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YEAR-BOOK OF PHARMACY

COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1888, TO JUNE 30,

1889.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL

CONFERENCE

AT THE

TWENTY-SIXTH ANNUAL MEETING

HELD AT

NEWCASTLE-ON-TYNE,

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OF THE

British Pharmaceutical Conference.

1888-89.

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INTRODUCTION.

ERRATA.

Page 129, line 12, *for* Cyripedium *read* Cypripedium.
,, ,, ,, 22, *for* senega *read* senegin.
,, 163, lines 37 and 39, *for* Glabre *read* Glaber.
,, 164, line 41, *for* strophantine *read* strophanthin.
,, 183, ,, 16, *for* $C_{10}H_{16}O$ *read* $C_{10}H_{18}O$.
,, 194, ,, 3, *for* H. Marpmann *read* G. Marpmann.
,, 207, ,, 28, *for* Antharobin *read* Anthrarobin.
,, 218, ,, 14, *for* Diatase *read* Diastase.

phanthus seeds contain, in addition to strophanthin, a nitrogenous glucoside yielding an alkaloid when treated with acids. Dr. Fraser's latest researches distinctly point to the absence of any alkaloid both in the seeds and the alcoholic extract, and to the non-formation of such a body as a decomposition-product of strophanthin. They show that pure strophanthin, the active principle of the seeds, has a composition corresponding to the formula $C_{16}H_{26}O_8$, and that its decomposition by acids results in the formation of glucose and strophanthidin, a crystallizable, bitter, neutral body resembling strophanthin in its physiological action. The alcoholic extract is stated to contain about 63 per cent. of impure strophanthin, 16 per cent. of mucilage, and 14 per cent. of resin.

The lead precipitate from an aqueous solution of the alcoholic extract is shown to yield an acid constituent which is described under the name of "kombic acid." In a communication to the same meeting by T. Christy, it is stated that the seeds of *Strophanthus glaber* yield a "crystallizable alkaloid," and that these seeds were the same as those employed in the researches of Hardy, Gallois, and Polaillon, who likewise asserted the presence of such a base. Arnaud, reporting on the same seeds, ascribes their activity to the presence of a crystallizable glucoside apparently identical with ouabaïn, which exhibits toxic effects strikingly similar to those of strophanthin.

The conversion of hyoscyamine into atropine under the influence of alkalies has been further investigated by W. Will and G. Bredig, who arrive at the conclusions that this change is due to catalytic action, and that atropine is an optically active base. A. Ladenburg, on the other hand, regards atropine as optically inactive, and as standing in the same relation to hyoscyamine as racemic acid does to lævotartaric acid. He is inclined to think that the supposed formation of atropine from hyoscyamine may be due to the employment of impure materials, and that this conversion, although possible, has not yet been actually accomplished.

The results of a study of the products of fractional precipitation of strychnine by means of potassium platinoso-chloride lead Dr. Koefoed to infer that the commercial alkaloid contains in addition to strychnine, $C_{21}H_{22}N_2O_2$, a base of the formula $C_{22}H_{24}N_2O_2$, for which he suggests the name "homostrychnine." For similar reasons he considers himself justified in regarding commercial brucine as a mixture of two alkaloids, differing appreciably from each other in their molecular weights. Another research on strychnine, by W. F. Loebisch and H. Malfatti, deals with the decomposition-products obtained in the distillation of the alkaloid with lime and alkalies.

O. Hesse and D. B. Dott are still at variance with regard to the proportion of water of crystallization contained in morphine, the former chemist remaining of opinion that the composition of the crystallized alkaloid corresponds to the formula $C_{17}H_{19}NO_3 + H_2O$, while the latter declines to accept the reasons advanced in support of this view as a conclusive proof of the incorrectness of his formula, $8\,C_{17}H_{19}NO_3 + 9\,H_2O$. The gradual formation of a yellow crystalline deposit in certain solutions of morphine is attributed by M. Neuss to the formation of oxydimorphine, a change which is said to be much favoured by the action of light. With refer-

ence to the synthetical preparation of codeïne from morphine by substituting a methoxyl-group for a hydroxyl-group, A. Knol shows that methyl sulphate may be advantageously substituted in this process for the methyl chloride usually employed, and that a product of very great purity may be thus obtained. E. Merck calls attention to some difficulties attending the preparation of perfectly pure narceïne, and particularly to the tenacity with which this alkaloid retains hydrochloric acid, showing at the same time that the presence of a small proportion of this acid greatly lowers the melting-point of the base. Some of his statements are adversely criticised in a paper read by D. B. Dott at the recent meeting of the British Pharmaceutical Conference. A report on narcotine by W. Roser is a continuation of this author's work on the derivatives of this base, and is chiefly confined to the consideration of products having cotarnine for their starting-point. The oxidation-products of papaverine have again received the attention of G. Goldschmidt, who has also continued his researches on the constitution of this alkaloid.

The cinchona alkaloids form the subject of a further report by Z. H. Skraup, in which it is stated that the "second half" of quinine has the same constitution as that of cinchonine, and that the chemical difference between these two alkaloids amounts to this, that quinine is a derivative of paramethoxyquinoline, whilst cinchonine is a derivative of quinoline itself. H. Schniderschitsch directs attention to the very close analogy existing between cinchonine and cinchonidine, and inclines to the opinion that both alkaloids contain the same two constituent groups, and that their isomerism, if not purely physical, is due to some slight difference in the manner in which the two nuclei are combined together. B. H. Paul and A. J. Cownley publish the results of analyses of twenty-three commercial samples of quinine sulphate, showing that in nearly half of these the amount of cinchonidine sulphate ranged from 6 to 12 per cent., a proportion exceeding the limits of impurity allowed by the standard of the British Pharmacopœia. They again point out that the official recrystallization test may lead to very fallacious results, partly on account of the use of acid in dissolving the sulphate, and partly on account of the large volume of mother-liquor with which the operation of testing is performed. The omission of all acid and a suitable concentration of the mother-liquor are insisted upon as indispensable conditions to insure accuracy of the test. Cupreine, the characteristic alkaloid of the bark of *Remijia pedunculata*, has been reinvesti-

gated by A. Oudemans, whose results confirm generally the statements of O. Hesse.

The literature of coca bases has again received valuable contributions. C. Liebermann and F. Giesel record the important observation that isatropyl-cocaïne and other hitherto valueless and troublesome by-products obtained in the extraction and purification of cocaïne split up on boiling with hydrochloric acid into ecgonine, and that the latter by suitable treatment with benzoic anhydride, can be readily converted into benzoyl-ecgonine, which in its turn may be changed into cocaïne by the introduction of a methyl group. The cocaine thus prepared is identical in all respects with the natural base. A. Einhorn and J. Klein effect the practical synthesis of cocaine by passing a current of dry hydrochloric acid gas into a methyl alcohol solution of ecgonine, and subsequently converting the resulting methyl-ester into cocaine by digesting the hydrochloride with benzoyl chloride. O. Hesse supplies further information respecting the alkaloid described by him under the name of cocamine, the composition of which he represents by the formula $C_{19} H_{23} N O_4$. The amorphous bases contained in genuine coca (*Erythroxylon Coca*) are regarded by him as benzoyl compounds of an oily non-volatile base and cocamine; while those from other coca varieties are stated to consist of cocamine and the cinnamyl compound of the oily base. Both are said to yield hygrine. The latter (hygrine) is shown by C. Liebermann to be resolvable by fractional distillation into two distinct bases, both differing from Hesse's hygrine in containing oxygen.

The discovery of a second alkaloid in tea is announced by A. Kossel. It is described by him under the name of theophylline, and stated to be dimethyl-xanthine. Indications of the existence of such an alkaloid had previously been obtained by B. H. Paul and A. J. Cownley in an examination of a sample of Himalayan tea. The presence of theobromine in this kind of tea, alleged by Liebig and Zöller, has not been confirmed. A research on caffeine by R. Leipen reveals the fact that the oxalate of this base, unlike other caffeine salts, is a remarkably stable compound which can be repeatedly recrystallized from water without suffering decomposition.

M. Arndt reports the existence in ipecacuanha of a second alkaloid, which he describes as a crystallizable volatile ammonium base yielding a fluorescent solution with water. The proportion of this constituent does not appear to exceed 0·5 per cent. of the weight of the root.

Berberine and some of its compounds and decomposition-products have been studied by W. H. Perkin, P. Marfori, and S. Hoogewerff and W. A. van Dorp. In the opinion of the two last-named chemists it is not unlikely that this alkaloid may prove to be a derivative of isoquinoline. The close relation between hydrastine and narcotine, first observed by Freund and Will, and subsequently by E. Schmidt, is now still further demonstrated by the latter in conjunction with F. Wilhelm; and though the conversion of one of these alkaloids into the other has not yet been accomplished, such a result may fairly be anticipated as an event of the near future. Additional light has also been thrown on the relations existing between colchicine and colchiceine through the labours of M. Johanny and S. Zeisel. Among other vegetable alkaloids and active principles which during the past year have been investigated or re-investigated may be named chelidonine, physostigmine, eseridine, ulexine, ergotinine and cornutine, wrightine, harmine and harmaline, chelerythrine, sanguinarine, anagyrine, fumarine, scopoletin, picrotoxin, andromedotoxin, quassin, methysticin, cubebin, arganin, and syringin.

W. Johannsen furnishes some interesting information respecting the distribution of amygdalin and emulsin in bitter almonds, which at once explains the fact that no action takes place between these principles in the seed. It is shown that emulsin is contained in the radicles and also in the fibrovascular bundles of the cotyledons, but is absent from the parenchymatous tissue of the curved sides of the cotyledons, while amygdalin is entirely confined to the parenchyma cells of the cotyledons.

The occurrence of skatole in the wood of *Celtis reticulosa*, observed by W. R. Dunstan, will be noted with interest since this body—well known as a decomposition-product of animal proteïd—appears not to have been met with before in the vegetable kingdom.

Cod-liver oil is reported by H. Marpmann to contain a peculiar constituent precipitable by alcohol or ether, which in aqueous solution is capable of imparting to other fats the assimilative properties of cod-liver oil. It is stated to be identical with a substance obtained by the same process from pancreatic juice which likewise possesses the property of causing fatty oils to emulsify with water. A. Gautier and L. Mourgues supplement their previous account of aselline and morrhuine, the alkaloids extracted by them from cod-liver oil, and also give a description of a new acid constituent of this oil, which they name morrhuic acid.

An important contribution to the chemistry and pharmacology of the nitrites of the paraffin series by W. R. Dunstan, E. J. Woolley, and W. Lloyd Williams supplies valuable information respecting the commercial amyl nitrite used in medicine. It is shown that the latter contains a notable proportion of iso-butyl nitrite, an impurity to which it appears to owe much of its therapeutic action. Physiological experiments made by Prof. Cash as well as by T. Lauder Brunton and T. Jessop Bokenham seem to prove that iso-butyl nitrite is more active than the mixture constituting the official amyl nitrite, and that perfectly pure amyl nitrite has less effect in lowering the blood pressure, and is therefore less likely to afford relief in angina pectoris than the Pharmacopœia peparation. Reporting on spirit of nitrous ether, D. J. Leech suggests that, in view of its great liability to spontaneous change, this preparation should be replaced by a stable solution of ethyl nitrite of definite strength. He has satisfied himself that it is not superior to such a solution in its physiological activity or therapeutic action.

The more or less dark coloration imparted to ether by certain samples of iodoform answering all the usual tests for purity is attributed by M. Neuss to the presence of an impurity not hitherto recognised. B. Fischer, however, shows that this coloration, which is due to the liberation of iodine, is brought about by perfectly pure iodoform in the presence of air, while the presence of certain impurities in the iodoform or in the solvent has the effect of preventing this coloration, either by preventing atmospheric oxidation or by combining with the liberated iodine. L. L. de Koninck calls attention to the occasional occurrence of free sulphur as an impurity in ether, and suggests agitation with a drop of pure metallic mercury as a test for the detection of this contamination. For this purpose it may be necessary however to make certain that the blackening of the mercury is not due to the presence of hydrogen peroxide. The solubility of tannin in ether and other liquids forms the subject of an interesting paper read by B. S. Proctor before the British Pharmaceutical Conference.

G. Krüss and F. W. Schmidt claim to have obtained evidence of the non-elementary nature of nickel and cobalt, and of the presence in both of a new metal as a common constituent differing from either of the two metals named. This important observation, however, is called in question by M. Fleitmann, who states that he has repeatedly tested the most diverse commercial samples of nickel and cobalt oxides without being able to obtain any indica-

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commend the well-known titration with iodine in the presence of sodium bicarbonate, in the place of the unsatisfactory process of the British Pharmacopœia. Dealing with ammoniacal mercury compounds, C. Rammelsberg points out that while true "white precipitate" is infusible, the preparation obtained by precipitating a solution of mercuric and ammonium chlorides by an alkaline carbonate is fusible. The former is stated to correspond to the formula NHg_2Cl, NH_4Cl, and the latter to NHg_2Cl, $3NH_4Cl$. The precipitate obtained by the action of tartaric acid on a solution of mercuric chloride is found by D. B. Dott to consist of calomel. Reports on benzoate, carbolate, and salicylate of mercury, furnishing improved processes for the preparation of these compounds, have also found a place in this volume.

The chemical nature of the peptones has engaged the attention of R. Palm, who advances arguments in favour of the view that peptone is a combination of protein with an acid in constant proportions. In connection with this subject he also deals with the separation of albumen from peptones. The prolonged action of dilute acids on the gluten of wheat, at a slightly elevated temperature, is found by A. Reychler to result in the formation of an opalescent liquid possessing the active properties of diastase. E. Stadelmann confirms the presence of pepsin in normal and pathological urine, while F. Helwes claims to have recognised the normal occurrence of rennet ferment in the same liquid. The alkaloidal constituents of urine are described in a paper by J. L. W. Thudichum. The internal administration of acids is shown by A. Haig to diminish the relative amount of uric acid excreted, whereas the administration of alkalies causes an increase in the excretion of this acid. J. Sjöqvist recommends a new process for the detection and estimation of free hydrochloric acid in the contents of the stomach.

The injurious effect of exhaled air is attributed by Brown-Séquard and d'Arsonval more to the presence of a pulmonary poison than to the action of carbonic acid.

We conclude our notices of chemical subjects in this place with a brief summary of some of the recent contributions to analytical chemistry. E. Léger describes a delicate test for bismuth, which is based on a well-known reaction hitherto employed as a test for vegetable alkaloids. The test solution is prepared by dissolving 1 gram of cinchonine and 2 grams of potassium iodide in 100 c.c. of water. A process for the detection of traces of mercury, re-

commended by J. Klein, consists in the reversed application of Nessler's test. Gutzeit's modification of Marsh's test for arsenic, in which the substance under examination is treated with pure zinc and hydrochloric acid, and the gas allowed to act upon a piece of filter paper moistened with 1 drop of strong solution of silver nitrate, is found by F. A. Flückiger to be so extremely delicate as to admit of the detection of 0·001 milligram of arsenious anhydride. The occurrence of appreciable quantities of arsenic in the glass of chemical apparatus is confirmed by J. Marshall and C. S. Potts, who have also found this objectionable impurity in commercial caustic soda and sodium carbonate. Gawalowski's method for the volumetric estimation of sulphuric acid has been critically examined by B. North, with the result of showing it to be utterly untrustworthy. H. Quantin estimates this acid by means of a titrated solution containing definite proportions of potassium chromate, barium chloride, and hydrochloric acid; but the process described by him appears to us to be so complicated and tedious that few analysts are likely to avail themselves of it. Volumetric methods, we venture to think, fail in their object if the trouble involved in them is greatly in excess of that connected with good gravimetric processes. A colorimetric method for the estimation of nitrates in natural waters, suggested by S. C. Hooker, is based upon the production of a green coloration on the addition of a sulphuric acid solution of carbazol, and is said to be delicate enough to indicate 1 part of nitric acid in 2,000,000 parts of water. For the estimation of nitrites, W. R. Dunstan and T. S. Dymond recommend a process depending upon the familiar reaction between hydriodic and nitrous acids and the titration of the liberated iodine by means of decinormal solution of hyposulphite. In order to prevent any re-oxidation of the liberated nitric oxide by air, and consequent renewal of the reaction, the operation is performed in the entire absence of air in a suitably constructed apparatus. The process is stated to be as applicable to organic as to inorganic nitrites. The liberation of a definite volume of nitrogen in the action of nitrous acid on urea forms the basis of another method for the estimation of nitrites devised by A. Vivier. The fact that chromic acid is capable of decomposing unlimited quantities of hydrogen peroxide, and yet remaining unchanged at the end of the reaction, is referred by Berthelot to the formation of an unstable intermediate product. T. Salzer recommends potassium chromate as a reagent for detecting tartaric acid in the presence of citric acid. The low results obtained in quantitative analyses of mix-

tures of citrates and tartrates are attributed by J. S. Ward to the slight solubility of calcium citrate in boiling water, and the incomplete precipitation of calcium tartrate in the presence of a citrate. New colour reactions are recommended for saccharin, antipyrine, and antifebrin, as well as tests for the detection of the latter (antifebrin) in phenacetin. The contributions to the literature of food adulteration which have found a place in this volume comprise reports on the detection of adulteration in butter, coffee, and pepper, and on the detection of cochineal as a colouring agent in confectionery.

Attention is called by van Hamel Roos to a new adulterant of senega root, differing essentially from the genuine drug. It is supposed to consist of the rootlets of *Cypripedium pubescens*. A so-called "spurious" cascará sagrada, which was recently met with in large quantities in the American market, has been examined by J. Moss, and found to consist of true cascara collected out of season. A new adulteration of saffron is reported upon by H. Adrian, and shown to consist in the impregnation of the genuine drug with a mixture of soluble salts composed of sodium borate and sulphate, potassium nitrate and tartrate, and ammonium chloride. A similar adulteration has also been observed by E. M. Holmes. For the purpose of ascertaining the quality and purity of a sample of saffron, B. S. Proctor suggests a colorimetric test, a full description of which will be found in this volume. The characters of genuine insect-powder, together with those of the Hungarian daisy and other adulterants, are described by G. M. Beringer and J. Schrenk. A suspicious-looking sample of cubebs, described by C. B. Lowe, proved to consist of the genuine drug in a very immature condition. E. Eidam directs attention to an adulteration of linseed meal with the residue of castor-oil seeds, and the means of its detection. M. Moerner describes a grossly adulterated sample of asafœtida containing only about 5 per cent. of the genuine drug, the remainder being composed of resinous-looking fragments consisting of alabaster, more or less coated with a thin layer of asafœtida resin. The occurrence of lycopodium and of sugar of milk as adulterants in commercial samples of green euonymin has been observed both by J. W. Thomson and H. S. Collins, the latter of whom believes also to have detected an admixture of extract of Indian hemp. The colouring matter in green euonymin is stated by W. Gilmour to be chlorophyll changed from its ordinary colour to a brighter green by the

action of copper. Means for the detection of sesame oil in cocoa-butter and of stearin in spermaceti are suggested by P. Zipperer and M. Farbi. The bleaching of wax by the use of chemicals instead of by sunlight is shown, both by M. Hübl and G. Buchner, to cause so considerable an alteration in its physical and chemical nature that the product may be pronounced adulterated by the analyst submitting it to the usual tests for purity. Lippmann confirms the observation that bees swarming in the neighbourhood of sugar-refineries, and feeding on the sugar, produce a honey devoid of the usual aroma and containing from 4 to 16 per cent. of saccharose. He therefore thinks that such a honey cannot be legally regarded as adulterated.

The physiological action of the bark of *Hedwigia balsamifera* has been investigated by Gaucher, Combemale, and Marestang, who find this drug to be a nerve poison, reducing temperature and producing paralysis and convulsions. These effects are shown to be due to the presence of a toxic alkaloid and a resinous constituent. The bark of *Rhus aromatica*, employed in the form of a tincture, is found by M. Max to be a useful remedy in the treatment of incontinence of urine. Cascara sagrada is reported by Goodwin to possess remarkable powers for the relief of rheumatism, an observation corroborated by the experience of Martin. In connection with this drug, it may here be stated that recent physiological experiments carried out by H. D. Fuge bear out the conclusion that the tasteless extracts now so much in favour, though possessing some degree of medicinal activity, are decidedly inferior in this respect to the ordinary liquid extracts. The medicinal properties of *Digitalis ambigua* are stated by H. Paschkis to be identical with those of *D. purpurea*, and to owe these to the same constituents. The toxic action of digitalis is found by M. Roger to diminish very notably when the product of maceration is concentrated by heat. The relative merits of digitalis and strophanthus as cardiac remedies have been re-investigated by D. G. Evans, who endorses the conclusion that the new remedy is superior to digitalis, especially in mitral complaints and cardiac failures. *Symphoricarpus vulgaris*, a plant belonging to the order *Caprifoliaceæ*, and indigenous to the south-western United States, is recommended by Newton as a valuable alterative and diuretic. The alleged value of *Hysterionica Baylahuen* as a remedy in certain gastro-intestinal troubles, has induced Baillé to experiment with samples of this Chilian plant obtained by Dujardin-Beaumetz.

He finds it very useful in persistent diarrhœa, and to act as a kind of antiseptic dressing upon the intestinal surfaces. It has also proved serviceable in chronic bronchitis. *Pycnanthemum linifolium*, known in some parts of the United States as "dysentery-weed," is recommended in cases of dyspepsia and intestinal affections. *Sedum acre*, which possesses emetic properties and was formally employed for many purposes, is now being tried in the treatment of diphtheria. *Adhatoda vasica*, an Indian drug, is also recommended for the same disease, and is credited with the power of destroying bacteria in the human system. Anthelmintic properties are ascribed to the cocoa-nut, which is warmly recommended by Pariso as a remedy for tapeworm. W. G. Greenawalt has tested the relative efficacy of both the clear fluid portion and the sediment of the ethereal extract of male-fern. He finds both to be active tænicides, the sediment being the more active of the two. M. K. Hyrans discusses the value of the seeds of *Pharbitis triloba* as a purgative, and suggests that the resin obtainable from them might be used as a substitute for jalap-resin. The gum obtained by evaporation from the juice of the common sow thistle (*Sonchus oleraceus*) is also spoken of as a powerful purgative. The relative merits of catechu and gambier as therapeutic agents have engaged the attention of H. Trimble, who arrives at the conclusion that gambier is the more astringent and in every respect the preferable drug of the two. Comparative experiments with borneol and laurel camphor lead R. Stockman to infer that both are exactly similar in their physiological action, but that the former is less irritating locally than the latter.

Two more synthetically prepared compounds have been added to the list of antipyretics. One of these, which is described under the name of "methacetin," is an acetyl compound of anisidin, and is stated to combine antiputrescent and diaphoretic properties with its antipyretic action. The other, to which the name "pyrodin" is given, contains acetylphenylhydrazin as its active constituent, and is said to be an exceedingly powerful antipyretic, acting even in cases in which other remedies of the same class have failed. Unfortunately its usefulness is very much lessened on account of the severe symptoms of poisoning which it is apt to produce in many cases.

Albyl tribromide has recently been strongly recommended as a remedy for whooping-cough, and also as being useful in the treat-

ment of hysteria and asthma. E. R. Squibb bears testimony to the excellent effect produced by inhalations of ethyl iodide in acute and chronic affections of the respiratory passages. The local application of camphoric acid is also highly recommended for the same affections. Anisic acid is found to be valuable as an antirheumatic, and agaric acid as an anhydrotic. Among other substances whose physiological action has recently been discussed may be named hyoscine, sparteine, ulexine, creatine, hydroxylamine, exalgin, anthrarobin, chrysarobin, and para- and meta-phenylenediamine.

The question as to what is the proper time for collecting aconite root is discussed by P. W. Squire, who arrives at the conclusion that the autumn is the most suitable season, as at that time the root is fully matured, and the numbing sensation produced by it upon the tongue is most marked.

The vegetable drugs which during the past year have formed subjects of chemical research are so numerous that we cannot do more in this place than to confine ourselves to a brief notice of a few of the most important. J. E. de Vrij records the interesting observation that young cinchona plants only contain the alkaloids in an amorphous state, and that the appearance of the crystalline alkaloids takes place as the plants develop; further, that *Cinchona succirubra* begins to show a diminution in the percentage of alkaloids after it reaches an age of 12 to 16 years, at which period it contains a large proportion of cinchona red. P. Schwabe confirms an observation previously made by Casselmann, that of the two principles, frangulin and emodin, contained in the bark of *Rhamnus frangula*, the former does not exist in the fresh bark, but is only formed in it after the bark is at least 12 months old. From *Rhamnus purshiana* he has obtained emodin and no frangulin; but he thinks it not unlikely that older bark than the sample examined might also contain the latter, as in the case of *R. frangula*. The root bark of *Euonymus atropurpureus* has been re-investigated by W. A. H. Naylor and E. M. Chaplin, whose results differ materially from those previously published by W. T. Wenzell. Instead of asparagin, they have obtained a non-nitrogenous glucoside, for which they propose the provisional name "atropurpurin." They have also obtained an acrid pungent principle, which Wenzell had failed to detect. Analyses of wild-cherry bark and its preparations (infusion, syrup, and liquid extract), by L. W. Hawkins, lead to the conclusion that the latter do not, as a rule, represent

the full value of the drug as far as hydrocyanic acid, its supposed active constituent, is concerned. The root of *Scopolia japonica* is shown by E. Schmidt and H. Henschke to yield a mixture of alkaloids consisting of hyoscine, hyoscyamine, and atropine. An examination of areca nut by E. Jahns reveals the presence of three distinct alkaloids, one of which acts as a strong poison. *Escholtzia Californica*, a plant belonging to the order *Papaveraceæ*, is found to contain morphine. Alkaloidal principles have also been isolated from kava-kava, *Spigelia Marylandica*, *Frittilaria Imperialis*, and *Mandragora autumnalis*. The toxic action of Condurango bark is traced by R. Kobert to the presence of several distinct glucosides and a resin. The poisonous principle of *Tanghinia venenifera* proves to approximate strophanthin and ouabain in its action. A principle acting as a heart poison has also been isolated from *Coronilla scorpioides*. Castor-oil seeds have yielded an albuminoid body to which they seem to owe their poisonous properties. A new crystalline constituent of ergot is described by C. Tanret under the name of "ergosterin." In a note on ergotin, J. C. Husband calls attention to serious variations occurring in the nature and composition of this preparation, and traces these variations to the vagueness in the directions given in the Pharmacopœia.

J. C. Umney directs attention to the very great difference between the abnormal and true congealing points of oil of star-anise, showing at the same time that no such marked difference exists in the case of the oil of *Pimpinella Anisum*. He recommends the determination of the abnormal congealing point as one of the tests for distinguishing these two oils. The absence of the usual characteristic odour in some samples of genuine oil of peppermint is confirmed by A. Jandous, and is attributed by him to the inclination of *Mentha* to form hybrids. The oil of *Pinus sylvestris* is found by O. Wallach to contain limonene, while phellandrene, the principal constituent of the oil of *Phellandrium aquaticum*, is shown by him also to occur in the oil of *Eucalyptus amygdalina*. The oils of cajeput, *Cussambrium spinosum*, myrtle, rosewood, bay leaves, and carrot have also met with notices in this volume.

M. Mosso reports upon the antagonistic action of cocaine and chloral hydrate, and suggests the former as an antidote for the latter, and *vice-versa*. Both strychnine and picrotoxin are recommended as antidotes for opium and other narcotic poisons. The incompatibility of dry antipyrine and salicylate of soda is pointed out by P. Vigier.

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syrup, while a similar service is performed by A. Cripps with regard to syrup of hydrobromate of iron and quinine.

Taking a collective view of the pharmaceutical literature of the year, it will be found to afford evidence of healthy activity, both at home and abroad.

CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I.

CHEMISTRY.

A Convenient Method for the Preparation of Oxygen. C. F. Göhring. (*Chem. Zeit.*, xii. 1659.) To a solution of hydrogen peroxide placed in a generating flask and rendered slightly alkaline with ammonia, solution of potassium permanganate is slowly added through the funnel tube in small successive portions. A steady current of oxygen is thus evolved. 100 c.c. of a 3 per cent. solution of hydrogen peroxide, when treated in this manner, yield one litre of oxygen.

Convenient Preparation of Chlorine. L. L. de Koninck. (*Zeitschr. für angew. Chemie*, No. 18, 1888; *Analyst*, November, 1888.) The author for several years advocated the use of a Kipp's apparatus, which after being charged with manganese dioxide and hydrochloric acid had to be heated on a water-bath. Owing to the many breakages, the author has now constructed an apparatus by means of which the chlorine may be prepared in the cold. Hydrochloric acid is passed through a tower containing *granulated* manganese dioxide, when the usual reaction takes place, and chlorine is liberated. The gas may be dried by means of calcium chloride or sulphuric acid. For the preparation of small quantities, the author used a Peligot's tube (a U-tube with three bulbs), one side of which is filled with lumps of manganese of the size of a pea, and the other with calcium chloride. For large quantities the author prefers R. Muencke's drying cylinder.

Improvement in the Manufacture of Phosphorus. A. Nicolle. (*Pharm. Journ.*, 3rd series, xix. 148, from *American Druggist.*) The mineral phosphate, either natural or artificial, is treated with

nitric acid, and then, on the addition of potassium sulphate, the calcium is precipitated as sulphate. This is removed by filtration, and mercurous nitrate in proper quantity is introduced. The phosphate of mercury thus obtained is distilled with carbon, when first mercury and then phosphorus distil over. To the calcium nitrate solution more potassium sulphate is added, and the resulting potassium nitrate crystallized.

The Atomic Weight of Chromium. S. G. Rawson. (*Ber. der deutsch. chem. Ges.*, 1889, 433.) Six determinations of the atomic weight of chromium gave a mean value of 52·06 (O = 15·96).

Nickel and Cobalt. G. Krüss and F. W. Schmidt. (*Ber. der deutsch. chem. Ges.*, xxii. 11–15.) The authors claim to have obtained evidence that both nickel and cobalt are not elementary substances, but that both contain a new metal as a common constituent which differs from either of the two metals named. This new element is described by them under the name "gnomium." The oxide of the new metal is stated somewhat to resemble alumina and zinc oxide, but to possess characteristic properties clearly distinguishing it from both. About 1 gram of the oxide was obtained from 50 grams of oxide of nickel. The metal is said to be black, and readily soluble in acids.

Gnomium, the Alleged New Element. M. Fleitmann. (*Chemiker Zeitung*, June 12, 1889.) The author throws doubt on the existence of the new metal obtained by Krüss and Schmidt (preceding abstract). He has repeatedly tested the most diverse commercial samples of nickel and cobalt oxide, and even while working upon large quantities of these substances he failed to obtain any indication confirming the presence of a new metal.

Preparation of Nitrous Oxide. G. Campari. (*Chem. Centr.*, 1888, 1569.) A steady current of pure nitrous oxide may be obtained by heating 5 parts of stannous chloride with 10 parts of hydrochloric acid of 1·21 sp. gr., and 0·2 part of nitric acid of 1·38 sp. gr. These proportions should be strictly adhered to, to ensure regularity of action.

Hyponitrous Acid. M. Maquenne. (*Comptes Rendus*, June 24, 1889.) The author describes the barium, strontium, calcium, silver and ethyl salts of this acid, and arrives at the conclusion that nitrous oxide is not the anhydride of hyponitrous acid.

Action of Chromic Acid on Hydrogen Peroxide. M. Berthelot. (*Comptes Rendus*, cviii. 477–479.) The fact that chromic acid or potassium bichromate is capable of decomposing unlimited quantities of hydrogen peroxide, and yet remaining unchanged at the end

of the reaction, is referable to the formation of an unstable intermediate product. When solutions of the two chemicals are mixed, and ammonia is added, until the mixture has assumed a dark brown colour, a chamois-yellow precipitate is formed containing hydrogen peroxide, chromic acid, and chromium oxide. This precipitate is the unstable intermediate product referred to; when washed with water it evolves oxygen and gradually yields a yellow filtrate, while a very small fraction remains undissolved. This residue contains the same constituents as the original precipitate, but in different proportions.

Action of Chlorine on Carbonic Anhydride. R. Lucion. (*Chem. Zeit.*, xiii. 32.) Dry chlorine is without action on dry carbonic anhydride at 300° C., and even at a red heat. In the presence of steam, however, hydrochloric acid and oxygen are formed.

The Decomposition of Carbon Bisulphide by Shock. T. E. Thorpe. (Abstract of a paper read before the Chemical Society, March 7, 1889. From the Society's Proceedings.) The author, in studying the action of the fluid alloy of potassium and sodium on carbon bisulphide, obtained a yellowish brown solid substance which exploded with great violence when subjected to pressure or friction. If the explosion occurred in contact with carbon bisulphide, that substance was resolved into its elements.

As carbon bisulphide is an endothermic compound, the author was induced to try whether its vapour could not be resolved into its elements by the explosion of various detonating agents, *e.g.*, mercuric fulminate, in the manner indicated by Berthelot. It is found that such a decomposition is readily effected by exploding a charge of 0·05 gram fulminate within a stout glass tube containing a few c.c. of carbon disulphide vapour. The carbon disulphide is at once resolved into carbon and sulphur, which line the inside of the tube. The experiment may be easily made with perfect safety, and is stated to form a good illustration, for class purposes, of the resolution of an endothermic substance into its elements by sudden shock.

Boric Acid. P. Georgievic. (*Journ. prakt. Chem.* [2], xxxviii. 118–120.) The very feeble acid character of boric acid is illustrated by the facts that—(1) a solution of an alkaline carbonate is not decomposed by it; (2) a solution of borax is completely decomposed by a current of carbonic anhydride, and barium borate is dissolved when suspended in water through which hydrogen sulphide is passed; (3) boric acid will not liberate iodine from a mixture of potassium iodide and iodate or nitrite; (4) the red

colour of ferric acetate and the violet colour of ferric chloride in solution of phenol are not bleached by boric acid; (5) boric acid is liberated from borax by the action of iodine, sodium iodide and iodate being formed.

Tests for the Purity of Potassium Carbonate. E. Bohlig. (*Archiv der Pharm.* [3], xxvi. 541, 542. Compare also *Year-Book of Pharmacy*, 1886, 31.) The gradual addition of a solution of 0·5 gram of potassium carbonate to a solution of 3 grams of silver nitrate in 100 c.c. of distilled water should result in the formation of a purely white (not yellowish) precipitate.

