ach. is frequently found on Java cinchona bark. If the bark be placed for some hours in cold water and then exposed to the air, a reddish and then brownish coloration appears on the places where the lichen grew. The lichen contains much salazinic acid, $C_{30}H_{24}O_{16}$ or $C_{28}H_{22}O_{15}$, which contains no alkoxyl groups.

The author enumerates differences in the constituents of certain lichens, due to differences in climate or in the substances upon which they grow. The alleged discovery of emodin in certain lichens by Bachmann rests upon unsatisfactory evidence. The substance examined has only certain reactions in common with emodin.—A. C. W.

PRIZES.

Prize for a Substitute for Benzine.

Bd. of Trade J., Feb. 14, 1901, 418.

The United States Consul at Coburg, in a report dated 12th December last, states that for years a substitute for benzine has been in demand. The objectionable points about benzine are its high inflammability and volatility, the danger of poisoning the atmosphere, &c. This was one of the chief topics of discussion at the Chemical Congress at Hanover in 1899, and last autumn the subject came up once more at the meeting at Cassel, when a premium of about 50*l.* was offered for an effectual substitute for benzine, or for means of rendering it less dangerous.

New Books.

Chemisch-Technisches Repertorium. Uebersichtlicher Bericht über die neuesten Erfindungen, Fortschritte und Verbesserungen auf dem Gebiete der technischen und industriellen Chemie, mit Hinweis auf Maschinen, Apparate und Literatur. Herausgegeben von Dr. Emil Jacobsen. 39. Jahrgang. 1900. Erstes Halbjahr. Zweite Hälfte. R. Gaertner's Verlagsbuchhandlung. Hermann Heyfelder, Schönebergerstr. 26, Berlin, S.W. 1901.

This is the number of the "Repertorium" for the second half of the first half-year of 1900, and it treats of the following subjects of Chemical Technology:—I. Foodstuffs. II. Paper. III. Photography. IV. Residues, Manures, Disinfection and Sanitation. V. Soaps. VI. Explosives and Matches. VII. Preparation and Purification of Chemicals. VIII. Fine Chemicals, &c. IX. Chemical Analysis. X. Apparatus, Machinery, Electro-technology and Thermo-Technology. XI. Appendix, &c. XII. New Books. Alphabetical Index of Subject-Matter.

Tables of Colour and Solubility of Simple Salts. Reprinted from "Chemistry for Examinations." By Henry W. Hill. Allman and Son, Ltd., 67, New Oxford Street, London. 1900. Price 2*s.* 6*d.*

Tables, strongly backed by cloth, indicating at a glance the solubility, colour, and certain other properties of the salts of the principal inorganic acids.

Qualitative Chemical Analysis, Organic and Inorganic. By F. Mollwo Perkin, Ph.D., Head of the Chemistry Department, Borough Polytechnic Institute, London. Longmans, Green, and Co., 39, Paternoster Row, London; New York, U.S.A.; and Bombay. 1901. Price 3*s.* 6*d.*

This work contains preface, table of contents, and 261 pages of subject-matter, and the alphabetical index. The pages are illustrated with nine wood engravings and a coloured engraving representing the spectra of the metals. In this work, besides the usual qualitative separation of the acids and bases, a second part is devoted to organic qualitative analysis, and the following sections are embraced here:—XI. Qualitative "Elementary" Analysis of Carbon Compounds. XII. Reactions and Separation of Organic Acids and Phenols. XIII. Aldehydes, Alcohols, Acetone, and Glycerin. XIV. The Sugars. XV. Bases, Glucosides, &c. XVI. Alkaloids.

Trade Report.

LEGISLATION; TARIFF CHANGES AND CUSTOMS REGULATIONS.

Assessment of Duty on Mercerized and other Cotton Cloths.

It has been found that the widths of Italian linings and mercerised cotton cloths frequently run from ¼ in. to 1 in., and occasionally 1½ in., less in actual measurement than stated in the invoices relating to the goods. The reason of this is said to be that such cottons are measured before being coloured, and that this process or the mercerising of the goods causes the shrinkage referred to. It has consequently been decided that such merchandise and all cotton tissues shall be assessed for duty on the basis, not of the invoiced, but of the actual, width, as returned by the appraiser at the port of entry.

Duties on Russian Petroleum.

Petroleum produced in Russia and imported into England, there refined and thence imported into the United States, is dutiable at a rate equal to the rate imposed by Russia on petroleum imported into that country from the United States. The provisions of paragraph 626, Act of July 24th, 1897, apply to the country where the oil is produced, and not to the country of exportation. Appeal of Vacuum Oil Company from Collector of Customs at Rochester, N.Y.; United States Board of General Appraisers.

TARIFF VALUATIONS OF CERTAIN GOODS IN BRITISH INDIA.

The Board of Trade have received, through the India Office, copy of a Circular (No. XXI. of 1900), issued by the Finance and Commerce Department of the Government of India on the 24th ult., fixing the valuations for tariff purposes of certain classes of goods.

Indian Valuation Tariff.

No.	Names of Articles.		Tariff Valuation.	Duty.
	CHEMICALS, DRUGS, MEDICINES, AND NARCOTICS, AND DYEING AND TANNING MATERIALS.			
			R. a.	
10	Chemical products and preparations—			
	Acid, sulphuric	Lb.	0 1½	5 %
	Alkali, Indian (sajji-khár)	Cwt.	1 8	"
	Alum	"	4 8	"
	Arsenic	"	21 8	"
	" China mansil	"	15 0	"
	Bicarbonate of soda	"	6 8	"
	Copperas, green	"	2 10	"
	Explosives, namely, blasting gelatine, dynamite, roburite, tonite, and all other descriptions, including detonators and blasting fuse.	..	*ad val.*	"
	Sal ammoniac	Cwt.	28 0	"
	Sulphate of copper	"	20 0	"
	Sulphur (brimstone), flour	"	6 4	"
	" ("), roll	"	6 0	"
	" ("), rough	"	5 8	"
	All other sorts of chemical products and preparations, including saltpetre and borax.	..	*ad val.*	"
11	Drugs, medicines, and narcotics—			
	Aloes, black	Cwt.	20 0	"
	" Socotra	"	25 0	"
	Aloe-wood	Lb.	6 0	"
	Asafœtida (hing)	Cwt.	65 0	"
	" coarse (hingra)	"	22 0	"
	Atáry, Persian	"	15 0	"
	Bánslochan (bamboo camphor).	Lb.	0 5	"
	Brimstone (amalsára)	Cwt.	35 0	"
	Calumba root	"	10 0	"
	Camphor, Bhimsaini (barás)	Lb.	50 0	"
	" refined, cake	"	1 11	"
	" crude, in powder	"	1 3	"
	Cassia lignea	Cwt.	35 0	"
	China root (chobchini), rough.	"	9 0	"
	China root (chobchini), scraped.	"	14 0	"
	Cubebs	"	22 8	"
	Galangal, China	"	9 0	"
	Pellitry (akalkára)	"	40 0	"
	Peppermint crystals	Lb.	8 0	"
	Quinine and other alkaloids of chinchona.	..	..	Free
	Salep	Cwt.	125 0	5 %
	Senna leaves	"	7 0	"
	Storax, liquid (rose mellose)	"	44 0	"
	Tobacco, unmanufactured	..	..	Free
	" manufactured	..	*ad val.*	5 %
	All other sorts of drugs, medicines, and narcotics, except opium (for which see Schedule III.).	..	"	"
12	Dyeing and Tanning Materials—			
	Alizarin dye, dry:			
	40 per cent.	Lb.	1 5	"
	50 "	"	1 9	"
	60 "	"	1 13	"
	70 "	"	2 1	"
	80 "	"	2 5	"
	100 "	"	2 14	"
	Alizarin dye, moist:			
	10 per cent.	"	0 4¾	"
	16 "	"	0 7	"
	20 "	"	0 8¼	"
	Aniline dye, moist (indigo blue).	"	0 6½	"
	Dyeing, &c. Materials—*cont.*		R. a.	
	Aniline dye, dry	Lb.	1 0	5 %
	" salts	"	*ad val.*	"
	Avar bark	Cwt.	4 12	"
	Buzgand (gulpista)	"	30 0	"
	Cochineal	Lb.	0 12	"
	Gallnuts (myrabolams)	Cwt.	3 0	"
	" Persian	"	45 0	"
	Madder or manjit	"	9 0	"
	Orchilla weed	"	4 0	"
	Sappan wood and root	"	5 8	"
	Turmeric	"	11 0	"
	All other sorts of dyeing and tanning materials.	..	*ad val.*	"
13	Metals—			
	Lead, ore, galena	Cwt.	14 0	"
	" pig	"	12 0	"
	" pipes	"	*ad val.*	"
	" sheets	Cwt.	14 0	"
	" " for tea-chests	"	..	Free
	Quicksilver	Lb.	1 12	5 %
	Tin, block	Cwt.	90 0	"
	" foil, China	Lb.	0 12	"
	" other sorts	..	*ad val.*	"
	Zinc or spelter, nails	Cwt.	20 0	"
	" " plates and other shapes, soft.	"	20 0	"
	Zinc or spelter, plates and other shapes, hard.	"	15 0	"
	Zinc or spelter, sheet or sheathing.	"	22 0	"
	Zinc or spelter, all other sorts.	..	*ad val.*	"
	All other sorts of metals	..	"	"
	OILS.			
16	Oils—			
	Cajeputi	Quart	1 12	"
	Cassia	Lb.	3 0	"
	Cocoanut	Cwt.	16 0	"
	Linseed	Imp. gall.	2 2	"
	Otto of sorts	Oz.	15 0	"
	Petroleum, including also naphtha and the liquids commonly known by the names of rock oil, Rangoon oil. Burma oil, kerosine, paraffin oil, mineral oil, petroline, gasoline, benzol, benzoline, benzine, and any inflammable liquid which is made from petroleum, coal, schist, shale, peat, or any other bituminous substance, or from any products of petroleum.	Imp. gall.	..	1 anna
	Petroleum, which has its flashing point at or above 200 degrees of Fahrenheit's thermometer, and is proved to the satisfaction of the Customs collector to be intended for use exclusively for the batching of jute or other fibre or for lubricating purposes or fuel.	..	*ad val.*	5 %
	All other sorts of oil, including paraffin wax.	..	..	"
	OTHER ARTICLES, UNMANUFACTURED AND MANUFACTURED.			
24	Building materials, bricks, cement, fireclay, lime.	..	*ad val.*	"
26	Candles, paraffin	Lb.	0 6	"
	" spermaceti	"	0 7	"
	" wax	"	1 0	"
	" all other sorts	..	*ad val.*	"
31	Coal, coke, and patent fuel	..	..	Free
38	Earthenware, china	..	*ad val.*	5 %
40	Fireworks and fulminating powder.	..	"	"
43	Glass and china	133½ Lb.	30 0	"
44	Gums, gum-resins, and articles made of gum or gum-resins—			
	Copal	Cwt.	70 0	"
	Cutch and gambier	"	16 0	"
	Gamboge	Lb.	0 15	"
	Gum ammoniac	Cwt.	15 0	"
	" Arabic	"	24 0	"
	" bdellium	"	13 0	"
	" Benjamin, ras	"	25 0	"
	" " cowrie	"	80 0	"

Indian Valuation Tariff—continued.

No.	Names of Articles.		Tariff Valuation.	Duty.
	Gums, &c.—*cont.*		R. a.	
	Gum bysabol (coarse myrrh)	Cwt.	22 0	5 %
	„ olibanum or frankincense.	..	..	Free
	„ Persian (false)	Cwt.	10 0	5 %
	„ kino	„	10 0	„
	Myrrh	„	28 0	„
	Rosin	„	4 8	„
	All other sorts of gums, gum-resins, and articles made of gum or gum-resin, including caoutchouc and gutta-percha.	..	*ad val.*	„
46	Hides and skins	..	„	„
48	Instruments and apparatus	..	„	„
52	Leather	..	„	„
53	Manures of all kinds	..	..	Free.
55	Oilcake	..	..	„
56	Oil-cloth and linoleum	..	*ad. val.*	5 %
57	Paints, colours, painters' materials, and compositions for application to leather, wood, and metals—			
	Lead, red, dry	Cwt.	14 0	„
	„ white, dry	„	16 0	„
	Ochre, other than European, all colours	„	1 8	„
	Paints, composition	„	55 0	„
	„ patent driers	„	12 0	„
	Turpentine	Imp. Gal.	2 6	„
	Verdigris	Cwt.	70 0	„
	Vermilion, Canton	Box of 90 bundles.	100 0	„
	Zinc, white, dry	Cwt.	25 0	„
	All other sorts, including glue and putty	..	*ad. val.*	„
58	Paper, pasteboard, millboard, and cardboard	..	„	„
60	Pitch, tar, and dammer—			
	Bitumen	..	„	„
	Dammer	Cwt.	5 0	„
	Pitch, American and European	„	7 0	„
	„ coal	„	3 0	„
	Tar, American and European	„	6 0	„
	„ coal	„	3 8	„
	„ mineral	..	*ad. val.*	„
63	Pulp of wood, rags	..	..	Free.
72	Soap	..	*ad. val.*	5 %
76	Tallow, grease, and stearine	Cwt.	20 0	„
78	Textiles not otherwise described.	..	*ad. val.*	„
79	Toilet requisites not otherwise described.	..	„	„

CUSTOMS TARIFF OF VENEZUELA.