The formation of a white precipitate, on adding one drop of solution of silver nitrate to a solution of a large excess of potassium carbonate, shows the presence of bicarbonate.

Potassium Chlorate. L. W. Hawkins. (*Pharm. Journ.*, 3rd series, xix. 775.) The author reports upon a sample of potassium chlorate which evolved the odour of chlorine while being kept in a bottle. The cause of this was traced to the accidental presence of a small quantity of tartaric acid.

Potassium Meta-bisulphite. J. M. Eder. (*Journ. Soc. Chem. Ind.*, 1888, 867.) Potassium meta-bisulphite, $K_2SO_3 \cdot SO_2$, is used in place of sodium hydrogen sulphite to preserve pyrogallol solutions. It is prepared by saturating a solution of potassium carbonate with sulphurous anhydride and adding alcohol. The salt separates as a white crystalline powder, and is washed with alcohol. It loses sulphurous anhydride when exposed to the air. The systematic name of the salt would be *potassium anhydrosulphite*.

Removal of Iodate from Potassium Iodide. H. N. Morse and W. M. Burton. (*Amer. Chem. Journ.*, x. 321, 322.) This removal may be rapidly effected by boiling the solution of the iodide with zinc amalgam and then filtering. The filtrate is free from zinc and mercury.

Ammonium Bromide. K. Thümmel. (*Archiv der Pharm.*, 1888, xxvi. 1124.) The author finds that, contrary to the requirements of the German Pharmacopœia, ammonium bromide invariably reddens litmus paper instead of being neutral. He also finds that by the action of bromine upon ammonia, nitrogen is evolved and ammonium bromide alone formed, as long as ammonia is in excess, a statement which is contradictory to the observation of E. Schmidt, that by this means a small quantity of an oxygenated product results.

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$NaBr, 2As_2O_3$. The corresponding iodine compound, $NaI, 2As_2O_3$, may be prepared in an analogous manner.

Arsenic in Glass and Alkalies. J. Marshall and C. S. Potts. (*Amer. Chem. Journ.*, x. 425–430.) The glass of German and American chemical apparatus was found to contain from 0·095 to 0·446 per cent. of arsenious acid. Commercial caustic soda contained amounts varying from 0·0028 to 0·0848 per cent., while commercial caustic potash was found to be free from arsenic. Sodium carbonate contaminated with arsenic may be readily purified by repeated recrystallization.

Acids and ammonia have no action on arsenical glass, but fixed alkalies readily extract arsenic from it.

Action of Sulphuretted Hydrogen on Arsenic Acid. L. W. McCay. (*Zeitschr. für Analyt. Chem.*, xxvii. 632–634; *Journ. Chem. Soc.*, January, 1889. Compare also Brauner and Tomiček, *Year-Book of Pharmacy*, 1888, 25.) When a slow stream of sulphuretted hydrogen is passed through an acidified solution of an arsenate at 70°, besides arsenic pentasulphide there is also formed some free thioxyarsenic acid, H_3AsO_3S. This, under the influence of mineral acids and heat, decomposes into free sulphur and arsenious acid, the latter of which then yields arsenic trisulphide with the sulphuretted hydrogen. A solution of thioxyarsenic acid may be obtained by passing sulphuretted hydrogen not in excess into a cold, dilute, acidified solution of potassium arsenate. If a larger quantity of sulphuretted hydrogen is employed, the excess may be removed either by immediate addition of copper sulphate or by a vigorous stream of air bubbles. An opalescence caused by free sulphur may be removed by shaking with asbestos. The clear, strongly acid liquid obtained, exhibits the following properties. It remains clear for a long time after addition of sulphuric or hydrochloric acid; it gives no immediate precipitate with sulphuretted hydrogen, but ultimately yields one. When boiled, it gives a precipitate of pure sulphur, without evolution of sulphuretted hydrogen or sulphurous anhydride. With sulphuretted hydrogen, the boiled and cooled liquid gives an immediate precipitate of arsenic trisulphide; it gives no precipitate with copper sulphate; with mercuric chloride it gives immediately a heavy yellowish white precipitate; with silver sulphate it gives a heavy black precipitate, the filtrate from which contains no arsenious acid. The potassium thioxyarsenate of Bouquet and Cloëz agrees with this solution in all the above particulars.

Chemical Observations on Tartar Emetic. W. R. Dunstan and L. E. Boole. (*Pharm. Journ.*, 3rd series, xix. 385–387.) In the first part of this paper the authors deal with the assay of tartar emetic, and point out that the characters and tests given in the British Pharmacopœia, unless considerably augmented or modified, do not constitute a satisfactory quantitative process for estimating the antimony. They recommend the well-known titration with iodine in the presence of sodium bicarbonate, and give a full account of the conditions under which this test gives the most satisfactory results.

An examination of commercial specimens of tartar emetic gave results varying from 94·7 to 102·3 per cent.

In another part of the paper the authors show that the action of alcohol on an aqueous solution of tartar emetic results in the precipitation of the salt in the anhydrous state. They plead in favour of the exclusive use of the anhydrous salt thus prepared for medicinal purposes, on account of its high degree of purity and its non-liability to spontaneous change.

The specific rotation of aqueous solutions of tartar emetic is also discussed in this paper. Determinations made by the authors at 15° C. with a four per cent. solution of the crystallized salt and a tube of 200 mm. in length, showed the angle of rotation to be $+11{\cdot}3°$, whence $[\alpha]_D = +141{\cdot}25°$. With the anhydrous salt, under the same conditions, the angle was found to be $+11{\cdot}4°$, whence $[\alpha]_D = +142{\cdot}5°$. These results are fairly in accord with those obtained by Krecke.

Decomposition of Sulphide of Antimony by Boiling Water. W. Elbers. (*Chem. Zeit.*, xii. 355, 356.) Antimony trisulphide, upon prolonged boiling with water, is slowly decomposed with the formation of antimonious anhydride and the evolution of sulphuretted hydrogen.

The Purity of Commercial Samples of Dried Sulphate of Iron. G. Lunan. (*Pharm. Journ.*, 3rd series, xix. 226, 227.) The author has examined nineteen commercial samples of this salt, collected from a large radius. The average percentage of $FeSO_4H_2O$ of the nineteen samples was 88·98, or practically 89, which is 8·5 less than required by the British Pharmacopœia. Only two samples were above the pharmacopœial standard. His results are embodied in the following table :—

Sample.	Percentage of $FeSO_4H_2O$.	Colour.	Solubility in Distilled Water.
A	75·225	Nearly white; greenish tint.	Entirely and quickly; powder separated by rate of solubility from a few green crystals.
B	93·075	Dark greyish white.	Large insoluble deposit; dark yellow sol.
C	86·7	Dull greyish white.	Considerable insoluble deposit; yellow solution.
D	89·25	Greyish white.	Almost entirely dissolved; solution opaque and tinted.
E	80·58	Degree less white than A.	Entirely and quickly; although retarded by a few effloresced crystals.
F	97·665	Nearly white, shade less so than A and E.	Uniformly and entirely, although slowly dissolved.
G	90·78	Greyish white.	Not entirely dissolved; yellow solution.
H	83·25	Greyish white.	Almost entirely; tinted solution.
I	98·43	Almost white.	Entirely although slowly; faintly tinted solution.
J	95·37	Dull greyish white.	Nearly dissolved; opaque and tinted sol.
K	89·8	Almost white.	Small quantity yellow deposit, but supernatant solution bright.
L	90·78	Dark greyish; green tint.	Part rapidly, remainder slowly and almost entirely, to bright solution.
M	96·5	White, with dull grey tint.	Slowly but entirely.
N	84·15	Greyish white.	Almost entirely.
O	92·85	Dull greyish white.	Small quantity, yellow deposit.
P	94·35	Dark greyish white.	Tinted sol.; yellowish brown deposit.
Q	92·8	Dark greyish white; darker shade than P.	Tinted dark solution, but almost entirely.
R	80·825	Nearly white.	Quickly and almost entirely.
S	78·288	Dark grey.	Large insoluble brown deposit.

Composition of Precipitated Ferrous Sulphate. H. Trimble. (*American Druggist*, October, 1888.) Five samples of this salt were examined. No. 1 was made according to the U. S. P. No. 2 according to the B. P., with the quantity of water reduced to 20 per cent., and without boiling the solution. No. 3 according to the proportions of the B. P., omitting the boiling; as this solution was quite dilute, the yield was small. No. 4 was made exactly according to the directions of the B. P. No. 5 settled out from the filtrate of No. 3, which was more dilute than the others, and therefore contained a larger quantity of the salt. The deposit took place during three weeks, in granular crystals much larger than in the other samples. The following results were obtained:—

	No. 1. U. S. P.	No. 2. Br. P. less 20 p.c. Water, not boiled.	No 3. Br. P. Not boiled.	No. 4 Br. P.	No. 5. Larger Crystals.	Theoretical.
Fe . .	20·48 p.c.	20·86 p.c.	20·35 p.c.	20·37 p.c.	20·53 p.c.	20·12 p.c.
SO_4 .	35·40 „	35·84 „	35 40 „	35·44 „	36·40 „	34·54 „
H_2O .	44·12 „	43·30 „	44·25 „	44·19 „	43·07 „	45·34 „
Total .	100·00	100·00	100·00	100·00	100·00	100·00

None of the specimens when first made gave more than slight indications of ferric iron, and the doterminations by potassium permanganate failed to indicate any appreciablo quantity. The above results are sufficient to show that the salt precipitated under different conditions is of constant composition. It is identical with the large crystals, keeps well in glass-stoppered bottles, but loses water, and is slowly oxidized by exposure to air.

Note on Oxide of Zinc. H. Belcher Thornton. (*Pharm. Journ.*, 3rd series, xix. 321, 322.) The result of the author's analyses lead to the conclusion that the oxide of zinc as generally met with in commerce *does* contain an appreciable quantity of carbonate.

Impurities in Commercial Litharge. T. Salzer. (*Zeitschr. des oesterr. Apoth. Ver.*, 1889, 21.) The author calls attention to the frequent occurrence of nitrites and of lime in litharge. Either of these impurities can be detected in the filtrate after washing with water by the usual reagents.

Basic Copper Chromate. L. Balbiano. (*Chem. Centr.*, 1888, 1024.) A solution of cupric sulphate is not completely precipitated by neutral ammonium chromate, the complete precipitation only being effected by the addition of ammonia. Both the precipitate first produced by the ammonium chromate and that by the later addition of the ammonia have the same composition, $Cu_3 Cr O_6 + 2 H_2 O$.

Infusible Tin. L. Vignon. (*Comptes Rendus*, cvii. 734–737.) If a solution of a tin salt containing no free acid be treated with metallic zinc, and if the tin thus precipitated be washed with water and dried in contact with air, the product is infusible and burns like tinder when heated in presence of air. This alteration in the properties of the tin does not take place during the precipitation, but during the drying in contact with air, and is due to

a partial conversion of the metal into stannous oxide. The amount of tin in the infusible product is 96 to 97 per cent.

Mercurous Oxide. W. Bruns and O. v. d. Pfordten. (*Ber. der deutsch. chem. Ges.*, xxi. 2010–2013.) Mercurous oxide oxidizes to mercuric oxide even at the ordinary temperature, and oxidation seems to take place more quickly in presence of moisture. Dry mercurous oxide is completely converted into mercuric oxide and metal when heated at 100° for some time. It is impossible to obtain mercurous oxide quite free from mercury and mercuric oxide. Even the treatment of mercurous acetate with alcoholic solution of potash and subsequent washing with ether and drying, the whole process being carried out in the absence of light, yields a product containing small quantities of these impurities.

Solubility of Mercuric Chloride in Solutions of Sodium Chloride. Dr. Homeyer and E. Ritsert. (*Pharm. Zeitung*, 1888, 739.) The authors results are embodied in the following table:—

Percentage of Na Cl solution.	100 parts Na Cl solution dissolve		
	at 15°	at 65°	at 100°
26 per cent. (saturated).	128 gm. $HgCl_2$	152 gm. $HgCl_2$	208 gm. $HgCl_2$
25 ,,	120 ,, ,,	142 ,, ,,	196 ,, ,,
10 ,,	58 ,, ,,	68 ,, ,,	110 ,, ,,
5 ,,	30 ,, ,,	36 ,, ,,	64 ,, ,,
1 ,,	14 ,, ,,	18 ,, ,,	48 ,, ,,
0·5 ,,	10 ,, ,,	13 ,, ,,	44 ,, ,,

Action of Tartaric Acid on Mercuric Chloride. D. B. Dott. (*Pharm. Journ.*, 3rd series, xix. 841.) When a dilute solution of mercuric chloride and tartaric acid is prepared, a white precipitate slowly makes its appearance, and increases in amount as the solution is allowed to stand. This precipitate is found to be insoluble in water and to blacken on the addition of caustic soda; it consists of calomel.

Ammoniacal Mercury Compounds. C. Rammelsberg. (*Journ. prakt. Chem.* [2], xxxviii. 558–569). True "white precipitate" is infusible, but the preparation obtained by precipitating a solution of mercuric and ammonium chlorides by an alkaline carbonate is fusible. The latter is converted into the former by boiling it with a solution of ammonium chloride. Both are double compounds of ammonium chloride with mercurammonium chloride, the infusible being NHg_2Cl, NH_4Cl, and the fusible, NHg_2Cl, $3NH_4Cl$.

Mercuric Benzoate. E. Lieventhal. (*Pharm. Zeitschr. für Russland*, 1889, 310.) This salt is made by dissolving 125 parts mercuric oxide in 250 parts nitric acid, sp. gr., 1·20, diluting with

4000 parts distilled water, and filtering; 188 parts sodium benzoate are dissolved in 4000 parts distilled water, the solution filtered and slowly added, with constant stirring, to the first solution; the bulky precipitate is collected on a linen strainer, thoroughly washed with cold water, expressed and dried. The product forms a light white powder, slightly soluble in ether, alcohol, chloroform and water, but easily dissolves in water if half its weight of sodium chloride is added. This solution gives all of the reactions of mercuric salts, excepting the precipitation by albumen; to this behaviour its use in subcutaneous injections is possibly due. Alcohol and ether poured over the powder cause it to assume a yellow colour.

Mercury Carbolate. H. Andres. (*Pharm. Zeitschr. für Russl.*, xxxii. 625.) Commercial preparations contain varying amounts of mercury. A preparation corresponding exactly to the formula $(C_6H_5O)_2Hg$ is obtained in the following way. Potassium phenate is first prepared by dissolving 94 parts of phenol and 56 parts of potassium hydrate in 90 per cent. alcohol, evaporating the solution to a syrup on the water-bath and drying over sulphuric acid. 100 parts of the potassium phenate are dissolved in alcohol and the filtered solution precipitated with an alcoholic solution of 112 parts of mercury bichloride. The orange precipitate is collected on a filter, washed with 60 per cent. alcohol until nearly free from chlorine, and then with absolute alcohol until the filtrate gives no reaction with sulphuretted hydrogen. The mercury phenate after drying in an exsiccator over sulphuric acid is an amorphous brick-red powder, insoluble in water, alcohol, ether, chloroform, and carbon bisulphide.

Mercury Salicylate. G. Kranzfeld. (*Chemist and Druggist*, March 30, 1889, from *Pharm. Zeit. f. Russl.*) In order to obtain the pure compound the author dissolves one equivalent of mercury bichloride in hot water and precipitates the clear solution with sodium hydrate. The mercuric oxide is well washed, placed in a flask with a little water, heated over a water-bath, and one equivalent of salicylic acid is then added gradually. After heating and shaking for some hours the yellow colour of the oxide gives place to the white colour of the salicylate. The end of the reaction may be further tested by the complete solubility of a sample in sodium hydrate solution. If the salt does not dissolve, a little more salicylic acid is added to complete the reaction. The product corresponds to the formula $Hg(C_6H_4.COO)_2$.

Behaviour of Salicylate of Mercury with Caustic Soda and with Halogen Alkali. (*Pharm. Centralhalle*, July 19, 1888; *Pharm. Journ.*, 3rd series, xix. 61.) Mercuric salicylate is readily dissolved by soda solution without residue in the proportion of a molecule of salicylate for each molecule of caustic soda used; or if concentrated hot solutions of the two compounds be mixed in equivalent proportions a double salt, represented by the formula

$$C_6H_4\begin{cases} COOHgOH, \\ ONa \end{cases}$$

crystallizes out in short prisms. By a hot solution of carbonate of soda salicylate of mercury is dissolved with a slight evolution of carbonic acid. When treated with aqueous solutions of the halogen salts of the alkalies it swells up like a jelly; but when heat is applied solutions are formed from which upon cooling double salts separate, having the composition represented by the typical formula $C_6H_4\begin{cases} COO-Hg-Cl, \\ ONa \end{cases}$ the mercury being in combination with both the salicylic and the halogen radicles. These salts dissolve in water only imperfectly and under partial decomposition, but are soluble in the presence of a certain quantity of halogen salt. Salicylate of mercury therefore resembles the albuminate in its solubility in solution of chloride of sodium, and has been recommended for use in the place of perchloride of mercury in the antiseptic treatment of wounds.

Zinc Salicylate. L. van Itallie. (*Nederl. Tydschr. v. Pharmacie*, February, 1889. From *Analyst*.) The author tests the salt by incinerating the compound, moistening the ash with nitric acid, and finally igniting the residue, which should be not less than 21 per cent. A commercial sample only yielded 18 per cent. The author estimated the degree of solubility of this salt in various fluids. One part dissolves in 25·2 parts of water at 16° C. One part of the anhydrous salt dissolves in 36 parts of ether of ·725 sp. gr. at 16° C., and in 450 parts of chloroform of 1·495 sp. gr. at 15° C. One part of the salt dissolves in 3·5 parts of spirits of wine, sp. gr. ·8194, at 15° C. In petroleum spirit it is quite insoluble.

Solvent Action of Rochelle Salt on Metallic Hydrates. H. N. Warren. (*Chemical News*, lvii. 223, 224.) The author includes the moist precipitates of the following metals in the list of hydrates and carbonates soluble in solutions of Rochelle salt: copper, zinc, manganese, nickel, cobalt, iron (ferrous and ferric), chromium,

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by its specific rotatory power and the melting point of its phenylhydrazone.

Constitution of Sorbinose. H. Kiliani and C. Scheibler. (*Ber. der deutsch. chem. Ges.*, xxi. 3276–3281; *Journ. Soc. Chem. Ind.*, March, 1889.) Sorbinose, like levulose, in unacted upon when treated with bromine and water at the ordinary temperature; hence it does not contain the aldehyde group. With hydrocyanic acid, sorbinose combines readily, but the compound could not be obtained in a crystalline form, and it decomposes very readily into its components. Oxidized with nitric acid (sp. gr. 1·39) at 35° for forty hours, a small quantity of a dibasic acid results; this acid possesses no reducing properties, and therefore contains neither a ketone group nor two hydroxyl groups attached to one carbon atom. An analysis of the potassium salt of the acid agrees with the formula $C_5 H_6 K_2 O_7$, and the crystalline form of this salt is identical with that of the potassium salt of trihydroxyglutaric acid obtained by Kiliani as an oxidation product of arabinose (*Ber.* xxi. 3006). The constitutional formula of this acid is $CO \cdot OH(CH \cdot OH)_3 \cdot CO \cdot OH$, and hence sorbinose is a ketone alcohol of the formula, $CH_2OH(CH \cdot OH)_3 CO \cdot CH_2OH$. Dessaignes previously obtained a dibasic acid ($C_5 H_8 O_7$), called by him aposorbic acid, by the oxidation of sorbinose with nitric acid. Its melting point (110°) differs from that of the acid obtained by the authors (127°). Sodium amalgam acts on sorbinose, forming an amorphous product; with red phosphorus and hydriodic acid a hexyl iodide results.

Action of Nitric Acid on Arabinose. H. Kiliani. (*Ber. der deutsch. chem. Ges.*, xxi. 3006–3009.) When 1 part of arabinose is heated at 35° for about six hours with 2 parts of nitric acid of sp. gr. 1·2, *arabonic acid* is formed, which may be converted into calcium arabonate by boiling the diluted solution with excess of calcium carbonate, filtering, evaporating, and mixing with alcohol. This process affords a ready means for the preparation of arabonic acid.

Perseite. L. Maquenne. (*Comptes Rendus*, cvi. 1235–1238, and cvii. 583–586.) The perseite employed was extracted from the stones of the ripe fruit of *Laurus persea*, which gave about 15 grams per kilo. No saccharose was present, but the stones contained a small proportion of reducing sugar identical in properties with invert sugar.

Pure perseite melts at 188°, and is sensibly volatile. Its composition corresponds to the formula $C_7 H_{16} O_7$.

Action of Glycerin on Starch. K. Zulkowski. (*Chem. Centr.*, 1888, 1060.) Starch, when heated in glycerine at 200°, produces a solution which gives a blue coloration with iodine at first, but which gradually changes to red. Addition of alcohol at this point precipitates erythrodextrin. If the heating is continued up to 210°, until the red coloration gives place to a brown one, alcohol precipitates achroodextrin. Other compounds are formed besides the two above named, and were separated by precipitation with barium hydroxide, etc., but were not further characterized.

Crystallized Saccharic Acid. O. Sohst and B. Tollens. (*Annalen*, ccxlv. 1–27; *Journ. Chem. Soc.*, August, 1888.) Saccharic acid is best prepared by adding 100 grams of powdered potato-starch suspended in 100 c.c. of water to 500 c.c. of nitric acid, sp. gr. 1·15. The mixture is heated at 60–70° until the evolution of red fumes almost ceases, and the product is then diluted with an equal volume of water, and the warm liquid neutralised by potassium carbonate. On the addition of strong acetic acid, the acid potassium salt, $C_6H_9O_8K$, is deposited in microscopic crystals. This salt is converted into silver saccharate by double decomposition, and the free acid is obtained by acting on the silver salt with hydrochloric acid. On leaving the concentrated solution for some days in an atmosphere free from ammonia, crystals of saccharic acid are deposited. After drying on porous plates at the ordinary temperature, the crystals have the composition $C_6H_8O_7$, the anhydride of saccharic acid. At the ordinary temperature, saccharic acid is monobasic, but the hot aqueous solution neutralises two equivalents of alkali. Saccharic acid behaves like a lactonic acid.

Saccharin-Amide (Para-amido-benzoyl-sulphinide). A. Noyer. (*Chemist and Druggist*, June 22, 1889.) This is a new non-carbhydratic sweetener, closely related to saccharin, as will be evident from the respective formulæ:—

$$C_6H_4\begin{cases}CO\\SO_2\end{cases}NH$$

(Benzoyl-sulphinide) [Saccharin].

$$C_6H_3\begin{cases}CO\\SO_2\\NH_2\end{cases}NH$$

(Para-amido-benzoyl-sulphinide) [Saccharin-amide].

Saccharin-amide is slightly soluble in cold water. A solution of it in hot water exhibits a deep blue fluorescence, and has an intensely and persistently sweet taste.

Notes on Saccharin. G. Bruylants. (*Journ. Pharm. Chim.*, 1888, 292.) It is usually supposed that saccharin is completely

eliminated with the urine. The author took doses of 0·5, 1, 1·5, and 2 grams respectively, of saccharin, and on examining the urine of twenty-four hours could only account for 80 per cent., 82 per cent., 84 per cent., and 88 per cent. of the saccharin taken. A ewe received on different days doses of 1, 2, and 5 grams of saccharin without suffering in health. The milk at first contained none, the second time traces, and the last time large amounts of saccharin. Saccharin is often considered an energetic antiseptic, and recommended as an addition to beer. The author finds that 1 per cent. of it does not prevent the alcoholic fermentation, although the process is protracted, whereas an addition of 0·013 per cent. is without any action whatever; 2·5 parts of saccharin per mille cannot prevent the acetification of beer. The pepsin digestion is not disturbed by saccharin, whereas the fermentation of pancreatic fluids which contain 1 per cent. of it proceeds very slowly. The author also confirms the fact that, taken as a medicine, it is harmless. For some considerable time he took daily doses of three grams without the least injurious effect; it did not even interfere with the digestion.

Cyanaldehyde. P. Chautard. (*Comptes Rendus*, cvi. 1167–1170. From *Journ. Chem. Soc.*) 170 grams of iodaldehyde dissolved in about twice its weight of absolute alcohol were mixed with 134 grams of dry powered silver cyanide, and the mixture heated to boiling on a water-bath for ten hours. The product was fractionated and dried over calcium chloride. The product is *cyanaldehyde*, a colourless, limpid, somewhat refractive liquid, with an odour recalling that of ethyl acetate. It is very volatile, and burns with a luminous but not smoky flame. It boils at 71·5°; sp. gr. at 15° = 0·881; vapour-density, 2·33. It is miscible with water, and dissolves in all proportions in alcohol, ether, chloroform, and acetone. With sodium hydrogen sulphite, it forms a crystalline compound; it reduces Febling's solution when heated, and is decomposed by soda, potash, and ammonia at a high temperature, with formation of resinous products. Hydrochloric acid also yields resinous products, together with a small quantity of crystals. Boiling nitric acid converts cyanaldehyde into cyanacetic acid.

When heated with a large excess of aniline in sealed tubes at 300° for sixteen hours, and the excess of aniline distilled off, cyanaldehyde yields crystals of *cyanethylidenediphenyldiamine*, $CN{\cdot}CH_2{\cdot}CH(NHPh)_2$, which melts at 113°.

Thiocyanaldehyde is obtained in a similar manner from iodalde-

hyde and silver thiocyanate. It is isomeric with acetyl thiocyanate, but is distinguished by its greater stability in presence of water. It is a very dense, viscid liquid, with a fœtid odour, and cannot be distilled without decomposition.

The Purity of Chloroform. C. Schwarz and H. Will. (*Pharmaceutische Zeitung*, 1888, 551.) Chloroform intended for anæsthetic purposes should stand the following tests :—

1. Three hundred grams are distilled on a water-bath until about 2 c.c. remain in the flask or retort; on addition of concentrated H_2SO_4 to this residue, no darkening should take place, nor should an odour of amylic compounds be developed.

2. Forty grams, shaken repeatedly with 30 grams concentrated H_2SO_4 in a glass-stoppered bottle, previously rinsed with H_2SO_4, should not darken within forty-eight hours.

3. The chloroform decanted from the above test, after the addition of a zinc iodide starch solution, should not blue this, and should not itself become red.

4. The chloroform from No. 2 shaken with distilled water, and the latter filtered into solution of silver nitrate, should cause no change.

Purity of Iodoform. M. Neuss. (*Pharmaceutische Zeitung*, 1888, 565.) The author has observed that several kinds of iodoform sold as pure, and answering to the tests of the German Pharmacopœia, give dark coloured ethereal solutions, due to liberation of iodine. He attributes this behaviour towards ether to the presence of an impurity not hitherto recognised.

Manufacture of Iodoform. H. Suilliot and H. Raynaud. (*Bull. Soc. Chim.*, li. 3, 4.) The authors base their process on the reaction between acetone and iodine, and by the use of hydrochlorite at a later stage, practically recover the whole of the iodine in the final product. One molecule of acetone and six of iodine in presence of sodium hydrate yield one molecule of iodoform, one-half of the iodine forming sodium iodide. If sodium hypochlorite be then added, a further molecule of acetone is attacked, yielding iodoform. There is no formation of chloroform or iodate. The mode of procedure is to dissolve 50 parts of potassium iodide, six parts of acetone, and two parts of sodium hydrate, in one or two litres of cold water. On adding to this a dilute solution of sodium hypochlorite, drop by drop, with agitation, a precipitation of iodoform ensues, which agglomerates rapidly. The hypochlorite is added until all acetone or iodide has disappeared. The results are close on the calculated quantities. As the presence of neutral

salts of the alkalies do not interfere with the reaction, crude caustic liquors may be used, if previously freed from sulphides, sulphites, etc. The liquor decanted from the precipitate contains only traces of iodine.

Iodoform. B. Fischer. (*Pharmaceutische Zeitung*, 1889, 31.) The author has investigated the cause of the pink coloration acquired by iodoform when dissolved in ether, etc., and finds that the ethereal solution of perfectly pure iodoform acquires a dark tint under ordinary conditions. But if the iodoform and the solvent be freed from air, the solution is of a pale yellow colour as long as air is completely excluded; this solution darkens immediately it is exposed to air, owing to the separation of free iodine. Certain impurities, either in the iodoform or in the solvent, appear to hinder this decomposition; in samples of iodoform containing amylalcohol, pyridine bases, and acetamide respectively, the darkening of the ethereal solution was not observed; so that in all probability these substances either take up the oxygen (from the air) in the solvent, or else the separated iodine.

Contamination of Ether with Sulphur. L. L. de Koninck. (*Apoth. Zeitung*, January 19, 1889, 71.) Ether is found by the author to occasionally contain free sulphur. This impurity may be readily detected by shaking the ether in a test-tube with one drop of pure metallic mercury; in the presence of sulphur the mercury becomes grey or black through the formation of sulphide.

Contamination of Ether with Sulphur. T. Bosch. (*Nederl. Tijdschr. voor Pharm.*, April, 1889, 113.) Alluding to an observation by L. L. de Koninck (preceding abstract), the author points out that the mere blackening of mercury in the test does not afford definite proof of the presence of sulphur in the ether, since hydrogen peroxide would produce the same result. Fusion of the black powder with pure sodium carbonate and nitrate, followed by treatment of the fused mass with nitric acid and subsequent testing for sulphuric acid with barium chloride, are recommended by the author in order to prove that the impurity indicated is really sulphur. Hydrogen peroxide may be easily detected by means of the well-known reaction with chromic acid.

Sulpho-Carbolates. F. B. Power and E. G. Raeuber. (*Chemist and Druggist*, May 25, 1889, from *Pharmaceutische Rundschau.*) The authors find that the sulpho-carbolates supplied by the manufacturing chemists conform with what are demanded by the various pharmacopœias, and are the *para*, not the *ortho*,

compounds. They should be prepared by digesting the mixture of phenol and sulphuric acid at the temperature of a water-bath for about six hours, instead of limiting the temperature to 55° or 60° C. for several days, as some text-books state. At the latter temperature mixtures of ortho and para compounds are obtained. The chemical formula, ($Na\,C_6\,H_5\,S\,O_4\,2\,H_2\,O$), and the description of sodium sulpho-carbolate, as given in the U.S. Pharmacopœia, pertain to the para compound, and are correctly expressed, with the following exceptions:—The crystals are not absolutely "permanent in the air," but effloresce slightly on exposure. The solubility is more exactly 1 part in 4·8 parts of water, instead of 5 parts; but the latter statement is sufficiently correct for practical purposes. The amount of residue left by the ignition of the sodium salt is not "36 per cent.," but 30·6 per cent.

The difference in the solubilities of the ortho and para sodium and zinc sulpho-carbolates in water is not very great.

Contribution to the Chemistry and Pharmacology of the Nitrites of the Paraffin Series. W. R. Dunstan, E. J. Woolley, and W. Lloyd Williams. (*Pharm. Journ.*, 3rd series, xix. 485–490.) In this elaborate investigation, carried out in the Research Laboratory of the Pharmaceutical Society, the authors deal with iso-butyl nitrite, the metameric amyl nitrites, and the chemical constituents of amyl nitrite used in medicine. Among many other points of interest, the fact is brought to light that commercial amyl nitrite contains a notable proportion of iso-butyl nitrite, which Professor Cash's preliminary investigation has proved to be more active than the mixture which constitutes the official "amyl nitrite."

As it is impossible to adequately treat the subject matter of this report in a moderately-sized abstract, we recommend the original account to the reader's attention, and refer him to the source above quoted.

Creolin. T. Weyl. (*Ber. der deutsch. chem. Ges.*, xxii. 138, 139.) Two preparations known as creolin were examined, with the following result:—Artmann's creolin is a dark-brown oil of a sharp odour, which forms an emulsion with water; when cooled, crystals of naphthalene separate. It contains 84·9 per cent. of hydrocarbons, 3·4 per cent. of phenols, 1·5 per cent. of acids, and 0·8 per cent. of sodium. Pearson's creolin is easily distinguished from the above in being readily soluble in ether. It contains hydrocarbons, 56·9 per cent.; phenols, 22·6 per cent.; acids, 0·4 per cent.; and sodium, 2·4 per cent.

Occurrence of Solid Hydrocarbons in the Vegetable Kingdom. H. Gutzeit. (*Ber. der deutsch. chem. Ges.*, xxi. 2881, 2882.) The author has found crystalline hydrocarbons in the fruit of the *Heracleum giganteum*, melting at 61–63° and 66–71°, and also in *Heracleum Sphondylium*, and in *Pastinaca sativa*. They were found to possess the general formula $C_n H_{2n}$. The presence of similar bodies has also recently been pointed out by Abbot and Trimble.

Occurrence of Skatole in the Vegetable Kingdom. W. R. Dunstan. (*Pharm. Journ.*, 3rd series, xix. 1010.) The occurrence of skatole in a plant has not hitherto been observed; it has appeared to be a characteristic product of the bacterial resolution of animal proteid.

The author reports having obtained this substance from the wood of *Celtis reticulosa*. By distilling 200 grams of this wood with water a minute quantity of a solid crystalline substance was obtained. It possessed a fæcal odour, and after purification melted at 93·5° C. Its physical and chemical properties were not those of α-naphthylamine. It afforded a crystalline picrate, by the analysis of which the substance was shown to possess the composition of methyl-indole ($C_9 H_9 N$); and by its physical and chemical properties it was proved to be identical with the Pr ·3 methyl-indole, or skatole, which Brieger isolated in 1877 from human fæces, and Salkowski soon afterwards obtained from among the putrefaction products of animal proteid. Nencki has observed the formation of the same substance when potash is fused with albumen, and it has also been prepared synthetically. Skatole from *Celtis reticulosa* corresponds in all its properties with synthetical skatole from propylidene phenyl-hydrazide.

Indole is associated with skatole in human fæces, but no indole could be detected in the wood of *Celtis reticulosa*.

The Existence of Salicylic Acid in Certain Genera of the Liliaceæ. A. B. Griffiths. (Abstract of a paper read before the Chemical Society, June 20, 1889. From the Society's Proceedings.) The author states that he has isolated salicylic acid from the leaves, stems, etc., of *Tulipa*, *Yucca*, and *Hyacinthus*, in the following manner:—

The leaves, stems, etc., cut up into small pieces, were digested with ether, and the solution distilled. The residue was treated with distilled water, and the solution filtered; the filtrate was then neutralised with potassium carbonate, evaporated, and finally distilled with pure chlorhydric acid. The aqueous distillate yielded

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ture of the two modifications yields an optically inactive substance which corresponds in other respects with its constituents.

Camphor, Menthon, and Borneol. Dr. E. Beckman. (*Pharm. Zeit.*, July 21, 422; *Pharm. Journ.*, 3rd series, xix. 62.) The author has previously reported upon the conversion of menthon, the liquid constituent of peppermint oil, into menthol, and of laurel camphor into borneol. He now definitely describes a process for carrying out these operations upon a manufacturing scale. The camphor (or, in the case of menthon, the peppermint oil containing it) is dissolved in ether or some other solvent indifferent to the action of sodium, and repeatedly treated with sodium and then with water. The reaction with camphor is shown by the equation:—

$$\underset{\text{Camphor.}}{2\,C_{10}H_{16}O} + Na = \underset{\text{Sodium Camphor.}}{C_{10}H_{15}NaO} + \underset{\text{Sodium Borneol.}}{C_{10}H_{17}NaO}.$$

These sodium compounds are decomposed by water with the formation of molecular quantities of camphor and borneol:

$$C_{10}H_{15}NaO + C_{10}H_{17}NaO + 2\,H_2O = C_{10}H_{16}O + C_{10}H_{18}O + 2\,NaOH.$$

The solution of camphor and borneol so obtained is treated afresh with sodium and water, until all the camphor is converted into borneol.

Apiole and Isapiole. G. Ciamician and P. Silber. (*Pharm. Journ.*, 3rd series, xix. 62, from *Ber. der deutsch. chem. Ges.*, xxi. 1622.) As the result of heating apiole, the so-called parsley camphor, with alcoholic potash, the authors have obtained a crystalline compound having the same composition as apiole, ($C_{12}H_{14}O_4$), which they have therefore named "isapiole." It melts at 55–56° (apiole melts at 30°), and is soluble in ether, acetic ether, acetone, benzol, hot alcohol, and glacial acetic acid, but insoluble in water, alkalies, and carbonated alkalies. Both apiole and isapiole yield upon oxidation with potassium permanganate in alkaline solution a crystalline acid represented by the formula $C_{10}H_{10}O_6$, and named "apiolic acid," but isapiole, when oxidized with potassium bichromate and sulphuric acid, yields a neutral compound, ($C_{10}H_{10}O_5$). Isapiole has been tested physiologically and therapeutically in the Padua clinic, and is reported to exercise a pronounced influence upon the vaso-motor system. Small doses (0·2 to 0·4 gram), administered internally, produced in half an hour excitation of the heart, with powerful pulse; larger doses (0·6 to 0·8 gram) were followed by a rebounding pulse, the effect

continuing for several days after administration, when the preparation had been previously used for some days. Like apiole, isapiole induced headache and passing intoxication, and after repeated ingestion caused digestive disturbances, loss of appetite, and even fever. Against dysmenorrhœa it was useless, and also in a case of ague.

Apiole. G. Ciamician and P. Silber. (*Ber. der deutsch. chem. Ges.*, xxi. 2129–2133. Also J. Ginsberg. *Ber. der deutsch. chem. Ges.*, xxi. 2514–2516.) In these additional reports the authors deal with bromo-, chloro-, nitro-, and acetyl-derivatives of apiole.

Conversion of Terpilene into a Menthene. G. Bouchardat and J. Lafont. (*Comptes Rendus*, cvii. 916–918.) When terpene, $C_{10}H_{16}, 2H_2O$, is heated to 100° for fifteen hours with an aqueous solution of HI (saturated with this gas at 0°), the dihydriodide of terpilene crystallizes out, identical with the corresponding terebenthene derivative, $C_{10}H_{16}, 2HI$. On raising the temperature the crystals melt, iodine is liberated, and the principal product formed is menthol-hydriodide, $C_{10}H_{19}I$, or an isomeride of the same. The oily mixture, after removing excess of acid, is heated to 100° with alcoholic potassium acetate, and the filtrate treated with water. The oil which separates is distilled, the portion going over from 167–170° being collected separately. The formula of the substance in this fraction is $C_{10}H_{18}$. It fixes the halogen acids slowly, which feature distinguishes it from the terpilene, $C_{10}H_{18}$. The solid hydrochloride, $C_{10}H_{18}2HCl$, melts at about 50° The mono-hydrochloride is also described. Alkalies act on it, reproducing the hydrocarbon, $C_{10}H_{18}$. Its composition is the same as that of menthol hydrochloride, obtained by the action of HCl on menthol, $C_{10}H_{20}O$, or on menthol camphor. The author concludes from the above that natural menthol must be regarded as belonging to the terpilene series.

Chemical Notes on Tea. Dr. B. H. Paul and A. J. Cownley. (*Pharm. Journ.*, 3rd series, xix. 24.) The authors have examined an authentic sample of Himalayan tea, but have not been able to confirm the presence therein of theobromine, alleged by Liebig and Zöller. In the course of this investigation they have obtained evidence that, in addition to caffeine, this tea contains another alkaloid; but the quantity of the latter obtained by them was too small to admit of the determination of its chemical nature.

A New Base in Tea. A. Kossel. (*Ber. der deutsch. chem. Ges.*, xxi. 2164–2167.) A new alkaloid, $C_7H_8N_4O_2$, which the author

names *theophylline*, exists in small quantities in tea extract, and occurs together with caffeine. It may be obtained from the syrupy extract in the following manner: After mixing with water sulphuric acid is added, and the resulting liquid filtered and supersaturated with ammonia. Ammoniacal solution of silver nitrate is then added, and the precipitate thus formed is collected by filtration. The precipitate is digested with warm nitric acid, the mixture filtered to separate silver salts that deposit, and the filtrate made alkaline with ammonia. In the course of twenty-four hours a brownish amorphous precipitate is deposited, which contains the new base in the state of a silver compound, and by evaporating the clear filtered liquid a further quantity of this silver compound is obtained. After separating the silver from this compound by treatment with sulphuretted hydrogen and filtering, a small quantity of xanthine is deposited from the clear filtrate, and upon concentrating the liquid the new base partly crystallizes out. The mother-liquor is then mixed with mercuric nitrate solution, the precipitate collected by filtration, and the filtrate made alkaline with sodium carbonate solution. A white precipitate is thus obtained in both cases, which consists almost entirely of a mercury compound of the base.

Theophylline crystallizes with 1 mol. of water, which it loses at 110°, is considerably more soluble in alcohol and water than theobromine, and is extremely soluble in very dilute ammonia. It melts at 264°, forms crystalline salts with hydrochloric acid nitric acid, platinum tetrachloride, auric chloride, and mercuric chloride, and combines with soda to form a readily soluble compound. When theophylline is evaporated with chlorine-water, a scarlet residue is obtained, which changes to violet when treated with ammonia.

A study of some of its derivatives leads the author to the conclusion that theophylline is dimethylxanthine.

Notes on Caffeine. R. Leipen. (*Monatsh. für Chemie*, x. 184–189.) The oxidation of caffeine by means of ozone is found to proceed in a manner analogous to that effected by means of potassium bichromate and sulphuric acid, the decomposition products being dimethylparabanic acid, ammonia, methylamine, and carbonic anhydride.

Caffeine oxalate, $(C_8H_{10}N_4O_2)_2\,C_2H_2O_4$, unlike other caffeine salts which are all decomposed by water, is a very stable compound, which can be repeatedly recrystallized from water without suffering decomposition.

Constitution of Cinchona Alkaloids. Z. H. Skraup. (*Monatsh. Chem.*, x. 39–50. From *Journ. Soc. Chem. Ind.*) The author has recently shown that the "second half" of cinchonine contains a nucleus which is certainly not a quinoline ring, but is in all probability a piperidine ring, and this view is in accordance with what is already known of the behaviour of cincholoipon and cincholoipic acid. Quinine, when oxidized with chromic acid, yields, as is already known, quinine acid, $C_{11} H_9 N O_3$, and syrupy products which are analogous to those obtained from cinchonine, and which can be separated into two portions by saturating the syrup with bases and extracting with alcohol. The portion insoluble in alcohol consists of salts of quinine acid, tricarbopyridinic acid and an amorphous nitrogenous acid which hitherto could not be obtained in a pure state. The last-named acid can, however, be easily prepared in a crystalline condition by oxidizing chitenine, $C_{19} H_{22} N_2 O_4$, which, as the author has previously shown, is formed together with formic acid when quinine is carefully oxidized with potassium permanganate. Chitenine, prepared as previously described, when crystallized from alcohol, generally contains an impurity which can be removed by dissolving in warm ammonia, saturating the solution with carbonic anhydride, and repeating the process. It has no well-defined melting-point, but generally melts at about 265° when heated slowly. It does not combine with phenylhydrazine, but it yields an amorphous yellowish red acetyl-derivative. It is reduced when treated with sodium amalgam in dilute sulphuric acid solution, yielding an amorphous base, the aqueous solutions of which are intensely yellow coloured. It yields an amorphous compound when treated with potash and ethyl iodide; and when heated with hydrobromic acid it is converted into the *hydrobromide*, $C_{19} H_{22} N_2 O_4 2 H Br$.

Oxidation of Chitenine.—The most important product of the oxidation of this substance by chromic acid (about 25 per cent. of the chitenine employed) consists of cincholoipic acid, the isolation of which is described in detail. This acid is obtained in the form of a syrup which could not be induced to crystallize, but when agitated with a little warm hydrochloric acid, and a crystal of cincholoipic acid hydrochloride (from cinchonine) thrown into the cold mixture, the *hydrochloride*, $C_8 H_{13} N O_4 H Cl$, separates in well-defined prisms or in small crystals, according to the concentration of the solution; further quantities of the salt can be obtained from the mother-liquors by converting into the lead salt, purifying the latter by repeatedly precipitating with alcohol, decomposing

with sulphuretted hydrogen, and treating the resulting syrupy acid as described above. The cincholoipic acid and the hydrochloride thus obtained are identical in chemical, physical, and also in optical properties, with the corresponding compounds obtained from cinchonine. It was also proved that from the mixture of neutral compounds which are formed when quinine is oxidized with chromic acid, a compound can be isolated which is identical with cincholoipon obtained by oxidizing cinchonine.

If cincholoipic acid is heated for a short time on the water-bath, it loses the power of crystallizing, and is precipitated in an amorphous condition when alcohol is added to the aqueous solution; even after dissolving in hydrochloric acid, the salt does not crystallize until after some weeks. This fact explains why in former experiments cincholoipic acid and its hydrochloride were not obtained in a crystalline condition.

Cincholoipic acid is best prepared as follows: 55 grams of commercial quinine sulphate are dissolved in 30 grams of concentrated sulphuric acid, the solution made up to 500 c.c., and each 100 c.c. is mixed in the cold with 380 c.c. of a 4 per cent. solution of potassium permanganate. After filtering from the manganese oxide, the filtrate and washings are evaporated to about $1\frac{1}{2}$ litre; the concentrated solution of chitenine thus obtained is heated on the water-bath, and a solution of 80 grams of chromic acid and an equivalent quantity of sulphuric acid is gradually run in. When oxidation is at an end, the whole is poured into excess of potash, boiled, filtered, the filtrate neutralised with sulphuric acid, and the potassium sulphate allowed to separate as completely as possible. The mother-liquors are mixed with a large volume of alcohol, concentrated sulphuric acid added, and the whole vigorously shaken until the precipitate becomes colourless and crystalline. The alcohol is evaporated, the solution boiled with excess of lead carbonate, filtered, concentrated, and the residual lead salt precipitated three or four times from its aqueous solution with alcohol, decomposed with hydrogen sulphide, and the filtrate acidified with hydrochloric acid, and concentrated. On adding a crystal of the salt, cincholoipic acid (4–5 grams) separates, and further quantities can be obtained from the mother-liquors, as well as from the lead salt which remains in solution after precipitating with alcohol. This method is also recommended for the preparation of cincholoipic acid from cinchonine.

The author's investigations prove that the "second half" of quinine has the same constitution as that of cinchonine; so that

the chemical difference between these two alkaloids is simply this, that quinine is a derivative of paramethoxy quinoline, whilst cinchonine is a derivative of quinoline itself. The manner in which the two nuclei are joined together may, however, differ in the two alkaloids, The further investigation of cincholoipon and cincholoipic acid will be of importance in ascertaining the constitution of quinine.

Constitution of Cinchona Alkaloids. H. Schniderschitsch. (*Monatsh. Chem.*, x. 51–64; *Journ. Soc. Chem. Ind.*, June, 1889.) The isomeric alkaloids cinchonine and cinchonidine are very similar in properties and in their behaviour towards reagents. When carefully oxidized with potassium permanganate, they both yield formic acid and are converted into cinchotenine and cinchotenidine respectively; these two compounds have the composition $C_{18}H_{20}N_2O_3$, and both contain a hydrogen atom replaceable by the acetyl-group. Cinchonine and cinchonidine both yield cinchoninic acid when treated with chromic acid; this fact proves that both compounds are quinoline derivatives, and that the hydroxyl-group must be situated in that portion of the molecule which is converted into cinchoninic acid. Comstock and Koenigs showed that the difference in constitution between these two alkaloids must be very slight, as they can be both made to yield one and the same cinchonidine.

When cinchotenine or cinchotenidine is oxidized with chromic acid, cincholoipic acid is obtained in a crystalline condition. An aqueous solution of cinchotenidine, prepared by oxidizing cinchonidine with 4 per cent. potassium permanganate solution, was treated with chromic acid as described by Skraup (preceding abstract). Cinchoninic acid and an acid identical with cincholoipic acid from cinchonine were obtained, and as apparently no other product was formed, the decomposition seems to take place in accordance with the equation—

$$C_{18}H_{22}N_2O_3 + O_4 = C_{10}H_7NO_2 + C_8H_{13}NO_4 + H_2O.$$

The formation of cincholoipic acid is a further proof that the difference in constitution between cinchonine and cinchonidine is extremely slight, and that in addition to the points noticed above, which these two alkaloids have in common, they both contain one and the same complex, consisting of eight carbon atoms which, on oxidation, yields cincholoipic acid, and is in all probability a piperidine derivative. It may be that both alkaloids contain the same two constituent groups, and that their isomerism, if not purely

physical, is due to some slight difference in the manner in which the two nuclei are combined together. If a compound identical with cincholoipon (from cinchonine) could be obtained from the nucleus in cinchonidine, which is not oxidized to cinchoninic acid, this view would be proved to be correct.

Constitution of Cinchona Alkaloids. J. Würstl. (*Monatsh. Chem.*, x. 65–72; *Journ. Soc. Chem. Ind.*, June, 1889.) Quinidine, $C_{20}H_{24}N_2O_2$ (conquinine), is isomeric with quinine, and, like the latter, it forms salt which give fluorescent solutions. Skraup (*Liebig's Annalen*, cxcix. 340) has previously shown that quinine and quinindine are both oxidized by potassium permanganate, yielding formic acid and a base, $C_{19}H_{22}N_2O_4$. This decomposition shows that one of the twenty carbon atoms is similarly situated in both alkaloids.

Quinine and its first oxidation-product, chitenine, when treated with chromic acid yield, as has been shown by Skraup, quinic acid and an acid syrup from which cincholoipic acid can be isolated.

The author treated an aqueous solution of chitenidine, prepared by oxidizing quinidine sulphate with a 4 per cent. solution of potassium permanganate, with chromic acid solution, as described by Skraup (this vol. p. 44), and obtained quinic acid and a cincholoipic acid identical with that formed from cinchonine, quinine, and cinchonidine. This fact proves that quinidine and quinine are both derived from a paramethoxyquinoline, and that the quinoline ring containing the methoxy-group is joined to the rest of the molecule in the same way as in quinine. In neither base can the hydroxyl-group be situated in that portion of the molecule which is oxidized to quinic acid, and both alkaloids contain the same complex ring, consisting of eight carbon atoms, to which the formation of cincholoipic acid is to be ascribed. The difference between the two alkaloids must therefore be due to a difference in constitution of the ring which does not yield quinic acid, and this difference cannot be greater than that between cinchonine and cinchonidine.

In determining the relation between the four cinchona alkaloids, it will be of great importance to ascertain whether a compound analogous to cincholoipin (from cinchonine and quinine) can be obtained from cinchonidine and quinidine.

The Quality of Quinine Sulphate. B. H. Paul and A. J. Cownley. (*Pharm. Journ.*, 3rd series, xix. 665.) The results

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part of the impurities together with a certain quantity of quinine. In this product the cinchonidine is determined by the "tetra-sulphate process." 1 gram of the mixture is dissolved in 9 grams of absolute alcohol and 3 grams of 50 per cent. sulphuric acid. The mixture is kept at 0° for twenty-four hours, the acid liquid is removed by suction, the crystals are washed with a little absolute alcohol, and then air-dried. They are then dissolved in water, and the base is precipitated by excess of sodium carbonate. It is dried first over sulphuric acid, and then at 115°. A correction (the amount of which depends on the percentage of cinchonidine found) must be applied. The author gives a curve for the purpose. The cinchonidine is very nearly pure. The hydro-bases are determined approximately by oxidizing the quinine and cinchonidine in acid solution by a 1 per cent. solution of potassium permanganate, rendering alkaline, and shaking with ether, followed by chloroform. The residue from these solutions, although very impure, are regarded as hydroquinine.

For the "chromate process" of De Vrij, see abstract, *Year-Book of Pharmacy*, 1887, 116; for the "oxalate test," see Schaefer (abstract, *Year-Book of Pharmacy*, 1887, 115). The amount of oxalate prescribed is insufficient for samples containing less than 15 per cent. of water, and the cooling at 20° should be prolonged to one hour. Schaefer's correction of 0·04 gram per 100 c.c. appears to be too large.

In Hesse's "bisulphate process," 5 grams of quinine sulphate are dissolved in 12 c.c. of normal sulphuric acid by warming, and the solution is allowed to crystallize in a narrow-necked funnel in a cold place. The mother-liquor is withdrawn by a filter-pump into a graduated cylinder, and the crystals washed with 3 c.c. of water. This solution is shaken with 16 c.c. of the ether (0·721–0·728), then 3 c.c. of ammonia (0·96) added, again shaken, and left for twenty-four hours. The ether is removed by a pipette, the crystals are collected on a filter, washed with water saturated with ether, dried between filter-paper, washed again with ether, and dried.

In the "crystallization process" of Paul and Hesse, 5 grams of quinine sulphate are dissolved in boiling water, and crystallized out four times, using in the first case 150 c.c., next 130 c.c., and then twice 120 c.c. The united mother-liquors are evaporated at a low temperature almost to dryness, the residue dissolved in the smallest possible quantity of dilute sulphuric acid, made up to 20 c.c., and shaken with ether and excess of ammonia. The crystals

which form are treated as in the bisulphate test. The hydro-bases crystallize in part with the quinine, therefore the mother-liquor should not be used for their determination.

The chromate process gives very varying results, but on the average gives the highest yield of cinchonidine, especially with the purer samples. The oxalate test gives the lowest numbers, but they are more concordant than those of the chromate process. The composition of the by-product is, however, variable. The bisulphate test gives results varying considerably. The alkaloids in the ethereal solution ought to be submitted to the process a second and even a third time; but even with this improvement the whole of the cinchonidine is not obtained, and the results vary much, but the composition of the by-product is more uniform than in the other processes. The crystallization test has the same advantages as the bisulphate test if the crystallization is repeated often enough, and is the process which is least influenced by the presence of hydro-bases. It is, however, tedious. The process of the German Pharmacopœia depends on the fact that the precipitate produced by ammonia in solutions of the alkaloids is soluble in excess of ammonia, but that much more ammonia is required for quinine than for the other alkaloids. The excess of ammonia required varies, however, very considerably with the temperature.

Quinine Lactate. A. Vigier. (*Journ. de Pharm. et de Chim.*, April 1, 1889.) The author suggests a method of preparing this salt extemporaneously when required for hypodermic injection. It consists in dissolving 21·65 grams of quinine sulphate in 400 grams of water and 25 grams of dilute sulphuric acid, precipitating with excess of ammonia, filtering, and washing the precipitate. The precipitate is then placed in a tared capsule with about 5 grams of lactic acid, and 100 grams of distilled water added at a temperature of about 80°, in order to obtain a clear solution and to effect its neutralization conveniently; after which it is evaporated down to 100 grams upon a water-bath, allowed to cool, filtered, and preserved in a bottle with a paraffined stopper. Each 5 grams of this solution would represent 1 gram of quinine lactate.

Cupreine. A. Oudemans. (*Chem. Zeit. Rep.*, May 11, 143. From *Pharm. Journ.*) Cupreine, the characteristic alkaloid of the bark of *Remijia pedunculata*, has been the subject of a thorough re-investigation by the author, who confirms generally the statements respecting the alkaloid made by Dr. Hesse. The composition

of the alkaloid crystallized from ether and dried at 130° C. is given as $C_{19}H_{22}N_2O_2$, and when separated from an alcoholic solution by water and dried in air, as $3C_{19}H_{22}N_2O_2 + H_2O$. Cupreine behaves as a diacid base, and gives with most acids two series of salts, which the author distinguishes as "basic" and "neutral." With some acids, as for instance, sulphuric acid, the alkaloid forms still another salt, containing double as much acid as the neutral salt, which is therefore considered an "acid" salt. The neutral and acid salts are as a rule pretty freely soluble in water, but the basic salts are less soluble in water, and the aqueous solutions are usually yellow, though the same basic salts give with absolute alcohol perfectly colourless solutions. The colourless solutions of neutral salts are not however coloured by a certain quantity of basic salt which results from dilution and decomposition. The rotatory power of free anhydrous cupreine in 97 per cent. alcohol is given as $[\alpha]_D = -175{\cdot}3°$.

A New Commercial Process for the Preparation of Cocaïne. C. Liebermann and F. Giesel. (*Ber. der deutsch. chem. Ges.*, xxi. 3196–3202; *Journ. Soc. Chem. Ind.*, February, 1889.) The extract of coca leaves does not yield pure cocaïne directly, but a mixture of a large number of alkaloids from which the cocaïne is separated. Liebermann has lately unfolded the nature of one of these by-products, to which he gave the name of isatropyl cocaïne, because the benzoic acid of cocaïne is replaced in it by isatropaic acid (γ and δ). All these foreign alkaloids are easily split up by boiling with hydrochloric acid into ecgonine, and this fact is made use of for preparing ecgonine on the large scale. The amorphous by-products up to this time also valueless, are to be had in quantity. Ecgonine forms the starting point for the preparation of cocaïne. Thus, ecgonine is converted into the benzoyl derivative, benzoyl ecgonine, and the latter is decomposed so as to yield cocaïne by Einhorn's method. The cocaine thus prepared from the hitherto troublesome by-products above referred to, shows all the chemical, physical, and medicinal properties of the "natural" cocaïne.

Synthesis of Cocaïne. A. Einhorn and J. Klein. (*Ber. der deutsch. chem. Ges.*, xxi. 3335.) The authors effect the practical synthesis of cocaïne by passing a current of dry hydrochloric acid gas into a solution of ecgonine in methyl alcohol, and afterwards converting the ester into cocaïne by digesting the hydrochloride with benzoyl chloride.

The Cocaines. C. Liebermann. (*Ber. der deutsch. chem. Ges.*, xxii. 124–133; *Journ. Soc. Chem. Ind.*, April, 1889.) From a by-product from cocaine the author has isolated two acids, which from their similarity to Fittig's α- and β-isatropic acid, he calls γ and δ-isatropic acid. The former can be converted into a new acid of the same composition, which is therefore named ϵ-isatropic acid. The γ-acid on distillation yields cinnamic acid and a small quantity of an oily by-product. The γ-acid also gives cinnamic acid on distillation, though in smaller quantity. On boiling the acids with acetic anhydride and sodium acetate, the anhydrides are formed. The anhydride of the γ-acid yields on heating with an alkali the ϵ-acid. With concentrated sulphuric acid, the sulphonic acids of γ- and δ-isatropic acid are formed.

By bringing together 2 parts of ecgonine, 1 part of water, and 2 parts of γ-isatropic-anhydride, and heating on the water-bath, isatropyl-ecgonine is formed, which after drying may be mixed with isatropic acid, dissolved in methyl alcohol, and saturated with hydrochloric acid gas. On evaporating off the methyl alcohol and the acid, dissolving in water and shaking out with ether, the ethereal solution leaves on evaporation isatropyl-cocaine of the formula $C_{19}H_{23}NO_4$. This substance is identical with the natural product.

By the same process, the author has prepared an anisyl-ecgonine and anisyl-cocaine.

The Alkaloids in Cocaine. A. Einhorn. (*Ber. der deutsch. chem. Ges.*, xxii. 399–402.) These investigations were limited to the by-products in the preparation of ecgonine hydrochloride from cocaine. The cocaine is decomposed with concentrated hydrochloric acid into ecgonine, which is precipitated by the addition of alcohol and ether. The filtrate on evaporation leaves a syrupy liquid. The syrup is dissolved in water, filtered, and caustic soda added, which precipitates a light coloured compound. This precipitate when dry partly dissolves in alcohol, from which a crystalline substance is obtained. The new product has probably the formula $C_{26}H_{32}N_3ClO$. The filtrate from this compound, after acidifying with hydrochloric acid, yields on evaporation crystallized anhydro-ecgonine. This substance is decomposed by hydrochloric acid at 270° into hydrocarbons, methyl chloride, ammonia, methylamine, and also basic substances, one of which yields a nitrose compound and the other is unchanged by the action of nitrous acid, but forms a double chloride with chloride of gold. Both bases when distilled with zinc dust yield oils smelling of pyridine.

The Coca Bases. O. Hesse. (*Ber. der deutsçh. chem. Ges.*, xxii. 665–671; *Journ. Soc. Chem. Ind.*, July, 1889.) Two kinds of coca leaves are found in commerce, the one obtained from *Erythroxylon coca*, which was the original trade product, and the other, which appeared later, derived from Jamaica and St. Lucia. The latter has been used in North Germany for the preparation of coca. The author obtained from this variety the substance which is named cocamine. This is a base which may be obtained in crystals by treating with acetic acid and precipitating with ammonia. It has the formula $C_{10}H_{23}NO_4$, and combines with one molecule of hydrochloric acid. Both the base and hydrochloride decompose on heating, the former yielding methyl alcohol and the latter methyl chloride. The residue left by the decomposition of the hydrochloride is cocamylecgonine, $C_{18}H_{21}NO_4$, and by a secondary reaction a small quantity of cocaic acid.

If the hydrochloride be boiled with hydrochloric acid it is split up into ecgonine and cocaic acid—

$$C_{18}H_{21}NO_4 + H_2O = C_9H_{15}NO_3 + C_9H_8O_2.$$

This acid is identical with γ-isatropic acid of Liebermann. A second acid is also present, but the quantity is too small for analysis. It is separated from the cocaic acid by the insolubility of the lime salt. Cocamine acts physiologically like cocaine, but rather weaker. The anæsthetic action is particularly weak. The action of γ-isatropylcocaine is, according to Liebreich, of an entirely different character, being a strong poison. If the crude coca bases are fractionally precipitated and dissolved in ether, and the ether evaporated, a syrupy residue remains, which, after maintaining for some time at 60°, no longer dissolves completely in acids. The insoluble portion dissolves in ammonia, and is precipitated by barium chloride. This new substance may be purified by fractional precipitation. Boiled with dilute acids it yields a new acid, which has not been further investigated, and ecgonine. The substance itself has the formula $C_{18}H_{19}NO_4$. The author calls the acid cocrylic acid, and the substance cocrylecgonine, and methylated cocrylecgonine, cocrylamine corresponding to cocamine. The brownish yellow oil obtained by the action of hydrochloric acid upon the so-called isatropylecgonine is probably cocrylecgonine, which is formed from the cocrylamine present. This is probably the reason that Liebermann's base has poisonous properties. The solution from which the cocamine is separated contains a mixture of bases, which, when treated with hydrochloric acid,

yield ecgonine, an oily non-volatile base, and hygrin, and the following acids, cocaic acid, cinnamic, and benzoic acids. The author concludes that the amorphous bases in the genuine coca are the benzoyl compounds of an oily non-volatile base and cocamine; but that other coca varieties consist of cocamine and the cinnamyl compound of the oily base, and that cocrylamine accompanies both. Both bases yield hygrin.

The Coca Bases. C. Liebermann. (*Ber. der deutsch. chem. Ges.*, xxii. 672–675.) The paper is a criticism on the foregoing investigation of Hesse, in which the author maintains the correctness of his former researches on the alkaloids accompanying cocaine.

Hygrin. C. Liebermann. (*Ber. der deutsch. chem. Ges.*, xxii. 675–679; *Journ. Soc. Chem. Ind.*, July, 1889.) To prepare the pure material, the crude product was dissolved in ether, separated from water, and allowed to stand over solid potash. The ethereal solution was then poured off and distilled in vacuo. The oil was fractionated. One portion boiled at 128–131° under a pressure of 50 mm., and another at 215° under the same pressure. Both bases differ in so far from Hesse's analytical results, that they contain oxygen, whereas Hesse's hygrin has the formula $C_{12}H_{13}N$.

The lower boiling base boils at 193–195° under ordinary pressure, and the analysis and vapour density corresponds with the formula $C_8H_{15}NO$. It forms salts and a picric acid addition-product. The higher boiling substance cannot he distilled at the ordinary temperature without undergoing decomposition. From a series of analyses of the free base and various salts, it appears to have the composition $C_{14}H_{24}N_2O$. Neither base is decomposed by heating with concentrated hydrochloric acid to 120°.

Strychnine and Homostrychnine. Dr. Koefoed. (*Rep. Pharm.*, March 16, 1889; *Pharm. Journ.*, 3rd series, xix. 864.) The author reports that upon precipitating a hydrochloric acid solution of the alkaloid with potassium platinoso-chloride, there is at first separated a compound in which the platinum amounts to 18·8 per cent., and subsequently another in which the quantity found was 19·35 per cent. The first quantity corresponds to a molecular weight of 347·59, and the second to 333·18, and the difference, 14, corresponds to CH_2. The ordinary formula for strychnine, as given in the Pharmacopœia is $C_{21}H_{22}N_2O_2$, which would be equal to a molecular weight of 333·31. The author considers therefore that he is justified in assuming that in commercial strychnine the $C_{21}H_{22}N_2O_2$ compound is accompanied by another that is repre-

sented by the formula $C_{22}H_{24}N_2O_2$, to which he gives the name "homostrychnine." For a similar reason he has arrived at the conclusion that ordinary "brucine" consists of two alkaloids, the molecular weights of which are approximately 398·24 and 414·85.

Strychnine. W. F. Loebisch and H. Malfatti. (*Monatsh.*, ix. 626–633; *Journ. Chem. Soc.* February, 1889.) Stoehr, on distilling strychnine with quicklime, obtained a mixture of skatole and β-methylpyridine. The authors find that when the alkaloid is distilled with soda-lime, in addition to the above-mentioned compounds, carbazole is formed, in quantity equal to 0·5 per cent. of the strychnine used.

Atropine and Hyoscyamine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xxi. 3065–3070; *Journ. Soc. Chem. Ind.*, 1889, 59.) Will (*Year-Book of Pharmacy*, 1888, 62) found that hyoscyamine is converted into atropine when treated with dilute alkalies or when heated above its melting-point. Will and Bredig, who investigated this subject more fully, came to the conclusion that atropine is an optically active base ($\alpha_D = -1·89$).

The author prepared atropine aurochloride from a sample of the purest commercial atropine (which was further purified by several re-crystallizations), and re-crystallized it fourteen times; the resulting salt melted at about 140°, and an 18 per cent. solution of the atropine obtained from this salt was optically inactive.

When an 8 per cent. alcoholic solution of commercial atropine is mixed with a few drops of very dilute soda, and kept for two hours, the solution is still optically active; but if the base obtained from the solution be re-crystallized several times, its rotatory power decreases. When a 6 per cent. alcoholic solution of atropine is mixed with a small quantity of soda, and kept for five hours, the solution is optically active; after standing for nineteen hours longer, the solution is still optically active, but if the base be then twice re-crystallized from dilute alcohol, the pure compound obtained has no rotatory power.

From these results the author concludes that atropine is an optically inactive base, standing in the same relation to hyoscyamine as racemic acid to lævotartaric acid, and that the conversion of hyoscyamine into atropine, although possible, has not yet been accomplished. He also found that when atropine is re-crystallized many times, small quantities of the hyoscyamine salt are obtained; and he is also of the opinion that the supposed conversion of hyoscyamine into atropine results from the employment of impure materials.

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The Amount of Water of Crystallization in Morphine. O. Hesse. (*Pharmaceutische Zeitung*, August 11, 1888.) The author criticises the results obtained by Dott (*Year-Book of Pharmacy*, 1888, 65), and also by Dieterich, both of whom found more water in morphine hydrate than accords with the usual formula. He has re-determined the proportion of water, and again finds it to be in perfect harmony with the formula $C_{17}H_{19}NO_3 + H_2O$. He assumes that the excess of water found by Dieterich was accidental, and that Dott failed to reduce the crystals to a fine powder and to remove the water mechanically enclosed in them.

The Amount of Water of Crystallization in Morphine. D. B. Dott. (*Pharm. Journ.*, 3rd series, xix. 180.) Replying to Hesse (see preceding abstract), the author does not consider that the experiments described by that chemist afford conclusive proof of the correctness of the formula $C_{17}H_{19}NO_3 + H_2O$, or of the incorrectness of the formula $8C_{17}H_{19}NO_3 + 9H_2O$, as found by himself (Dott). He objects to the grinding of the morphine to a powder, on the ground that the heat thus developed might cause loss of water of hydration, and thus introduce an error into the determination.