See Bd. of Trade J., Jan. 24, 1901, *p.* 222, *and Jan.* 31, 1901, *p.* 277.

CUSTOMS TARIFF OF ECUADOR.

See Bd. of Trade J., Jan. 31, 1901, *p.* 288, *and Feb.* 7, 1901, *p.* 335.

I.—GENERAL.

SAUERBECK'S "INDEX NUMBERS."

Comm. Intelligence, Jan. 26, 1901, 38. (*See also this J.*, 1894, 762A; 1895, 609; and 1896, 755.)

A comparison of prices in 1899 with those of preceding years in that great world's market, London, is made by Prof. A. Sauerbeck, in a publication issued by the Royal Statistical Society. This comparison, according to Prof. Sauerbeck's statement which precedes it, "shows the course of prices of 45 commodities during the last 20 years, as compared with the standard period of 11 years, 1867–77." The statement of values is in the form of "index numbers" in which the average price during the period 1867–77 is taken as 100, and the relative price in the years named, from 1880 to 1899, is based thereon. The 45 articles considered are arranged in six great groups: Vegetable food; animal food; sugar; coffee and tea; minerals; textiles; and sundry materials. In vegetable food, the index number for the year 1880 was 89; for the year 1885, 68, for the year 1890 it was 65; in 1896 it reached its lowest point, 53; and in 1899 averaged for the year, 60. In animal food, the figure for 1880 was 101; for 1885, 88; for 1890, 82; in 1896 again the lowest point, 73; and in 1899, 79. Sugar, tea, and coffee stood in 1880 at 88; in 1890 at 70; and reached their lowest average, 51, in 1898, and in 1899 stood at 53, though for coffee and tea, as shown in the discussion accompanying the tables, the 1899 figures were the lowest recorded in the tables. In minerals, the index figure in 1880 was 79; in 1885, 66; in 1890, 80; in 1895 it reached its lowest point, 62; and in 1899 stood at 92, by far the highest point in the 20 years' period, 1880–99, under consideration. In textiles the index figure for 1880 was 81; for 1890, 66; and reached the lowest point in 1897 and 1898, when it stood in each year at 51, returning in 1899 to 58. In the list headed "sundry materials," the index figure for 1880 was 89; for 1885, 76; for 1890, 69; and reached its lowest point in 1897, when it stood at 62, and in 1899 returned to 65. Taking the grand total of the 45 articles considered in the various classes of vegetable food, animal food, sugar, coffee and tea, minerals, textiles, and sundries, the index figure for 1880 was 88; for 1885, 72; for 1890, 72; and in 1896 reached its lowest point, 61; returning in 1899 to 68.

Discussing the table from which the above figures are taken, Prof. Sauerbeck says:—

"The index number for all commodities was 68, against 64 in 1898, or 32 per cent. below the standard period 1867–77, and 14 per cent. below the 10 years 1878–87, but 3 per cent. above the average of the last 10 years. As compared with 1898, the advance amounted to four points (or $6\frac{1}{4}$ per cent.), while the rise on 1896, the lowest year on record, was as much as seven points (or $11\frac{1}{2}$ per cent.). The rise was smaller than was probably expected by many observers, and this is explained by the fact that the average advance for the whole year applied only to materials, and here principally to minerals; to a smaller extent to textiles, and to a very slight extent to sundry materials. Articles of food, on the other hand, were in the aggregate lower—an advantage no doubt to consumers—and were exactly on a level with 1897, so that the advance obtained in 1898 was again lost.

"Four articles out of the 45 contained in my tables showed records of lowest prices, viz.: Brazil coffee, flax, coarse wool, and the average import price of tea. Articles of food were a little lower, but materials 24 per cent. higher than in December, 1898, while the rise for materials from the lowest point in February, 1895, amounted to as much as 36 per cent. in the aggregate. Articles of food, on the other hand, were only $8\frac{1}{2}$ per cent. above their lowest record point in July 1896.

"In the course of last year prices of corn remained generally on a low level, the small wheat crop of the world of 1897 (283 million quarters) having been followed in 1898 by the largest crop on record (358 million quarters), and in 1899 by another good crop (324 million quarters). Meat and butter were somewhat dearer, the latter being affected by the drought in August. Sugar and the common sorts of tea ruled a little higher than in the preceding year though both articles are still on a very low basis, the average import price of all sorts of tea imported having been the lowest on record. Brazil coffee, under the influence of four large crops in succession, was lower than ever before, Santos touching 25*s.* per cwt. in September, but improving again to 32*s.* towards the end of the year. Metals generally reached their highest points between July and October, but gave way to some extent later on, while coal obtained almost famine prices at the end of the year and early in 1900. Iron has not been so high since 1874, but copper and tin, although very dear, were still higher during the speculation in 1887–88.

"Among the textiles we have to record an advance for cotton, in view of a large consumption and lower estimates of the current crop, but prices during the past year were still very low as compared with former periods. Flax touched the lowest price on record, improved gradually, and realised a sharp advance in December. Manila hemp experienced great fluctuations in conjunction with the policy of opening and again closing the port the price was 17*l.* sterling per ton at the end of 1897, and about 64*l.* sterling at the end of last year, probably the highest figure on record. Merino wool advanced over 60 per cent., and has not been so high since 1880, while the bulk of coarse wools occupied the lowest level on record for the greater part of the year, improving to some extent towards the end. Silk was considerably higher.

"The past year will, on the whole, be considered a very prosperous one, and the activity of the manufacturing industries in Europe, as well as in America, was greater than at any time since 1871-73."

Chemical Imports of Mexico.

Foreign Office Annual Series, No. 2546, *Jan.* 1901.

The value of the chemical products imported into Mexico in the year 1899 was 455,300*l.*, as against 376,615*l.* in 1898. The principal articles in which an increase is most visible are :—

Articles.	Value.	
	1898.	1899.
	£	£
Paints and varnishes, including aniline dyes, and extracts from dye-woods.	78,905	101,016
Drugs, patent medicines, &c..........	75,414	92,303
Sulphate of copper, iron, &c..........	48,947	79,005

The greater quantity of articles imported under this head come from the United States and Germany.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum Deposit at Beaumont, Texas.

Bd. of Trade J., Feb. 14, 1901, 411.

H.M. Consul at Galveston reports that a petroleum deposit of considerable extent has recently been discovered at Beaumont, a Texas town lying some 150 miles to the west of Galveston, and 25 miles from the coast.

It has long been supposed that considerable deposits of oil existed in that vicinity, but it is only within the last few weeks that it has actually been discovered.

The one well which has been sunk up to now is, at present, producing some 5,000 to 6,000 barrels a day.

The oil, however, is a very low quality, and is only fit for fuel.

It is understood that arrangements are being made to construct a pipe line to Port Arthur, whence the oil will be shipped in tank steamers.

IV.—COLOURING MATTERS, Etc.

The Indigo Industry.

C. Rawson. Calcutta "Englishman"; through Chem. Tr. Journal, Feb. 9, 1901. *(See also this Journal,* 1899, 467—474.)

In order to compete successfully with artificial indigo and indigo substitutes, and to put the industry of India once more upon a firm basis, the cost of production must be considerably diminished, or, in other words, a greater yield of plant must be obtained from each acre of land cultivated, as well as a greater amount of colouring matter from every maund of plant put into the vats. This can now undoubtedly be done and at a remunerative cost, but in order to make the industry a success it needs the co-operation of buyers, agents and planters. Many planters are unable to take advantage of the situation unless they have the assistance of their agents; others fear to put down new manufacturing plant lest buyers should unduly depreciate the value of the indigo produced on account of its being made by some process out of the ordinary.

It would appear from several letters which have recently been published in English papers, that indigo planters were doing nothing to retain their position in the field, and wild statements have been made by individuals knowing little or nothing about the condition of labour in this country, that the whole process of manufacture was most crude and antiquated. As many readers of the *Englishman* are aware, the Behar Indigo Planters' Association has taken the matter in hand, and during the past three years a considerable amount of research work relating to improvements both in the cultivation and manufacture of indigo has been done in the Mozufferpur district, though for obvious reasons little has hitherto been published. Another body, known as the Indigo Improvements Syndicate, has also been working with similar objects in view at Dulsing Serai. Judging from statements made by several correspondents, an erroneous impression has apparently been received and spread that the older association was confining its attention entirely to matters connected with improved methods of manufacture, and that the syndicate was dealing solely with the agricultural part of the problem. One of the great difficulties attending the introduction of an improved process of manufacture is the attitude taken by buyers with respect to the indigo thereby produced. If any compound generally termed a "chemical" is added to the liquid during any stage of the manufacturing operation, the product is named "patent" or "chemical" indigo by the Calcutta buyers, and is looked upon with suspicion. Its quality may be superior, but it rarely, if ever, commands the same price as indigo of a similar character made by the old ordinary process. Sulphuric or hydrochloric acid added to the "liquid" indigo in the boiler unquestionably improves the quality of the product, but it has frequently been stated in Calcutta that indigo which has been so treated was undesirable, and that the acid used would tend to rot the cloth subsequently dyed with it. It is absolutely impossible, however, for such an effect or any other injurious effect to take place. Even without taking special precautions, the acid used in the boiling process is subsequently removed, and does not appear in the finished indigo. But in an extreme case, not at all likely to occur in practice, if, through carelessness, some acid still remained in the dried cake, it would be at once neutralised by the lime or other alkali always present in large quantities in the dye vat. There is certainly some reason for buyers looking with suspicion upon so-called "patent" indigo, because much which has been made in the past has been of inferior quality, but if any doubt exists regarding the value of such indigo the remedy is very simple, *viz.*, analysis. An analysis of the sample will clearly show the quality of the indigo, and put an end to all speculations and diverse opinions. If indigo is to hold its own against artificial dyes it will certainly be necessary to modify the present mode of manufacture, but if buyers throw obstacles in the way by discounting the value of indigo so produced, the position of the planter may not be much improved.

During the past season several factories in Behar have made a certain amount of indigo by what is known as the "blower" process. It consists in oxidising the "liquor" obtained on steeping the plant by forcing air through a number of perforated pipes lying at the bottom of the vat in place of oxidising by the ordinary beating wheel. In this way an increase of from 20 to 25 per cent. of colouring matter is obtained, without the assistance of any chemical compound. The operation may be performed either by means of mechanical air compressors or by steam blowers. In the latter case, the temperature of the liquid is raised slightly, and a small amount of carbonate of lime (naturally always present in the solution) is precipitated with the indigo, thereby reducing the colouring matter in the product by 2 or 3 per cent. By adding a little sulphuric acid to the "mal" in the boiler, however, this is at once removed, and the indigo obtained is of precisely the same quality as that made by the ordinary process. If the amount of acid is increased, the quality of the product is decidedly superior to the ordinary indigo, and the working of subsequent operations is much facilitated. In one respect the indigo thus made is superior to that made by wheel beating, as it contains a slightly greater amount of indirubin.

The quality of the indigo made by the process during the past season should not be taken as an index of the quality which will be produced in future, as many planters, looking upon the operation as being in an experimental stage, unfortunately laid down plant of insufficient power, resulting in the production of indigo of an inferior quality to that which otherwise would have been obtained.

So long as prices remain about equal, value for value, the majority of dyers in Great Britain will continue to use natural indigo, but if the synthetic dye can be supplied at a lower price, one cannot be surprised if they make a change. In the great conflict which has now commenced between the old indigo industry of India and the large dye manufacturing firms of Europe, it behoves planters, agents, and buyers to join forces and pull together for the mutual interests at stake.

The Export of Indigo.

Comm. Intelligence, Feb. 9, 1901.

An Indian Government memorandum recently published gives the exports of indigo of the last five years in cwts., as follows:—

From	1895-96.	1896-97.	1897-98.	1898 99.	1899-1900.
Calcutta	111,714	109,001	71,364	81,779	59,078
Madras	60,706	41,629	47,356	41,203	38,701
Bombay	7,330	8,647	9,631	5,681	6,641
Karáchi.........	5,870	8,195	4,690	4,966	5,849

The report gives a very poor return for the exports in the first eight months of the current season. Prices continue low and discouraging.

Dyestuffs in Egypt.

Foreign Office Annual Series, No. 2549, *Jan.* 1901.

Year.	Total Value Imported.	Of which from United Kingdom.
	£	£
1897	260,218	12,230
1898........................	260,603	13,258
1899	246,043	18,056
1900 (first 6 months).........	157,124	..
1899 „ „	131,236	..

In 1899 there was a decrease of nearly 15,000*l.*, chiefly in indigo; there was an increase in other colours and dyes. During the first half of 1900 there was a marked recovery, the total value imported exceeding by nearly 25,000*l.*, the total for the same period of 1899. There was a slight improvement in indigo, and an increase of nearly 20,000*l.* in other colouring matters. Indigo represents more than two-thirds of the total value of this class of goods.