Morphine Hydriodide. H. Knnz. (*Archiv der Pharm.* [3], xxvi. 307–311.) This body is obtained by mixing a saturated alcoholic solution of potassium iodide with a concentrated solution of morphine hydrochloride. It crystallizes in fine needles having a composition represented by the formula—

$$C_{17}H_{19}NO_3, HI + H_2O.$$

Codeïne. A. Knoll. (*Archiv der Pharm.* [3], xxvii. 229.) Some years back codeïne was prepared synthetically from morphine by substituting a methoxyl-group for a hydroxyl-group. In place of methyl chloride, the author proposes the use of a methyl sulphate for this purpose. The mass is taken up with dilute sulphuric acid, and the codeïne is separated from a residue of undecomposed morphine by treatment with ammonia, when, on diluting somewhat, the codeïne remains in solution. The codeïne thus obtained is chemically pure, and agrees completely in all its properties with natural codeïne obtained from opium.

Narcotine. W. Roser. (*Liebig's Annalen*, ccxlix. 156–172.) This is a continuation of researches on the derivatives of narcotine. The present paper deals with those derivatives which have cotarnine for their starting point, and the author prefers Anderson's method for the preparation of this substance from narcotine by the

action of nitric acid, in preference to manganese dioxide and sulphuric acid. The melting-point of cotarnine is given as 132–133°, at which it also begins to decompose. By the action of methyl iodide on cotarnine a product is obtained containing the two following substances:—

Cotarnine hydriodide, $C_{12}H_{13}NO_3HI$, forms glittering yellow needles sparingly soluble in water and cold alcohol.

Cotarnmethinmethyliodide, $C_{14}H_{20}NO_4I$, is easily soluble in hot water, and crystallizes by slow cooling in long glittering needles of light yellow colour. On digesting this with silver chloride the corresponding chloride, $C_{14}H_{20}NO_4Cl \cdot 3H_2O$, is obtained, and is distinguished by its readiness to form large clear crystals. Cotarnmethinmethyliodide is remarkable in being derived from cotarnine, not merely by the addition of methyl-iodide, but by the inclusion of a second methyl-group. On treating the aqueous solution with caustic soda, a separation of oily drops ensues accompanied by the smell of a volatile base. The decomposition of the base of the salt is expressed by the equation—

$$C_{14}H_{20}NO_4(OH) = C_{11}H_{10}O_4 + H_2O + N(CH_3)_3.$$

The oily body forms on cooling a white crystalline compound, $C_{11}H_{10}O_4$, which, having the characters of a ketone, is termed *cotarnone*. The volatile base is trimethylamine. From the nature of this change the constitutional formula of cotarnmethinmethyliodide must be $(C_{11}H_{11}O_4)N(CH_3)_3I$, and from a consideration of the transformation undergone by cotarnine in these reactions, the author draws the following conclusions:—

"The formula of cotarnine is not $C_{12}H_{13}NO_3 \cdot H_2O$, but $C_{12}H_{15}NO_4$, the so-called water of crystallization belonging to the constitution. Cotarnine is a secondary base.

"A pyridine group is not contained in free cotarnine, but is contained in its salts."

Cotarnone, $C_{11}H_{10}O_4$, is easily soluble in alcohol, ether, or acetic acid, and crystallizes from alcohol in rhombic plates, melting at 78°. It is an indifferent body, stable against alkalies, but transformed on warming with acids into dark-coloured products.

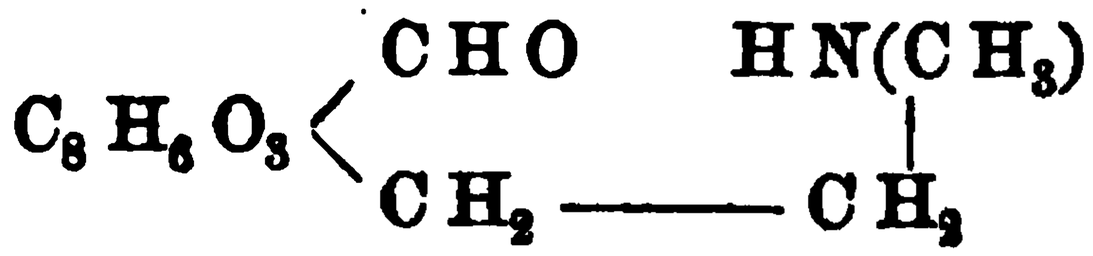
Cotarnonoxime, $C_{10}H_{11}O_3(NOH)$, is formed on warming cotarnone with hydroxylamine hydrochloride in alcoholic solution. It crystallizes from dilute alcohol in fine needles, melting and decomposing at 130–132°.

Cotarnic acid, $C_8H_6O_3(COOH)_2$, is obtained from cotarnone by the action of potassium permanganate. It crystallizes readily

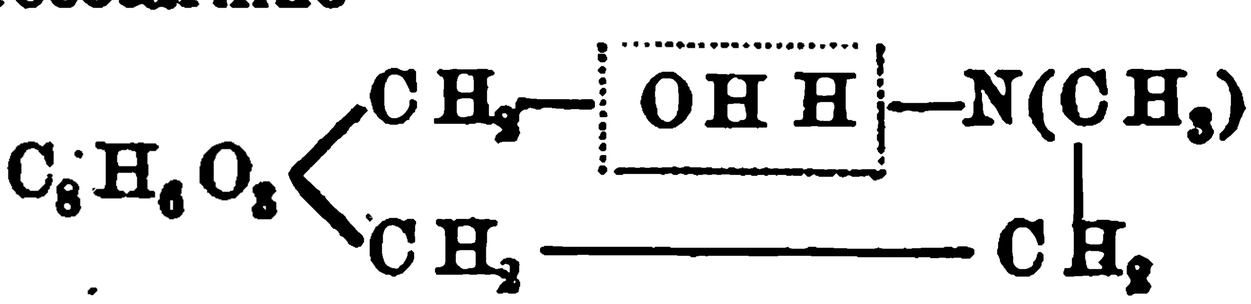
from water, and melts at 178°, with decomposition. It forms an acid potassium salt, which, on double decomposition with silver nitrate, yields a neutral silver salt and free acid. The author observes that hydrastinine comports itself on treatment with methyliodide in a manner strictly analogous to cotarnine, yielding a volatile base and an indifferent substance as final products.

The formula for cotarnine, and its relation to hydro-cotarnine, as deduced from the results of these researches, may be thus expressed.

Cotarnine—



Hydrocotarnine—



Chemically Pure Narceine. E. Merck. (*Chem. Zeit.*, xiii. 525, 526; *Journ. Soc. Chem. Ind.*, 1889, 567.) As the author has found that the melting point of various preparations of narceine melt as much as 20° above the melting-point given by Hesse, he considered it doubtful whether the pure substance had yet been obtained. He obtained a sample melting at 153°, which contained 1·06 per cent. of hydrochloric acid. This amount it obstinately retains, and crystallizes from water containing free ammonia without losing chlorine. To prepare the pure base, the author starts from chemially pure narceine hydrochloride prepared by himself. It melts at 163° with decomposition, crystallizes with one molecule of hydrochloric acid, but without water. Treated with water it decomposes, yielding the pure base, melting at 170–171°. It possesses a feebly alkaline reaction. It combines readily with acids, absorbing hydrochloric acid if present in the atmosphere, by which the melting-point is at once lowered considerably. For therapeutic purposes a good quality of commercial narceine should be free from meconine, and when free from acid should not melt under 165°. Chemically pure narceine is free from acid, and does not fuse below 170°.

Oxidation-Products of Papaverine. G. Goldschmiedt. (*Monatsh.*, ix. 327–348.) This is a continuation of the author's previous researches on the oxidation of papaverine with permanganate (see abstract, *Year-Book of Pharmacy*, 1888, 68.)

The present report deals mainly with the action of permanganate on papaverine benzyl chloride and papaverine ethobromide. For particulars reference should be made to the original paper.

Constitution of Papaverine. G. Goldschmiedt. (*Monatsh.*, ix. 349–360; *Journ. Chem. Soc.*, October, 1888.) Papaverine is a derivative of isoquinoline; it contains the two groups, dimethoxyisoquinoline,

$$<^{N:CH-}_{CH:CH}>C_6H_2(OMe)_2[(OMe)_2=1:2 \text{ or } 3:4],$$

and dimethylhomocatechol, which are most probably united by the CH_2-group of the latter. The constitution of papaverine is therefore probably

$$C_6H_3(OMe)_2\cdot CH_2\cdot C<^{C_6H_2(OMe)_2}_{N.CH:CH-}>, [(OMe)_2=1:2 \text{ or } 3:4],$$

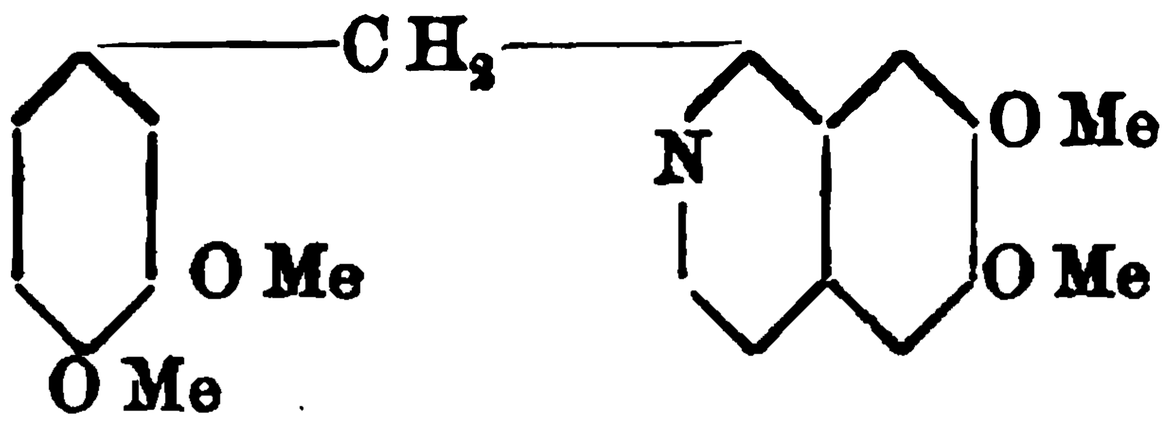
and in accordance with this view papaveraldine has the constitution

$$C_6H_3(OMe)_2\cdot CO\cdot C<^{C_6H_2(OMe)_2}_{N\cdot CH:CH-}>,$$

and papaverinic acid the constitution

$$C_6H_3(OMe)_2\cdot CO\cdot C<^{C(COOH)}_{N\cdot CH:CH}>C\cdot COOH.$$

Constitution of Papaverine. G. Goldschmiedt. (*Monatsh.*, ix. 778–781.) In this further contribution on the subject of the preceding abstract, the author reports that metahemipinic acid, obtained by the oxidation of papaverine, is dimethoxy-orthophthalic acid, and differs from hemipinic acid by giving protocatechuic acid on fusion with potash. The constitution of papaverine is therefore represented by the formula—



Chelidonine. A. Henschke. (*Archiv der Pharm.* [3], xxvi. 624–644.) The alkaloid was obtained partly by recrystallization of the commercial base, and partly by direct extraction from the root of *Chelidonium majus*. Probst's method of extraction was employed, the stamped root being boiled in water acidified with sulphuric acid, ammonia in excess added, and the filtrate dried.

This was purified by treatment with acidified alcohol, and again with ether, and finally was repeatedly crystallized from boiling alcohol. Chelidonine, $C_{20}H_{19}NO_5 + H_2O$, forms vitreous, tabular, colourless, monoclinic crystals of about 3 mm. diameter. The reactions of the base are given in detail. Solutions of the salts of this base have an acid reaction, and the hydrochloride has the formula $C_{20}H_{19}NO_5 \cdot HCl$; the nitrate, $C_{20}H_{19}NO_5$, HNO_3; the sulphate, $C_{20}H_{19}NO_5, H_2SO_4 + 2H_2O$; the platinochloride, $(C_{20}H_{19}NO_5)_2, H_2PtCl_6 + 2H_2O$; this was not obtainable in a crystalline form; the aurochloride, $C_{20}H_{19}NO_5$, $HAuCl_4$, is easily obtained in crystals. Ethyl iodide combines with the base, and the compound is not acted on by potassium hydroxide; these and less positive results lead to the conclusion that chelidonine is a tertiary base. By oxidation with potassium permanganate in alkaline solution, chelidonine yields oxalic acid, methylamine, and ammonia, the latter resulting from the decomposition of methylamine. In acid solution the oxidation goes further, carbonic anhydride and methylamine resulting.

Effect of Mass in the Conversion of Hyoscyamine into Atropine by Alkalies. W. Will and G. Bredig. (*Ber. der deutsch. chem. Ges.*, xxi. 2777–2797. Compare also abstract, *Year-Book of Pharmacy*, 1888, 62.) The authors investigated the action of soda on a solution of hyoscyamine containing 6·6667 grams in 100 c.c., and on a solution of twice this concentration. The results, which are given in tabular and diagrammatic form, show that in the same time the rotatory power of the more concentrated solution is diminished twice as much as that of the more dilute solution. The action of the soda is, therefore, a catalytic action.

Tables are also given showing that to produce a certain decrease in the rotatory power of a solution containing a given quantity of hyoscyamine, a definite volume of normal soda takes four times as long as the same volume of a solution containing four times as much soda. The results obtained with dimethylamine show that the action of this base is quite similar to that of soda.

The decrease in the rotatory power of solutions containing the same quantity of hyoscyamine, under the influence of soda, potash, tetramethylammonium hydroxide, dimethylamine, and ammonia, of different concentrations, is given in tabular form, and shows that ammonia and dimethylamine act much more slowly than the other three bases.

From the observed final rotatory power of solutions of hyoscyamine under the influence of soda, potash, and tretramethylam-

monium hydroxide, based on the assumption that the hyoscyamine has been completely converted into atropine, the specific rotatory power of the latter is $[\alpha]_D = -1{\cdot}89$.

When the conversion of hyoscyamine into atropine is almost complete, a small quantity of the latter is decomposed into tropine and tropic acid; owing to this secondary reaction, the relative values of the velocity constants are increased in the case of soda, potash, and tetramethylammonium hydroxide, and decreased in the case of ammonia and dimethylamine.

The authors intend to try and measure the action constants of bases by a more complete study of this phenomenon. Sodium carbonate converts hyoscyamine into atropine, but ammonia has the slowest action of all the bases experimented with.

Reactions of Physostigmine. M. Eber. (*Pharm. Zeit.*, August 15, 483. From *Pharm. Journ.*) The author states that gold chloride, the double iodide of potassium and bismuth, and the double iodide of potassium and zinc, are such delicate precipitants of this alkaloid from a solution of the sulphate, as to make it perceptible on a white plate if only 0·000001 gram be present, a quantity not recognisable by the physiological test. A drop of physostigmine solution containing the same quantity, if brought into contact on a white surface with a drop of 5 per cent. solution of potash or soda, shows at the point of contact a red colour, similar to that of oxyhæmoglobin or picrocarmine, due to the formation of rubreserine. After the drop dries up a yellow mass is left that dissolves again with the red colour. If baryta water be used, the carmine colour is produced at first, and then it changes to dark blue. The formation of rubreserine, the oxidation-product of physostigmine, is not so simple as has generally been supposed, a volatile strongly alkaline base separating at the same time, which, like rubreserine, has no action on the pupil. Neither rubreserine, the blue compound, nor the volatile base were found in the urine of an animal to which physostigmine had been administered, but a base was separated closely resembling physostigmine, except that it was inactive on the pupil. This same inactive base has been separated from samples of commercial physostigmine, and is formed upon boiling a neutral solution of physostigmine. There are reasons for thinking that physostigmine is not converted directly into rubreserine by boiling or by exposure to sunlight, but that it is formed under these conditions from this more unstable "inactive physostigmine." If therefore a solution of commercial physostigmine became red soon after its preparation,

the author would attribute the change to the presence of inactive physostigmine in the sample.

Eseridine, a New Derivative of Physostigmine. W. Eber. (*Pharm. Zeit.*, October 13, 1888. From *Pharm. Journ.*) "Eseridine" is the name that has been given by the author to an alkaloidal substance said to occur already formed in the Calabar bean, and also to be producible from physostigmine. When physostigmine is treated with sulphurous acid or grape-sugar alkali, two compounds are formed, one giving a violet colour with hydriodic acid, apparently the compound named "inactive physostigmine," and the other the "eseridine" in question, which liberates iodine energetically. The relative yield appears to depend upon the intensity of the chemical action, the proportion of the iodine-liberating compound being preponderant when sulphurous acid is used, and that of the other compound when grape-sugar alkali is used. Eseridine is only sparingly soluble in water, and soluble salts have not yet been prepared; in some subcutaneous experiments made to test its physiological action, it was therefore brought into solution by the addition of dilute sulphuric acid. From the results on animals it was inferred that eseridine resembles physostigmine in its laxative action, though without disturbance of the cerebral nervous system, and that it is an irritant of the spinal cord, but not cumulative in its action, like strychnine. The dose required to produce toxic results was six times greater than that of physostigmine. The author claims certain advantages for eseridine over physostigmine on the ground that it is permanent in solution, six times less poisonous, and that it acts upon the bowels with a minimum of disturbance of the nervous system. The alkaloid is prepared in a crystalline form by Messrs. Boehringer, of Manheim, who have published some further information concerning it, according to which its composition is represented by the formula $C_{15}H_{23}N_3O_3$, or as containing a molecule of water more than the physostigmine from which it is derived and into which it can be reconverted by suitable treatment with an acid. It also differs in being sparingly soluble in ether, in which physostigmine is very soluble.

Berberine. W. H. Perkin. (Abstract of a paper read before the Chemical Society, December 6, 1888. From the Society's Proceedings.) Berberine appears to crystallize with 5 to 5½ mols. of water, 2 of which remain when the substance is dried at 100° till constant. Berberine hydrochloride, dried over sulphuric acid in a vacuum at a temperature of about 40°, has the formula

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Further analyses have proved it to be meconin. The body obtained by the action of nitric acid on it is nitro-meconin.

Hydrastine. E. Schmidt and F. Wilhelm. (*Archiv der Pharm.* [3], xxvi. 329–365.) The extract obtained by treating the coarsely powdered root of *Hydrastis canadensis* with water acidified with acetic acid at 100°, is evaporated to a syrup, and excess of dilute sulphuric acid added, when berberine sulphate separates. The filtrate neutralised with ammonia gives a precipitate containing much hydrastine; this is separated, and on adding ammonia in excess to the filtrate a further precipitate is produced, which contains *canadine*. Both precipitates boiled with ethyl acetate give solutions which on cooling deposit hydrastine in large crystals, somewhat coloured, but rendered pure by recrystallization. The crystals from the second ammonia precipitate are much purer than those from the first; by slow evaporation of the ethyl acetate solution they can be obtained as large as walnuts.

Hydrastine picrate, $C_{21}H_{21}NO_6, C_6H_2(NO_2)_3 \cdot OH + 4H_2O$, is thrown down as an amorphous yellow precipitate, which is deposited from its boiling alcoholic solution in splendid yellow needles. By the action of ethyl iodide on hydrastine under pressure, a well-crystallized ethiodide, $C_{21}H_{21}, NO_6, EtI$, can be obtained, melting at 205–206°. The corresponding chloride could only be obtained in a gummy mass; its solution was therefore precipitated with platinum and gold chlorides respectively, and the corresponding double salts were obtained and analysed. Both are amorphous, the platinochloride being light red, melting at 207°, and having the composition $(C_{21}H_{21}NO_6, EtCl)_2PtCl_4$, and the aurochloride being yellow, melting about 110°, and having the composition $C_{21}H_{21}NO_6, EtCl, AuCl_3$.

Hydrastine-ethylammonium hydroxide, obtained by exactly precipitating the iodine from hydrastine ethiodide by means of silver oxide, concentrating the filtrate, and allowing to remain over sulphuric acid, appears as compact, slightly coloured crystals, which are purified by recrystallization from hot water. Their composition is $C_{21}H_{21}NO_6Et \cdot OH$, showing that the hydrastine has the character of a tertiary base, and does, not, as Power supposed, belong to the imido-bases. The attempts to obtain a hydrocompound by the action of nascent hydrogen on hydrastine, both in acid and alkaline solution, were unsuccessful. The evidence as to the existence of a third alkaloid, canadine, was doubtful.

Hydrastine, when treated with manganese dioxide and sulphuric

acid, yields opianic acid and *hydrastinine*. Oxidation with platinic chloride gives the same products. Potassium permanganate in alkaline solution produces hemipinic and nicotinic acids; in acid solution opianic acid is produced, as one of the authors had ascertained when Freund and Will's publication of the same fact first appeared. The base formed simultaneously was not isolated, but by employing barium permanganate, hydrastinine in small quantity was obtained, along with opianic acid. Chromic acid yielded the same two products.

Comparing narcotine and hydrastine, the author considers that the former contains three methoxyl-groups, thus: $C_{19}H_{14}(OMe)_3NO_4$, whilst the latter contains only two, thus: $C_{19}H_{15}(OMe)_2NO_4$. Since the oxidation of narcotine with manganese dioxide and sulphuric acid yields opianic acid and cotarnine, and under the same conditions hydrastinine gives opianic acid and hydrastinine—further, as opianic acid contains two methoxyl-groups, and cotarnine contains one of these groups, as shown by Wright,—it follows that hydrastinine contains no methoxyl-group, and cotarnine may prove to be a methylated hydrastinine. The author hopes later to succeed in converting hydrastine into narcotine.

Ergotinine and Cornutine. E. Bombelon. (*Chem. Centr.*, 1888, 472.) Both alkaloids can be obtained by treating powdered ergot free from fat with alcohol of 95°, in which 50 grams of soda is dissolved, and allowing the mixture to remain for twenty-four hours. The extract must be again treated with cold alcohol without soda; it contains sphacelinic acid, both alkaloids, some fat, resin, and extractives; it is then acidified with citric acid and distilled, to remove the alcohol. The watery solution remaining is filtered (the residue contains the sphacelinic acid), and the filtrate supersaturated with soda and shaken with ether. Ergotinine, with some cornutine, is dissolved. To separate these alkaloids completely, the dried ergotinine must be again taken up with absolute ether. The alkaloids are only stable when combined with acids; weak, watery solutions of the alkaloids quickly decompose.

Colchicine and Colchiceine. M. Johanny and S. Zeisel. (*Pharmaceutische Post*, September 16, 599. From *Pharm. Journ.*) Some time ago, Zeisel, guided by the results obtained in the investigation by analytical methods of the relations existing between colchicine and colchiceine, described colchiceine as acetotrimethylcolchinic acid, and colchicine as being the methyl ether of colchiceine. Reversing the process, and proceeding synthetically, the

authors, by heating trimethylcolchinic acid with acetic anhydride, have obtained a product in no way distinguishable from colchiceine resulting from the saponification of colchicine. In addition, they have succeeded by the introduction of a methyl group into colchiceine in converting it into colchicine. This can be effected by the action of methyl iodide upon colchiceine-sodium, or by the passage of hydrochloric acid gas through a solution of colchiceine in methylic alcohol; but when the former process is adopted there is formed at the same time a dimethyl compound, or methylcolchicine, which is quite analogous to what takes place when morphine is similarly treated for its conversion into codeine. Methylcolchicine, unlike colchicine, does not form a crystalline compound with chloroform, which facilitates its separation. When boiled with very dilute hydrochloric acid, it is changed into methylcolchiceine, $C_{22}H_{25}NO_6$, which resembles colchiceine closely, but is an insomer of colchicine. If methylcolchiceine be heated with fuming hydrochloric acid to 165° C., methylamine is split off, which is considered to indicate that the second methyl group introduced replaces an atom of hydrogen in the ammonia residue present in colchicine.

Ulexine. A. W. Gerrard and W. H. Symons. (*Pharm. Journ.*, 3rd series, xix. 1029, 1030.) The authors have made a further study of this alkaloid. Their ultimate analysis of the base and of its platinum salt leads to the formula $C_{11}H_{14}N_2O$. Ulexine is a strong base; it precipitates quinine, cocaine, and strychnine from solutions of their salts; it also liberates ammonia from its compounds. Ulexine dissolves in nitric acid, sp. gr. 1·42, and in sulphuric acid, without coloration; but if to a drop of solution of ulexine in such nitric acid, spread out on a white tile, a drop of strong sulphuric acid be added, a yellow or red ring appears round the sulphuric acid.

With ferric chloride, ulexine or its salts give a red coloration, which disappears on dilution with water. If to a solution of ulexine in chloroform bromine be added drop by drop, a nearly white precipitate falls. On further addition of bromine this is converted into an orange-coloured body, which subsequent analysis leads us to think may be tribromo-ulexine.

Ulexine acts as a powerful diuretic, but must be employed with caution. According to Dr. J. R. Bradford, it has a powerful and widespread action, being a nerve and muscle poison, a respiratory poison, raising arterial tension, and producing diuresis. Pinet considers it as an antidote to strychnine.

From the residues of the purification of ulexine the authors have obtained a small quantity of a second base, which they intend to investigate.

Piperidine. E. Lellman and W. Geller. (*Ber. der deutsch. chem. Ges.*, xxi. 1921–1923.) When piperidine (5 grams) is heated with nitrobenzene (22 grams) at 250–260° for four hours, it is converted into pyridine.

Wrightine (Conessine) and Oxywrightine. H. Warnecke. (*Archiv der Pharm.* [3], xxvi. 248–261, 281–292; *Journ. Chem. Soc.*, August, 1888.) Powdered seeds of *Wrightia antidysenterica* are freed from fat by means of ether; the powder is then digested with alcohol and hydrochloric acid at 60°, freed from alcohol by distillation and digestion with water, and concentrated ammonia is added in large excess. The precipitate is washed, pressed, rubbed up with sand, and extracted with light petroleum. The almost colourless solution is shaken up with solid potash to remove all water, and allowed to evaporate; and the crystalline residue is purified by recrystallization. The formula of wrightine is probably $C_{24} H_{40} N_2$; its platino-chloride, hydrochloride, nitrate, and oxalate are described; its reactions in strong hydrochloric acid solution with alkaloid reagents are also described in detail.

Oxywrightine is prepared by dissolving wrightine in 5 per cent. sulphuric acid, and mixing this with dilute potassium iodate solution. After remaining twenty-four hours in the dark, the separated iodine is removed by chloroform, and the colourless liquid is carefully treated with ammonia. After a short time a crystalline precipitate begins to form, and precipitation is rapidly completed on the addition of concentrated ammonia. The crystals of oxywrightine are anhydrous, colourless, compact needles of strongly alkaline reaction and bitter taste. This alkaloid, like atropine and hyoscyamine, strongly reddens phenolphthalëin, while wrightine is much less effective, and the other alkaloids have still less action. Oxywrightine has the composition $4\,C_{12} H_{21} N O, C_{12} H_{19} N O_2$.

There are also described—oxywrightine platino-chloride, methyl hydroxide, metho-chloride, and methyl hydroxide and platino-chloride.

The colourless solution of oxywrightine in eight drops of concentrated sulphuric acid, when heated to 90–100° becomes yellow, passing gradually to violet-red; with two drops of sulphuric acid the yellow becomes an intense rose colour. This is characteristic, and clearly shows $\frac{1}{1000}$ mgrm.

Harmine and Harmaline. O. Fischer. (*Ber. der deutsch. chem. Ges.*, xxii. 637–645.) This paper is a supplement to a paper published four years ago by the author and E. Täuber (*Ber. der deutsch. chem. Ges.*, xviii. 400), concerning the alkaloids of *Peganum harmala*. By the oxidation of harmine, a dibasic acid, ($C_{10} H_8 N_2 O_4$), was obtained, from which, by separation of carbon dioxide, a base, ($C_8 H_8 N_2$), resulted. Harmine takes up four atoms of hydrogen when treated with sodium and alcohol, and is converted into tetrahydroharmine. The latter substance forms interlaced needles, melting at 199° C. Its solution exhibits a faint bluish green fluorescence, which is rendered more green by oxidizing agents, such as ferric chloride or silver nitrate. A tetrabromoharmine, $C_{13} H_{12} N_2 O Br_4$, has been formed. Sulphurous acid removes the bromine from this addition-product. Alkaline carbonates have the same effect on warming, and even boiling alcohol reconverts the substance into harmine. Harmaline yields on reduction with sodium or zinc dust the same final product as harmine, namely, tetrahydroharmine. Harmalol is obtained as hydrochloride by the action of hydrochloric acid on harmaline. Harmine oxidized in glacial acetic acid solution with chromic acid yields harminic acid, $C_{10} H_8 N_2 O_4$. Harminic acid is also obtained from harmaline by a similar process. Harmine is produced by the partial oxidation of harmaline. Harminic acid yields on heating a beautiful crystalline base, apoharmine ($C_8 H_8 N_2$). Harmolic acid, $C_{12} H_{10} N_2 O_5$, is produced by the fusion of harmol with caustic potash. It crystallizes from hot water in small needles, which melt at 246–247° C. with decomposition.

Many attempts were made to synthesise apoharmine or hydroapoharmine, but without success; nor are these substances identical with any known bodies of the same percentage composition, as for example, Merz and Ris's tetrahydroquinoxaline, which not only possesses the same composition as dihydroapoharmine, but similar properties (*Ber.*, xx. 1190).

Chelerythrine and Sanguinarine. E. Schmidt. (*Archiv der Pharm.* [3], xxvi. 622, 623.) The author is unable to confirm Schiel's conclusion that chelerythrine and sanguinarine are identical. The former appears to have the formula $C_{19} H_{17} N O_4$, as deduced from the analysis of the small quantities obtained, whilst the latter, from the analysis of various compounds, has the formula $C_{17} H_{15} N O_4$, thus confirming Naschold's result.

Anagyrine. E. Hardy and N. Gallois. (*Comptes Rendus.*, cvii. 247–249. From *Journ. Chem. Soc.*) The authors discovered

anagyrine in 1885 (*Comptes Rendus Soc. Biol.*, 1885, 391), two years before Reale's description of the alkaloid (*Gazz. Chim. Ital*, 1887, 385).

The seeds of *Anagyris fœtida* are macerated with cold water, treated with basic lead acetate, the lead removed by hydrogen sulphide, and the filtrate concentrated and mixed with mercuric chloride, which precipitates the anagyrine. The precipitate is decomposed by hydrogen sulphide, and the concentrated filtrate saturated with sodium carbonate and agitated with chloroform, the chloroform solution being afterwards agitated with hydrochloric acid, from which the hydrochloride crystallizes on evaporation.

Anagyrine, $C_{14}H_{18}N_2O_2$, is a yellowish, amorphous substance which dissolves in water, alcohol, or ether, and softens and becomes viscous when exposed to the air. Its solutions give a white precipitate with potassium mercuriodide, a brown precipitate with iodine solution, and the usual general reactions for alkaloids. With acids, it forms salts which, contrary to the statement of Reale, crystallize readily.

Anagyrine hydrochloride, $C_{14}H_{18}N_2O_2, HCl + 4H_2O$, forms white rectangular tables belonging to the rhombic system, does not alter when exposed to air, and dissolves very readily in water or chloroform, but is less soluble in alcohol, and only slightly soluble in ether. The crystals become anhydrous at 125°. The rotatory power of the hydrochloride is $[\alpha]_D = -114°$. The *aurochloride*, $C_{14}H_{18}N_2O_2, H{\cdot}AuCl_4$, forms at first a yellow, amorphous precipitate, but this rapidly becomes crystalline. The *platinochloride*, $C_{14}H_{18}N_2O_2, H_2PtCl_6$, separates in crystalline tufts. All these salts were analysed, and the composition of the alkaloid was thus definitely determined.

Anagyrine has a moderate toxic action. In warm-blooded animals it produces vomiting, coldness, and tremor, slackening of the respiratory movements, and finally stoppage of respiration and circulation. When administered to a frog, the cessation of muscular movements is very remarkable; the motions of the heart persist long after all other movements have ceased.

Acid Nicotine Tartrate. H. Dreser. (*Archiv der Pharm.* [3], xxvii. 266–270.) Acid nicotine tartrate, $C_{10}H_{14}N_2(C_4H_6O_6)_2 + 2H_2O$, forms white crystalline tufts, easily soluble in water, and with an acid reaction. For analysis, the salt was precipitated with platinum chloride.

The Alkaloids from Cod-Liver Oil. A. Gautier and L. Mourgues. (*Comptes Rendus*, cvii. 626–629. From *Journ. Chem. Soc.*)

A previous notice of this subject will be found in the *Year-Book of Pharmacy*, 1888, 32.

Aselline, $C_{25}H_{32}N_4$, is an amorphous, colourless solid, which becomes green on exposure to light. It melts to a viscous, yellowish liquid with an aromatic odour, recalling that of the ptomaïnes, is very slightly soluble in water, to which it imparts a bitter taste and an alkaline reaction, but dissolves in ether, and still more readily in alcohol; sp. gr. about 1·05. The salts of aselline crystallize readily, but are partially decomposed by water. The mercurochloride crystallizes from warm water; the aurochloride is very easily reduced; the platinochloride is orange-yellow and dissolves in warm water, but is decomposed by boiling water. Aselline is feebly toxic, and produces fatigue and stupor; 3 mgrms. of the hydrochloride killed a greenfinch in fourteen minutes.

Morrhuine, $C_{19}H_{27}N_3$, is separated from aselline by taking advantage of the greater solubility of its platinochloride. It is a thick, oily, amber-coloured liquid, with an odour which recalls that of aselline, and is only slightly soluble in water, but more soluble in alcohol and ether. It is caustic and strongly alkaline, and absorbs carbonic anhydride from the air. The hydrochloride is very deliquescent; the aurochloride is yellow, and dissolves in warm water; the platinochloride is somewhat soluble, and crystallizes in needles.

Morrhuine constitutes one-third of the total bases in the oil, and an ordinary dose of one fluid ounce contains two milligrams. It excites the appetite, and has remarkable diaphoretic and diuretic properties. In large doses it produces fatigue and stupor.

Constitution of Quassin. V. Oliveri. (*Gazz. Chim. Ital.*, xvii. 570–577.) The author arrives at the conclusion that quassin contains four hydroxyl groups, OH, two carboxymethyl groups, COOMe, and two ketonic groups, CO. From other results obtained, which he hopes soon to publish, it would appear that quassin is an anthraquinone-derivative.