VII.—ACIDS, ALKALIS, AND SALTS.

Graphite Discovery in the Godavery District of India.

Comm. Intelligence, Feb. 16, 1901.

A coal company working in the Godavery district has accidentally discovered a large deposit of graphite. The property is to be vigorously worked, and the estimated production is 100 tons a month. A mineralogist from Cornwall is now on his way to India to superintend the working of the property.

Sulphur Industry of Sicily.

Eng. and Mining J., Feb. 9, 1901, 180.

In 1900 the exports of brimstone aggregated 557,668 long tons, as against 479,031 tons in 1899, showing an increase of 78,637 tons, or 14·1 per cent. in the past year. The movement in 1900 is classified by Emil Fog & Sons, of Messina, as follows: United States and Canada, 162,233 tons; France, 103,647 tons; Italy, 101,073 tons; United Kingdom, 23,973 tons; Germany, 28,702 tons; Scandinavia, 22,681 tons; Russia, 22,090 tons; Austria, 21,594 tons; Greece and Turkey, 19,647 tons; Holland, 18,595 tons; Belgium, 9,721 tons; Spain, 6,187 tons; other countries, 6,810 tons. The largest increases in exports, as compared with 1899, were to the United States, Holland, and Scandinavia. Stocks in Sicily on December 31, 1900, were 221,204 long tons, as against 277,098 tons in 1899, and 248,023 tons in 1898.

Chemicals and Drugs in Egypt.

Foreign Office Annual Series, No. 2549, *Jan.* 1901.

Year.	Total Value Imported.	Of which from United Kingdom.
	£	£
1897........................	258,517	31,499
1898........................	230,166	35,396
1899........................	274,112	40,288
1900 (first 6 months)	132,847	..
1899 „ „	137,396	..

The falling off in 1898 was caused by a diminution in the importation of common soap. During the first half of 1900 there was a falling off of 4,000*l.* in common soap, other articles showing an increase. British imports in this class consist chiefly of chemicals and drugs, and are increasing.

Common soap, which is the principal of this category of imports, is almost entirely imported from Crete. The import appears, however, to be diminishing owing to the competition of local manufactures.

Chemical Works in Bosnia.

Foreign Office Annual Series, No. 2552, *Feb.* 1901.

The chemical works at Tuzla are doing very well. They produced in 1899 about 15,000 tons of alkalies and 10,000 tons of other chemical products, and paid a dividend of 12 per cent. The works employ over 400 workmen and the paid-up capital is 93,000*l.*

The "Holzverwerthungs-fabrik," at Teslić, with a capital of 125,000*l.* (3,000,000 kr.), which produces from beechwood methylic alcohol, acetone, pyroligneous acid, acetate of lime, tar, and charcoal, and impregnates sleepers and building timber, is not so far prospering, as it has not yet recovered from the heavy outlay incurred in the reconstruction of the machinery, involved by the failure of the process, known as the Bergmann patent, which was at first employed.

The calcium carbide works at Jaïce, with a capital of 250,000*l.* (6,000,000 kr.), also did not thrive in 1899.

VIII.—GLASS, POTTERY, AND ENAMELS.

Glass and China in Mexico.

Foreign Office Annual Series, No. 2546, *Jan.* 1901.

Glass, china, and earthenware are all articles where an opening could be easily acquired by the British manufacturer, if he would only assist his agents by stretching a point or two in regard to certain special requirements for this market.

The following example is of quite recent date. A merchant of this city required some dinner ware of a certain weight and pattern, and the order was given to representatives of British manufacturers for a quotation. After a long time the reply came that as they were not accustomed to make that style of ware in the quality required they could not accept the order, and in consequence the order was sent on to France and Germany, where it was executed without delay.

Glass in Egypt.

U.S. Cons. Reps., Feb. 1901, 254.

All kinds of glassware are at present much in demand in Egypt. In 1898, the imports of glassware (window glass not included) amounted to 1,500,000 francs (289,500 dols.). Lamp glass in particular is wanted and is principally imported from Austria and Germany. The increased use of gas has caused an augmentation of the sales of all kinds of articles for gas lamps. France, Austria, and Germany also furnish large quantities of glassware for electric lamps. Goods out of pressed glass—as, for instance, salt and pepper stands, beer mugs, sugar basins, and all kinds of table glassware of medium quality and prices, spirit and beer bottles, and similar articles—are purchased in considerable quantities.

In 1898, the imports of glassware from Austria amounted to 570,000 francs (110,010 dols.) and those from France to 260,000 *francs* (50,180 *dols.*); *after these come* Germany, Belgium, Great Britain, and Italy.

As regards china, Germany, Austria, and Italy have increased their sales, while France seems to have been doing less business. England and Belgium have also considerably diminished their exports in this line. The French trade included the better-class articles, mostly from Limoges. Italy exports ordinary faïence goods, which are largely in demand on account of low prices.

Would it not be well for our glass manufacturers to cast an eye on Egypt as a likely market for their wares?

X.—METALLURGY.

New Nickel-Ore Works at Newcastle, N.S.W.

According to the *Queensland Government Mining Journal* for December last, arrangements have been completed for the establishment of large nickel-ore smelting and refining works at Newcastle (New South Wales). An area of 400 acres has been secured on the Wallsend Coal Company's property, and the ore to be treated will be brought from New Caledonia by a regular line of steamers. The works will provide employment for a large number of men.

Output of Minerals in Bosnia and the Herzegovina during the Year 1899.

Foreign Office Annual Series, No. 2552, *Feb.* 1901.

Mineral.	Output in 1899.	More or Less than in 1898.	Value.	More or Less than in 1898.
	Tons.	Tons.	£	£
Coal	303,425	+ 32,242	54,169	+ 6,975
Iron ore	67,085	+ 8,552	13,972	+ 3,276
Copper ore	3,980	+ 195	2.082	+ 120
Manganese	5,266	− 54	7,458	− 305
Chrome ore	196	− 262	653	− 711
Iron pyrites	430	+ 190	179	+ 79
Grey copper	631	+ 93	853	− 302
	Gallons.	Gallons.		
Brine	30,537,034	+4,625,698	4,627	+ 701
Total	..	..	83,993	+ 9,833

XII.—OILS, Etc.

Cotton-Seed Oil Production in Mexico.

Chamber of Commerce J., Feb. 1901, 38.

The *Moniteur Officiel du Commerce* says that the annual production of cotton-seed oil in Mexico is on an average 1,500,000 kilos. (3,306,900 lb.) and the quantity consumed in 1899 was 14,000,000 kilos. (30,864,400 lb.) In the United States, as well as in Mexico, the crop was inferior to an average one. Cotton oil is absolutely indispensable for the manufacture of soap, which explains the endeavours made to discover a plant the properties of which would be analogous for producing the said oil. It has been found that the seeds of the castor-oil plant and of the "coyol" might be cultivated with profit, especially on account of their hardness and of the fatty oil they supply, and which is particularly adapted for the manufacture of soap. From the United States there were recently imported some machines for the purpose of extracting the oil from the castor seed which is harvested near Durango, where experiments which have lasted nearly two years have yielded very satisfactory results. The "coyol" grows abundantly in a wild state in the tropical regions; it is a shrub or kind of palm, which produces berries containing 80 per cent. of oil, of great service for making soap.

Soap and Candle Trade in the South of Europe.

Chamber of Commerce J., Feb. 1901, 37.

All manufacturers of soap who desire to dispose of their productions in Turkey, are urgently advised by *Handels Museum* to employ only olive oil which is perfectly pure. Soaps which contain cotton oil or earthnut oil are not admitted by the Turkish customs officials, particularly at Salonica. The smallest admixture of cotton oil suffices for confiscating a shipment, and the exporter interested may think himself lucky if he succeeds in recovering his merchandise. Some exporters assert even that they had met with such difficulties although olive oil only had been employed in the manufacture; the cause seems to have been that the olive oil had been conveyed in casks which had previously contained cotton oil. The Bulgarian market shuts itself off more and more from the employment of foreign candles and soaps. The German Consul at Varna reports that the tallow and wax candles used there are mostly of native manufacture, only stearine candles being imported from Belgium and the Netherlands. The importation of ready-made soaps is continuously decreasing, as three Varna soap factories almost completely cover the requirements. France, Turkey, Germany, and Greece supply the raw material. Greek soap, which formerly was in great demand, no longer meets with buyers on account of its high price. From a French consular report it appears that at Leghorn English soap controls the market, owing to the abundant advertisements which the English manufacturers publish. In the South of Europe there are seven soap factories. In 1898 the quantity exported was 6,563,112 kilos., and in 1899, 6,847,307 kilos. Medicinal soaps are imported from Germany, and meet a satisfactory sale at firm prices.

XIII. A.—PIGMENTS, PAINTS, Etc.

Paints and Colours in Mexico.

Foreign Office Annual Series, No. 2546, *Jan.* 1901.

Paints and colours are articles that with a little careful management could easily be introduced. The greater quantity of paints and colours are imported from Germany and are nearly all made from aniline dyes; and varnishes are principally of American manufacture. Up to the present this branch of trade has received very little attention from the British manufacturer, and though one or two feeble attempts have been made to introduce them no foothold has been acquired, owing to the lack of experience required to conform to certain local customs and methods of business in this market.

XV.—MANURES.

Phosphate Industry in Christmas Island.

The *Straits Budget* of 22nd December last, in an article on Christmas Island, says that an interesting feature in the development of that place is the vast extent of the phosphate deposits already discovered, and the extension which the existence of these deposits may make to the trade of Singapore. The business of working the deposits and exporting the phosphates really commenced in January, 1900, and, since then, over 30,000 tons of it have been exported to England, Germany, Japan, and Australia. The profit on this has been over 1*l.* a ton, and this rate of profit will increase as the island is further developed and more labour-saving devices can be utilised in the work of quarrying, loading, &c. With the projected improvements it is believed that the output will soon be increased to at least 100,000 tons per annum—producing a profit of considerably over 100,000*l.* The demand for phosphates is in excess of the supply, and it is a demand that is yearly increasing. In the present clearing of only 20 acres, 42 prospect holes have been sunk through the phosphate bed, and these show over 620,000 tons of the product in sight and immediately available. It is also stated that there are over 50 adjacent areas known to be as rich if not richer. Large beds of phosphate of aluminia have also been discovered, and under modern scientific treatment this latter product may yet prove even more valuable than the phosphate of lime.

The phosphates produced are now all exported in the natural state as they come from the ground; but as the scheme advances, the syndicate recently formed to develop the island will erect its own plant for milling the raw stuff, and treating it so as to transform the phosphates into superphosphate, which are the staple form in which phosphates are used as a fertilising agent. The works for this purpose will very possibly, for convenience of trade, be erected in Singapore.

PHOSPHATES IN RUSSIA.

Foreign Office Annual Series, No. 2548, *Jan.* 1901.

Thomas Phosphate.—In 1901 Thomas phosphate will be manufactured in Russia. Slag will be taken at first from the Kertch Metallurgical Iron Works. The port of delivery for South and Central Russia will be Mariupol. The Russian Thomas slag will contain about 20 per cent. of phosphoric acid, instead of the 17 or 18 per cent., which is usually found.

Super-Phosphates.—In competition with the Thomas phosphate, a Russian firm is about to start a large superphosphate works at Schmerinka, utilising the deposits of phosphorites found in the neighbourhood. The sulphuric acid, however, cannot be obtained from nearer than Poland.

XIX.—PAPER, PASTEBOARD, Etc.

PAPER IMPORTS OF MEXICO.

Foreign Office Annual Series, No. 2546, *Jan.* 1901.

There is an increase in the value of the imports of paper during the year 1899. The figures are 407,056*l.*, as against 306,234*l.* in 1898.

The articles in which this increase is most noticeable are cigarette paper, unsized paper, wrapping and writing papers, and wall paper.

The value of cigarette paper, which is classified under a separate heading in the Customs tariff, imported almost entirely from Spain, was 85,619*l.*, or 29,000*l.* over what it represented in 1898, thereby demonstrating that the demand by the tobacco factories was larger than the year before.

The value of unsized paper for printing purposes was 11,000*l.* in excess of what it was in 1898.

Wrapping paper also shows an increase of nearly 10,000*l.* over 1898.

Writing paper, which includes all kinds, whether in packets or in fine cases of stationery, shows an increase in value of over 7,000*l.*

Wall papers also show an increase in value, namely 15,913*l.* against 11,264*l.* in 1898. This increase is due to the larger demand for this article occasioned by the number of new buildings being erected in the various towns throughout the country, as well as in the City of Mexico.

The countries that supply this article in largest quantities are France and Germany. The United Kingdom and the United States do not supply as much, owing to the difference in width and length of the rolls. The workmen here, being accustomed to make their calculation on French-made papers, find it difficult to fall into the way of calculating on papers made in the United Kingdom or the United States, though the manufacturers of the latter country are now making their paper of the same size as the French or German make.

In this article British manufacturers might have a very fair opening, if they would look into the matter, though, of course, they would have to compete with the very low prices at which the French papers are sold. The duties leviable on wall papers are as follows;—

Description.	Duty.
	Cents.
Ordinary wall paper without gilding, &c.. Per legal kilo. (not gross weight)	10
Finer paper with gilding or velvet........ Per legal kilo.	20
„ „ silk or other combination „ „	50
Lincrusta Walton is considered as the finer quality of paper, and pays.............. „ „	20

The value of wood pulp imported into Mexico in the year 1899 amounted to 11,413*l.*, as agains 11,661*l.* in 1898.

PAPER; HINTS TO EXPORTERS OF ——.

U.S. Cons. Rep., Feb. 1901, 256.

According to a French report, Austria is crushing French competition in Egypt in the sale of cigarette paper, both on account of quality and price. In writing and printing paper also, Austria commands the Egyptian market, Italy and Great Britain alone competing to some extent.

From Durban, Natal, comes a Belgian report, according to which cardboard is an import article of some importance. The demand is only for first quality cardboard that will bend easily without breaking. Special care must be devoted to the packing of cardboard. It must be packed between wooden boards, wider and longer than the cardboard itself, in order to protect the edges. Belgian cardboard frequently arrives greatly damaged. Imported cardboard is chiefly used by bookbinders.

Waterproof cardboard is also exported to Natal, only of the following dimensions, however: 36 by 18 ins. and from 4 to 5 mm. (0·1576 to 0·197 in.) thick.

The demand for printing paper seems to be on the increase, but only in the better, well-glazed grades. Scotch and German makes are given the preference.

XX.—FINE CHEMICALS, Etc.

DUTY-FREE ALCOHOL IN THE UNITED STATES.

Chem. and Druggist, Feb. 2, 1901.

A Bill to amend the revenue laws so as to provide for a rebate of the internal revenue-tax on domestic alcohol used in the manufacture of exported articles has been introduced into Congress. The object of this Bill is to extend to manufacturers using domestic alcohol the same right to a drawback of the tax paid thereon that is now enjoyed by manufacturers using foreign alcohol. If it becomes law these manufacturers contend that it will greatly facilitate the export-trade in chemicals, varnishes, flavouring-extracts, perfumery, pharmaceutical preparations, and other articles in which alcohol is a necessary raw material. A memorial stating the advantages which it is claimed would result from the enactment of the Bill has been prepared and signed by a large number of prominent manufacturers in New York. In support of the amendment it is urged, among other things, that Great Britain, Germany, and France give their manufacturers tax-free alcohol for their export trade, the result of this policy being that the United States is quite unable to compete with these countries, as there is a duty of 2·06 dols. per gallon on the raw material. The memorialists, in conclusion, express surprise that the use of foreign alcohol, free of tax, in the production of articles for export is allowed, while the domestic article is taxed. They also urge that there is no reason for this discrimination in favour of foreign alcohol, and that it is possible for a manufacturer to buy domestic alcohol, export it, re-import it, and use it in the manufacture of articles for export free of any tax whatever.

INDIAN HEMP.

Chem. and Druggist, Feb. 9, 1901.

The Government of India intend to amend the present Bombay Abkari Act (1878) by another Bill, to be called the Abkari Act Amendment Bill. The general intention of the measure is to secure as far as possible complete control over the production and sale of hemp drugs, and to tax them by the imposition of direct quantitative duties. Some of the more important points of the Bill are as follows:—Power is sought to prohibit absolutely, or except under licence, the cultivation of the hemp plant and the production of hemp drugs. It is also proposed to establish bonded or other warehouses for the storage of intoxicating drugs, postponing until such time as may be fixed the levy of the duty (if any) payable on them when so stored. Provision is further made for the framing of rules by Government to regulate the time and place of payment of duty. Every person taking out a licence to cultivate hemp shall, if called upon, give such security for the observance of the conditions of his licence as the collector may require.

Tea-sweepings and Caffeine.

Chem. and Druggist, Feb. 9, 1901.

By a recent decision of the United States Treasury Department tea-sweepings (for the manufacture of caffeine), when mixed with asafœtida, can now be imported duty free. For a long time the Treasury Department declined to permit the importation of tea-sweepings under any classification, holding that the Pure Tea Act excluded such merchandise, even though not designed for consumption as tea. Finally, a concession was made to the importers upon condition that sufficient asafœtida should be mixed with the sweepings. The question then arose as to whether such a mixture could be imported as a crude drug. The Courts have now upheld that it can, and refunds to a considerable amount will be made.

Australian Products: Eucalyptus, Dyes, Camphor, Resin, Tan, Gum, &c.

R. T. Baker. Comm. Intelligence, Feb. 16, 1901, 9.

Australia offers a vast and inexhaustible field for those experienced in the industrial utilisation of vegetable products. Although the practical value of economical botany remains imperfectly understood throughout the Commonwealth, there are not wanting indications of its approaching recognition as a new and valuable source of national wealth. Recently, in New South Wales, Mr. R. T. Baker, F.L.S., curator and economical botanist of the Sydney Technological Museum, appeared as a witness before a Royal Commission appointed to inquire into the condition of the western lands of the State. In the course of his examination he produced samples of eucalyptus oil in various stages extracted from trees in the eastern portions of New South Wales, and stated that the colony now produced eucalyptus oil of the highest quality, fully equal to the best in the market. He said that a vast amount of research had lately been made in connection with the flora of that part of the parent State, with very valuable results. For instance, myrticolorin, a new dyeing material, had been obtained from the leaves of the red stringy bark, in addition to the valuable oil extracted from the same source. This dye, which was not yet on the market, gave a lighter and better colour than the American quercitrin, which was obtained from the bark of an American oak. The New South Wales article was thus a by-product which would prove of great commercial importance. Mr. Baker produced several cloth samples showing the qualities of the myrticolorin dye. A quantity had been sent home to the leading manufacturers in England and Germany. The manufacturers in England were delighted with the results, and sent back several specimens of cloth, which he submitted to the Commission. Out of trees and shrubs in the eastern portion of the State he had, with the assistance of his staff, extracted camphor, perfumes (such as otto of roses, ionone, and cinnamon), dyes, and peppermint, and cajuput—oils which ought now to be pushed on the market. The camphor, in fact, was identical with the camphor of commerce, and was taken from the tree known as cinnamomum oliveri. New South Wales could also compete against India and Bulgaria with its geraniol extract for the reason that it combined several products, such as perfumes, which in the countries mentioned had to be manufactured separately. The very fact that the Buddah tree, so common as a parasitic growth in the western portion of the State, spluttered and showed resinous qualities when burned, went to prove that it held a marketable commodity which might prove of great commercial value, and there were other trees out west of which the same might be said. So far as the eucalyptus tree was concerned the nature of the soil in which it grew made no difference; it would yield the same results in oils and dye no matter where grown. Mr. Baker's evidence went to show that the vegetable products of the western, or dry country, in New South Wales, possessed an economical value not inferior to those of the eastern or coastal districts. It may be mentioned that there are in the west, as in the east, many millions of eucalyptus trees of various kinds, the trees and shrubs from which oils, resins, dyes, tans, and other products can be obtained being several hundred in number. Yellow dyes are furnished by the fever bark, cedar, cockspur vine, light yellow wood, mallotus discolor, crab-tree, and turmeric tree; red dyes by scrub, or brush bloodwood, red cedar, bloodwood, mallotus phillipensis, and mangrove; brown from the brigalow, Queensland cascarilla, fustic, bitter bark, pipturus argenteus, and satin wood; purple from hymenanthera dentata; sap green from the musk tree; and black from messmate, or stringy bark. Many other vegetable dyes might be mentioned. Essential oils are obtained from the native sassafras, ridge myrtle, tea tree, native peppermint, Queensland sassafras, native laurel, dogwood, sandfly bush, and all the varieties of eucalyptus. The resin-producing trees include the Moreton Bay pine, sassafras, pinkwood, Port Jackson fig, various kinds of pine, silky oak, beefwood, sandal wood, turpentine tree, grass tree, and cheesewood. The tan, gum, and kino producing trees and shrubs are also exceedingly numerous, but remain comparatively unutilised.

Export of Tartaric Material from the Italian Continent from Oct. 1, 1899, to Sept. 30, 1900.

Foreign Office Annual Series, No. 2550, *Feb.* 1901.

Articles.	To—	Quantity.	Total.	
			Quantity.	Value.
		Tons.	Tons.	£
1. Half - refined tartar.	U.S.A.	7½		
	U.K.	315		
	Germany	386½		
	France.........	145		
	Other countries	364	1,218	2,855
2. Vinaccia argols	U.S.A.	965		
	U.K.	1,390		
	Other countries	722	3,077	6,510
3. Crude argols..	U.S.A.	1,395		
	U.K.	60		
	Germany	170		
	Other countries	374	1,999	3,360
4. Wine lees	U.S.A.	240		
	U.K.	980		
	Germany	190		
	France.........	80		
	Other countries	1,555	3,045	1,596
	Total	..	9,339	14,321

BOARD OF TRADE RETURNS.

Summary of Imports.

Articles.	Month ending 31st Jan.	
	1900.	1901.
	£	£
Metals..............................	2,859,322	2,855,315
Chemicals and dyestuffs	552,230	491,300
Oils	1,060,964	972,291
Raw materials for non-textile industries.	4,196,534	4,073,790
Total value of all imports	44,555,914	45,987,516

Summary of Exports.

Articles.	Month ending 31st Jan.	
	1900.	1901.
	£	£
Metals (other than machinery)	3,726,694	3,622,533
Chemicals and medicines	782,763	852,450
Miscellaneous articles	2,917,326	3,092,136
Total value of all exports....	23,583,682	24,753,531

IMPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST JANUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Cement.......... Tons	3,934	9,457	8,082	18,009
China and earthenware. Cwt.	23,093	24,713	59,474	62,135
Drugs .... Value £	..	..	117,493	88,095
Glass:—				
Sheet .... Cwt.	132,474	46,566	71,698	27,476
Plate .... "	47,902	16,234	55,799	18,174
Flint .... "	23,904	34,542	35,002	65,007
Bottles .... Gross	104,969	155,639	43,807	57,004
Other.......... Cwt.	56,195	25,430	108,427	44,519
Glue, size, gelatin "	17,959	16,560	39,511	36,148
Leather, unmanufactured. "	143,110	130,833	882,732	788,442
Oil seed cake .... Tons	44 232	37,951	269,320	244,603
Paints and pigments. Value £	..	..	119,861	89,885
Paper, pasteboard Cwt.	474,768	457,173	346,232	332,012
Scientific instruments. Value £	..	..	45,216	37,800
Soap and soap powder. Cwt.	12,405	21,888	17,800	19,019
Zinc manufactures. "	46,794	26,781	62,702	32,079

IMPORTS OF METALS FOR MONTH ENDING 31ST JANUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Copper:—				
Ore.............. Tons	15,106	7,409	117,470	106,238
Regulus .... "	7,984	7,630	234,484	296,346
Unwrought ...... "	7,356	4,793	541,897	342,914
Lead, pig and sheet "	20,682	18,198	337,415	303,116
Pyrites .... "	72,989	70,322	115,004	120,318
Quicksilver .... Lb.	40,388	423,900	4,667	51,509
Silver ore....... Value £	..	..	103,146	102,522
Tin .... Cwt.	61,689	72,821	352,451	479,598
Zinc.............. Tons	6,048	3,743	128,176	70,365

IMPORTS OF RAW MATERIAL FOR NON-TEXTILE INDUSTRIES FOR MONTH ENDING 31ST JANUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Bark, Peruvian .. Cwt.	3,581	3,949	7,663	9,493
Caoutchouc ...... "	40,473	51,963	522,110	580,787
Gum:—				
Arabic .... "	5,593	4,935	12,011	12,076
Lac, &c. .... "	12,998	14,334	43,729	47,756
Gutta-percha .... "	9,067	7,902	120,305	131,618
Hides, raw:—				
Dry............ "	59,239	30,419	159,816	79,831
Wet .... "	68,122	49,989	143,510	114,829
Ivory .... "	1,448	840	55,218	33,077
Manure:—				
Guano .... Tons	6,436	376	25,547	2,605
Bones.......... "	9,033	5,436	42,428	21,895
Paraffin.......... Cwt.	118,724	114,381	137,083	166,855
Linen rags .... Tons	1,580	1,237	12,862	11,948
Esparto .... "	17,793	22,262	70,480	92,498
Pulp of wood..... "	40,313	40,941	179,154	226,207
Rosin............ Cwt.	200,995	135,825	46,398	34,648
Tallow and stearin "	193,916	115,692	249,518	145,956
Skins:—				
Goat .... No.	1,750,151	1,414,122	167,197	137,584
Sheep.......... "	1,398,209	1,584,098	172,356	180,652
Nitrate of soda... Tons	19,300	6,587	148,913	55,453
Phosphate of lime "	35,589	34,929	58,619	56,750

IMPORTS OF OILS FOR MONTH ENDING 31ST JANUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Cocoa-nut....... Cwt.	44,622	86,115	59,182	108,273
Olive............ Tuns	2,455	887	86,456	32,855
Palm .... Cwt.	89,765	73,346	100,200	84,573
Petroleum:—				
Illuminating.. Gall.	20,624,198	19,405,194	457,821	389,544
Lubricating... "	3,884,416	3,293,356	119,258	102,349
Seed............ Tons	3,238	4,293	72,644	108,580
Train, &c. ...... Tuns	752	666	13,437	12,346
Turpentine ..... Cwt.	45,592	28,746	83,613	41,288