Scopoletin. D. Takahashi. (*Chem. Centr.*, 1888, 1364, 1365.) Scopoletin, $C_{10}H_8O_4$, the fluorescent substance occurring in *Scopolia japonica*, is extracted from the roots by treatment with alcohol, evaporation of the alcoholic solution, treatment with strong hydrochloric acid, drying with admixture of sand, extraction with chloroform, and finally recrystallization several times from absolute alcohol. It consists of colourless needles, melting at 198–199°, little soluble in cold water, readily soluble in alcohol, ether, and chloroform. *Acetylscopoletin*, $C_{10}H_7O_4Ac$, melts at

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the so-called general alkaloid reagents. Its reaction with dilute and concentrated mineral acids is characteristic, as with them it gives intensely red decomposition-products. Concentrated sulphuric acid gives a dark reddish brown, which becomes deeper red on warming, and turns light mulberry-red on dilution with water. The addition of alkali removes the colour, which reappears on acidifying. Evaporation with dilute (1 : 5) sulphuric acid gives a beautiful rose-red colour. The pure material gives off no odour during this evaporation, but if not completely purified, a strong and very characteristic odour of ericinol is evolved. Evaporation with dilute hydrochloric acid gives a residue somewhat more violet red in tint. Evaporation with phosphoric acid gives a mulberry-red residue, clearly perceptible with very minute quantities, as in the case of the other acids. The fatal dose for small animals has been found to vary from 0·10·–0·45 mgrm. per kilo. body-weight. No chemical antidote is known as yet. In investigating poisoning cases, Dragendorff's process is recommended; but no acid should be used for extraction, as the solubility of the poison is not thereby increased. After extraction and purification by evaporation, taking up in alcohol, etc., the substance may be agitated with light petroleum, then with chloroform, and to the residue left by the chloroform the characteristic tests given above may be applied.

Methysticin. D. Davidoff. (*Journ. Russ. Chem. Soc.*, 1888, 522, 523. From *Journ. Chem. Soc.*) The author has studied the properties of methysticin from the root of Kawa-Kawa, or *Macropiper methysticum*, and some of its derivatives. It melts at 138–139°, and has the formula $C_{16}H_{18}O_5$. The diacetyl-derivative, $C_{20}H_{22}O_7$, melts at 122–123°; the dibenzoyl-compound, $C_{30}H_{26}O_7$, melts at 148°; the hydrate, $C_8H_{10}O_3$, melts at 158–159°; the ethyl ether, $C_8H_9EtO_3$, melts at 99–100°; benzoylmethysticic acid, $C_{10}H_{14}O_4$, melts at 122°, and the amido-compound, $C_8H_{11}NO_2$, forms yellow crystals.

Methysticin. C. Pomeranz. (*Monatshefte*, ix. 863, 864; *Journ. Chem. Soc.*, March, 1888.) Methysticin is a non-nitrogenous, non-volatile, neutral substance, which occurs in the alcoholic extracts from the roots of *Macropiper methysticum*. It crystallizes in long silky needles melting at 131°, sparingly soluble in hot water, ether, and light petroleum, readily soluble in alcohol, benzene, and chloroform. It contains about 65·4 per cent. carbon and 5·1 per cent. hydrogen. When fused with potash, it gives chiefly protocatechuic acid. Heated with thirty times the amount of 10 per

cent. potash solution, it completely dissolves; and from the solution, which smells strongly of piperonal, hydrochloric acid precipitates a yellowish compound, which separates from alcohol in small white crystals melting at 180°. This compound, which contains 64·26 per cent. carbon and 4·85 per cent. hydrogen, is readily soluble in alkaline carbonates, and yields piperonylic acid on oxidation with permanganate.

Cubebin. C. Pomeranz. (*Monatsh.*, ix. 323–326; *Journ. Chem. Soc.*, October, 1888; compare also *Year-Book of Pharmacy*, 1888, 59.) When cubebin is oxidized with permanganate in alkaline solution, it yields piperonylic acid, and may therefore be regarded as a compound derived from the group $CH_2 : O_2 : C_6H_4$, in which one of the atoms of hydrogen in the benzene nucleus is replaced by the gronp C_4H_5O. By the action of benzoic chloride on cubebin, hydrogen chloride is liberated, and an atom of hydrogen in the C_3H_5O-group is displaced by benzoyl; hence the oxygen is present in the form of hydroxyl. From the benzoyl-derivative, benzoic acid may be readily regenerated by hydrolysis. Cubebin, therefore, has the constitution—

$$H_2C : O_2 : C_6H_3 \cdot C_3H_4 \cdot OH \; [O_2 : C_3H_5O = 1 : 2 : 4].$$

Arganin. S. Cotton. (*Répert. de Pharm.*, 1888, 247. From *Pharm. Journ.*) A new bitter principle, named *arganin*, has been obtained by the author from the kernels of the argan nut. It is extracted from the cake after expression of the oil by means of hot 90 per cent. alcohol. Ether is then added to the filtered liquid by degrees, so as to promote the crystallization of the bitter principle. These crystals are then purified by solution and recrystallization from boiling absolute alcohol. Arganin appears to be very hygroscopic, since the moisture of the atmosphere is sufficient to reduce the crystals to a viscous consistence. It forms a definite compound with sulphuric acid, crystallizing in elongated prisms. Arganin is insoluble in ether, oils, and sulphide of carbon, but is easily soluble in water.

Syringin. G. Körner. (*Chem. Centr.*, 1888, 1098, 1099.) The author finds that syringin, formerly considered as a glucoside, is hydroxymethylconiferin, $C_{17}H_{24}O_7$. He prepares it according to Kromayer's method (*Die Bitterstoffe*, 1861, 56). It crystallizes from water in long, slender, white needles, which are only sparingly soluble in cold water, but readily in hot. It contains water of crystallization, which is given off at 100°. Melting-point 191–192° It does not form insoluble compounds with solutions of metallic salts; it reacts with mineral acids similarly to coniferin.

By the action of emulsin, syringin is split up into dextrose and *syringenin* (*hydroxymethylconiferyl alcohol*); the latter resembles coniferyl alcohol.

Distribution of Amygdalin and Emulsin in Bitter Almonds. W. Johannsen. (*Bied. Centr.*, 1888, 326.) Emulsin is contained in the radicles and also in the fibrovascular bundles of the cotyledons of both bitter and sweet almonds, but is absent from the parenchymatous tissue of the curved sides of the cotyledons. Amygdalin, on the other hand, is confined to the parenchyma cells of the cotyledons, and occurs in bitter almonds only. The emulsin does not act on the amygdalin in the seed, owing to the fact that they are not in contact, but in different parts. The quantity of emulsin present in bitter almonds is found to be sufficient to convert forty times the quantity of amygdalin associated with it into essential oil and hydrocyanic acid.

Occurrence of Vanillin in the Seeds of Lupinus Albus. G. Campani and S. Grimaldi. (*Chem. Centr.*, 1888, 377.) The author records the interesting observation that the seeds of *Lupinus albus* contain an aromatic constituent identical in all respects with vanillin.

Conversion of Coniferin into Eugenol. L. Chiozza. (*Chem. Centr.*, 1888, 443.) On heating coniferin with sodium amalgam in a weak alkaline solution, eugenol is formed, which may be precipitated by dilute sulphuric acid after throwing down any unchanged coniferin by the addition of a small quantity of water to the cold solution, and filtering.

Quillajic Acid. R. Kobert. (*Chem. Centr.*, 1888, 927, 928. From *Journ. Chem. Soc.*) The saponin of commerce, as all other specimens of saponin, is an almost inactive, non-poisonous modification of quillajic acid. The author precipitated the acid from the aqueous extract of the bark of *Quillaja saponaria* with neutral lead acetate; the precipitate was freed from lead, the solution of the acid evaporated almost to dryness, and then taken up with hot absolute alcohol. The colouring matter was precipitated with chloroform; the quillajic acid eventually crystallized out in pure white flakes. It is insoluble in ether, soluble in water and alcohol. On treatment with concentrated sulphuric acid, it becomes dark red. By boiling with dilute mineral acids, it is split up into an unfermentable glucose and sapoginin; this solution reduces Fehling's solution. Quillajic acid has the formula $C_{19}H_{30}O_{10}$. The sodium salt acts as a very severe caustic on the tongue and throat, and the smallest particles coming in contact

with the nose and throat cause violent sneezing and coughing. Brought on to the eye, it causes severe pain, flow of tears, and swelling of the lids. Injected into the blood, the sodium salt proves fatal, causing cramp and paralysis of the respiratory organs and brain. On the other hand, it may be imbibed into the stomach without injury to the extent of five hundred times the quantity which proves fatal when injected into the blood.

Aspartic Acids. R. Engel. (*Comptes Rendus*, cvi. 1734–1737.) The author has previously shown that fumaric and maleic acids unite directly with ammonia to form aspartic acid. He now reports that the products of these reactions are perfectly identical, being the same inactive aspartic acid in either case.

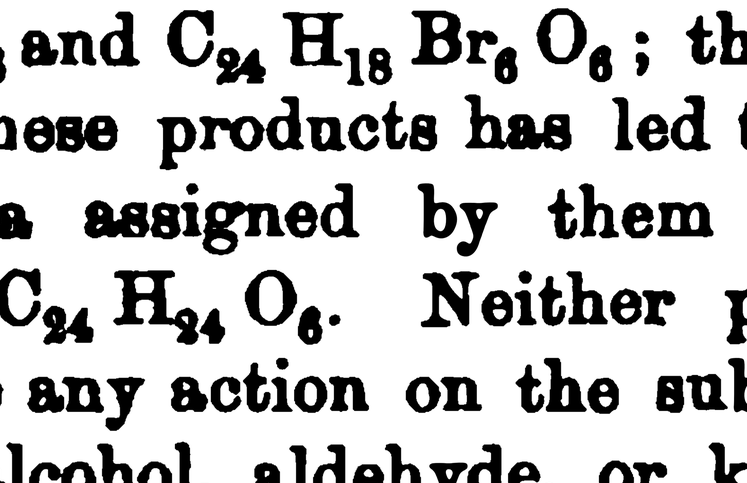
Filicic Acid. G. Daccomo. (*Ber. der deutsch. chem. Ges.*, xxi. 2962–2970.) Filicic acid, prepared by the method previously described (abstract, *Year-Book of Pharmacy*, 1888, 181), has the composition $C_{14}H_{16}O_5$. It is a yellowish, odourless, crystalline powder, melts at 179–180° (uncorr.), and is insoluble in water, almost insoluble in absolute alcohol, moderately soluble in glacial acetic acid, ether, amyl alcohol, and toluene, and readily in chloroform, carbon bisulphide, and benzene. The *benzoyl*-derivative, $C_{21}H_{20}O_6$, separates from dilute alcohol in colourless crystals, melts at 123°, and is very readily soluble in ether, but insoluble in water. The *ethyl* salt, $C_{16}H_{20}O_5$, prepared by treating the acid with alcoholic potash and ethyl iodide, separates from dilute alcohol in reddish crystals, melts at 142°, and is very readily soluble in ether and benzene, but insoluble in water. The *propyl* salt, melting at 158°, and the *ethylene* salt, melting at 165°, resemble the ethyl salt in appearance and solubility.

Bromofilicic acid, $C_{14}H_{15}BrO_5$, prepared by treating the acid with bromine in glacial acetic acid solution, crystallizes from alcohol in red prisms, melts at 122°, and is very readily soluble in absolute alcohol and ether, but insoluble in water.

Filicic Acid. E. Luck. (*Ber. der deutsch. chem. Ges.*, xxi. 3465–3468.) Replying to Daccomo (see preceding abstract), the author states that filicic acid melts at 184·5°, but if the specimen is allowed to solidify and the melting-point again taken, it is found to sinter at about 130°, and melt at 150–160°.

Pterocarpin and Homo-pterocarpin. P. Cazeneuve and L. Hugounenq. (*Comptes Rendus*, cvii. 737–740. *Journ. Soc. Chem. Ind.*, 1889, 59.) The physical properties of these two substances, extracted from red sandal-wood, have been previously described by the author (*Year-Book of Pharmacy*, 1887, 58).

Homo-pterocarpin, when heated until it decomposes, yields cresol and a little catechol (pyrocatechin). Distilled over zinc dust, a small quantity of a volatile oil, with a coumarin-like smell, is formed, together with benzene, toluene, acetylene, ethylene, and carbonic oxide. Hydrochloric acid attacks homo-pterocarpin in the cold, more readily on heating, with the liberation of methyl chloride and the formation of a black resin which dissolves in alkalies to form a fluorescent solution; a small quantity of an amorphous body is held in solution by the hydrochloric acid, which also dissolves in alkalies to form a red fluorescent solution, and is regarded by the authors as probably belonging to the fluoresceïn group of colours. Hydriodic acid acts similarly to hydrochloric acid. Heated with dilute sulphuric acid (1 : 10) in a sealed tube, homo-pterocarpin appears to undergo an isomeric change, forming an opaque yellow resin; the sulphuric acid undergoes no change. Fused with caustic potash at 250–300°, a volatile oil having the smell of coumarin results; no fatty or aromatic acid could be isolated. Treated with nitric acid in the cold, a green, amorphous, unstable nitro-derivative is obtained, which is decomposed by boiling water with the formation of resinous bodies. Fuming nitric acid attacks homo-pterocarpin very readily, and a nitro-compound results, which is regarded as trinitro-orcinol, $C_7 H_3 (N O_2)_3 . (O H)_2$. It melts at 162°, and yields a characteristic barium salt. Two crystalline bromine derivatives result by treating homo-pterocarpin with bromine, having the formulæ $C_{24} H_{23} Br O_6$ and $C_{24} H_{18} Br_6 O_6$; the latter melts at 270°. The composition of these products has led the authors to double the original formula assigned by them to homo-pterocarpin, viz.:—$C_{12} H_{12} O_3$ to $C_{24} H_{24} O_6$. Neither phenyl hydrazine nor acetic anhydride have any action on the substance; this excludes the presence of an alcohol, aldehyde, or ketone group, and the body is regarded as an anhydride of a poly-orcinol, the following constitutional formula being suggested as a probable one:—



Homo-pterocarpin.

Pterocarpin.—The action of the above-mentioned reagents on pterocarpin is similar to their action on homo-pterocarpin, and there is no doubt that the former is a lower homologue of the latter, having the formula $C_{20}H_{16}O_6$. It yields a mono-bromo-derivative, $C_{20}H_{15}BrO_6$.

Brazilin. C. Schall and G. Dralle. (*Ber. der deutsch. chem. Ges.*, xxi. 3009–3017.) This paper furnishes a description of bromo-ethyl- and methyl-derivatives of brazilin. For particulars reference should be made to the original paper.

Theory of Dyeing. E. Knecht. (*Ber. der deutsch. chem. Ges.*, xxi. 2804, 2805; *Journ. Chem. Soc.*, January, 1889.) When wool is boiled with a mixture of sulphuric acid (2 parts) and water (3 parts) for two hours, it dissolves almost entirely; when filtered, a clear, light brown solution is obtained. If this is mixed with aqueous solutions of acid coal-tar dyes, intensely coloured precipitates are formed, which dissolve readily in alkalies, but not in water or dilute acids.

A solution of silk in moderately dilute sulphuric acid behaves in like manner. Animal fibres, therefore, yield a substance which forms insoluble bases with acid coal-tar dyes; it has not yet been determined whether this substance already exists in the fibres, or whether it is gradually formed by the action of the acid bath.

Pure Chlorophyll. A. Hansen. (*Pharm. Journ.* 3rd series, xix. 1036.) The author agrees with A. Tschirch that the chlorophyll-green obtained and described by him some time ago as pure was a compound of chlorophyll and sodium. He believes, however, that he has now succeeded in separating pure chlorophyll-green by the following process:—

Grass-leaves were boiled in water for from a quarter to half an hour, then washed in water, pressed, and dried in the dark. The chlorophyll pigment was then extracted with boiling alcohol, and the solution saponified by heating for three hours with a slight excess of caustic sodium. The excess of sodium was then converted into carbonate by carbonic acid, and the mixture thus dried in a water-bath. The chlorophyll-yellow was then extracted with ether, in which the compound of chlorophyll-green with sodium is quite insoluble, and then with a mixture of equal parts of alcohol and ether, in which it is only slightly soluble, and the residue extracted again with a mixture of equal parts of alcohol and ether and phosphoric acid. This sets free the chlorophyll, which dissolves in the mixture of alcohol and ether, and can be

evaporated as a shining, black-green, perfectly solid brittle substance, insoluble in water, benzol, and carbon bisulphide, soluble with difficulty in pure ether, easily in alcohol. The solution has a beautiful pure green colour, which becomes red and strongly fluorescent when concentrated. It offers great resistance to reagents, especially mineral acids. Its exact composition has not been ascertained, but it contains iron and nitrogen.

Pure chlorophyll-yellow can also be obtained by a different process from grass-leaves. It crystallizes in orange-red crystals. Insoluble in water, but soluble in alcohol, ether, chloroform, and benzol, with a dark yellow, in carbon bisulphide with a red, colour. The author states further that the yellow colouring matter of flowers and fruits, and that contained in the petals of the poppy, is identical with the chlorophyll-yellow of leaves. As regards the mode in which chlorophyll occurs in the living cell, the green substance which fills up the holes of the chlorophyll grains is not a solution, but consists of combinations of the two chlorophyll-pigments with fatty acids, which possess a half-solid consistence.

Contribution to the Chemistry of Chlorophyll. E. Schunck. (*Pharm. Journ.*, from *Proc. Royal Soc.*, xliv. 448–454.) The author describes a body under the name "phyllotaonin," obtained by the action of boiling alcoholic soda on chlorophyll extracted from grass leaves by ethyl alcohol. Phyllotaonin is obtained on spontaneous evaporation of its ethereal solution in regular flattened crystals or crystalline scales, which by reflected light appear of a fine peacock or steel-blue colour; the crystals are mostly opaque, but when very thin are transparent, and appear brown by transmitted light. Phyllotaonin is insoluble in boiling water, easily soluble in boiling alcohol and ether, but does not crystallize out on cooling. It is also soluble in benzol, carbon bisulphide, chloroform, aniline, and glacial acetic acid, but insoluble in ligroin. In concentrated hydrochloric acid it dissolves with a bright bluish green colour. It is distinguished from phyllocyanin by the solution in glacial acetic acid, which is of a fine violet colour, giving a spectrum different from that of the ethereal solution; while the solutions of phyllocyanin in ether and acetic acid, both of which are of a dull green colour, give the same spectrum.

Formation of Calcium Oxalate in Leaves. A. F. W. Schimper. (*Ann. Agronom.*, xiv. 175–187; *Journ. Chem. Soc.*, September, 1888.) Calcium oxalate is very generally found in leaves, although it seems to be wanting in certain families of plants, such as mosses and most ferns and grasses. In order to observe the distribution

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and André, that the young leaves contain as much oxalic acid as the old leaves, but that in the former it is present chiefly as potassium oxalate, and in the latter as calcium oxalate; that is, when the activity of the leaf ceases, the oxalic acid is fixed by lime, and the potash liberated to migrate to the still living shoots and leaves.

In order to arrive at the physiological meaning of the secondary deposit of calcium oxalate, the author has endeavoured first to solve the problem why lime is an essential constituent of plants. Various plants, among them *Tradescantia selloi*, were grown in a normal nutritive solution, and in the same solution deprived in succession of calcium, potassium, and magnesium salts, also in solutions containing these metals in the forms of nitrate, sulphate, and phosphate respectively. The development of the *Tradescantia* was normal in all the solutions for the first three weeks, and continued to be so in the complete solution. In the solution without lime, the leaves successively became smaller and smaller, brown and dead in patches, and the buds at last dried up. Under the microscope the assimilating cells of the leaves were seen to be surcharged with starch, so that assimilation was not prevented. The conducting cells were empty of starch, and the raphides of oxalate, formed at first in the youngest shoots, had disappeared. In the solutions without potassium and magnesium salts the old leaves died, but new shoots and leaves continued to be formed. Under the microscope the leaves were seen to be completely deprived of starch and glucose, so that assimilation had ceased, although the migration of carbohydrates continued until new shoots were formed, the plants eventually dying of exhaustion, just as if cultivated in air deprived of carbonic anhydride. The addition of a little potash salt caused assimilation to recommence. The cells of the plant grown in the complete solution showed abundance of raphides and of secondary crystalline deposits of calcium oxalate, and when lime was added to the solution hitherto deprived of it, the plant grown in this solution also began to form these crystals after eight or nine days. It follows from this and other experiments that lime is essential to the migration of carbohydrates, although not to their assimilation, and that, having assisted this migration, perhaps by combining with the soluble carbohydrate, it is afterwards converted into oxalate and thrown out of solution. Secondary deposits of calcium oxalate are formed, whether the calcium be supplied as nitrate, phosphate, or sulphate. By a series of microchemical observations the author shows that

these salts enter the leaves unaltered, and are often stored up, especially in the hairs. In the leaves, the nitrogen, phosphorus, and sulphur are assimilated, and the lime removed as secondary oxalate. Even detached leaves (etiolated) will absorb the above-mentioned salts from nutrient solutions and live for several weeks, becoming healthy and increasing in size, and it is easy by micro-chemical means to follow the disappearance of the nitrate reaction (diphenylamine) and the corresponding decomposition of crystals of calcium oxalate. This decomposition of nitrates takes place only in light and in green cells; probably the assimilation of sulphur and of phosphorus is dependent on the same conditions.

Distribution of Tannin in Plants. E. Wagner. (*Chem. Centr.*, 1888, 252; *Journ. Soc. Chem. Ind.*, 1888, 759.) In the plants investigated (*Crassulaceæ*), tannin was only found dissolved in the parenchymatous tissue cells. The principal tissues yielding tannin are the epidermis and the ground and other tissues in its immediate proximity. The cells containing tannin are pale in colour, which is frequently quite transitory; they store up little or no starch, and in most cases the chlorophyll granules and calcium oxalate crystals in them are smaller in size and fewer in number than in the cells destitute of tannin. These experiments have not as yet elucidated the function of tannin and its distribution within the plant.

Source of Nitrates in Plants. B. Frank. (*Chem. Centr.*, 1888, 336.) Contrary to the general view taken as to the origin of nitric acid in plants, experiments conducted by the author tend to show that nitrates are never found in the plant, but that the nitric acid must be presented to the plant ready formed. It is then assimilated by the roots, from which it passes to the upper parts by means of the larger cell systems of the stem and leaf ribs. The author points out that in plants such as the ash, in which nitrates are absent from the upper parts, they may yet be detected in the finer rootlets.

The Occurrence of Boric Acid as a Natural Constituent in Wine. G. Baumert. (*Ber. der deutsch. chem. Ges.*, 1888, 3290.) The author quotes a number of observations by himself and others tending to prove that boric acid is a normal constituent of wines of every description. He has also examined the growing vines and invariably found boric acid in the leaves, tendrils, wood, grapes, and grape-stems.

An Acid from Cod-liver Oil. A. Gautier and L. Mourgues. (*Comptes Rendus*, cvii. 740–743; *Journ. Chem. Soc.*, February, 1889.) Cod-liver oil contains an acid in the form of an unstable compound resembling the lecithins, which decomposes in contact with acids or alkalies, and yields glycerol, phosphoric acid, and the new complex acid. Lecithins themselves are present in the oil, and add to its value by presenting phosphorus in a readily assimilable form.

The oil is systematically extracted with alcohol of 35 per cent. containing 3 per cent. of hydrochloric acid, and the solution is saturated with potassium carbonate and distilled in a vacuum at 45°. The residue is acidified, heated for a moment at 100°, and extracted with alcohol at 85°. The latter dissolves the acid, which separates as a viscid, colourless substance on cooling or on adding water. The crude product is dissolved in potash, neutralized with nitric acid, and lead acetate added so long as the precipitate is not discoloured. The lead precipitate is washed with water, decomposed by hydrogen sulphide, and the solution filtered whilst hot. The lead sulphide is washed with hot alcohol, and the washings and the original filtrate are evaporated in a vacuum. The new acid, *morrhuic acid*, crystallizes in soft, yellowish, square plates of the composition $C_9 H_{13} N O_3$, which differs from tyrosine by H_2 only.

Morrhuic acid has a disagreeable odour, recalling that of kelp; when freshly precipitated it is oily and viscid, but it gradually solidifies. It dissolves in hot water, but separates on cooling, and is soluble in alcohol, but only slightly soluble in ether. It reddens litmus, decomposes carbonates, and forms crystallizable salts with the alkalies; its solutions give precipitates with lead and silver, but not with copper salts. Morrhuic acid also combines with acids and forms a crystalline hydrochloride, which is decomposed by water, morrhuic acid separating in the form of an emulsion; the platinochloride is soluble and crystallizes in very small prisms; the aurochloride forms an amorphous precipitate which readily alters when heated.

When distilled with lime, morrhuic acid yields a base which gives with methyl iodide and potash the reaction characteristic of the pyridines. When oxidized with potassium permanganate, it yields a monobasic pyridinecarboxylic acid, which crystallizes in prisms and rhomboidal lamellæ, and forms a platinochloride and an aurochloride.

The silver salt of morrhuic acid contains two atoms of the metal, and hence it is bibasic. The fact that it gives no precipitate with

copper acetate indicates that the carboxyl is not in direct union with the pyridine ring, and it probably has the constitution

$$CH\begin{matrix}<\\>\end{matrix}\begin{matrix}CH\cdot C(OH)\\CH_2\cdot NH-\end{matrix}\begin{matrix}>\\<\end{matrix}C\cdot C_3H_6.COOH.$$

This formula explains the ready reduction of the silver salt even in the cold.

De Jongh's *gaduine* is probably identical with morrhuic acid.

Ricinoleic Acid. F. Krafft. (*Ber. der deutsch. chem. Ges.*, xxi. 2730–2737.) Pure ricinoleic acid can be prepared as follows:—Castor oil is hydrolysed with concentrated potash, the salt completely decomposed by heating for as short a time as possible with concentrated hydrochloric acid, and the liquid acid, after washing with water, cooled until it solidifies. It is then freed from oily impurities by pressure at a gradually increasing temperature. It is a hard, white, crystalline substance, melts at 16–17°, and solidifies again when cooled considerably below its melting-point. The solid acid seems to undergo no change when exposed to the air for several weeks, but in the liquid state it alters slightly. It commences to boil at about 250° (15 mm.), and an oily liquid distils, the temperatures rising considerably, but œnanthol and undecylenic acid are not formed. A compound, $C_{18}H_{32}O_3$, boiling at about 230° (15 mm.) is obtained when the distillate is fractionated at 15 mm. pressure. Barium ricinoleate is readily soluble in hot, but only sparingly in cold water. Castor oil which has been kept for a long time in a cool place deposits considerable quantities (3 to 4 per cent.) of a granular, crystalline substance which contains the glycerides of stearic and ricinoleic acids. The author finds that normal heptylic acid is formed, together with azelaic and oxalic acids, when ricinoleic acid is oxidized with nitric acid.

Isoleic Acid. M. C. and A. Saytzeff. (*Journ. pract. Chem.* [2], xxxvii. 269–290.) When iodostearic acid, obtained by the action of hydriodic acid on ordinary oleic acid, is heated in a reflux apparatus with alcoholic potash, and the product of the reaction is decomposed with sulphuric acid, together with ordinary oleic acid, an isomeride is formed which melts and solidifies at 44–45°. This solid oleic acid may be also prepared by distilling hydroxystearic acid, obtained by the successive action of sulphuric acid and water on ordinary oleic acid. The best yield is obtained if the operation is conducted under a pressure of 100 to 150 mm., when the distillation takes place at 280–300°. Oleic and isoleic acids

can be separated by means of their zinc salts; that of the latter being less soluble in alcohol.

Isoleic acid, $C_{18}H_{34}O_2$, is insoluble in water, dissolves readily in alcohol and ether, and forms a liquid dibromide, $C_{18}H_{34}O_2Br_2$, isomeric with that obtained from oleic acid, but differing from it in not reacting in the cold with silver oxide. It furnishes a *dihydroxystearic* acid, which differs from its isomeride, not only in its melting-point (76–78°) and solidifying point (66–64°), but also in being much more soluble in alcohol and ether. This new dihydroxystearic acid, on treatment first with hydriodic acid, and then with tin and hydrochloric acid, gives ordinary stearic acid.

Isoleic acid combines with hydriodic acid to form a new iodostearic acid. This is a thick yellow oil, and differs from its isomeride in not readily reacting with silver oxide, in being more soluble in alcohol aud ether, and in undergoing no change on distillation.

Iodostearic acid, prepared from isoleic acid, gives only isoleic acid when boiled with alcoholic potash, whilst that formed from ordinary oleic acid gives a mixture of oleic and isoleic acids. When fused with potash, isoleic acid behaves like its isomerides, and gives a mixture of palmitic and acetic acids. When oxidized with permanganate in alkaline solution, isoleic acid yields a mixture of dihydroxystearic acid and a saturated bibasic acid not yet investigated.

Conversion of Oleic into Stearic Acid. P. de Wilde and A. Reychler. (*Bull. Soc. Chim.*, 1889, 295, 296; *Journ. Soc. Chem. Ind.*, June, 1889.) By heating oleic acid with 1 per cent. of iodine in sealed tubes to 270–280°, a mixture of fatty bodies results, containing 70 per cent. of stearic acid. This fatty acid can be separated by melting the contents of the tubes with tallow soap, boiling with acidulated water, and then distilling with superheated steam. One-third of the iodine is obtained as hydriodic acid in the resulting liquors, but the remainder is difficult to recover, being retained in the tarry residue formed. Bromine acts similarly, yielding a solid acid melting at 51·5°, whilst with chlorine an acid melting at 31·5° results. The addition of colophony facilitates the reaction in each case. It is suggested that the unsaturated oleic acid first takes up iodine, that then hydriodic acid is given off, and this acts upon the oleic acid with formation of stearic acid and regeneration of iodine.

Drying Oils. A. Bauer and K. Hazura. (*Monatshefte*, ix. 459–468; *Journ. Chem. Soc.*, December, 1888.) In this paper the

authors contest many of the views advanced by Mulder on the products of oxidation of drying oils. They find that the rate of oxidation, and consequent hardening, of drying oils, depends on the ratio in which linoleic and linolenic acids are present; the more linolenic acid there is in the oil, the more rapid is the oxidation, which consists not only in the satisfying of the uncombined valencies with oxygen, but also in the formation of products containing hydroxyl-groups. On oxidation, the salts of the acids behave in a precisely similar manner.

When thin layers of drying acids are left exposed to the air for a considerable period at ordinary temperatures, or for a shorter time at 80°, the product is an anhydride insoluble in ether, but furnishing soluble acids when heated with alkalies. The drying of oils depends on the presence of linoleic, linolenic, and isolinolenic acids, and in no way on that of oleic acid, which forms no solid oxidation-products on exposure to air.

Chemical Constitution of Wool. P. Richard. (*Journ. Soc. Chem. Ind.*, 1888, 841.) The behaviour of wool towards colouring-matters shows that it acts as an amido-acid—towards acid colours it is basic, and towards basic colours acid.

The author's experiments tend to support this view.

Wool was laid in a solution of sodium nitrite (15 grams per litre) for twenty-four hours at a temperature of about 15°. At the end of this time the wool had attained a straw colour. After now being washed and taken through strongly alkaline sodium phenate, it was dyed a reddish brown; resorcinol, with excess of caustic soda, gave a granite-red; pyrogallol, with excess of caustic soda, red-brown; α-naphthol gave a granite-red; β-naphthol, brown.

Moderately concentrated hydrochloric acid modifies the colours. If the wool, after treatment in the nitrite bath, be steeped in ammoniacal water for twenty-four hours to correct acidity, the colours obtained with phenols are still the same as those obtained above, only a little darker. It is thus clear that the fibres have undergone, with the nitrite, some change, which renders them capable of combining with phenols, as the diazotised amines do. This change is, moreover, quite different from that effected by nitrating and then colouring orange with alkalies, in which case no colour changes are obtained with phenols.

The natural hypothesis is that a diazo-compound of the wool is obtained, but one which is much more stable than the ordinary diazo-compounds. Boiling with hydrochloric acid does not completely destroy it. After this treatment, however, it may be dyed

with diazonaphthalene chloride, and this seems as though there were liberated in the fibre a phenol, produced by the decomposition of a diazo-compound with boiling water.

Exactly the same holds for silk as for wool.

Spongin. P. Zalocostas. (*Comptes Rendus*, cvii. 252–254.) The organic matter of sponges, previously treated with hydrochloric acid and with benzene, was submitted to the action of barium hydrate under pressure. The results obtained, which will be found fully detailed in the original paper, justify the conclusion that spongin approximates to proteid matter in its constitution, and especially to collagenous matter.

Excretion of Iron from the Animal Organism. S. Zaleski. (*Chem. Centr.*, 1888, 759.) The author arrives at the conclusion that iron, in contradistinction to other heavy metals, is excreted by the liver and not by the intestine.

Lactic Acid in the Blood. G. Salomon. (*Virchow's Archiv*, cxiii. 356–360.) Observations on the blood removed from the vessels during life show that lactic acid is then as constantly absent as it is present in the blood examined after death.

If the blood is examined immediately it is drawn, lactic acid is found to be absent, but if the blood is allowed to stand a short time and then examined, the acid will then be found. Its formation is connected with the ferment actions that set in in shed blood, or in blood left in contact with dead tissues. If it is formed at all during life, it must be rapidly oxidized, and so cannot be discovered in living blood.

Effect of Alcohol on Perspiration. G. Bodländer. (*Chem. Centr.*, 1888, 760.) The author finds that in the majority of cases alcohol causes a diminution of the amount of perspiration. On account of this power of diminishing the amount of perspiration, alcohol may be useful in the case of profuse perspiration of debilitated subjects.

Poisonous Effect of Exhaled Air. Drs. Brown-Séquard and d'Arsonval. (*Comptes Rendus*, cviii. 267–272.) The authors' experiments lead to the conclusion that the injurious effect of exhaled air is mainly due to the presence of a pulmonary poison or poisons, and not to the presence of carbonic acid.