IMPORTS OF CHEMICALS AND DYESTUFFS FOR MONTH ENDING 31ST JANUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Alkali............. Cwt.	19,070	19,020	12,270	6,176
Bleaching matters "		20,825		7,157
Borax .... "	45,080	50,934	21,266	25,136
Brimstone .... "	48,583	51,470	10,267	10,734
Nitrate of potash.. "	32,392	23,160	26,845	20,043
Chemicals, other Value £	..	..	120,743	141,887
Cutch and gambier. Tons	2,035	2,304	37,732	46,359
Dyes:—				
Alizarin.......Value £	..	..	17,381	14,855
Aniline and other "	..	..	40,624	38,163
Indigo .... Cwt.	7,657	2,702	111,405	47,939
Bark.............. "	24,376	28,566	8,703	10,946
Valonia........... Tons	2,737	1,641	31,547	17,500

EXPORTS OF METALS (OTHER THAN MACHINERY) FOR MONTH ENDING 31ST JANUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Brass............ Cwt.	10,314	9,757	54,806	52,667
Copper .... "	86,882	53,111	348,903	204,283
Lead............. Tons	1,975	2,493	37,729	48,249
Plated wares... Value £	..	..	37,699	40,184
Telegraph wires "	..	..	54,063	596,122
Tin .... Cwt.	10,355	8,732	61,260	55,728
Zinc.............. "	14,080	15,006	13,627	13,728

EXPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST JANUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
	Lbs.	Cwt.	£	£
Gunpowder..... Lb.	696,900	4,762	14,943	13,107
Candles......... "	1,953,500	2,770,200	32,454	49,215
Caoutchouc..... Value £	..	..	124,011	86,833
Cement......... Tons	29,390	22,814	54,874	45,053
Products of coal. Value £	..	..	147,823	150,005
Earthenware ... "	..	..	131,350	149,465
Stoneware ...... "	..	..	11,698	12,786
Glass:—				
Plate .... Sq. Ft.	168,936	6,881	8,480	13,936
Flint .... Cwt.	6,726	10,173	17,062	22,965
Bottles .... "	62,297	85,879	29,897	42,136
Other kinds ... "	19,411	18,637	18,578	19,614
Leather:—				
Unwrought.... "	11,760	12,707	115,644	123,123
Wrought......Value £	..	..	33,065	39,420
Seed oil .... Tons	3,730	3,077	80,382	84,677
Floorcloth.......Sq. Yds.	2,330,600	2,161,000	103,561	106,548
Painters' materials Val. £	..	..	148,862	162,625
Paper............. Cwt.	73,999	92,313	116,612	148,110
Rags.............. Tons	7,085	5,678	39,272	31,891
Soap .... Cwt.	80,459	90,853	79,370	93,689

Exports of Drugs and Chemicals for Month ending 31st January.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Alkali .... Cwt.	354,430	..	93,722	..
Bleaching materials „	107,143	135,680	28,704	41,101
Chemical manures Tons	34,421	28,914	221,001	225,219
Copper sulphate .. „	3,667	7,059	87,560	162,908
Medicines....... Value £	..	..	103,444	113,680
Soda compounds:—				
Ash............. Cwt.	..	122,393	..	26,246
Caustic .... „	..	104,496	..	46,183
Bicarbonate .... „	..	27,066	..	9,380
Crystals .... „	..	13,432	..	2,221
Sulphate........ „	..	30,313	..	2,738
Other sorts ..... „	..	2,445	..	1,729

Monthly Patent List.

*** The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.**

I.—PLANT, APPARATUS, AND MACHINERY.

Applications.

983. O. Rippich. Improved apparatus for decanting wort and other liquids. Jan. 15.

1133. J. McNeil. Improvements in evaporating apparatus. Complete Specification. Jan. 17.

1145. E. Lambert. Improvements relating to drying apparatus. Jan. 17.

1153. A. J. Boult.—From A. Roller, Maschinenfabrik, Germany, and A. Schiff, Russia. Improvements in and relating to drying apparatus. Complete Specification. Jan. 17.

1393. G. C. Marks.—From A. Hannetelle-Chapius, France. Improved concentrating apparatus, applicable to acids, saline solutions, and in general to other liquids capable of concentration. Jan. 21.

1556. S. Puplett. Improvements in freezing and refrigerating apparatus. Jan. 23.

1999. C. Spiegel. Improvements in furnaces burning naphtha residue. Jan. 29.

2109. H. Ruelle and E. Montagne. Improvements in and connected with smoke-consuming apparatus for furnaces and the like. Jan. 30.

2352. H. Reck and A. Borsu. Improvements in centrifugal separators. Feb. 4.

2384. R. Scheuffgen. Apparatus for preventing explosions in vessels containing explosive fluids. Complete Specification. Feb. 4.

2888. F. Kafferle. Improvements in or relating to pressure-reducing apparatus. Complete Specification. Feb. 4.

2467. H. S. Hatfield. Improvements in gas thermometers and pyrometers. Feb. 5.

2484. C. W. Vollmann. Improvements in freezing apparatus. Complete Specification. Feb. 5.

2550. R. Walker. *See* Class IX.

2613. R. Snowdon. Improvements in kilns. Feb. 7.

2775. H. C. Anstey. Improvements in evaporators. Feb. 8.

2819. G. Cope. Improved apparatus for mixing and agitating paints, oils, and the like. Feb. 9.

2892. H. Hildebrand. Improvements in heating or cooling vessels for liquids or gases. Complete Specification. Feb. 11.

2922. G. King. Improvements in means for closing the mouths of retorts. Feb. 11.

2975. J. Dewhurst. Improvements in means or apparatus for use in filtering and conducting liquids. Feb. 12.

2976. R. Price and J. Kershaw. A new anti-incrustation preparation. Feb. 12.

3173. E. S. Hermes. Improvements in bag filters for clarifying beer, wines, spirits, perfumes, water, and other liquids. Feb. 14.

3200. A. Wilson.—From E. M. Söhne, Germany. Improvements in centrifugal apparatus. Feb. 14.

3266. J. H. Brearley. Improvements in generator or regenerative furnaces or kilns. Feb. 15.

Complete Specifications Accepted.*

1899.

25,229. J. J. Meldrum, T. F. Meldrum, and J. W. Meldrum. Supplying air to furnaces, and steam-jet blowing or forcing apparatus therefor, and other purposes. Jan. 30.

1900.

996. W. P. Thompson.—From L. T. Wright, United States. Rotary stirrers for roasting furnaces. Jan. 23.

1828. F. W. Lefelmann. Acid-proof vessels and other articles. Jan. 30.

2663. W. P. Gibbons and G. B. A. Gibbons. Construction of regenerative and other furnaces, and muffles and bricks therefor. Feb. 13.

4721. J. V. Musgrave. Humidifying apparatus. Jan. 9.

5992. A. Smith. Manufacture and construction of filtering material and filters. Feb. 6.

6072. H. Reck and A. Borsu. Centrifugal separators. Feb. 6.

12,449. W. R. Jennison. Liquid coolers. Jan. 23.

13,749. S. G. Mabouleix. Apparatus for heating and cooling fluids, and for sterilising or pasteurising liquids. Feb. 20.

14,935. W. M. Barnes. Drying apparatus. Jan. 23.

16,152. C. M. Bump. Furnaces. Jan. 23.

16,974. P. Naef. Process and apparatus for crystallising and freezing. Jan. 30.

17,700. W. L. Jackson. Kilns. Jan. 30.

18,352. H. A. Desrumaux. Apparatus for filtering, purifying, or similarly treating liquids. Feb. 6.

19,126. J. E. Carroll. Method of distillation. Jan. 23.

19,340. L. Béchaux. Liquid fermentation apparatus. Jan. 30.

21,914. A. J. Boult.—From C. Hromadnik, Germany. Apparatus for use in treating liquids or materials in liquids. Jan. 30.

22,490. S. T. Bleyer. Furnaces. Feb. 6.

22,581. H. Desrumaux. Apparatus for filtering liquids. Feb. 6.

23,244. L. Kaufmann. Process for effecting rapid crystallisation. Feb. 6.

23,608. J. E. Bousfield.—From The Snowflake Refrigerator Company, Ltd., South Australia. Refrigerators. Feb. 20.

II.—FUEL, GAS, AND LIGHT.

Applications.

906. H. Sefton-Jones.—From C. Fader, Republic of Argentina. Improved automatic gas-lighting apparatus, operated by gas pressure. Jan. 14.

919. T. E. Pye. Improvements in apparatus for the production and storage of acetylene gas. Jan. 14.

993. F. W. C. Schniewind. Improvements relating to regenerative coke ovens. Complete Specification. Jan. 15.

1018. J. Lewis. Improved means for effecting the ignition of incandescent gas lights or gas jets. Jan. 15.

1058. J. H. Sheldrake. An improvement in incandescence gas burners. Complete Specification. Jan. 16.

1173. J. H. Hartridge. Improved methods and means for carburetting air and enriching gas for illumination, heating, and power purposes; partly applicable for purifying hydrocarbons. Jan. 18.

1283. M. Martin. Improvements relating to apparatus for automatically generating acetylene gas. Complete Specification. Jan. 15.

1482. O. Imray.—From W. J. Donaldson, W. A. Mears, and G. S. Emerick, United States. Improvements in apparatus for burning pulverised fuel. Complete Specification. Jan. 22.

1525. J. W. Ward. Improvements in or relating to burners for incandescent gas lighting. Jan. 23.

1683. Thorn and Hoddle Acetylene Company, Ltd., and C. Hoddle. Apparatus for generating acetylene gas. Jan. 24.

1703. F. M. Bennett and J. O. Fowler, jun. Improvements in appliances for producing perfect combustion of gas. Complete Specification. Jan. 24.

1756. A. McLean. Improvements in the mode of and apparatus for treating peat. Jan. 25.

1789. H. Aitken. Improvements in means for the utilisation of naphthalene for illuminating and heating purposes. Jan. 25.

1823. C. Gluth. Improvements in and relating to supports for incandescent mantles for illumination purposes. Jan. 26.

1918. A. Laughlin. Improvements in and relating to gas producers. Complete Specification.

1977. E. W. Lancaster. Improvements in acetylene generators. Jan. 29.

2005. W. P. Thompson.—From A. Wasmuth, Germany. An improved process for strengthening incandescent bodies for gas lighting. Complete Specification. Jan. 29.

2020. E. Gobbe. Improvements in and apparatus for the utilisation of the heat of coke removed from retorts or ovens. Jan. 29.

2101. P. Goetschke. Improvements in incandescing media or incandescence materials for gas lighting. Jan. 30.

2221. J. H. Green and W. H. Green. Acetylene generator and holder, by carbide to water principle, for one or any number of lights. Feb. 1.

2225. W. J. Crossley and J. Atkinson. Improvements in heat interchanger for use in connection with gas producers. Feb. 1.

2261. W. Lowen.—From F. W. and Dr. C. Killing, Germany. An improvement in the construction or manufacture of burners used for incandescent gas lighting. Feb. 1.

2469. O. Imray.—From J. R. McLean, United States. Process and apparatus for enriching coal-gas. Complete Specification. Feb. 5.

2509. A. Rudolph. Improvements in air-carburetting apparatuses. Complete Specification. Feb. 5.

2533. C. H. Guest. Carburetters. Feb. 6.

2672. W. H. Westwood, E. T. Wright, and W. W. S. Westwood. Improvements in apparatus employed in the manufacture of coal and other gases. Feb. 7.

2691. Lawton's Patents, Ltd., and A. W. Lawton. A new or improved method of and means for dehydrating gases or gaseous mixtures, applicable for cooling gases or gaseous mixtures, or for other analogous purposes. Feb. 7.

2713. R. P. Pictet. Improvements in and in apparatus for the industrial production of liquid air. Feb. 8.

2750. J. C. H. Kramers and J. G. Aarts. Improvements in the manufacture of water-gas and semi water-gas, and in apparatus therefor. Feb. 8.

2766. K. Gossweiler. Improved acetylene generator, with automatic supply of carbide. Complete Specification. Feb. 8.

2820. A. J. Boult.—From Chemische Technische Industrie Gesellschaft mit beschränkter Haftung, Germany. Improved manufacture of automatic gas igniters. Feb. 9.

2831. G. C. Fowler, M. A. Fowler, E. J. Fowler, trading as Welcome and Co. An improved fuel. Feb. 9.

2841. A. Mitchell. Fuel, improvements on. Feb. 9.

2846. J. S. Kemp-Welch. Improvements in the manufacture of water-gas and producer-gas, and in apparatus used therefor. Feb. 9.

2859. H. H. Kinloch. Improvements in apparatus for and method of preparing and moulding peat or turf. Complete Specification. Feb. 9.

2875. G. H. Barber. Improved hydraulic main for gas-works or carbonising-plant. Feb. 11.

2912. A. Kahn and M. Heberlein. Improved manufacture of artificial fuel. Complete Specification. Feb. 11.

2944. J. J. Hendler and E. K. Reeves. Improvements in apparatus for generating and burning acetylene and other gases. Complete Specification. Feb. 11.

3017. J. von Romocki. From H. Ascher, Germany. Improvements relating to incandescent gas burners. Feb. 12.

3038. W. T. Sugg. Improvements in the production of surfaces for use in incandescent gas lighting. Feb. 12.

3099. F. L. Barrett. Improvements in machinery or apparatus for charging retorts used in the manufacture of coal-gas. Feb. 13.

3215. P. Jensen.—From G. Heine, Norway. Method of and apparatus for treating peat. Complete Specification. Feb. 14.

3264. J. W. Blakey. An improved anti-vibrating gas and air burner. Feb. 15.

3296. A. J. Boult.—From Société Lumière Boule, Belgium. Improvements in or relating to burners for incandescent gas lighting. Complete Specification. Feb. 15.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

2709. P. Leroy. Gas generators. Jan. 23.

2888. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2888*a*. P. Naef. Method and apparatus for producing gas and by-products. Feb. 6.

2888*b*. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2888*c*. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2888*d*. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2888*e*. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2888*f*. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2917. P. Naef. Method and apparatus for producing coke-gas and by-products in part applicable for other purposes. Feb. 13.

2917*a*. P. Naef. Method and apparatus for producing coke-gas and by-products in part applicable for other purposes. Feb. 13.

2917*b*. P. Naef. Method and apparatus for producing coke-gas and by-products in part applicable for other purposes. Feb. 13.

2917*c*. P. Naef. Method and apparatus for producing coke-gas and by-products in part applicable for other purposes. Feb. 13.

2917*d*. P. Naef. Method and apparatus for producing coke-gas and by-products in part applicable for other purposes. Feb. 13.

3844. E. W. Lancaster. Apparatus for stirring or agitating the contents of and cleaning acetylene generators. Feb. 13.

4407. G. Stevenson. Apparatus for the generation and storage of acetylene gas. Feb. 13.

4736. A. H. Arozt. Gas for illuminating and heating purposes. Feb. 6.

4786. C. Morelle. Apparatus for generating acetylene gas. Jan. 30.

5945. T. L. Whitehead. Device for diminishing or increasing the light of a gas jet from a distant position. Feb. 13.

5989. W. P. Thompson.—From W. Karsten, Germany, Manufacture of incandescent mantles. Feb. 13.

6512. F. W. Jeffery. Burners for incandescent gas lighting. Feb. 13.

7210. C. A. von Welsbach. Osmium illuminating filaments. Jan. 30.

7596. W. P. Thompson.—From A. Simonini, United States. Lighting devices for causing the ignition of illuminating gases and vapours. Jan. 23.

8415. O. Münsterberg. Means of obtaining intense heat from limelight or other purposes. Feb. 20.

14,121. G. C. Marks.—From The General Electric Company, United States. Methods of and means for producing light. Jan. 30.

18,211. D. Chandler and S. B. Chandler. Revolving gas scrubbers and washers. Jan. 30.

19,267. S. A. Scheele. Improvements in or relating to incandescent gas burners. Jan. 23.

20,229. H. Shepherd. Acetylene gas generators. Feb. 13.

22,206. A. J. Boult.—From A. E. Grasset, France. Carburetters for air and gas. Jan. 30.

22,226. C. E. J. Berthold. Automatic gas lighters. Feb. 6.

22,491. C. Carpenter. Incandescent gas burners. Jan. 23.

22,492. C. Carpenter. Apparatus for fitting pegs to incandescent gas burners. Jan. 23.

22,853. D. W. Anderson, E. B. Shaw, J. F. Chalmers, and J. T. Wright. Heating systems. Feb. 13.

23,027. C. Carpenter. Igniting of incandescent gas burners. Jan. 23.

23,642. O. Reitz. Appliances connected with incandescent gas lighting apparatus. Feb. 13.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Application.

2105. J. Meikle. Improvements in the distillation of tar, and in apparatus therefor. Jan. 30.

Complete Specifications Accepted.

1900.

10,267. E. J. Duff. Destructive treatment of refuse or waste carbonaceous materials. Feb. 6.

1901.

279. F. Rauch. Manufacture of tar. Feb. 20.

IV.—COLOURING MATTERS AND DYESTUFFS.

Applications.

913. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of dyestuffs capable of giving on fibre shades fast against washing. Jan. 14.

922. H. Erdmann. An improved manufacture of indigo. Jan. 14.

999. J. Imray.—From La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, France. Manufacture of substantive black colouring matters. Jan. 15.

1357. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of colouring matters of the anthraquinone series. Jan. 21.

1358. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of colouring matters of the anthracene series. Jan. 21.

1644. T. R. Shillito. — From J. R. Geigy and Co., Switzerland. Sulphur dyestuffs. Jan. 24.

1766. F. Ullmann. Manufacture of diphenyl derivatives. Jan. 25.

1787. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of colouring matters on the fibre, and of products for use therein. Jan. 25.

2009. W. P. Thompson.—From the firm of Gebrüder Flick, Germany. Improvements in processes for the preparation of a soluble indigo paste. Complete Specification. Jan. 29.

2188. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacturing of colouring matters directly dyeing cotton. Jan. 31.

2397. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of disazo colouring matters. Feb. 4.

2592. R. B. Ransford. — From L. Cassella and Co., Germany. Improvements in the manufacture of dyestuffs from amidonitro-salicylic acid and in dyeing therewith. Feb. 6.

2839. J. Imray.—From La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, France. Manufacture of blue dyestuffs. Feb. 9.

2907. H. H. Lake.—From Farbwerke Mülheim vormals A. Leonhardt and Co., Germany. Improvements relating to the manufacturing of colouring matters. Feb. 11.

2913. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. The manufacture or production of new basic dyestuffs. Feb. 11.

3239. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new colouring matter and derivatives thereof, and the employment thereof in dyeing. Feb. 14.

3311. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. The manufacture or production of dyestuffs of the anthracene series. Feb. 15.

Complete Specifications Accepted.

1900.

1977. R. B. Ransford.—From L. Cassella and Co., Germany. Production of fast dyeings with dyestuffs containing sulphur. Feb. 6.

2195. W. W. Stolaroff. Manufacture of a permanent black acid-proof cotton dye. Jan. 30.

4115. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture and application of alizarin products for directly dyeing vegetable fibres. Jan. 30.

4677. R. B. Ransford.—From L. Cassella and Co., Germany. Production of mono-azo-dyes derived from amidonaphtholsulpho acids. Jan. 23.

5040. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of new aromatic compounds and colouring matters therefrom. Feb. 6.

5459. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of new halogen derivatives of the anthracene series, and colouring matters therefrom. Feb. 6.

5763. H. H. Lake.—From Farbwerke Mulheim vormals A. Leonhardt and Co., Germany. Manufacture and production of phenol glycin-carboxylic acid, and of derivatives thereof, and of intermediate products relating thereto. Jan. 23.

6053. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of new blue colouring matter. Feb. 20.

6628. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of the neutral esters of acetylphenylglycine-ortho-carbonic acid. Jan. 30.

7074. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of black colouring matter directly dyeing cotton. Jan. 30.

7075. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a black colouring matter directly dyeing cotton. Jan. 30.

7076. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a black colouring matter directly dyeing cotton. Jan. 30.

7292. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of blue trisazo dyestuffs. Feb. 13.

19,879. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Reduction of azo and nitro compounds. Jan. 30.

21,970. M. Lange. Dyestuffs, and processes for production of same. Jan. 30.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Applications.

1042. J. E. Prestwich. Improvements in the method of and apparatus for treating textile yarns and threads with liquids. Jan. 16.

1160. J. E. Bousfield, of the Firm of G. F. Redfern and Co.—From F. Cantù, G. Miglioretti, and G. Maffei, Italy. The manufacture of sheets, waterproof fabrics, imitation linen goods, and the like, from casein. Jan. 17.

1939. T. Kay and Kay Brothers, Limited. Improved utilization of waste felt. Jan. 29.

2055. A. Fielding. A new or improved process of dyeing and (or) filling textile yarns or fabrics. Jan. 30.

2056. A. Fielding. An improved manufacture of viscose (cellulose sulpho-carbonate) for certain purposes. Jan. 30.

2283. R. Weiss. Improvements in apparatus for treating textile materials with circulating fluids. Complete Specification. Filed Feb. 1. Date applied for July 3, 1900, being date of application in France.

2927. R. B. Ransford.—From L. Cassella and Co., Germany. Improvements in preventing the deterioration of dyed cotton. Feb. 11.

3330. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the treatment of raw silk, of mixed raw silk and woollen goods, and of mixed raw silk, and cotton goods. Feb. 15.

Complete Specifications Accepted.

1900.

3075. J. Woodhead and N. Thompson. Treatment of gummed silk waste to prepare it for spinning. Feb. 20.

3416. H. W. Kearns. Method of producing a silky lustre on cotton yarns or fabrics. Feb. 20.

6193. A. Mellor and H. E. Mowbray. Machines or apparatus for cleaning and lustreing yarns of silk and like fibres. Feb. 13.

16,161. W. R. Lake.—From C. F. Johnson, United States. Apparatus for use in connection with the mercerising of yarn. Feb. 6.

19,688. W. Urben. Recovering solvent from compounds or emulsions obtained in degreasing wool. Feb. 13.

23,722. H. H. Lake.—From National Package Company, United States. Manufacture of fibrous compositions. Feb. 6.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, and BLEACHING.

Applications.

939. E. Ashworth and J. Lindley. Improvements in apparatus used in the dyeing, bleaching, and treatment of cotton and other textile materials. Jan. 15.

1140. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. An improved process for dyeing paper fabrics. Jan. 17.

1159. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in printing textile materials with indigo. Jan. 17.

1285. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. An improvement in dyeing. Jan. 19.

1639. J. T. Short. Improvements in or connected with machines for washing, dyeing, or otherwise treating clothes, fabrics, and other fibrous materials. Jan. 24.

1834. J. Skoupil. Improvements in the process and apparatus for dyeing, bleaching, and finishing textiles and fibres. Jan. 26.

2182. J. Müller. A process for dyeing gloves and the like. Complete Specification. Jan. 31.

2393. R. B. Ransford.—From L. Cassella and Co., Germany. Improvements in dyeing with sulphide colours. Feb. 4.

2555. J. F. Riding. Improvements in the bleaching of vegetable textile materials and products. Feb. 6.

2565. R. E. Oldroyd, J. W. Tillotson, and S. S. Tillotson. Improvements in the method of and apparatus for cop dyeing and sizing. Feb. 6.

2631. J. E. Gilham and J. E. Musgrave. Improvements or devices in or in connection with piece dying, washing, and bleaching machines for the prevention of crimping and similar defects. Feb. 7.

3084. R. F. S. Molesworth. Improvements in the production of azo colours on cotton and other fibres. Feb. 13.

Complete Specifications Accepted.

1900.

2510. D. Stewart. Apparatus for driving, calico-printing, bleaching, washing, dyeing, finishing, and like machinery. Feb. 6.

4534. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Printing on raw silk or textile material containing raw silk. Feb. 13.

19,937. F. Shuman and C. Shuman. Mercerising machines. Jan. 30.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

1234. A. G. Bloxam.—From Chemische Fabrik Rhenania. Improvements in apparatus for the manufacture of nitric acid. Complete Specification. Jan. 18.

1385. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Improvements in the manufacture of sulphuric anhydride by the contact process. Jan. 21.

1491. C. G. Sudre and C. V. Thierry. Improvements in the treatment of oxides of metals or metalloids or compounds of same and products obtained therefrom. Complete Specification. Jan. 22.

1516. T. G. Webb and Webb's Patents, Ltd. Improvements in and connected with apparatus for concentrating sulphuric acid and other liquids. Jan. 23.

1842. C. Enoch. Improvements relating to the production of silicofluoride of sodium. Jan. 26.

1904. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture of sulphuric acid. Jan. 28.

2010. U. Wedge. A new or improved process and apparatus for the treatment of chemical compounds for oxidising or raising same to a higher oxide. Complete Specification. Jan. 29.

2039. E. C. Paramore. Improvements in the method of and apparatus for generating, treating, and utilising chlorine gas. Complete Specification. Jan. 29.

2282. C. L. Gelstharpe and F. Gelstharpe. A method of recovering tin and producing copperas from waste tin cuttings or other substances containing tin, and apparatus therefor. Complete Specification. Feb. 1.

2342. H. Precht. An improved process for the production of potassium magnesium carbonate. Feb. 4.

2368. O. Imray. — From Farbwerke vormals Meister, Lucius und Brüning, Germany. Improvements in the manufacture of sulphuric anhydride by the contact process. Feb. 4.