Contribution to the Study of Ptomaines. O. de Coninck. (*Comptes Rendus*, January 7, 1889.) The author has converted the ptomaine, $C_8H_{11}N$, into pyridin, and the intermediate product, carbono-pyridin, presents the principal characters of nicotianic acid.

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tabular β-creatinine of urine are obtained, which when dissolved and again evaporated in the cold give efflorescent creatinine. Finally, if effloresced creatinine is dissolved at 100°, tabular α-creatinine of urine is obtained, and this when dissolved and evaporated in the cold recrystallizes unchanged; 3 mols. of creatinine of urine are equivalent in reducing power to 1 mol. of glucose, whilst 3 mols. of flesh creatinine are required to effect the same amount of reduction. The efflorescent creatinine has the same solubility in water as the tabular α-salt. Urine creatinine differs from flesh creatinine in its power of reduction, in the composition of its platinochloride, and in its solubility in water and alcohol. Boiled with water, the creatinine is converted into urinary creatine, $C_4H_9N_3O + H_2O$. It can be converted by Liebig's process into a creatinine hydrochloride, which is identical with that obtained from flesh creatine by the same process. From this hydrochloride four different creatinines are obtained, which are not identical with the above creatinines directly prepared. Crystallographic measurements of the natural creatinines are given. The creatinines from urinary creatinine have less reducing powers than the natural creatinines, but greater than that of creatinine from flesh creatine.

Determination of Free Hydrochloric Acid in the Contents of the Stomach. J. Sjöqvist. (*Zeit. physiol. Chem.*, xiii. 1–11.) The author gives a critical review of the processes in use for this purpose, and then recommends the following new method, which he finds to give absolutely accurate results:—The contents of the stomach are evaporated to dryness with barium carbonate and then incinerated; barium chloride remains unchanged, and the salts of the organic acids are burnt to barium carbonate. The barium chloride is then extracted with water, and the quantity of barium dissolved is a measure of the original amount of free hydrochloric acid. The barium may be estimated by Mohr's titration method. In this method, potassium dichromate is added to the barium solution, by which means a precipitate insoluble in water and acetic acid is formed; the indicator of the end of the reaction is the yellow colour which the smallest excess of the dichromate gives the liquid which floats over the precipitate. A more delicate test for excess of the dichromate, is, however, Weerster's tetramethylparaphenylenediamine paper. Potassium dichromate in an acetic acid solution acts in the same way as ozone, to test for which the paper was originally used; it turns it blue.

The titration is carried out as follows:—The solution of barium

chloride is placed in a beaker, and a quarter of its volume of alcohol added, then a few c.c. of a 10 per cent. solution of sodium carbonate containing 10 per cent. of acetic acid. A standard solution of potassium dichromate is then added from a burette till the end-reaction is obtained. Directions are given for the preparation of the standard solution: the most convenient was found to be one of which each c.c. correspond to 4·05 mgrms. of H Cl.

Chemical Nature of the Peptones, and the Separation of Albumen from them. R. Palm. (*Zeitschr. für Analyt. Chem.*, xxvii. 359–363; *Journ. Chem. Soc.*, September 1888.) According to the author's view peptone is a solution of protein in an acid. It can be obtained by the action of lactic acid on the albumen of eggs, milk, or blood, also on gelatin, fibrin, or chondrin. An alcoholic solution of peptone mixed with enough ether gives an oily precipitate containing protein and lactic acid in constant proportions. A peptone solution, neutralised with ammonia, is coagulable by heat, and gives all the reactions of an albumen solution. Mixed with strong alcohol all the albumen is precipitated. This accounts for the fact that peptones show, on analysis, the same composition as the proteids from which they are obtained. Solutions of peptones reduce Fehling's solution. Since cow's milk sometimes contains as much as 1·5 per cent. of peptone, determination of the sugar by that solution gives too high a result.

Peptone solutions are precipitated by potassium xanthate, albumen gives no precipitate until after the addition of an acid.

Artificial Diastase. A. Reychler. (*Ber. der deutsch. chem. Ges.*, xxii. 414–419.) By the action of dilute acids on the gluten of wheat, at a temperature of 30–40° C., for several hours, a considerable portion of the gluten is dissolved to an opalescent liquid, which possesses all the properties of diastase.

General Method of obtaining Non-organised Ferments in Pure Aqueous Infusions. N. Kravkoff. (*Journ. Chem. Soc.*, August, 1888; from *Journ. Russ. Chem. Soc.*) The non-organised ferments, together with albuminoids, are precipitated by ammonium sulphate. By treatment with alcohol, the albuminoids become insoluble, and the ferments can then be extracted with water. From human saliva, the ferment was obtained as follows: the saliva was mixed with an equal volume of water, and finely-powdered ammonium sulphate was added to complete saturation, leaving some of the salt undissolved. After filtration, the precipitate was boiled for five minutes with strong alcohol, in order to render it more compact and easier to remove from the

filter; it was then placed in absolute alcohol from 1 to 1½ day. After carefully decanting the alcohol, the precipitate was dried at 30°, and then extracted with a volume of water equal to that of the original saliva. On filtration, a clear liquid was obtained, showing but a slight opalescence, and quite free from albuminoid or mucous substances. At 40° a turbid starch solution is rendered clear at once. Fehling's test is reduced. This ferment infusion loses its activity in the air, whereas in an atmosphere of carbonic anhydride or chlorine, its hydrolytic property remains unaltered. In the same way, an infusion of trypsin (better pancreatin) was obtained from the salivary gland of a dog's stomach, or the stomach of a calf or pig; it was found that the pancreas infusion obtained from the dog had the most energetic action, that from the calf being the most feeble. The filtrates from the quasi-mechanical precipitation with ammonium sulphate contain no active ferment, and the above pure ferment infusion, on addition of ammonium sulphate, becomes turbid, and the flocks which separate, after being treated in the same manner as the precipitates obtained from saliva, give extracts with the same hydrolytic (saccharifying) properties as the above infusions, whilst the filtrates are found to be inactive.

Fermentation of Grape-juice. A. Audoynaud. (*Ann. Agronom.*, xiv. 211–221; *Journ. Chem. Soc.*, September, 1888.) Many salts added to the juice in small proportion (0·5–1 gram per kilo. of fresh grapes) increase the vitality of the yeast. Most active are ammonium sulphate, phosphate, and carbonate, probably because they supply nitrogen to the yeast plant in a more available form than the albuminoids of the must. Nitrates cannot be substituted. Soluble calcium salts, such as the nitrate, sulphate, and bicalcic phosphate, also hasten the fermentation. Magnesium salts are far less efficacious. Boric acid is without action. The proportion of water has considerable influence on the rapidity of fermentation. The following conditions ensure great rapidity and regularity; water, seven to eight times the weight of the sugar present; temperature, 25°; ammonium carbonate and bicalcium phosphate, each added in the proportion of 500 grams per 1000 kilos of grapes; the must must remain acid after all these additions.

Ammonia as an Antiseptic. Dr. Gottbrecht. (*Archiv exp. Path. und Pharm.*, April, 1889.) The author's experiments confirm Dr. B. W. Richardson's statements respecting the antiputrescent properties of ammonia. Animal matter placed in 5 per cent. ammonia solution was found free from putrescence after nearly

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to the fact that boracic acid is by no means as harmless as is generally supposed.

Preservation of Milk. H. Droop Richmond. (*Analyst*, January, 1889.) The author has studied the preserving action of hydrofluoric acid on a large number of samples of milk. He arrives at the conclusion that this agent exercises a very decided preserving action if added while the samples are fresh, but that it is of very little use if decomposition has already set in.

Variations in the Fat of Milk. L. F. Nilson. (*Bied. Centr.*, 1888, 171–183.) The author found, with but few exceptions, that the evening's milk was richer in fat than the morning's milk. The former gave 3·82 per cent. of fat, and the latter 3·33 per cent. as an average of the whole year.

Variations in the Composition of Milk. H. Faber. (*Bied. Centr.*, 1888, 316, 317.) The author's results confirm the observation that evening milk is richer in fat than the morning milk. The milk of October and November was found to contain more fat than that of other parts of the year. The solids not fat, as a rule, do not seem to fall below 8·7 per cent.

Citric Acid as a Normal Constituent of Cow's Milk. F. Soxhlet. (*Journ. Soc. Chem. Ind.*, 1888, 861.) Experiments made by G. T. Häckel have confirmed the presence of citric acid as a normal constituent of cow's milk. The examination of a great number of samples shows that they contain from 1·8 to 2·2 grams of calcium citrate, and from 0·9 to 1·1 gram of citric acid per litre, or about 0·1 per cent. of citric acid; so that the quantity of citric acid yielded by a good milking cow in a day amounts to as much as that contained in two or three lemons. The lime found in milk serum generally exceeds that combined with the mineral acids, the presence of citric acid will now explain the apparent anomaly. This acid is supposed to be derived either from citric acid in the hay or green fodder, or to be formed from the decomposition of cellulose. The concretions frequently found in condensed milk consist of pure calcium citrate, and as human milk contains no citric acid, it is perhaps characteristic of milk from herbivora.

The Nature of Milk. A. Béchamp. (*Comptes Rendus*, cvii. 772–775; *Journ. Soc. Chem. Ind.*, 1889, 58.) Three questions present themselves for solution:—

(1) Is milk a mere emulsion of naked fat globules, or is each globule provided with a definite covering?

(2) Are other albuminoids besides casein present, and are they different in different kinds of milk?

(3) Does milk curdle or ferment without the introduction into it of foreign organisms?

The last two questions are answered by the author in the affirmative, but he reserves the detailed proof for the full memoir. The first is, however, dealt with as follows:—

Fresh milk or cream is mixed with diluted alcohol, and then filtered. The albuminoids—which are combined with the alkalies—pass into the filtrate, while the fat globules are retained. They are washed with a weak solution of ammonium carbonate in dilute alcohol, which does not attack their enveloping membranes, as is seen when they are examined microscopically. These operations should preferably be conducted at a temperature approaching 0° C. Thus prepared, the fat globules can be preserved almost indefinitely in weak aqueous ammonium carbonate or alcohol. After trituration, the fat can be dissolved out by ether (the membranes being left easily distinguishable under the microscope), but brisk churning is necessary to cause the separation of butter if only water be used. When heated, a portion, amounting to at least 1·3 per cent. of the dry globules, remains unfused, retaining the butter fat, however, on account of its spongy structure; from this it can be freed by ether. It appears to be epidermal in character. On ignition the globules leave some ash.

Note on the Digestion of Fermented Milk or Koumiss. T. R. Powell. (*Pharm. Journ.*, 3rd series, xix. 143.) The author considers it probable that the indigestion and nausea so often produced in cases where a milk diet is desirable, are the result of the coagulation of the milk, a coagulation which may be delayed by the addition of alkalies. He also concludes that koumiss is retained by the stomach in preference to milk, for the following reasons:—

(1) That coagulation has already taken place.

(2) That the precipitated casein, the nourishing constituent, is in a very fine, almost gelatinous, condition.

(3) That carbonic acid is present in the free state and exerts a sedative action.

(4) That free lactic acid still further stimulates and aids digestion.

Chymosin, the Active Constituent of Rennet. L. H. Friedburg. (*Amer. Chem. Soc.*, x. 98–113.) The author refers at some length to the researches of O. Hammarsten, and then discusses the process for the preparation of chymosin patented in the United States by Blumenthal in 1886. This process yields a preparation per-

fectly free from pepsin. The author's experiments lead to the conclusion that pure pepsin free from chymosin is incapable of curdling milk.

Rennet Ferment in Human Urine. F. Helwes. (*Pflüger's Archiv*, xliii. 384–396.) The author finds that rennet ferment is normally present in human urine, but that the amount is generally very small.

Pepsin in Normal and Pathological Urine. E. Stadelmann. (*Zeit. Biol.*, xxv. 208–231.) The occurrence of a pepsin-like ferment in urine has been noticed by many observers. The author's investigation affords confirmatory evidence that this ferment is true pepsin, and that it occurs both in normal and pathological urine. No diagnostic value can therefore be attached to the presence or absence of pepsin in the urine in cases of disease.

Paralactic Acid in Urine. G. Colasanti and R. Moscatelli. (*Gazz. Chim. Ital.*, xvii. 548–557.) The occurrence of paralactic acid in normal urine has hitherto never been definitely proved. The author reports that he has detected it in the urine of soldiers after forced marches of 20 to 25 kilometers.

Mean Composition of Normal Urine. P. Yvon and M. Berlioz. (*Lancet*, 1888, 629.) A series of tables of the analysis of normal urine are given. The observations are very numerous, and were made on healthy adults, male and female. The present results are contrasted with those of other authors, and in each case the maxima and minima, as well as the means, are given. The latter are summarised thus:—

	Male.	Female.
Volume per diem . .	1360 c.c.	1100 c.c.
Specific gravity . . .	1·0225	1·0215
Urea (per litre) . . .	21·5 grams.	19·0 grams.
„ (per diem) . . .	26·5 „	20·5 „
Uric acid (per litre). . .	0·5 „	0·55 „
„ (per diem) . .	0·6 „	0·57 „
Phosphoric acid (per litre) .	2·5 „	2·4 „
„ (per diem) .	3·2 „	2·6 „

Thus, with the exception of uric acid, the amounts are higher on each head among males than among females; but with uric acid, the quantities eliminated in the twenty-four hours are almost precisely the same for the two sexes. The authors desire to correct, as resulting from these observations, the proportionate quantities of urea and uric acid given in their *Manual of Urinary Analysis*, which should be as 40 : 1, instead of 30 : 1; and of urea and phosphoric acid, which should be as 8 : 1, instead of 10 : 1.

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were precipitated with phosphomolybdic or phosphotungstic acid. The precipitate was washed, treated with barium hydroxide, and barium carbonate, care being taken to avoid an excess of hydroxide, and the deep red solution thus obtained was filtered. If ferric chloride is added to the red liquid, it produces a bulky precipitate, which contains *urochrome*, the colouring matter of the urine in combination with iron. This urochrome may be isolated in several different ways, and then treated with sulphuric acid, or the precipitate may be treated directly with the acid. In either case the product answers to the description given by Proust, in 1881. It is a deep, violet-red, bulky precipitate, which when treated with ether yields a resin and a mixture of omicholin and omicholic acid. The portion insoluble in ether consists of a red compound, *uropittin*, soluble in alcohol, and a black resin, *uromelanin*.

Omicholin has approximately the composition $C_{24} H_{38} N O_5$, and is a red, resinous substance, insoluble in ammonia, but soluble in ether and alcohol. Its solution shows a bright green fluorescence, and gives an absorption-spectrum consisting of a band between D and E.

Omicholic acid has the composition $C_5 H_{22} N O_4$, and is also a resinous, red substance, soluble in ether or alcohol, forming a solution which shows a green fluorescence and gives an absorption-band between D and E. This band is, however, narrower than the band given by omicholin. Omicholic acid is soluble in ammonia, and is reprecipitated by acids.

Uropittin was not obtained pure. It is always mixed with one or other of its modifications, *meta-uropittin* and *uro-rubin*, and is partially altered by contact with the oxygen of the air. It contains 11 per cent. of nitrogen. Its alcoholic solution is red, and gives an absorption-band at F.

Uromelanin has the composition $C_{36} H_{43} N_7 O_{10}$, and is insoluble in alcohol or ether, but dissolves in dilute solutions of the alkalies, from which it is precipitated by acids. With silver, barium, calcium, lead, and zinc it forms basic and acid salts. The silver salt has the composition $C_{36} H_{40} Ag N_7 O_9$. Uromelanin is a very stable substance; the quantity excreted by an adult is 0·3 to 0·5 gram per day.

Neither urochrome nor any of the other products can be obtained crystallized. Urochrome is an alkaloid, the function of which is as yet unknown. The products of its decomposition are not related to the colouring matters of the blood or of the bile.

If the filtrate from the urochrome iron precipitate is concen-

trated, it yields bulky crystals which may be purified by re-crystallization from alcohol. These consist of an alkaloid, *uro-theobromine*, isomeric with ordinary theobromine. It sublimes without change, forms no crystalline precipitate with silver nitrate, and displaces acetic acid from cupric acetate, forming an insoluble compound.

Creatinine is also present, and the mother-liquor from the creatinine contains three alkaloids. *Reducine*, $C_{12}H_{26}N_6O_9$, or $C_6H_{11}N_3O_4$, forms a barium compound which is almost insoluble in alcohol. Neutral or acid solutions of reducine reduce ferric, cupric, or mercuric salts to ferrous, cuprous, or mercurous salts respectively, and silver salts to metallic silver. *Para-reducine* unites with zinc oxide to form a compound, $C_6H_9N_3O \cdot ZnO$ or $C_6H_9ZnN_3O_2$. *Aromine* could not be isolated in a pure condition. When heated it gives off an aromatic odour, resembling that obtained from tyrosine under similar conditions.

Uric Acid in the Urine of Herbivora. F. Mittelbach.. (*Zeit. physiol. Chem.*, xii. 463–466.) The author has examined the urine of oxen, sheep, horses, and pigs, and has ascertained the presence of uric acid in all of them.

Excretion of Uric Acid. A. Haig. (*Journ. Physiol.*,. viii..211–217; *Journ. Chem. Soc.*, December, 1888.) The administration of acids diminishes the relative amount of uric acid excreted, and that of alkalies increases it; as an instance, in one case the normal proportion of uric acid to urea was 1·35. After a few doses of 4 grams of citric acid, the relation was 1·41; after similar doses of potassium citrate, it was 1 : 28. In these cases there is not only a relative, but also an absolute diminution and increase in the uric acid excreted. The excretion of uric acid is much affected by the digestion of food, and is three times as much during the "alkaline tide" as at other periods; a large part of this increased secretion must be regarded as a washing out of the uric acid accumulated in the liver and spleen in the "acid tide" periods between meals or during sleep, and not as entirely due to increased formation of uric acid during digestion. Certain peculiar forms of headache most marked during the strongest "alkaline tide," as during the digestion of breakfast, are regarded as being due to the increased amount of uric acid in the circulation during that period. Such headaches may be cured by a dose of acid.

Salicylic acid, however, forms an important exception to this rule, for while it increases urinary activity, it does not in any way diminish the excretion of uric acid; moreover, acids given while

salicylates are present in the circulation, have no longer the power of diminishing the excretion of uric acid; excessive excretion of uric acid under salicylates is not accompanied by any headache. Benzoates do not act in the same way, probably because hippuric acid, which they form, is less soluble than salicyluric acid. Both uric and salicyluric acids are present in the urine passed under the influence of salicylates; this is probably due to the salicylate acting on the uric acid in the blood, but not on that secreted by the kidney itself. In these experiments, Haycraft's method of estimating uric acid was employed. Salicyluric acid does not give the reactions on which this process depends.

A large part of the value of salicylates in uric acid diseases is due to their preventing acids from causing retention of uric acid. Some drugs have the opposite action, and cause retention of uric acid. Lead, iron, and lithia are instances of these. The action of lead in precipitating an attack of gout is well known. Iron also causes relapses in gout and does harm in epilepsy and uric acid headache. On the other hand, salicylates prevent gout, the peculiar headache in question, and also epilepsy. This, and other certain facts not chemical in nature, seem to place epilepsy in the same category as gout, and it is considered probable that epilepsy is really an uric acid disease, the poison (uric acid) acting on the nerve-centres.

Estimation of Uric Acid in Urine. F. Czapek. (*Zeit. physiol. Chem.*, xii. 502–511.) The process recommended by the author is a simplification of Haycraft's method. The essential feature is that a known quantity of ammoniacal silver solution is added to the urine, the uric acid being thus precipitated as silver urate; this is filtered off, and the silver is estimated not in the precipitate (as in Haycraft's method), but in a certain measured proportion of the filtrate. From these data, the amount of silver residue is obtained, and thus the amount of silver and uric acid in the precipitate. By this process not only is the use of the filter-pump unnecessary, but it also does away with the washing of the precipitated urate, which is very troublesome. The silver in the filtrate is estimated by warming and titrating with potassium sulphide or sodium sulphide solution, the browning of lead paper being the indicator used for ascertaining the termination of the reaction. Several successive titrations are necessary to obtain a correct result.

Detection of Pus in Urine. D. Vitali. (*Pharm. Rundschau*, 1888, 531.) The author recommends tincture of guaiacum as a

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Saffranin as a Test for Grape-sugar. L. Crismer. (*Chem. Centr.*, 1888, 1510, from *Pharm. Zeit.*, xxxiii. 651.) If 2–3 c.c. of a 1 : 1000 solution of saffranin is heated in a test-tube with a few drops of a solution of grape-sugar, and 2–3 c.c. of soda, the safranine becomes reduced, and the solution is rendered colourless and opalescent, owing to the precipitation of the decolorised dye. At the surface the colour of the dye rapidly reappears, owing to reoxidation. The author recommends this reaction for the detection of grape-sugar in solutions, such as urine, since the saffranin is not reduced by uric acid, creatinine, chloral, chloroform, hydrogen peroxide, or hydroxylamine salts, all of which reduce Fehling's solution. Egg-albumen reduces saffranin slowly but completely.

Estimation of Starch. F. Seyfert. (*Zeitschr. für angewand. Chem.*, 1888, 15.) The author describes the following rapid method of estimating starch in commercial starch powders; 1 gram of starch is treated with 100–150 c.c. of hot water, and heated on the water-bath at 100° C. till perfectly gelatinised. The paste is washed into a 500 c.c. flask, and 50 c.c. of an iodine solution, containing but little potassium iodide, and about 12–13 grams of iodine per litre added, as well as 20 c.c. of strong hydrochloric acid. The solution is diluted to 500 c.c., well shaken, and allowed to settle. Two lots of 50–100 c.c. are then pipetted off and titrated with sodium thiosulphate. Iodide of starch, according to the formula $(C_{24}H_{40}O_{20})_6I_7$, contains 22·865 per cent. of iodine. From this the amount of starch indicated by the tests can be readily calculated.

Test for Carbohydrates. L. v. Udranszky. (*Analyst*, Nov. 1888.) Undoubtedly the furfurol reactions furnish the most delicate tests for the carbohydrates. H. Schiff uses a test paper made by immersing paper in a mixture of equal volumes of xylidin and glacial acetic acid diluted with alcohol, and drying. A small quantity of the substance to be tested is heated with a slight excess of concentrated sulphuric acid, and the test paper held in the evolved vapours; a beautiful red colour is produced owing to the formation of the furoxylidin. It will detect as little as 0·00007 gram glucose in an aqueous solution. The author uses a furfurol reaction even more delicate than the above, detecting 0·000028 gram glucose in solution. One drop of a dilute solution to be tested is mixed with two drops of a 15 per cent. alcoholic solution of *a*-naphthol in a test tube, and a half c.c. concentrated sulphuric acid is carefully poured in to form a distinct layer. If at the line of contact a *violet colour* above a green layer is produced,

carbohydrates are present. Urine is diluted with 9 volumes of water and *one drop* proceeded with as above. If the violet colour is not produced, the urine is considered normal; if the colour is produced, the urine may be considered abnormal, because it yields a quantity of furfurol which is also obtained from a glucose solution containing at least 0·5 per cent. By means of these two tests carbohydrates were detected in all urines examined: albumen perfectly free from carbohydrates heated with concentrated acids formed furfurol, which was recognised in the distillates, establishing for the first time by chemical reactions a close relationship between the albuminoids and the carbohydrates. In testing urine for carbohydrates, if albumen be present in larger quantities, it must first be removed, small quantities do not introduce appreciable errors, owing to the small quantity of urine taken. Fehling's solution under the most favourable conditions failed to detect less than 0·00012 gram glucose in aqueous solution; testing urine by the three tests, the bodies other than carbohydrates decrease the delicacy of Fehling's test to a greater degree than the first two tests.

Estimation of Citric and Tartaric Acids in Mixtures of the Two. J. S. Ward. (*Pharm. Journ.*, 3rd series, xix. 380.) The author's experiments show that the results obtained in quantitative analyses of mixtures of citrates and tartrates are too low, accuracy being impaired by the slight solubility of calcium citrate in boiling water, and by the incomplete precipitation of calcium tartrate in the presence of a citrate.

Detection of Citric Acid in the Presence of Tartaric or Malic Acid. Prof. Meau. (*Analyst*, November, 1888.) The author heats the acid with 0·7 per cent. of glycerin until vapours of acrolein are evolved; the mass is then taken up by a little ammonia, the greater part of which is afterwards expelled by heating. A few drops of nitric acid (the fuming acid diluted with five parts of water) are then added. Under this treatment citric acid yields a green compound, which turns blue on heating. Tartaric and malic acids do not produce the same coloration.

Behaviour of Citric Acid and Tartaric Acid with Potassium Chromate. T. Salzer. (*Ber. der deutsch. chem. Ges.*, xxi. 1910, 1911.) When a solution of citric acid is coloured pale-yellow by a drop of potassium chromate solution, the colour remains unchanged, even after addition of sulphuric acid, for some days. A solution of tartaric acid similarly treated becomes colourless. The presence or absence of ½ per cent. of tartaric

in citric acid can be detected by extending the experiments over some hours.

Rapid Method for the Determination of Acetic Acid in Acetates. A. Sonnenschein. (*Chemical News*, lviii. 60.) The author dissolves 5 grams of the powdered sample of sodium acetate in water in a beaker with the aid of heat, and makes up in a flask to 250 c.c. If carbonaceous matter is present it is filtered off before making up; 50 c.c. of the clear liquid are mixed with three drops of phenacetoline in a porcelain capsule. If a red colour is produced it is titrated with hydrochloric acid until it turns to a yellow. The acid consumed is calculated as sodium carbonate. Two drops of methyl-orange are next added, titrating until redness appears. The acid consumed is calculated as acetic acid or sodium acetate. Acetate of lime gives a coloured solution, and must be treated with carbonic acid, boiled with animal charcoal, filtered, and made up to a known volume.

A New Reaction of Sulphocyanides. G. Colasanti. (*Gazz. chim. Ital.*, xviii. 1888, 397–399; *Ber. der deutsch. chem. Ges.*, 1889, 239, 240.) On adding to a very dilute solution of sulphocyanic acid or of an alkaline sulphocyanide a few drops of solution of copper sulphate, a fine emerald-green coloration is produced. The reaction may be made the basis of a quantitative colorimetric process. It is not applicable for the detection of sulphocyanides in saliva unless the mucus is first precipitated by alcohol, the filtrate evaporated on a water-bath, and the residue dissolved in water before the test is applied. In a similar manner, sulphocyanides may be readily detected in urine.

Test for Distinguishing Carbolic Acid and Resorcinol from Salicylic Acid. L. van Itallie. (*Apoth. Zeit.*, iv. 99.) The bluish-violet coloration produced on the addition of a few drops of ferric chloride to a solution of phenol or resorcinol, changes to yellowish green on the further addition of a drop or two of lactic acid, whilst the coloration due to salicylic acid undergoes no change.

The Testing of Creasote. W. Brandes. (*Archiv der Pharm.* 1889, 111; *Journ. Soc. Chem. Ind.*, May, 1889.) The German Pharmacopœia requires the sp. gr. 1·03 to 1·08 for creasote from beechwood tar. This is a mixture of guaiacol and cresol, the former of which has the sp. gr. 1·117, and the latter 1·088 at 15° C., from which it is evident that the specific gravity of good creasote must be higher than that given in the Pharmacopœia. A creasote which was free from phenol and cresol fulfilled the above require-

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applied only to colourless solutions. In order to examine coloured solutions, Kossakoffsky recommends precipitating the colouring matter with lead acetate and then treating the filtrate with sulphuric acid.

Detection of Chloral or Chloroform in Liquids. C. Schwarz. (*Zeitschr. für Analyt. Chem.*, xxvii. 668, 669.) If chloral hydrate or chloroform be heated with a solution of resorcinol in presence of excess of caustic soda, a red coloration is produced, which on the addition of acid disappears, but reappears with caustic alkali. If, on the other hand, an excess of resorcinol and only a drop or two of soda solution is used, the product is a yellowish red solution with intense yellowish green fluorescence. 0·0001 gram of chloral hydrate in 1 c.c. gives this reaction very distinctly when vigorously boiled with 0·05 gram of resorcinol and five drops of soda solution. In the case of urine, the boiling must be protracted, and a considerable excess of alkali must be present (to decompose urochloralic acid or trichlorethylalcohol). Coloured solutions must be previously decolorised.

Detection of Methyl Alcohol in Spirits. J. Habermann. (*Zeitschr. für Analyt. Chem.*, xxvii. 663.) The test recommended is based on the fact that commercial methyl alcohol contains impurities which have a strong reducing action on potassium permanganate. Cazeneuve and Cotton shake 10 c.c. of the spirit to be tested with 1 c.c. of a 0·1 per cent. solution of permanganate at 20°. If wood spirit is present, decolorisation takes place immediately; with pure alcohol, 20 minutes is required. The author points out that certain essential oils which may be present in spirit or brandy would cause a similar reduction, but that might be removed by shaking the spirit twice with half its volume of pure olive oil and then filtering through a wetted filter. In the presence of sugar, the spirit must be distilled, and the distillate tested.

Determination of Alcohol. B. Röse. (*Zeitschr. für angewand. Chem.*, i. 31–35.) An excess of potassium permanganate oxidizes alcohol completely to carbonic acid and water when to the mixture so much concentrated sulphuric acid is added that it amounts to 40 per cent. of the whole. The analytical process is as follows:—About 5 grams of the dilute alcohol is weighed in a flask; 50 c.c. of the permanganate is run in, and then 20 c.c. of sulphuric acid whilst shaking. After a few minutes, 100 c.c. of water is added, then a measured excess of oxalate, the liquid heated nearly to boiling, and the excess of the oxalate found by permanganate.

In four experiments, 100·18, 100·0, 100·24, and 100·0 per cent. of the alcohol present was indicated.

Estimation of Iodoform. M. Greshoff. (*Chemist and Druggist*, May 4, 1889.) According to the author, silver nitrate acts readily on iodoform at ordinary temperatures as follows:—

$$C H I_3 + 3 Ag N O_3 + H_2 O = 3 Ag I + 3 H N O_3 + C O.$$

The reaction takes about an hour and a half for its completion, and the nitric acid set free can then be titrated.

Test for Antipyrine. A. C. Stark. (*Pharm. Journ.*, 3rd series, xix. 949.) The now well-known reaction between nitrous acid and antipyrine can be utilized as a test for antipyrine in the following manner.

Place in a test-tube a few grains of potassium nitrate, add a little water, and then excess of strong sulphuric acid, and fill the tube up with the suspected liquid. A green coloration is immediately produced if antipyrine be present. This test is delicate and reliable, and has the advantage of being specially characteristic of antipyrine.

Colour Reactions of Antifebrin. D. Vitali. (*Chem. Centr.*, 1888, 424.) Acetanilide (antifebrin) gives the following colour reactions. A trace of it gives a blue coloration with a few drops of a solution of bleaching powder and a crystal of phenol. Mixed with a solution of potassium chlorate in sulphuric acid, it produces a red colour, which is changed to yellow by water, by heating to blood-red. With a crystal of potassium nitrite and a drop of concentrated hydrochloric acid, acetanilide produces a yellow colour, which, on heating, changes through green to blue. On evaporation to dryness, an orange-coloured residue remains, which is coloured red by ammonia.

Reactions of Antifebrin (Acetanilid). (*Zeitschr. für Analyt. Chem.*, xxviii. 103, 104.) G. Vulpius recommends the following test:—A few centigrams of the substance are boiled with 1 c.c. of potash solution for a short time. A glass rod dipped in a bleaching-powder solution is then suspended over the liquid; the bleaching-powder solution quickly assumes an amber yellow colour, especially when viewed by transmitted light. By reflected light it has a violet tinge, and after long boiling, a distinct violet colour is produced. Aniline treated in a similar manner gives an immediate voilet coloration, but no intermediate yellow tinge is produced. To detect acetanilid in urine, Vulpius gives the following:—The concentrated urine is boiled for a few minutes with

H Cl, cooled, extracted with ether, the ether evaporated, and the residue dissolved in water and mixed with a few cubic centimetres of an aqueous solution of phenol, and half its volume of a 1 per cent. solution of bleaching-powder. A brownish red coloration is produced, which is changed to a beautiful blue by ammonia.

Yvon heats acetanilid gently with mercurous nitrate, whereby a body is produced which dissolves with a green colour in alcohol.

D. Cella and Arzeno heat a few centigrams of the substance very gently with 2–3 drops of a solution of mercurous nitrate, and after solution has been effected, add 2–3 drops of strong sulphuric acid, when a blood-red coloration is produced. The last reaction is given by resorcinol, phenol, salicylic acid, tannic acid, gallic acid, and thymol, but not by benzoic acid.

F. A. Flückiger rubs up two parts of acetanilid with one part of caustic potash, moistened with chloroform, tranfers the mixture at once to a test-tube, and heats very gently. The mixture turns brown, and gives off the very characteristic smell of phenylcarbamine.

Detection of Antifebrin in Phenacetin. M. J. Schröder. (*Nederl. Tydschr. v. Pharmacie*, January, 1888. From the *Analyst*.) Phenacetin, when taken internally, yields phenetidin and paramido-phenol, both harmless bodies, whilst antifebrin yields aniline, which is decidedly poisonous. It is therefore of importance to test for the presence of antifebrin in phenacetin. The author found the best test to be Plugge's reagent, which consists of a solution of mercurous nitrate with a little nitrous acid. ·5 gram of the sample is boiled in a test-tube with 8 c.c. of water, allowed to cool, and filtered off from the recrystallized phenacetin. The filtrate is boiled with a little potassium nitrite and dilute nitric acid, then mixed with some of Plugge's reagent, and again boiled. If no red colour is got, the sample may be considered as practically pure; at all events there cannot be more than 2 per cent. of antifebrin.

Detection of Antifebrin in Phenacetin. C. Schwarz. (*Pharm. Zeit.*, xxxiii. 357.) The great resemblance which antifebrin bears to phenacetin in physical as well as chemical respects, and the difference in the commercial values of these products—phenacetin being about fifteen times the price of antifebrin—may, in the author's opinion, give rise to the adulteration of phenacetin with antifebrin. A simple method of detecting such admixture is to heat the product with caustic soda in the presence of chloroform, when the

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evaporated to dryness. The finely powdered residue is extracted with chloroform, from which extract the caffeine is obtained in beautiful crystals on evaporation: these are dried at 100°, and weighed. Commercial samples gave 3·12 to 3·8 per cent. of pure caffeine. The ash of guarana amounts to 1·3–2·0 per cent., and is rich in phosphates.