2407. A. Germot and H. E. L. Fiévet. Process of and apparatus for treating metallic sulphides. Feb. 4.

2504. G. F. Jaubert. Improvements in the manufacture of alkaline earth dioxides. Complete Specification. Feb. 5.

2719. C. R. Lindsey. Improvements in the manufacture of lead acetate. Feb. 8.

2915. J. Boulton. Improvements in and relating to the manufacture of potassium cyanide and sodium cyanide. Feb. 11.

3071. E. M. Taylor. Alkali creosolate compound for bleaching and scouring. Feb. 13.

3305. A. G. Bloxam.—From Chemische Fabrik Rhenania, Germany. Improved manufacture of nitric acid, and apparatus therefor. Feb. 15.

3327. H. Rabe. Process for the production of anhydrous sulphuric acid. Complete Specification. Feb. 15.

3328. G. W. Johnson.—From The Deutsche Gold und Silber Scheide Anstalt vormals Rössler, Germany. Improvements in the manufacture or preparation of cyanide and its compounds. Feb. 15.

3329. G. W. Johnson.—From The Deutsche Gold und Silber Scheide Anstalt vormals Rössler, Germany. Improvements in the manufacture or preparation of alkali cyanides. Feb. 15.

3392. J. G. Behrens. Improved process for manufacturing chemically pure acetic acid. Complete Specification. Feb. 16.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

4272. J. Potut. Means of and apparatus for the manufacture of sulphuric acid. Feb. 20.

4712. J. Hargreaves. Manufacture of chlorides and oxides. Feb. 13.

5644. F. M. Spence. D. D. Spence, and H. Spence. Manufacture of aluminous compounds. Feb. 6.

5808. J. Künsdner. Manufacture of carbonate of soda crystals. Feb. 20.

9343. G. N. Vis. Vacuum evaporating apparatus for separating common salt (chloride of sodium) from solutions, especially from brine. Jan. 23.

17,928. A. C. Johnson. Processes for producing sulphuric acid. Jan. 30.

21,557. M. Meslan. Apparatus for the production of fluorine and the like. Feb. 6.

23,781. E. W. Engels. Process for the production of carbonic oxide. Feb. 13.

VIII.—GLASS, POTTERY, AND ENAMELS.

APPLICATIONS.

1055. L. A. Garchey. Improvements connected with the manufacture of glass stone. Jan. 16.

1976. C. Franklin. A method of ornamenting and decorating figured, rolled, or other glass. Jan. 29.

1985. A. H. Fuller.—From A. Navarein, France. Improvements in glass decorations, transparencies, and the like. Jan. 29.

3100. R. D. Lucas. Improvements in or relating to the decoration of china, earthenware, glass, enamelled iron ware, and the like. Feb. 13.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

2656. G. A. J. Schott. Pumping apparatus for slip and glazes used in the manufacture of pottery and for other purposes. Jan. 23.

5344. A. H. Corn. Construction or shape of appliances or "thimbles" for use in supporting ceramic ware or pottery ware whilst being fired. Feb. 6.

6376. S. B. Furnival. Clay or filter-presses used in the manufacture of china and earthenware. Feb. 13.

6926. L. M. Regle. Glass-melting pots or crucibles. Jan. 30.

16,610. The Automatic Glass-Blowing Patents Syndicate, Ltd.—From H. J. Colburn, United States. Glass-blowing machines. Jan. 23.

16,613. The Automatic Glass-Blowing Patents Syndicate, Ltd.—From H. J. Colburn, United States. Glass-blowing machines. Jan. 23.

21,148. B. J. B. Mills.—From Société Anonyme des Enduits Archambault, France. Treatment of carboys, bottles, and other articles of glass, pottery, and the like, and of casks and other vessels of wood or other permeable materials, and of cork bungs and stoppers. Jan. 23.

23,879. G. von dem Borne and W. von Debschütz. Manufacture of polychrome ornamented glazed or similar ceramic ware. Feb. 6.

1901.

210. R. B. Ransford.—From Société Parisienne de Céramique, France. Ornamenting ceramic ware. Feb. 13.

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

APPLICATIONS.

945. T. Oddy. An improved method of manufacturing Portland slag cement. Jan. 15.

1055. L. A. Garchey. *See* Class VIII.

1266. R. B. Rigby. Improvements in the manufacture of Portland cement. Jan. 19.

1479. H. H. Lake.—From D. Wachtel and Co., Germany. Improvements relating to the production of slaked lime. Complete Specification. Jan. 22.

2409. H. E. Rüsager. Improvements in the manufacture of Portland cement. Feb. 4.

2499. J. Wilkinson. Improvements in the manufacture of slabs or plates, suitable for use as building material, and for other purposes. Feb. 5.

2550. R. Walker. Improvements in kilns for calcining Portland cement, and the like. Feb. 6.

2861. V. Barreto. New or improved apparatus for slaking lime. Complete Specification. Feb. 9.

3101. F. Howett. Improvements in or relating to artificial stone, in situ pavements, floors, walls, ceilings, and the like. Feb. 13.

3153. F. H. Brooke. Improvements in the manufacture of silica bricks and blocks. Feb. 14.

3271. N. T. Ashton, J. Crompton, and J. D. Kelly. Improvements in hydraulic cement. Feb. 15.

3282. S. S. Bromhead.—From G. Möller and P. Pfeiffer, Germany. Process for the manufacture of solid blocks of cement out of cement slush. Complete Specification. Feb. 15.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

2739. A. W. Green. Construction of fireproof floors and roofs. Feb. 20.

5297. G. H. F. E. M. Drenckhahn and C. H. A. C. Sudhop. Manufacture of pipes of cement or the like material. Jan. 23.

5922. W. Lessing and D. Rheinfeld. Process for burning cement, gypsum, or the like, and apparatus therefor. Jan. 23.

16,307. H. Seifarth. Preparation of artificial stone. Feb. 13.

23,040. C. Krause and A. Beddies. A process for the impregnation of wood and fibrous substances. Feb. 20.

X.—METALLURGY.

APPLICATIONS.

930. C. Diesler. Improved process of smelting and reducing metals. Complete Specification. Jan. 14.

952. S. Davis. Improvements in the process of stripping tinned-scrap and spelter-scrap. Complete Specification. Jan. 15.

1099. J. G. Lorrain.—From G. Thompson. Improvements in or connected with the manufacture of steel and its alloys containing steel or to be used therewith. Jan. 16.

1375. G. Grunauer. An improved manufacture of cast iron. Complete Specification. Jan. 21.

1376. D. Davies. Improved manufacture of iron, steel, and wrought iron. Jan. 21.

1403. S. Cowper-Coles. An improved apparatus for the electrolytic production of copper tubes and sheets. Jan. 22.

1699. G. B. Hammond and T. Dennis. Improvements in means or apparatus for use in connection with the coating of metal plates or sheets with tin lead of other metals or alloys. Jan. 24.

1738. W. Pethybridge. Improvements in the treatment of telluride gold ores. Jan. 25.

1758. H. H. Lake. From A. G. Betts, United States. Improvements relating to the refining of lead. Complete Specification. Jan. 25.

2237. E. E. Johnson and H. L. Sulman. Improvements in precipitating precious metals from their solutions. Feb. 1.

2255. C. J. Head. Improvements in the methods of chlorination for the extraction of metals from their ores, concentrates, tailings, slimes, and the like. Feb. 1.

2286. W. J. Foster. Improvements in the manufacture of iron in blast furnaces. Feb. 1.

2632. H. W. Williams. An improvement in cupolas and blast furnaces. Feb. 7.

2677. A. A. Crosby. Improvements relating to crucibles or retorts more particularly designed for use in connection with the treatment of ores. Complete Specification. Feb. 7.

2756. H. Leyendecker. An improved process for diminishing the solubility of lead in acids and other chemical compounds. Feb. 8.

2781. E. Kikut. Improvements in or relating to blast devices for furnace and for other purposes. Feb. 8.

2782. J. C. Butterfield. Improvements in obtaining zinc from its ores. Feb. 8.

2939. C. Haber and A. Savelsberg. Apparatus to be employed in the treatment of molten lead, copper, and other metals. Feb. 11.

3009. E. M. Totten. Improvements in and relating to a composition of matter for uniting or soldering aluminium parts. Complete Specification. Feb. 12.

3044. F. C. H. Pape and W. S. Henneberg. Improvements in crushing and lixiviating ores and metallurgical products. Complete Specification. Feb. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

1082. C. F. Mendham.—From W. L. Bailey and P. Murray, China. Apparatus for working tin-plate and like material. Jan. 23.

4941. C. L. Bell. Apparatus for casting metals. Jan. 23.

4961. R. Weidner. Alloy, and process of producing the same. Feb. 13.

7026. P. Bergsöe. Process for obtaining pure tin from tinned sheet iron waste and other materials coated with or containing tin, and for refining raw tin. Feb. 13.

7028. C. Kellner. Extraction of zinc from waste products. Feb. 13.

8184. C. Goedecke, jun.—From C. Goedecke, Germany. Blast furnaces for smelting dusty and fine granular iron ore. Jan. 30.

17,027. C. M. Westman. Method of and apparatus for treating ores. Feb. 13.

17,189. A. Simon. Treatment of copper ores or minerals for the obtainment of copper and other metals therefrom, and the recovery and treatment of by-products of the process. Feb. 13.

17,190. A. Simon. Apparatus for the production of manganese, ferromanganese, and alloys of manganese. Jan. 23.

17,594. F. W. Preto. Process of extracting tin from tin-plate and the like waste. Feb. 20.

19,400. R. W. James.—From The Bethlehem Steel Company, United States. Method of and means for determining and controlling the temperature of highly heated bodies. Feb. 13.

19,401. R. W. James.—From The Bethlehem Steel Company, United States. Means for ascertaining the temperature of highly heated receptacles or objects. Feb. 13.

19,402. R. W. James.—From The Bethlehem Steel Company, United States. Metal baths for tempering tools and the like. Feb. 13.

20,469. P. Rogers and J. Player. Machinery or apparatus for coating metal plates or sheets with tin or other metals or alloys. Feb. 13.

21,195. D. Laird. Assay furnace. Jan. 30.

21,345. L. Mach. Process of manufacturing aluminium alloy. Jan. 30.

23,403. G. Huth.—From F. Pich, Germany. Flux for brazing. Feb. 13.

23,477. A. J. Boult.—From E. C. Pohlé and S. Croasdale, United States. Processes for the Reduction of refractory ores. Feb. 13.

23,803. J. E. Jasset and A. E. Cinqualbre. Process for depositing nickel and other metals upon metallic surfaces. Feb. 20.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

APPLICATIONS.

1484. S. O. Cowper-Coles. Improvements in means to be employed in the electro-deposition of metals. Jan. 22.

1849. A. Brochet and G. Ranson. Process for the electrolytic preparation of the bases of the alkaline earths. Jan. 26.

1890. J. T. Niblett. Improvements in electric storage batteries or accumulators. Jan. 28.

1966. H. Rose, J. Halifax, and C. H. Antrobus. Improvements in and connected with positive rods for secondary electric batteries. Complete Specification. Jan. 29.

1981. J. T. Niblett. Improvements in electric storage batteries or accumulators. Jan. 29.

2363. F. Landolt. Electrode for galvanic cells. Feb. 4.

2490. T. A. Edison. Improvements in storage batteries. Complete Specification. Feb. 5.

2505. A. P. Strohmenger and A. B. Pescatore. Improvements in and in apparatus for obtaining metals by electrolysis. Feb. 5.

2587. G. Rosset. Improvements in electric batteries. Feb. 6.

2853. G. W. Johnson.—From Société Paul Chapuy and Co., France. Improvements in electric batteries. Feb. 9.

2933. C. A. Wilde. Improvements in electrodes for secondary batteries or accumulators. Feb. 11.

2941. L. Gottscho. Improvements in thermo-electric batteries. Feb. 11.

3192. P. Jurie. Improvements in electric furnaces. Complete Specification. Feb. 14.

3313. W. P. Thompson.—From Société Mangano Electrique pour la purification des eaux et des boissons, France. Purifying beverages and liquids by means of manganates under influence of the electric current. Complete Specification. Feb. 15.

3370. J. Liddle.—From The Globe Electric Company, United States. Improvements in battery electrodes. Complete Specification. Feb. 16.

3391. R. F. Yorke. Improvements in secondary batteries. Feb. 16.

3401. S. O. Cowper-Coles. Improvements in apparatus for use in the electro-deposition of metals. Feb. 16.

3402. S. O. Cowper-Coles. Improvements in apparatus for use in the electro-deposition of metal upon tubes. Feb. 16.

3411. M. Pisca. Improvements relating to electric accumulators. Feb. 16.

3416. W. Erny. Improvements relating to the construction of electrodes containing zinc for use in electric batteries, and method of producing and employing the same. Feb. 16.

3417. W. Erny. Improvements in galvanic batteries. Feb. 16.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

1566. M. Wuillot. Accumulator plates. Jan. 30.

2783. J. Y. Johnson.—From The Deutsche Gold und Silber Scheide Anstalt vormals Roessler and Birger Carlson, Germany. Electrical arc furnaces. Feb. 13.

2994. M. Kugel. Process for the electrolytic deposition of nickel or its allied metals. Jan. 30.

5016. T. J. Holland and A. P. Laurix. Porous diaphragms for electrolytic apparatus. Feb. 13.

19,099. J. Myers. Electrode for accumulators of electricity. Feb. 20.