New Tests for Tannic and Gallic Acids. S. G. Rawson. (*Chemist and Druggist*, May 11, 1889.) When a solution of tannic acid is treated with ammonium chloride alone a precipitate falls, but only with extreme slowness, whereas on the addition of ammonia a beautiful white precipitate instantly appears; but this, probably by oxidation, becomes rapidly of a reddish brown colour. With gallic acid no precipitate falls in either a strong or a weak solution, but the liquid becomes of a red colour. One part of tannic acid in 5,000 is readily detected, and, with care, one part in 20,000, or even 50,000, may be detected. There is no advantage in substituting other salts, such as the phosphate, carbonate, or oxalate, for ammonium chloride. With gallic acid, as previously mentioned, no precipitate is formed; but a ring, usually of a greenish colour, on its lower surface, is produced, this being recognisable in solutions containing one part of gallic acid in 100,000 of water. Another delicate test for both acids is to add to the solution containing one of them chlorine water and then ammonia, a beautiful red colour being at once produced. With tannic acid the colour is very well marked and distinct, but is not quite so noticeable with gallic acid, for with this acid, as is known, ammonia also gives a red colour.

Process for Estimating the Strength of Solutions of Tannin. C. Collin and L. Benoist. (*Journ. Soc. Chem. Ind.*, 1888, 779.) The author's (patented) process for the estimation of tannin consists in titrating a solution of gelatine and an aniline colour with the tannin solution.

The following solutions are used:—A 5 per cent. solution of gelatine in water; a 5 per cent. solution of methylene blue in water; a 5 per cent. solution of pure tannin, by means of which the gelatin solution is standardized. To perform an estimation, 0·5 c.c. of the gelatin solution is placed in a test glass, and two drops of the blue solution, with 5 c.c. of the acetate of lime. The solution is diluted to 80 c.c. with distilled water at a temperature of 55–66° C. The tannin solution is gradually added from a burette till all the gelatine is precipitated, and the solution becomes colourless.

Detection of Nitrobenzol in Presence of Oil of Bitter Almonds. K. List. (*Chem. Zeit.*, xii. 1727.) The liquid to be tested is warmed with soda and a few drops of ferrous sulphate, to remove any hydrocyanic acid; a large excess of permanganate is then added, to destroy the oil of bitter almonds, after which any nitrobenzol present can be recognised by its odour.

Colour Reaction of Oil of Cloves with Aniline Sulphate. E. Nickel. (*Chem. Zeit.*, xiii. 592.) The author has previously shown that eugenol gives a yellow colour with aniline sulphate; this reaction is also given by oil of cloves, which contains eugenol.

Estimation of Paraffin, Cerasin, and Mineral Oils in Fats and Waxes. F. M. Horn. (*Zeitschr. für angew. Chem.*, 1888, 458–460; *Journ. Soc. Chem. Ind.*, 1888, 696.) The author saponifies the mixture, evaporates the resulting mass to dryness, and extracts in a Soxhlet's apparatus with chloroform, which, unlike petroleum ether, does not dissolve any of the soap.

The solution in chloroform is then evaporated and the mineral oil weighed.

In the case of a wax, the chloroform solution will also contain the higher alcohols; these can be separated by digestion with acetic anhydride, which converts them into acetates soluble in excess of the anhydride. They are filtered off from the unattacked paraffin in a hot-water funnel, the paraffin being washed first with acetic anhydride and then with hot water; so long as the filter paper is kept wet none of the paraffin passes through; when washed it is dried together with the filter, dissolved in chloroform or petroleum ether, the solution evaporated to dryness, and weighed. Glacial acetic acid may be substituted for acetic anhydride, but it is less suitable, as the acetates of the higher alcohols are apt to separate out unless the solution is kept quite hot. The method is applicable if rosin, as well as paraffin, has been used for adulterating the wax; the results of analysis of known mixtures show close concordance.

Estimation of Pure Glycerin in Crude Glycerin of Commerce. R. Benedikt and M. Cantor. (*Zeitschr. für angew. Chemie*, 1888, 460–462.) Preference is given by the authors to the following method:—

1 to 1·5 gram of the crude glycerol is heated with 7 or 8 grams acetic anhydride, and about 3 grams anhydrous sodium acetate, for from one to one and a half hour with reversed condenser; it is allowed to cool, 50 c.c. of water are added, and the heating is continued (still

with the condenser, as glyceryl triacetate is volatile in a current of steam), until it begins to boil. When the oily deposit at the bottom of the flask is dissolved, the liquid is filtered from a white flocculent precipitate—which contains most of the impurities of the crude glycerol,—allowed to cool, phenolphthalein added, and dilute caustic soda (about 20 grams per litre) run in until neutrality is obtained. Care must be taken not to exceed that point, as glyceryl triacetate is easily saponified. 25 c.c. of strong caustic soda (about 10 per cent. strength) are now added from a pipette.

The mixture is then heated for fifteen minutes, and the excess of alkali titrated back with N or $\frac{N}{2}$ hydrochloric acid.

The strength of the alkali used is determined at the same time by titrating another 25 c.c., measured with the same pipette, with the same acid.

The difference between the two titrations gives the amount of alkali consumed in saponifying the glyceryl triacetate, and from this the quantity of glycerol can be calculated.

Estimation of Free Alkali and Free Fatty Acid in Soap. E. Dieterich. (*Journ. Soc. Chem. Ind.*, May, 1889.) Dissolve one part of soap in 20–50 parts of water, and add so much sodium chloride that a little remains undissolved. Filter and wash with a little saturated salt solution; dissolve the mass in water, and again salt out and filter as before. Combine the two filtrates and determine the free alkali by means of centinormal H_2SO_4, and phenolphthalein.

Dissolve the soap, salted out above, in 30 c.c. of absolute alcohol by warming on a water-bath, add phenolphthalein, and titrate with centinormal KHO. Calculate as oleic acid. As the alcohol frequently contains substances which decolorise phenolphthalein, it is necessary to determine separately the amount of centinormal KHO required to redden the phenolphthalein in 30 c.c. of alcohol, and to subtract this from the former determination.

Detection of Adulterations in Vegetable Fatty Oils. W. Peters. (*Archiv der Pharm.*, 1888, 322; *Journ. Soc. Chem. Ind.*, 1889, 64.) The following points are to be observed:—

1. The melting-point of the mixture of insoluble fatty acids obtained by saponification with hydrochloric acid or dilute sulphuric acid. In pure olive oil this should be between 24° and 29°; if above 29°, cotton-seed oil is present; if below 24°, linseed, poppy, or castor oil is present.

2. The colour imparted to a solution of the oil in nitric and

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and thoroughly extracted with *dry ether*, the acids being received in an accurately weighed flask.

When the extraction is complete, the ether is evaporated off, and the flask and contents put in the water oven, and when dry allowed to cool, and finally weighed.

When the percentage of insoluble fatty acids has been ascertained, add sufficient standard alkali to the flask, heat gently, when saponification rapidly takes place; then wash the soap solution thoroughly into a basin, and titrate again with standard acid, and estimate the amount of alkali now consumed by the insoluble fatty acids.

The amount of soluble fatty acids found is calculated as butyric acid.

A Method for the Analysis of Butter, Oleomargarine, etc. H. N. Morse and W. M. Burton. (*Amer. Chem. Journ.*, x. 322–328; *Journ. Soc. Chem. Ind.*, 1888, 697.) The method depends on the fact that the relation between the amounts of alkali needed to neutralise the soluble and insoluble fatty acids of any given fat is a constant quantity. This is shown by the following table, which gives the mean value of several concordant determinations in each case:—

Name of Fat.	Per Cent. KOH required for Insoluble Acids.	Per Cent. KOH required for Soluble Acids.
Butter	86·57	13·17
Cocoa-nut Oil (unwashed)	91·95	8·17
Cocoa-nut Oil (washed with hot water)	92·43	7·42
Cocoa-nut Oil (washed with dil. Na_2CO_3)	92·33	7·45
Cotton-seed Oil	92·05	7·76
Oleomargarin	95·40	4·57
Lard	95·96	3·82
Beef Tallow	96·72	3·40

The process is conducted as follows:—

Between 1 and 2 grams of the dry and filtered fat—the exact quantity need not be known—is placed in an Erlenmeyer flask of 250 c.c. capacity, and heated with that amount of alcoholic potash, of approximately 20 grams per litre, which exactly equals 40 c.c. of a standard hydrochloric acid, of which 1 c.c. = 20 mgrms. KOH. When saponification is complete, phenolphthalein is added, and the excess of alkali determined by the standard hydrochloric acid; this gives the total alkali required for all the fatty acids.

The alcohol is then evaporated off, during which process the

solution becomes alkaline, doubtless from loss of a small amount of volatile acids in the form of ethereal salts. This loss, though inconsiderable, may be made good, if desired, by means of very dilute acetic acid, which is added until neutrality is restored.

The soap is then treated with just enough standard H Cl to exactly liberate all the acids; this quantity is, of course, the difference between 40 c.c. and the number of c.c. used to neutralise the excess of alkali after saponification.

The flask is fitted with a condensing arrangement, consisting of a glass tube about 400 mm. long and 5 mm. in diameter, having its upper end bent downwards and attached to a small U-tube containing a little water; this is designed to prevent the escape of volatile acids during the heating of the flask, which is continued until its contents become clear. The solution, to which is added the liquid from the U-tube, is then filtered through thick paper, well wetted, and the insoluble fatty acids washed until the filtrate measures 1 litre.

The soluble fatty acids can be directly titrated with alkali of $\frac{1}{10}$ the strength of that previously used; but the insoluble fatty acids had better be dissolved in 50 per cent. alcohol, saponified with the quantity of the stronger alkali that was originally used for the fat, and the excess titrated back with an acid of $\frac{1}{10}$ the strength of that employed before.

The flasks used are but little attacked by the comparatively dilute alkali, and therefore do not vitiate the results if they have been previously boiled with strong potash.

New Mode of Detecting Chicory in Coffee. M. Karz. (*Pharm. Rundschau*, 1888, 390.) The author suggests the determination of chlorine as the means of establishing the purity of coffee. Coffee contains 0·03 per cent., chicory 0·28 per cent. of chlorine. 25 grams should be used for incineration, and the ash examined volumetrically with silver nitrate.

Detection of Cochineal in Articles of Food. E. Lagorce. (*Journ. de Pharm. et de Chim.* [5], xviii. 489–492.) The substance under examination is extracted with water or weak alcohol, the filtrate acidulated, if necessary, with the least quantity of dilute acetic acid, the solution agitated with amyl alcohol, and the latter separated and evaporated in the presence of sufficient water. On now adding a few drops of a weak solution of uranium acetate to the resulting aqueous solution, a bluish green coloration or precipitate is produced, which is changed to orange by acids.

Detection of Cocaine in Forensic Investigations. U. Mussi. (*Chem. Centralbl.*, lix. 1599.) The substance under examination (contents of stomach, etc.) is digested with 2 parts of alcohol of 90 per cent. and a little hydrochloric acid at 60° C. in a flask fitted with an inverted condenser, and this treatment is repeated several times with fresh portions of alcohol. The united filtrates are evaporated to dryness at 50–60° C., the residue is dissolved in water, the solution shaken with three successive portions of ether, the aqueous solution after rejection of the ether precipitated with baryta-water and again repeatedly agitated with ether. The resulting ethereal solutions are then allowed to evaporate in vacuo. The alkaloidal residue is tested for cocaine after being converted into hydrochlorate.

Cocaine is rapidly decomposed in the organism and also in the objects intended for analysis.

Detection of Oxalic Acid in cases of Poisoning. D. Vitali. (*Chemical News*, lix. 206.) Absolute alcohol extracts part of the acid out of a mixture of flesh and oxalic acid. It may then be precipitated as ammonium oxalate by adding ammonia. This deposit is dissolved in water, precipitated with lead acetate, the precipitate of lead oxalate is decomposed by sulphuretted hydrogen, and free oxalic acid is crystallized out of the solution.

Detection of Minute Traces of Arsenic. F. A. Fluckiger. *Archiv der Pharm.* [3], xxvii. 1–30; *Journ. Chem. Soc.*, June, 1889.) Gutzeit's method is far more sensitive than any other; this is based on the formation of the yellow compound, $As Ag_3, 3 N O_3 Ag$, by the action of arsenious hydride on silver nitrate; under the action of water, the yellow compound becomes black, owing to the formation of arsenious oxide and metallic silver. A convenient apparatus consists of a glass cylinder, 10 cm. high, about 25 c.c. capacity, and with a neck of $1\frac{1}{2}$ cm. diameter. For the production of hydrogen, hydrochloric acid of 1·036 sp. gr. (7·3 per cent. $H Cl$) with small bars of pure zinc (sulphuric acid of 1·055 sp. gr., or $8\frac{1}{3}$ per cent. $H_2 S O_4$) may be used; 4 c.c. of the acid and 1 gram of the zinc give a moderate and sufficient current. The mouth of the vessel is covered with a couple of layers of filter-paper twisted about the neck. A small piece of filter-paper is now moistened by means of a single drop of a saturated solution of silver nitrate, which has been slightly acidified with nitric acid, and is twisted over the other two layers. If no yellow stain appears within an hour, the underside of the paper is also examined. It is well to conduct the operation away from too much light. The reaction is

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Volumetric Estimation of Lead in Presence of Tin. P. Yvon. (*Journ. Pharm.* [5], xix. 18–21.) The lead-tin alloy is treated with nitric acid, by which the lead is dissolved and the tin converted into insoluble stannic acid. The excess of nitric acid is neutralised by the addition of a very slight excess of sodium hydrate, and a few drops of acetic acid in excess are added. The solution is then diluted so as to contain not less than $\frac{1}{2}$ per cent. of lead, and titrated with normal potassium ferrocyanide solution (10·201 grams per litre) which has been standardised against a normal lead nitrate solution (15·987 grams per litre), using drops of dilute ferric chloride solution on a porcelain slab as indicator. The process is very rapid and sufficiently exact for commercial purposes.

Analysis of Lead Peroxide and of Red Lead. L. Opificius. (*Chem. Zeit.*, xii. 477.) For this purpose the peroxide or red lead may be readily dissolved without the application of heat by treatment with nitric acid, sp. gr. 1·20, and chemically pure copper. Adulterants are thus left that would otherwise be dissolved by treatment with hot solvents; these can, therefore, be readily detected and estimated.

Characteristic Reaction of Bismuth. E. Léger. (*Bull. Soc. Chim.*, l. 91–93.) It is well known that a solution of bismuth iodide and potassium iodide forms an orange-yellow precipitate with a number of alkaloids, for which it is therefore used as a test. The author suggests the employment of this reaction for the detection of bismuth. The test solution is prepared by dissolving 1 gram of cinchonine and 2 grams of potassium iodide in 100 c.c. of water. In order to obtain the highest degree of sensitiveness it is necessary: (1) to employ the reagent in excess; (2) to avoid too great an excess of nitric acid; (3) to avoid especially the presence of hydrochloric and sulphuric acids. The precipitate is soluble in alcohol. Solutions of the salts of mercury, cadmium, copper, and lead also give precipitates of various colours with the cinchonine reagent. Solutions containing these metals besides bismuth are precipitated with sulphuretted hydrogen, the sulphides of copper, lead, cadmium, mercury, and bismuth converted into nitrates, then into carbonates, and the carbonates of bismuth and lead separated by means of potassium cyanide; these carbonates are converted into chlorides, and the lead chloride separated by means of alcohol. The alcoholic solution is evaporated to dryness, dissolved in a drop of nitric acid and a small quantity of water, and treated with the reagent.

Qualitative Separation of Gold and Platinum from Arsenic, Antimony, and Tin. L. L. de Koninck and A. Lecremier. (*Zeitschr. für Analyt. Chem.*, xxvii. 462, 463.) The dry or wet mixed sulphides are heated in a current of HCl gas. Antimony and tin are rapidly volatilised as chlorides, and also the sulphide of arsenic, but the latter without change. The residue consists of gold and platinum. The volatile substances condense partly in the cooler portion of the apparatus, and partly in a receiver containing water. By filtration the arsenic is separated from the antimony and tin.

Action of Sodium Thiosulphate on Cupric Salts. G. Vortmann. (*Monatsh.*, ix. 165–179; *Journ. Chem. Soc.*, August, 1888.) The compound obtained when a solution of sodium thiosulphate is added to a solution of copper sulphate has been investigated by many experimenters, and various formulæ have been assigned to it. The author's results are as follows: a greenish yellow salt, $Cu_2S_2O_3, Na_2S_2O_3 + 3H_2O$, separates in the form of microscopic prisms when saturated solutions of copper sulphate and sodium thiosulphate, in the proportion of 1 mol. of copper sulphate to 2 mols. of sodium thiosulphate, are mixed and allowed to stand at the ordinary temperature. Sodium tetrathionate is also formed. When, however, the solutions are previously heated to 40° and then mixed, the temperature rises 5–7°, and on standing in water at 40° an intensely citron-yellow salt, $3Cu_2S_2O_3, 2Na_2S_2O_3 + 8H_2O$, separates in the form of microscopic prisms. When this salt is washed with alcohol and dried over sulphuric acid, it loses 3 mols. H_2O, but if left too long it gradually decomposes. This citron-yellow salt can also be prepared from the greenish yellow one by continued washing with cold water, and it is always formed when the solutions of copper sulphate and sodium thiosulphate are warm or dilute. It is unstable, decomposes, and becomes black on standing. When boiled with water or dilute sulphuric acid, it is decomposed: $3Cu_2S_2O_3, 2Na_2S_2O_3, 8H_2O = 3Cu_2S + 2Na_2SO_4 + H_2SO_4 + S_2 + 2SO_2 + 7H_2O$.

Attempts to prepare copper thiosulphate were unsuccessful.

Salts containing more than 1 mol. of sodium thiosulphate to 1 mol. of copper thiosulphate, such as $Cu_2S_2O_3, 2Na_2S_2O_3 + 4H_2O$; $Cu_2S_2O_3, 3Na_2S_2O_3 + 2H_2O$, and $Cu_2S_2O_3, 4Na_2S_2O_3 + 6H_2O$, are best obtained by mixing a solution of the citron-yellow salt with a solution of the calculated quantity of sodium thiosulphate and adding alcohol. The double salts separate as oily liquids which solidify when treated with fresh quantities of absolute

alcohol. They are yellow to white, crystalline compounds, which are more stable, and less readily decomposed when boiled with water than the salts described above. They do not decompose on keeping, and are readily soluble in water, but are not deliquescent. With barium salts their aqueous solutions give a white precipitate, $Cu_3 S_2 O_3, 2 Ba S_2 O_3 + 7 H_2 O$, which is soluble in hydrochloric acid, but almost insoluble in water.

The Estimation of Alumina and Free Sulphuric Acid in Alum Cake and Sulphate of Alumina. R. Williams. (*Pharm. Journ.*, 3rd series, xix. 32.) The author recommends Chancel's method of estimating alumina by boiling with sodium thiosulphate (Watts' "Dictionary," i., 155) as more accurate and expeditious than the ammonia process. In support he quotes results obtained. The estimation of the free acid in alum cake, etc., is best effected by the following process: 300 grains of the sample are weighed into a stoppered bottle, and 1200 grains measure of strong alcohol added, the contents of the bottle being frequently shaken, and the digestion allowed to proceed all night. The next morning the alcohol is filtered off, and 800 grains measure of the filtrate (equal to 200 grains of the sample) titrated with decinormal caustic soda. Experiment shows that the alcohol does not extract other matters besides sulphuric acid which are liable to affect the result. To further test the accuracy of the method, ordinary sulphate of alumina was freed from sulphuric acid by washing with alcohol, and known amounts of acid were then added, and the amount estimated by the process described; the results were as follows:—

Percentages of Free Sulphuric Acid.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Added . .	0·73	1·22	0·98	0·49	0·59
Found . .	0·69	1·19	0·96	0·44	0·54

Quantitative Separation of Barium, Strontium, and Calcium. M. Kupfferschlaeger. (*Bull. Soc. Chim.*, xlix. 854–856.) The mixture of carbonates is dissolved in a slight excess of very dilute nitric acid, the solution evaporated to dryness, the residue dissolved in distilled water, and the filtered solution again evaporated to complete dryness. The residue of mixed nitrates is agitated with a small quantity of a mixture of absolute alcohol and ether, and the solvent separated by filtration as soon as the solution becomes clear; this process is repeated three times, the proportion of ether being gradually increased until the mixture contains

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A New Method for the Estimation of Nitrites. A. Vivier. (*Comptes Rendus*, cvi. 138.) The author's method is based on the well known reaction between urea and nitrous acid:

$$2\,CO(NH_2)_2 + N_2O_3 = 2\,N_2 + CO_2 + (NH_4)_2CO_3,$$

according to which twice as much nitrogen is evolved as is contained in the substance under examination. The process is carried out in a flask suitably connected with tubes, and a funnel provided with a tap or clamp. The funnel is intended for the introduction of the reagents. The apparatus is so constructed that the operation can be conducted in the entire absence of air and in a current of carbonic anhydride. A full description of the apparatus and the *modus operandi* will be found in the original paper.

Organic substances and nitrates are said to have no disturbing influence on the process.

Estimation of Nitrites. W. R. Dunstan and T. S. Dymond. (*Pharm. Journ.*, 3rd series, xix. 741–743.) The process employed by the author is based on the familiar reaction between hydriodic and nitrous acids, in which nitric oxide is set free and iodine liberated:

$$2\,HI + 2\,HNO_2 = 2\,H_2O + 2\,NO + I_2.$$

The liberated iodine is titrated with a standard decinormal solution of sodium hyposulphite. In order to prevent any re-oxidation of nitric oxide by air, and consequent renewal of the reaction, the operation is performed in the entire absence of air in an apparatus constructed as follows:

A stout glass flask, having a capacity of about 100 cubic centimetres, is closed by a tightly fitting india-rubber cork, through which passes a piece of rather wide glass tubing, one end of which (that within the flask) is cut off obliquely, so that liquid may flow freely through it. The other end of the tube is connected by means of a piece of thick india-rubber tubing with a larger glass tube which forms a lipped funnel. A steel screw clamp regulates communication between the funnel and the tube, and the short interval of india-rubber which is not occupied by glass tubing forms a hinge upon which the flask may be moved into a position at right angles to the funnel, in order to mix by agitation the liquids which are introduced into the apparatus. The absence of any leak in the apparatus is ascertained by boiling about 50 cubic centimetres of water in the flask until steam has continually issued from the funnel for some minutes, when the screw clip is

quickly closed and simultaneously the source of heat is removed. A little water is now placed in the funnel and the flask is cooled by immersion in water. On sharply inverting the flask the "click" of the water against the airless flask should be quite distinct. No water should be drawn from the funnel or from any of the joints into the flask, and no diminution in the intensity of the "click" should be observed after the apparatus has been standing; neither, when the flask is inverted and the funnel empty, should any bubbles of air pass through into the liquid. Having thus proved the absence of any leak in the apparatus, it is ready for use.

The estimation of the nitrite is conducted in the following manner: Five cubic centimetres of a 10 per cent. solution of potassium iodide, five cubic centimetres of a 10 per cent. solution of sulphuric acid, and forty cubic centimetres of water are introduced into the flask, which is securely fitted with the cork carrying the funnel and tube. The screw clip being open, and a free passage left for the escape of steam, the liquid is boiled. After a few minutes, when any iodine which may have been liberated has been expelled, and the upper part of the flask is completely filled with steam, which is also freely issuing from the funnel, the clip is tightly closed, and at the same moment the source of heat is removed. A little water is now put into the funnel, and also on the rim of the flask, as a safeguard against a possible minute leakage, and the vessel is cooled by immersion in water. A solution containing a known weight of the nitrite (equivalent to about 0·1 gram of nitrous acid) is placed into the funnel and slowly drawn into the flask by cautiously unscrewing the clip. The liquid which adheres to the funnel is washed into the flask with recently boiled and air-free water, care being taken that during this operation no air is admitted into the flask. When experiments are being made with organic nitrites which are insoluble in water, they are dissolved in alcohol, and alcohol is also used to wash the funnel. When the nitrite is very volatile, a little cold alcohol should be put in the funnel, and the point of the pipette containing the nitrite should be held at the bottom of the funnel beneath the alcohol, and the liquid quickly drawn from the pipette into the flask. The nitrate having been introduced, the flask is well shaken, and the liberated iodine is titrated with a standard solution of sodium thiosulphate, small quantities of which are delivered from a burette into the funnel and gradually drawn into the flask; the screw clip renders it

quite easy to admit minute quantities of the solution. As soon as the iodine is decolorized, any standard solution remaining in the funnel is returned to the burette. From the volume of the standard solution used, the amount of nitrous acid may be readily calculated. The results are accurate.

The process is as applicable to organic as to inorganic nitrites, as was proved by the analysis of ethyl, propyl, butyl, and amyl nitrites of known purity.

Determination of Nitrates in Water. S. C. Hooker. (*Ber. der deutsch. chem. Ges.*, xxi. 3302.) The author's process is based on the property of solution of carbazol in concentrated sulphuric acid of producing a dark green coloration on the addition of small quantities of oxidizing agents. A measured quantity (2 c.c. or less) is mixed with 4 c.c. of concentrated sulphuric acid, and after cooling, a small quantity of carbazol in concentrated sulphuric acid added. The coloration is compared with that obtained with varying quantities of solution of potassium nitrate of known strength, treated in exactly the same manner. The delicacy of the reaction is stated to be such that 1 two-millionth part of nitric acid in water is distinctly indicated by it.

Estimation of Nitrogen and Phosphoric Acid in Organic Substances. O. Lange. (*Journ. Chem. Soc.*, May, 1889.) 10 grams of the substance is heated with 50 c.c. of concentrated sulphuric acid and 0·5 to 1 gram of copper sulphate in a half-litre flask; when the reaction is complete, the flask is filled to the mark, 50 c.c. of the solution are mixed with 100 c.c. of Märcker's citrate solution and 25 c.c. of magnesia mixture for the estimation of phosphoric acid; whilst the nitrogen is determined in another 50 c.c. by distillation with soda.

Estimation of Free Oxygen in Water. M. Latieu. (*Archiv der Pharm.* [3], xxvi. 128.) About 200 c.c. of water is treated with a definite quantity of sodium hydroxide and ferrous-ammonium sulphate solution in a narrow-necked flask closed by a perforated stopper. The precipitate formed is again dissolved by the addition of a definite volume of dilute sulphuric acid, and standard permanganate solution is added, corresponding with the excess of ferrous solution remaining. The excess of ferrous solution added above that indicated by the permanganate solution measures the free oxygen present.

The Volumetric Estimation of Sulphates. H. Quantin. (*Bull. Soc. Chim.*, li. 21–24.) The standard reagent is prepared by dissolving 19·48 grams of neutral potassium chromate in 200 c.c. of

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when a bromide is heated with potassium permanganate and aluminium sulphate, whilst chlorides and iodides do not yield chlorine or iodine under these conditions. The author proposes a method of estimating bromine. The solution of a bromide is mixed with 10 c.c. of a permanganate solution (1 in 25) for each 0·1 gram bromine, and then with some aluminium sulphate solution saturated at ordinary temperatures; the bromine is distilled off in a current of carbonic anhydride, and titrated.

Note on the Standardizing of Permanganate. R. Jahode. (*Zeitschr. für angew. Chemie*, No. 4, 1889; *Analyst*, April, 1889.) The author conducts the standardizing of permanganate by means of iron wire, as follows:—The iron is dissolved in boiling acid in a flask which is closed by a cork through which goes a doubly bent tube, the end of which is made to dip into a beaker containing a solution of sodium bicarbonate. When solution is complete and the liquid allowed to cool, the soda solution finds its way into the flask; but no sooner have a few drops got in, than an evolution of carbonic acid gas setting in drives the fluid back.

Estimation of Carbon in Commercial Iron. L. L. de Koninck. (*Journ. Soc. Chem. Ind.*, 1888, 693.) The method usually adopted for estimating carbon in iron consists in dissolving out the iron with cupric chloride and ammonium chloride solution, and then oxidizing the residual carbon by means of chromic acid and sulphuric acids to CO_2, which is collected in potash bulbs. Unless the carbon is completely freed by washing from chlorides, the subsequent oxidation may give rise to the evolution of chlorine, which will vitiate the results. This may be avoided by bringing into the flask, in which oxidation occurs, a small quantity of silver sulphate.

Estimation of Phosphorus in Iron by Molybdate. C. Meineke. (*Zeitschr. für angew. Chemie*, i. 68–72; *Journ. Chem. Soc.*, October, 1888.) The author cannot confirm Tamm's statement that the presence of manganese is prejudicial to the determination of phosphoric acid. He obtains identical results whether the iron is separated from the manganese as acetate, or whether the treatment is omitted. The amount of phosphoric acid precipitable after simple dissolution of the iron in nitric acid does not bear any constant proportion to that found after evaporation and ignition. Instead of the evaporation and ignition, the complete oxidation of the phosphorus can be effected by adding chromic acid to the nitric acid solution. With irons containing more than 3 per cent.

of carbon, the addition of some sulphuric acid is necessary. The process is as follows:—4·375 grams of the iron are dissolved in 50 c.c. of nitric acid; 30 c.c. of diluted sulphuric acid (equal volumes of strong acid and water) are added, and the whole is evaporated to 15 or 20 c.c.; 2½ or 3 grams of chromic acid are now added, the liquid boiled for ten minutes, and then diluted. If manganese peroxide separates, it must be reduced by hydrogen dioxide, but this generally introduces traces of phosphoric acid. The solution is now made up to 250 c.c., filtered, and 100 c.c., after partial neutralisation with ammonia and heating to 90°, are precipitated with molybdate. The precipitate, after being washed, first with acidified ammonium nitrate, and then with cold water, is gently ignited. A gram corresponds to 1 per cent. of phosphorus in the iron.

The organic matters in bog-iron ore are without influence on the determination of the phosphorus it contains.

Estimation of Nitrogen in Vegetable Soils. M. Berthelot and G. André. (*Comptes Rendus*, cvii. 207–209.) In order to avoid the error liable to be caused by the presence of nitrates, the author proposes their removal by treating the soil with four times its weight of cold water, previous to the combustion. This treatment removes at most a few milligrams of organic nitrogen per kilo., a quantity much smaller than the errors of the determination.

Estimation of Carbon in Vegetable Soils. T. Schloesing. (*Comptes Rendus*, cvii. 296–331.) The ordinary method of combustion by means of oxygen and cupric oxide gives satisfactory results in the determination of the carbon in soils, but in order to avoid errors arising from the presence or formation of alkaline carbonates, the carbonates existing in the original soil and in the residue from the combustion should be carefully determined.

Methyl-Orange and other Indicators. A. H. Allen. (*Pharm. Journ.*, 3rd series, xix. 902–905.) This paper deals with the most important indicators of neutrality now in use, and the individual merits of each of them in special cases. As it does not admit of condensation without losing much of its value, we cannot do more in this place than to recommend it to the reader's attention and to refer him to the above source.

Method for Avoiding "Bumping" in Distillation. W. Markownikoff. (*Journ. Russ. Chem. Soc.*, 1887, 520, 521.) The disagreeable phenomenon of "bumping" is avoided only for some little time after boiling commences when platinum wire or pieces

of charcoal, etc., are introduced into the liquid. A far better method is to introduce into the liquid a few very thin capillary glass tubes of 3 to 10 mm. in length, and sealed up at one end. The boiling then goes on quietly at ordinary or reduced pressure, even in the presence of precipitates.

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PART II.

MATERIA MEDICA AND PHARMACY.

Adulteration of Senega Root. Dr. van Hamel Roos. (*Chemist and Druggist*, December, 1888.) The author had occasion to examine a case of senega which contained an admixture differing essentially from the genuine drug. The adulterant consisted of radical filaments, having a length up to 50 centim., and a thickness of 3–4 mm. at the upper part, gradually diminishing towards the extremity of the radical filament. The bark had a grey-brown dark colour, was somewhat wrinkled and deprived of the botanical character of the root of *Polygala*, of Virginia. The smell was weakly aromatic; the taste somewhat bitter. An anatomical examination of this root showed it to belong to a monocotyledon, probably *Cypripedium pubescens*, the root of which is also used as a medicine. The quantity of the foreign root mixed with the true senega was so considerable that it could not have been present accidentally or without intention of fraud, as is often the case with the root of *Panax quinquefolium*, L., or the American ginseng.

Chemical Examination of Senega Root. L. Reuter. (*Archiv der Pharm.* [3], xxvii. 309–317.) The essential oil of senega is found to be a mixture of methyl salicylate and an ether of valerianic acid. The sugar (glucose) found in different samples of senega varied between 5·5 and 7·3 per cent., and the proportion of senegin (a glucoside identical with saponin) from 2 to 3·5 per cent.

Constituents of Flag Root. H. Thoms. (*Ber. der deutsch. chem. Ges.*, xxi. 1912–1920.) Calamus root was extracted with light petroleum to remove the oil, and then treated with alcohol, which extracted a sugar and tannic acid. The root, after this treatment, has no odour, is no longer bitter, and has a woody taste. If it is now treated with water, an extract is obtained containing potassium and sodium sulphates, an acid salt of tartaric acid, and dextrin.

The sugar of calamus root is dextrose.

Acorin forms a thick, honey-coloured substance of an aromatic odour and bitter taste; it contains no nitrogen, and is neutral to litmus. When treated with dilute acid, is decomposed into an ethereal oil, a resin acid, and what is probably a sugar.

When a calamus extract is heated with alkali, trimethylamine is formed (compare Geuther, *Year-Book of Pharmacy*, 1888, 131).

The Proper Time for Collecting Aconite Root. P. W. Squire. (*Pharm. Journ.*, 3rd series, xix. 645.) The conclusions arrived at by the author are as follows: (1) That the root arrives at maturity in the autumn, when it has attained its maximum size, the tissues being then complete and the tuber root full of starch. (2) That the numbing sensation produced upon the tongue is most pronounced in roots which are gathered at this period.