21,149. J. Meurant. Electrolytic process for the precipitation of metals and alloys from their solutions, as also for the deposition of metals or alloys or other metals or alloys or on other substances. Feb. 13.

22,605. T. Müller. Plate holders for electric accumulators. Jan. 23.

22,606. T. Müller. Process for chemically consolidating the active material of electric accumulators. Jan. 23.

22,607. T. Müller. Electric accumulator cells. Jan. 23.

23,106. C. A. Allison.—From The Waterbury Battery Co., United States. Galvanic batteries. Feb. 20.

23,107. C. A. Allison.—From The Waterbury Battery Co., United States. Galvanic batteries. Feb. 20.

23,743. E. Tiquet. Battery cells. Feb. 20.

1901.

484. H. H. Lake.—From Globe Electric Co., United States. Secondary electric batteries. Feb. 13.

XII.—FATS, OILS, AND SOAP.

APPLICATIONS.

1014. J. W. Warren. Improvements in method for clarifying hydrocarbon oils. Complete Specification. Jan. 15.

1379. P. H. Joselin and J. Crichton. Obtaining blown oil. Complete Specification. Jan. 21.

1386. A. Kronstein. Improvements in oxidising wood oil and mixtures thereof. Complete Specification. Jan. 21.

1387. A. Kronstein. Improved process for thickening wood oil and manufacturing viscid bodies therefrom. Complete Specification. Jan. 21.

2011. A. W. Burwell. Improvements in oleaginous compounds or oils for tinning baths, and method of producing the same. Complete Specification. Jan. 29.

2847. L. M. B. Raynaud. An improved composition for the manufacture of soap for use in sea water. Complete Specification. Feb. 9.

2897. F. T. F. Wilson. A new or improved gun or rifle oil or lubricant. Feb. 11.

3375. R. J. Jordan. Improved cleaning soap. Feb. 16.

COMPLETE SPECIFICATIONS ACCEPTED.

1899.

23,539. S. Dyson and J. Gaskell. Manufacture of saponaceous products from petroleum or other mineral oils. Feb. 6.

1900.

3716. S. von Greave and A. Reinecken. Process of manufacturing oxidising agents from fats or fatty acids for converting hydrocarbons into fats or fatty acids. Jan. 30.

6909. J. C. W. Stanley and The Cotton-Seed Oil Syndicate, Ltd. Treatment of cotton seed. Feb. 13.

9872. E. Maertens. Art of separating solvents from oily, fatty, waxy, soapy, or emulsified solutions of the same. Feb. 20.

21,468. R. Haddan.—From E. R. Edson, United States. *See* Class XIV.

21,469. R. Haddan.—From E. R. Edson, United States. Rendering apparatus. Feb. 6.

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

Applications.

960. W. M. Walters. Improvements in compositions or cements for coating surfaces. Jan. 15.

1399. W. B. Middleton. An improvement in the treatment of zinc oxide. Jan. 22.

2116. O. Imray.—From International Acheson Graphite Company, United States. A process for manufacturing graphite. Complete Specification. Jan. 30.

2295. J. B. Hannay. Improvements in water paints. Feb. 1.

2297. J. B. Hannay. Improved process and apparatus for manufacturing a white pigment of lead. Feb. 1.

2362. A. Gutensohn and T. Cupper. Improvements in the method of, and an apparatus for producing litharge from metallic lead. Feb. 4.

2429. H. McMurtry. Improvements in compositions for polishing leather or the like. Feb. 5.

2796. W. B. Middleton. Improvements in and connected with the manufacture of zinc compounds applicable more particularly to that of zinc paint. Feb. 9.

2819. G. Cope. *See* Class I.

2842. G. W. Flather. Improvements relating to the manufacture of varnish. Complete Specification. Feb. 9.

Complete Specifications Accepted.

1900.

2774. G. Bischof. Conversion of white lead into oil paste, and apparatus for that purpose. Feb. 13.

4615. E. Schaal and M. Schaal. Manufacture of a substitute for gum, copal, and amber. Jan. 23.

20,725. H. H. Lake.—From R. A. Worstall and C. F. Hackathorn, United States. Manufacture of varnish. Jan. 23.

21,553. F. Gerhardt. Binding substances for colouring matters, and protective coatings or paints. Feb. 13.

23,603. A. J. Boult.—From P. C. Ralli, H. Mayer, and L. Toch, United States. Compound to be used as a substitute for gutta-percha. Feb. 6.

XIV.—TANNING, LEATHER, GLUE, and SIZE.

Applications.

2645. J. Pate. An improved sizing preparation. Feb. 7.

3062. G. S. Falkenstein and C. Falkenstein. Improvements in the art of making artificial leather. Complete Specification. Feb. 12.

Complete Specifications Accepted.

1900.

2479. A. Thompson and E. Blin. Manufacture of tanning liquids. Jan. 30.

2972. A. J. Boult.—From The Fosslitch Leather Company, United States. Artificial leather. Feb. 13.

17,966. L. L. Kelsey. Process of making glue, and products resulting therefrom. Jan. 30.

21,468. R. Haddan.—From E. R. Edson. Obtaining gelatine and oil from fish and other gelatine-yielding and oil-yielding material. Jan. 23.

23,250. J. Wezel. Preparation of a substitute for animal glue. Feb. 20.

XV.—MANURES, &c.

Applications.

2035. C. Beyer. An improved machine for the distribution of artificial manure. Jan. 29.

2133. T. Gray. An artificial manure for the preserving of crops from destruction by wire worm and other pests. Jan. 31.

2335. J. Ostersetzer. Improvements in the manufacture of artificial manures. Feb. 4.

3178. J. Hughes. Improvements in the treatment of superphosphate for fertilizing purposes. Feb. 14.

XVI.—SUGAR, STARCH, and GUM, Etc.

Applications.

1390. J. Clark. Improvements in the manufacture of brewing sugar. Jan. 21.

2251. L. Wenghöffer. Improvements in the treatment of gluten to render it more stable or durable and suitable for transport. Complete Specification. Feb. 1.

2294. G. W. Johnson.—From M. Leconte and Compagnie Electro-Sucrière, France. Improvements in the manufacture of rice-starch and other amylaceous compounds. Feb. 1.

Complete Specification Accepted.

1900.

6972. W. Prampolini. Process for manufacturing elastic gum. Feb. 20.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

931. B. Fischer. Improvements in apparatus to promote the germination of malt. Complete Specification. Jan. 14.

933. Spiritine Ltd. and H. Ballantyne. Improvements in the manufacture of solidified spirit. Jan. 14.

983. O. Rippich. *See* Class I.

997. F. Knüttel and The Berliner Actiengesellschaft für Eisengiesserei und Maschinenfabrikation. Process of curing raw malt. Jan. 15.

1599. K. Enzinger.—Of The Filter and Brautechnische Maschinen-Fabrik Actiengesellschaft. Process and arrangement for filling casks. Jan. 23.

1774. T. Ingham. Improvements in fining or purifying beer and other alcoholic beverages, and in extracting and purifying alcohol. Jan. 25.

2026. C. G. Sudre and C. V. Thierry. Improvement for the treatment of distillers' spent residues or wash, and apparatus therefor. Complete Specification. Jan. 29.

2311. A. Mambré. Improvements in drying and curing malts and other cereals. Feb. 4.

2501. A. de Schepper. Improvements in machines for malting purposes. Feb. 5.

2680. O. Francke. Improvements in and relating to apparatus for the continuous production of malt. Feb. 7.

2690. F. Grötte. Process of preserving beer. Complete Specification. Feb. 7.

3194. B. E. R. Newlands. *See* Class A.

Complete Specifications Accepted.

1900.

1228. E. A. Barbet. Production of alcohol and of pressed yeast by the aid of sugar-forming organisms. Jan. 30.

2333. S. Dymond. Apparatus for germinating and preparing all grain for brewers, distillers, and the like. Jan. 23.

3522. C. G. Sudre and C. V. Thierry. Treatment of distillers' spent residues or wash. Feb. 13.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

1057. E. D. Bell. Improvements in alimentary preparations. Jan. 16.

1573. H. Iscovesco. An improved process for refining and sterilising butter. Jan. 23.

3043. P. G. Richter. Improvements in preserved food products, and the process of preparing the same. Complete Specification. Feb. 12.

3194. B. E. R. Newlands. Improvements in the drying or roasting or smoking of malt, hops, hams, or other alimentary matters. Feb. 14.

3197. I. Klimont. Process for the manufacture of improved artificial butter (margarine). Feb. 14.

B.—Sanitation; Water Purification.

1021. B. H. Thwaite. The destruction of bacteria in sewage, and apparatus therefor. Jan. 16.

1555. W. Defries. Improved means of improving or purifying water in respect of its gaseous contents. Jan. 23.

1616. R. Malabar. Improved means of purifying sewage. Jan. 24.

1777. O. Schmidt. Improvements in apparatus for purifying effluents. Complete Specification. Jan. 25.

1913. A. M. Clark.—From O. Fromme, Germany. Improved method of and means for the pasteurisation of liquids. Jan. 28.

2243. J. Westaway. A new or improved filtering apparatus applicable for the treatment of sewage, yeast, the by products of manufacturing processes, and the like. Feb. 1.

C.—Disinfectants.

1520. J. H. Pollok. An improved carbolic disinfectant. Jan. 23.

1984. G. C. Fowler, M. A. Fowler, and E. J. Fowler. Improvements in disinfectants, perfumes, insect and vermin destroyers, and the like, and in the preparation and manufacture of the same. Jan. 29.

Complete Specifications Accepted.

1900.

A.—Foods.

6022. J. P. Tomlin. Antiseptic process for the preservation and packing of eggs. Feb. 13.

16,199. E. W. Morris. Diabetic sugar-free milk. Feb. 20.

B.—Sanitation; Water Purification.

5809. W. Pirrie. Appliance for sterilising liquids. Feb. 13.

20,625. J. Kroog. Sterilisation of liquids. Jan. 30.

C.—Disinfectants.

5981. A. Zimmermann.—From The Chemische Fabrik auf Actien vormals E. Schering, Germany. Antiseptics. Feb. 20.

XIX.—PAPER, PASTEBOARD, Etc.

Application.

2601. H. J. H. Fenton. Process for the production of bromo-methyl-furfural from cellulose. Feb. 6.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

1467. J. Takamine. Improvements in glandular extractive products consisting of the active principle of the suprarenal glands, and the process of producing the same. Complete Specification. Jan. 22.

2899. E. Wirth. Manufacture of a nitro-derivative of carbazole from nitroso-carbazole. Complete Specification. Feb. 11.

3217. L. Weil. Obtaining saponine from horse-chestnuts. Complete Specification. Feb. 14.

3287. C. Bauer.—From L. Lederer, Germany. An improved process of forming triacetate of pyrogallol. Feb. 15.

3394. J. Wetter.—From F. Rose, Germany. Improvements relating to the preservation and concentration of fruit juice, or to the manufacture of fruit extracts. Feb. 16.

Complete Specification Accepted.

1900.

9872. E. Maertens. *See* Class XII.

XXI.—PHOTOGRAPHY.

Applications.

1092. R. Wedmann. An improved process for producing stippled or grained photographic pictures directly from photographic negatives or diapositives. Jan. 16.

1168. J. A. Hicks. A chemical compound for use as a special toning bath in connection with photography. Jan. 18.

1818. W. J. McConnell. Improvements in and relating to photography. Jan. 26.

2637. W. G. Perks and H. G. M. Fletcher. An improved method of separating flexible photographic films, cards, and the like. Feb. 7.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

984. C. H. Curtis, C. L. Watson Smith, D. J. Metcalfe, A. C. Pearcy, and A. F. Hargreaves. Improvements in explosives. Jan. 15.

2014. H. Geary and E. Neal. Improvements in packing and storing explosives, and in the manufacture of shells, mining fuses, and the like. Jan. 29.

2253. J. B. Bernadou. Improvements in smokeless explosives or colloids, and process for making the same. Complete Specification. Feb. 1.

2339. D. Bachrach. Improvements in nitro-cellulose and similar compounds, and process of making the same. Complete Specification. Feb. 4.

2367. A. Luck. Improvements in the manufacture of explosives. Feb. 4.

2650. J. C. Schrader. Improvements in and relating to machines for mixing explosive compounds. Complete Specification. Feb. 7.

Complete Specifications Accepted.

1900.

1888. G. Beneké. Factories for the manufacture of explosives. Feb. 6.

2448. K. Wiessner and M. Wiessner. Machine for the manufacture of wax matches. Feb. 13.

4593. W. D. Borland. Manufacture of nitro-explosives. Jan. 23.

8462. A. Reichwald.—From the Firm of F. Krupp, Germany. Time fuses. Feb. 20.

21,065. L. Wöhler. Detonators. Feb. 20.

23,252. P. M. Justice. From The International Smokeless Powder and Dynamite Co., Ltd., United States. Smokeless powder in the process of manufacturing the same, and in apparatus therefor. Feb. 13.

PATENT UNCLASSIFIABLE.

Application.

2679. A. Kronstein. Process for rendering materials proof against the action of moisture and of chemical agents. Complete Specification. Feb. 7.

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