The author therefore suggests that the roots should be collected in the autumn, when the root is in perfection, and when there would be no difficulty in separating the old decayed roots. He points out, however, that the roots of *Aconitum Napellus* differ in appearance and microscopic structure as much from one another as they do from *Aconitum paniculatum*; consequently, it would not be possible to distinguish with certainty and separate from one another a mixture of the two roots except by taste, nor would it be possible in digging up roots in the autumn to distinguish the one from the other. It would be equally impossible for the herb gatherer to taste each individual root. As, however, *Aconitum Napellus* is in flower some little time before *Aconitum paniculatum*, it would be quite easy to distinguish the plants in the summer. He therefore suggests that the places where *Aconitum Napellus* abounds should be taken note of and marked in the summer, when the plants in flower can be recognised.

Jamaica Sarsaparilla. Sir J. Hooker. (*Bot. Mag.*, June, 1889; *Pharm. Journ.*, 3rd series, xix. 989.) The square-stemmed plant, described by Hanbury as *Smilax officinalis*, has recently flowered in Kew Gardens, and the author has satisfied himself that this plant is not, as Hanbury supposed, identical with *S. officinalis*. It is described anew by him under the name of *Smilax ornata*. Until male and female flowers of the plants yielding the various commercial sarsaparillas can be obtained, the new name *S. ornata* must evidently be accepted as that of the plant yielding the official sarsaparilla, since the author is disposed to think, from the evidence before him, that the cultivated Jamaica sarsaparilla (*Smilax officinalis*) and *Smilax ornata* will prove to be distinct species.

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and evaporated to dryness on a water-bath. The residue when treated with alcohol yields the hydrochlorate of the base.

The author does not mention whether or not this espigeline is identical with the "spigeline" previously obtained by him (Husemann, "Pflanzenstoffe," 1884, p. 1327).

Senecio Canicida. M. Debiérre. (*Pharm. Journ.*, from *Archiv*, February, 1889, 130.) The physiological action of *Senecio canicida* a composite plant, native of Mexico, and used, as its name implies, to poison dogs, has been investigated by the author. The active principle of the plant is more abundant in the root than in the leaves. Three stages occur in the poisoning arising from its use, viz., a period of excitation, then one of rest, and lastly of spasm. The temperature rises and remains high until the animal dies, death taking place from paralysis of respiration; the pupil of the eye is dilated, and the blood becomes black and fluid, and the membranes of the brain are found to be congested. Whilst the poison paralyses the sphincters of the bladder and ectum, it irritates the involuntary muscles of the intestine bladder, and iris. Although it causes tetanic symptons like those of strychnine, it differs from that alkaloid in lowering reflex excitability.

The Root of Apocynum Cannabinum. D. A. Sokoloff. (*Med. Chronicle*, September, 1888.) The North American plant, *Apocynum cannabinum*, belongs to the natural family *Apocyneæ*, which has already supplied a series of cardiac poisons and powerful remedies (*Strophanthus hispidus*, *Tanghinia venenifera*, *Vinca major*, *Thevetia neriifolia*, *Nerium Oleander*, etc.). The author has undertaken an experimental inquiry into the biological action of the drug in Professor S. P. Botkin's clinical laboratory in St. Petersburg. The experiments consisted in the intravenous injection of an aqueous infusion of the root (eight grams to 100 c.c. of water) into various warm-blooded animals, the single dose of the infusion varying from three to ten cubic centimetres. The chief outcome of his researches may be condensed thus:—

(1) The drug produces a very pronounced retardation of the cardiac action; with a very considerable enlargement of the pulse wave and a marked rise of the blood tension.

(2) The initial retardation of the heart is followed by an acceleration of the cardiac action, while the arterial pressure ascends still further.

(3) The cardiac retardation (first stage) is caused by an irritating action of the drug, both on the central and peripheral inhibitory apparatuses.

(4) The subsequent acceleration (second stage) is not dependent upon anything like paralysis of the inhibitory apparatuses, since the injection of another dose of the infusion can again give rise to a retardation of the heart's work.

(5) On the injection of a very large dose, the two stages are followed by a third one, which is characterized by cardiac arhythmia, the appearance of Traube's waves, and a gradual fall of the blood pressure down to 0.

(6) The rise of the blood tension during the first and second stages is dependent not only upon the stimulation of the vasomotor centres in the medulla oblongata, but also (and that in a very considerable degree) upon the excitation of the spinal vasomotor centres. Moreover, the heart and blood vessels themselves take a certain active part in the causation of the rise.

(7) Both the central and peripheral vaso-dilatory apparatuses remain wholly intact.

Fritillaria (Coronaria) Imperialis. K. Fragner. (*Ber. der deutsch. chem. Ges.*, Dec. 12, 1888.) The author has examined the bulbs of this liliaceous plant and isolated from it a new alkaloid, which he proposes to name "*imperialine*." Its composition is represented by the formula $C_{33}H_{60}NO_4$. This base produces a strong fluorescence with hydrochloric acid; on warming, a brownish green coloration is obtained, which gradually turns brownish red. It has a bitter taste. Its physiological action is similar to that of the alkaloid of *Scilla maritima*.

Scopolia Japonica. E. Schmidt and H. Henschke. (*Archiv der Pharm.* [3], xxvi. 185–203; *Journ. Chem. Soc.*, August, 1888; compare abstr. *Year-Book of Pharmacy*, 1888, 133.) 10 kilos. of scopolia root were extracted with 90 per cent. alcohol; the filtered extract, when freed from alcohol and concentrated, deposited a granulo-crystalline fatty compound whose nature was investigated by Henschke. This substance was removed and the liquid was mixed with excess of potassium carbonate solution, when a bluish phosphorescence and odour of trimethylamine made their appearance. The alkaloids were now removed by means of chloroform, the latter distilled off at the lowest possible temperature with the aid of water, acidified with sulphuric acid, and potassium carbonate in very slight excess was added to precipitate the former. Further treatment with chloroform was necessary to remove potassium sulphate and purify the alkaloids, but it was found impossible to obtain them in crystalline form, even on treatment with ether; a brownish syrup only resulted. To evaporate the alkaloids, this

syrup, dissolved in hydrochloric acid, was fractionally precipitated by gold chloride as suggested by Ladenburg. After repeated recrystallization, hyoscine aurochloride, melting at 198–200°; hyoscyamine aurochloride, melting at 159–160°, and atropine aurochloride, melting at 136–138°, were isolated.

Scopolia Hardnackiana. E. Schmidt. (*Archiv der Pharm.* [3], xxvi. 214, 215.) The freshly gathered root of this plant was examined for alkaloids by the method employed for *Scopolia japonica*. Hyoscyamine aurochloride was the only salt obtained. The alcoholic extract showed a blue fluorescence like that obtained from japonica, but there was not sufficient material available to ascertain whether this was due to the presence of scopoletin.

Proximate Analysis of Saxifraga Ligulata. D. Hooper. (*Pharm. Journ.*, 3rd series, xix. 123.) The habitat of the Indian Saxifrages is mostly confined to the northern and mountainous parts of the peninsula, as the Himalayan ranges from Bhutan to Kashmir, at elevations of 7000–10,000 feet, and the Khasia Hills. *Saxifraga ligulata* grows abundantly in the Punjab Himalayas, and the rhizome, or officinal part of the plant, is sent down to the plains and sold in the bazaars of the North-west Provinces and Bengal. The root is bruised and applied to boils and ophthalmia in some places where the plant grows. It is considered absorbent, and is given in dysentery and cough.

The following table gives the quantity of the different constituents of the rhizome as far as they were identified in the author's analysis of an authentic sample of the drug:—

Wax and odorous principle	·92
Gallic Acid	1·17
Tannic Acid	14·28
Glucose	5·60
Mucilage	2·78
Metarabin, Albumen, etc.	7·85
Starch	19·00
Calcium Oxalate	11·61
Mineral Salts	3·80
Sand	·58
Crude Filtre	20·80
Moisture and loss	11·61
	100·00

Ipecacuanha. A. Tschirch and M. Lüdtke. (*Archiv der Pharm.*, May 31, 432; *Pharm. Journ.*, 3rd series, xix. 64.) The authors' report upon the examination of thirty-two specimens

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taken to observe if any air spaces or channels exist in any portion. When the fluid begins to drop from the percolator, the *upper* open end is securely corked to prevent any further flow of the liquid, and the whole allowed to macerate for about two hours, or preferably over night. Percolation is then proceed with until about 50 c.c. of percolate is obtained or the root is exhausted; this is the case if six to ten drops of the liquid, when evaporated, and the residue dissolved in dilute sulphuric acid, give no precipitate with Mayer's solution.

The solution thus obtained is introduced into a separator, and washed with *four* successive quantities of slightly acidulated water (about 8 c.c. at a time). The aqueous liquid now containing the emetine is washed once with ether while still acid, then rendered alkaline with ammonia, and washed *three* times with 6 c.c. of ether, followed by two successive washings with 6 c.c. of chloroform. The mixed ethereal and chloroformic solutions are washed once with water, then evaporated in a current of air, and dried by exposure over sulphuric acid for some hours; it is then weighed, dissolved in 20 c.c. of water acidulated with six drops of 5 per cent. (by volume) sulphuric acid, in which it should be almost entirely soluble, and titrated with Mayer's solution (half strength) in the usual manner: 1 c.c. = 0·00945 gram emetine.

Presence of a Volatile Base in Ipecacuanha. M. Arndt. (*Apotheker Zeitung*, December 15, 1036. From *Pharm. Journ.*)

Whilst engaged in an investigation having for its object an improvement in the method of determining the amount of emetine in ipecacuanha, the author has met with what he considers to be a second alkaloid in that drug. It was observed that during the distillation of a mixture of powdered ipecacuanha, potassium carbonate and ferric chloride with water, white crystals were deposited in the well-cooled condensing tube, while together with the water, which showed a strongly alkaline reaction, there passed over a heavy dense gas that readily dissolved in it. The aqueous solution was yellow, fluorescent, and had an ammoniacal odour. A mixture of 125 parts of powdered ipecacuanha, 50 of sodium carbonate, 10 of ferric chloride, and 11 of water, was then distilled for some hours in a continuous apparatus, after which the distillate was collected in a vessel containing hydrochloric acid, the distillate evaporated to 20 parts, and redistilled with strong soda solution, when a colourless product was obtained having a strong odour of trimethylamine, pointing to the decomposition of an ammonium base. Upon repeating the experiment, and using barium hydrate instead of

sodium hydrate in redistillation, the base was separated from the hydrochloric acid compound and distilled over undecomposed and free from the trimethylamine odour. Upon spontaneous evaporation of a few drops of the distillate the base formed characteristic crystals occurring in rods and crosses, fluorescent at the edges, but otherwise colourless. The hydrochlorate formed finer octahedral crystals, fluorescent at the edges and smooth at the corners. It gave precipitates with platinum chloride, mercury potassioiodide, Nessler's reagent and solution of iodine. The nitrate resembled nitrate of emetine in not solidifying. The author is satisfied that he was dealing with a volatile ammonium base existing already formed in the drug, and not with a decomposition product of emetine, for when using potassium carbonate and ferric chloride, he obtained a far larger yield of emetine from ipecacuanha root than by any other method. The yield of the new base was small, varying between 0·3 and 0·5 per cent. of the weight of the root used. No experiments have been made as to its physiological action.

Cascara Sagrada in Rheumatism. Dr. Goodwin. (*Chemist and Druggist*, October, 1888.) The author reports that cascara sagrada possesses remarkable powers for the relief of rheumatism. Encouraged by the results accidentally obtained on his own person, he tried it on a number of patients with great success. Within twenty-four hours he found a marked improvement in every case. Fifteen-drop doses of the fluid extract of cascara sagrada three times a day are given, and in some cases the remedy may advantageously be combined with salicylate of sodium.

Dr. Martin also reports (*Lancet*, September 1st, p. 420) that he has succeeded in subduing the pains of rheumatism, after sodium salicylate had failed, by administering cascara sagrada in combination with that salt, the proportions being 15 grains of the salicylate with 10 minims of the liquid extract in orange-flower water every three or four hours.

Alkaline Cascara Sagrada Preparations. Dr. J. Irving. (*Chemist and Druggist*, October, 1888.) In view of the recent discussion on the activity of cascara preparations which have been rendered palatable by treatment with alkali, the following comments by the author are of interest. He calls attention to the repulsive looking mixture which the ordinary liquid extract forms with water, and states that this unsightliness may be entirely obviated without the use of either glycerine or syrups. A very small quantity of liq. ammoniæ, B.P., added to the mixture will

clear it to a bright ruby colour, seen by transmitted light, the transparency of which is not altered by a flavouring agent such as tinct. aurantii, nor by a sweetener like saccharin :—

Ext. casc. sag. liq.	♏xxx.
Liq. ammoniæ	gr. iij.
Tinct. aurantii	♏xv.
Liq. sacchar. (5 per cent.)	q.s.
Aquæ	ʒiss.

M. Ft. haust.

Again, ammonia permits cascara to be dispensed with some preparations of iron, such as ferri et ammonii citras, the mixture, though dark in proportion to the amount of extract used, being a perfect solution.

Ferri et ammon. citratis	gr. xxx.
Liq. ammoniæ	♏x.
Ext. cascar. sag. liq.	ʒss. to ʒj.
Liq. saccharin.	q.s.
Aq. aromat. ad	ʒvj.

M. Cap. unciam ter in die.

This combination is found especially serviceable, with (or without) small doses of digitalis, where the heart is enfeebled and constipation exists, with tendency to œdema of the extremities; in such a case the liquid extract of cascara, given with the iron in regulated small doses three or four times a day, serves an obvious twofold purpose: (1) it counteracts the binding effect of iron in relieving the bowels, and (2) assists the circulation by removing excess of fluid. In a similar way cascara may be combined with liq. bismuthi et ammon. citratis in digestive derangements.

Note on Cascara Sagrada. J. Moss. (*Pharm. Journ.*, 3rd series, xix. 649.) The author reports that a large quantity of spurious cascara sagrada has lately been met with in the American market. It occurs in quills and in curved pieces, the former up to 5 inches in length, the latter irregular as to size, but somewhat thicker than the quills, which are not more than one-twentieth to one-sixteenth of an inch thick. The specimen examined by the author seemed to consist of several different kinds of bark or at least of bark from different districts. The outer surface is dark dull earthy brown with a greenish tinge and occasional small round lichens on it. The inner surface is roughly fibrous and very varied in colour, and several of the pieces have adherent

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cent., as before. *Emodin*, $C_{15}H_{10}O_5 + H_2O$, gives red to brown-red amorphous precipitates with the alkaline earths and with lead, copper, and mercury salts. It dissolves in dilute alkalies to a splendid dark cherry-red colour, but gives no crystals on evaporation. A solution in alcoholic potash, heated at 100° in a sealed glass tube, showed fine needle-like aggregates after standing unopened for twenty-four hours. *Frangulin* melts at 228° to 230°, whilst Casselman puts it at 249° and Faust at 226°, the differences being due to impurity in the last two cases. It is almost insoluble in water and ether, more easily in chloroform, benzene, and alcohol, and very soluble in hot acetic acid. When dry, it forms a beautiful, light-yellow, brittle mass, with somewhat silky lustre. Its composition is $C_{21}H_{20}O_9$. Four to five hours' boiling with 20 per cent. sulphuric acid converts it into emodin and glucose. If anywhere, frangulinic acid should make its appearance here, but the compound previously described under this name is identical with emodin.

The coarsely powdered root of *Rhamnus purshiana* (*Cascara sagrada*) was extracted with ether, and then with 98 per cent. alcohol. After the addition of water, the ether extract was shaken repeatedly with light petroleum until the oily extracts became almost colourless. On removing the petroleum, the dark-coloured mother-liquor gave an immediate brown-red, flocculo-crystalline precipitate. As in the case of *Rhamnus frangula* bark, the alcoholic extract shaken up with ether after the addition of water afforded a crystalline product. The petroleum product which proved to be identical with this was found to be emodin. Frangulin was not present, although it may possibly occur in older bark.

Constituents of Condurango Bark. R. Kobert. (*Chem. Zeit. Rep.*, xiii. 58; *Journ. Chem. Soc. Ind.*, May, 1889.) Condurango bark contains at least three active substances, viz.—two or three glucosides and a resin, which are all similar in their action.

The *condurangin* of Vulpius is also not a simple substance, but a mixture of two of the above glucosides. It is observed that when its solution is heated to 40° C., it coagulates like albumen, and it resembles this substance also in being precipitated when the solution is saturated with sodium chloride. Hot filtered solutions therefore contain very little or no condurangin.

Condurangin possesses marked poisonous action on the central nerve system. It interferes with the animal movements, destroys the appetite, produces a strong flow of saliva and vomiting. On the heart, blood-vessels, blood, etc., it is without action. The

fatal dose for flesh-eating animals is 0·02 gram for every kilo. of animal weight, and for the herbivorous about three times this amount.

Cinchona Bark. J. E. de Vrij. (*Journ. Soc. Chem. Ind.*, 1886, 865.) *Cinchona succirubra*, the original source of the red cinchona bark, begins to show a diminution in the percentage of contained alkaloids after it reaches an age of 12–16 years, whilst it is at this age that it contains a large quantity of cinchona red.

When an excess of 95–98 per cent. alcohol is added to an aqueous extract of cultivated cinchona bark, a sticky substance is precipitated, as was long ago (1820) observed by Pelletier. This body is a calcium salt which yields, when warmed with water and magnesia, calcium quinate, magnesium quinate, and cinchona red; this decomposition points to the presence of both quinic acid and cinchona tannin in the salt, which latter is transformed into cinchona red by treatment with magnesia in contact with the oxygen of the air. The calcium salt is hygroscopic; its turns the plane of polarisation to the left, but to a less extent than calcium quinate does. Cinchona tannin, which is precipitated from an aqueous extract of the bark by strong acids, occurs in considerably greater quantity in the cultivated than in the wild bark.

From the author's investigations it appears that the young cinchona plants only contain the alkaloids in an amorphous state (so-called quinoidine), and that the appearance of the crystalline alkaloids takes place as the plants develop; hence it is probable that the latter are produced from the former, and that the reverse process, often regarded as the more probable, does not occur. Two forms of the amorphous alkaloid, one of which turns the plane of polarisation to the right, the other to the left, exist in the bark.

The neutral combinations of the amorphous alkaloid (quinoidine) with acids which give an alkaline reaction on litmus paper are very hygroscopic, and extremely soluble in water, and this solubility is communicated to the similar salts of the crystalline cinchona alkaloids when present. Advantage is taken of this property in the preparation of quinetum, or cinchona febrifuga, which consists of the neutral salts of the total alkaloids of the bark, which have an alkaline reaction and are very readily soluble in water. Quinetum is of especial value for subcutaneous injection.

White Cedar Bark. (*Gardener's Chronicle*, August 11, 1888.) The white cedar of British Guiana has a local reputation as a remedy for syphilis. Its botanical source was hitherto unknown,

and it is now identified with *Tabebuia longipes*, of the natural order *Bignoniacæ*.

Rhus Aromatica. Dr. Max. (*Amer. Journ. Pharm.*, April, 1889, from *L'Union Méd.*) *Rhus aromatica* has been found useful in incontinence of urine in children as well as in old people. The author employed the tincture of the bark, of which he gave from 20 to 50 drops daily.

Adulteration of Ground Elm Bark. G. M. Beringer. (*Amer. Journ. Pharm.*, 1888, 552.) The adulteration to which the author calls attention consisted of maize and potato starches. The genuine bark contains no starch of any kind.

Physiological Action of Hedwigia Balsamifera. MM. Gaucher, Combemale and Marestang. (*Comptes Rendus*, cvii. 544–547.) The bark from the stems of *Hedwigia balsamifera* yields 19 per cent of alcoholic and 17 per cent. of aqueous extract, whilst the root-bark yields 18 per cent. of alcoholic and 25 per cent. of aqueous extract. Subcutaneous injection of the alcoholic extract, in quantities of 0·146 gram per kilo. of animal weight, was sufficient to produce serious symptoms in a guinea pig, and 0·161 gram per kilo. caused death in an hour and a half; 0·298 gram in an hour. The alcoholic extracts from both root and stem are of equal activity; but the mortal injection of aqueous stem extract is 0·53 gram per kilo., death ensuing in twenty minutes; whilst of the aqueous root extract, 0·65 gram per kilo. is required to produce death in one hour. The various effects produced are described in detail, and lead to the conclusion that *H. balsamifera* is a nerve poison, reducing temperature and producing paralysis and convulsions. The only post-mortem evidences of its use are visceral, and more especially pulmonary, congestion, which are more marked when death is slow than when it is rapid.

Special investigations showed that the active principles of these extracts were an alkaloid and a resin, which were isolated and submitted to toxicological tests. In these experiments the alkaloid was found principally to cause convulsions, but also to occasion paralysis and reduction of temperature, whereas the injection of an amyl-alcohol solution of the resin is followed by the latter symptoms only, though in this respect it is very much more active than the alkaloid, and is, in fact, by far the more poisonous of the two substances. It is very sparingly soluble in ether, chloroform, benzene, and methyl and ethyl alcohols, but is more soluble in amyl alcohol, which dissolves $\frac{1}{300}$th. The convulsions produced by the alkaloid resemble those produced by

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diosmin. The amount present in the leaves varies very much, not only with the season when they are gathered, but also with the age of the plant; at no time, however, is it large. The best way of extracting it is first to treat the leaves with light peteoleum to remove the essential oil and waxy and resinous matters, then with cold alcohol of 85 per cent., which removes the chlorophyll and acid extractive substances, and finally to treat it with boiling alcohol of 80 to 85 per cent., which is the best solvent for the diosmin. It is very troublesome to purify, but this may be effected by treating the residue left on evaporation of the alcoholic solution successively with a solution of ammonium carbonate, cold alcohol, and ether, and then recrystallizing repeatedly from alcohol of 80 to 85 per cent.

When pure, diosmin is a white, crystalline powder, consisting of very slender microscopic needles, odourless, tasteless, and insoluble in most solvents. Its best solvent is boiling alcohol of 80 to 85 per cent. It melts at 243–244°, with decomposition and evolution of gas. If cautiously melted on platinum foil, it emits a pleasant odour resembling that of orange peel when it begins to burn; subsequently the odour is like that of caramel. Diosmin does not reduce Fehling's solution. It dissolves in concentrated sulphuric acid, and in solutions of the alkalies with yellow coloration, but at the same time undergoes alteration.

The results obtained by the analysis of diosmin agree with the numbers obtained for hesperidin. The author is making a careful comparison of diosmin with hesperidin, in order to ascertain whether they are identical or not.

Assay of Coca Leaves. Prof. van der Marck. (*Nederl. Tydschr. v. Pharmacie*, April, 1889; *Analyst*, June, 1889.) The author first tried Squibb's method. Fifty grams of the leaves were marcerated with 40 grams of 95 per cent. alcohol and 1·6 gram of hydrochloric acid. After percolating and distilling off the spirit, the residue was taken up with 30 c.c. of ether, which was then shaken with 30 c.c. of water and 1 c.c. of 10 per cent. acid. The aqueous fluid was drawn off and the ether once more shaken with 10 c.c. of acidified water. The mixed acid fluid, after being once more shaken with a little ether to remove any colouring matter, was rendered alkaline with sodium carbonate, and the isolated alkaloid shaken out with ether. The author obtained ·49 per cent. of alkaloid, but objects to the process on the following grounds: (1) The quantity of alcohol ordered is too small, and should be doubled. (2) As a rule, the ether, when shaken with

acid water, forms a troublesome emulsion. (3) Twice shaking with ether is insufficient. (4) The residue left on evaporation is not pure cocain, as it did not dissolve completely in hydrochloric acid, and left about 50 per cent. of insoluble residue. It is also dangerous to distil a strongly acid alcoholic solution of cocain, as it so readily decomposes.

The author next tried the process of Castaing. Fifty grams of coca leaves were treated with 400 c.c. of boiling water, and after standing for half an hour percolated. The residue was then percolated with alcohol of 85 per cent., and the mixed filtrates thrown down with lead acetate. After the excess of lead had been removed with sodium sulphate, the liquid was concentrated, filtered, rendered alkaline with sodium carbonate, and shaken out with ether. The amount of cocain was ·38 per cent., but it was only partly soluble in dilute hydrochloric acid, and much coloured.

The next process tried was that of Albertoni and Guareschi. Fifty grams of the leaves were exhausted with ether, the ether was distilled off, the residue treated with boiling water, and the solution evaporated to dryness with a little magnesia. On extraction with amylic alcohol, ·14 per cent. of alkaloid was obtained.

As a last resource Bignon's process was tried. Fifty grams of the powdered leaves were macerated for forty-eight hours with a 20 per cent. solution of sodium carbonate, then dried on the water-bath, and exhausted with petroleum spirit to dissolve the cocain. The solution was shaken with dilute hydrochloric acid, which takes up the cocain. The acid fluid was then rendered alkaline and shaken with ether, which extracted the cocain. The percentage of cocain got by this process amounted to ·06, a proof that most of the alkaloid had been decomposed by the strong alkali.

The author then tried the following idea: twenty-five grams of the powder were mixed with 10 grams of magnesia and a little water, and dried on the water-bath. After percolating with ether (so as not to dissolve any hygrin), the ether was distilled off and the residue treated with acid water and filtered. After rendering alkaline, the alkaloid was extracted with chloroform. Obtained ·2 per cent. alkaloid. A similar experiment was made with 50 grams of leaves, and ·19 per cent. of alkaloid was obtained. Ether may, however, be advantageously substituted for chloroform.

The author finally recommends the following process: fifty grams of the powdered leaves are mixed with 20 grams of magnesia, and dried at 60° C., then extracted with ether. After dis-

tilling off the ether, the residue is taken up with 30 c.c. of 2 per cent. hydrochloric acid. The acid is filtered and repeatedly agitated with ether, to remove colouring matters. Ammonia is then added, and the mixture shaken out three times with 25 c.c. of ether. After standing for a little while over a few pieces of calcium chloride, the ether is evaporated and the alkaloid weighed.

Acacia Anthelmintica. M. Thiel. (*Pharm. Journ.*, from *Bull. Comm.*, January, 1889, 36.) In Abyssinia the bark of the *Acacia anthelmintica* is used as a tænicide by the natives, by whom it is alleged to be more effective for the purpose than *kousso*, whilst less disagreeable in taste. A powder of the bark is mixed with flour used for making bread; it is also taken mixed with butter or honey, and as a strong infusion. According to the author it contains a substance resembling saponin in its chemical properties, which he has named "moussenin."

Coronilla Scorpioides. F. Schlagdenhauffen and E. Reeb. (*Nouv. Rem.*, December 24, 1888; *Amer. Journ. Pharm.*, February, 1889.) The authors have separated from the leaves the bitter principle, *coronillin*, to which they assign the formula $C_{11} H_{12} O_5$. It is a yellowish powder, soluble in water, acetone, and amylic alcohol; slightly soluble in chloroform and ether. Heated with diluted hydrochloric acid, an amorphous resin is separated, to which the authors give the name of coronillein. This also occurs as a yellow powder, but is not bitter to the taste. It is insoluble in water, but dissolves in alcohol, acetone, and chloroform. Coronillin, say the authors, is a heart poison; coronillein has no perceptible physiological action.

Ageratum Mexicanum. H. Molisch. (*Zeitschr. des oesterr. Apoth. Ver.*, January 1, 1889.) This garden plant, belonging to the order *Compositæ*, was found by the author to yield *coumarin*. 1 kilogram of the leaves yielded 0·6 gram of this odorous principle, while only traces could be obtained from the flowers, and the roots gave a negative result entirely. The coumarin is not contained in the living plant, but is formed in it after the plant has perished. Its odour becomes very perceptible while the leaves are being dried.

Constituents of Antirhinum Majus. T. L. Phipson. (*Chem. News*, lviii. 99.) Leaves and stalks of *Antirhinum majus* (snapdragon) are soaked in cold water for a few days, filtered, precipitated with lead acetate, the slight excess of lead acetate is removed from the solution by means of hydrogen sulphide, and the solution separated to a thin syrup. After being a few days in a warm, dry

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cold alcohol, acetic acid, benzol, petroleum ether, and water, represented by the formula $C_{12} H_{11} O_3$; (3) "chekenetin," obtained in yellowish, almost olive-coloured crystals, represented by the formula $C_{11} H_7 O_6 + H_2 O$, and probably allied to quercetin; and (4) "cheken bitter," an amorphous substance, soluble in most solvents, to which the bitter taste of cheken leaves is attributed.

Machorka. (*Chemist and Druggist*, February, 1889.) In Russian journals attention has been recently called to a new product of the tobacco industry, viz., the nicotinous extract of the commonest variety of Russian tobacco, known as "machorka." This extract is used largely in the Russian Empire, and considerable quantities of it are also exported, principally to South Africa. It is used in the first place for the destruction of parasites on plants and animals, and it has recently been used in the treatment of foot and mouth disease in sheep. The machorka tobacco yields from 20 to 25 per cent. of this extract. There are at present manufactories for the preparation of tobacco extract in many parts of the Continent, especially in Germany, France, and Italy; but it is said that the Russian machorka extract is by far superior to any of these products.

Some Drugs of British Sikkim. D. Hooper. (*Pharm. Journ.*, 3rd series, xix. 225.) This paper contains notices of the following plants:—*Tinospora cordifolia*, *Gynocardia odorata*, *Schima Wallichii*, *Shorea robusta*, *Pterospermum acerifolium*, *Canarium Bengalense*, *Gouania leptostachya*, *Millettia pachycarpa*, *Dichroa febrifuga*, *Terminalia Chebula*, *Eugenia obovata*, *Randia Dumetorum*, *Pœderia fœtida*, *Pentapterygium serpens*, *Teucrium Anacrostachyum*, *Colebrookia oppositifolia*, *Polygonum molle*, *Cinnamomum Tamala*, and species of *Macaranga*. For particulars reference should be made to the original paper.

Rhus Glabra. J. A. Palen. (*Amer. Journ. of Pharm.*, August, 1888, 389.) This plant was found to contain a varying amount of tannin, and a colouring matter allied to, if not identical with, that of quercitron bark. The leaves collected in Iowa in July gave 16·36 per cent. of tannin, whilst those collected in August gave 15·75 per cent., which is less than the amount obtained from leaves grown in Virginia.

Helianthemum Canadense. W. Crutcher. (*Amer. Journ. of Pharm.*, August, 1888, 390.) The author's analysis of this plant showed the presence of 10·8 per cent. of tannin, and indications of the presence of a glucoside crystallizing in fine needles.

Pilea Pumila. F. R. Weiser. (*Amer. Journ. of Pharm.*, August, 1888.) The author reports that this plant has some reputation for counteracting the effect produced by *Rhus Toxicodendron*. The fresh plant is bruised, and then applied either by binding it on the eruption, or by rubbing the affected parts with it; the effect seems to be instantaneous, allaying the itching and preventing the spreading of the eruption. The plant is popularly known as *clearweed* and *richweed*, and grows from Canada to Florida. After drying it has a somewhat fragrant tea-like odour. An analysis of the dried and powdered plant yielded the following results:

Extracted by Petroleum Spirit (volatile oil, ·26; fat, ·70; wax, ·28; chlorophyll, ·08) .	1·32
„ by Ether (mostly chlorophyll) . . .	1·52
„ by Alcohol (glucoside, etc.) . . .	1·00
„ by Water (mucilage, dextrin, sugars, etc.) .	8·89
„ by dilute H K O	4·90
„ by dilute H Cl	9·02
Lignin	8·25
Wood fibre, ash, and moisture	66·33

A portion of the alcoholic tincture obtained above, on being allowed to evaporate spontaneously, yielded crystals which responded to the tests for glucosides. Half a pound of the powder was then percolated with alcohol, the tincture concentrated by distillation, the extract treated with water, and the aqueous solution agitated with chloroform, the residue obtained on evaporating the chloroform was redissolved in water and evaporated in a desiccator, when a substance was left having a strong vanilla-like odour, and which did not respond to tests for either alkaloids or glucosides.

Euphorbia Pilulifera. J. H. Bunting. (*Amer. Journ. of Pharm.*, 1888, 552.) The author's analysis of this drug shows the presence of the following constituents: wax, caoutchouc, chlorophyll, resin, tannin, sugar, mucilage, carbohydrates, albuminoids, calcium oxalate, and other salts.

Euphorbia Geniculata. Prof. Sieckenberger. (*Pharm. Journ.*, 3rd series, xix. 346.) The author reports that within the last few years a South American species of *Euphorbia*, *E. geniculata*, has been introduced into Egypt, apparently accidentally, and has spread as a weed over the entire country. Already the plant is known to have given rise in different districts to losses of sheep, horses, and cattle, that were poisoned through

eating it. The natives have commenced to use it as a medicine, either eating the young plants, or drinking an infusion prepared from them, the consequences being sometimes rather serious. In a preliminary investigation of the plant, the author has obtained evidence of the presence in the juice of the acid resin characteristic of the *Euphorbiaceæ*, as well as euphorbon and caoutchouc.

Embelia Ribes. C. J. H. Warden. (*Pharm. Journ.*, 3rd series, xix. 305.) In a former communication to the *Pharmaceutical Journal* (January 21, 1881, 601), the results of a partial examination of *Embelia ribes* were described. The most interesting principle isolated was an acid—embelic acid; in this note the ultimate composition of the acid is given, together with certain of its reactions. The acid crystallized from alcohol has a composition corresponding to the formula $C_9 H_{14} O_2$. It is soluble in alcohol, insoluble in water, fuses at 140° C. to a deep red liquid. At 155° it begins to decompose, with indications of a partial sublimation. The ammonium salt was found effective as an anthelmintic for tænia; it has the advantage of being tasteless.

The Anatomical Structure of Grindelia Robusta. J. Beauvais. (*Ber. der deutsch. bot. Ges.*, 1888, 403; *Amer. Journ. of Pharm.*, February, 1889.) *Grindelia robusta* belongs to the order of *Compositæ*, sub-order *Tubulifloræ*, and is a herb with oblong, thickish, light green and toothed leaves. Both sides of the leaves have the epidermis covered with a thick cuticular layer, and contain glands and stomata. The glands consist of a one-celled base bearing the gland-cell, which is filled with resin. Beneath the epidermis of both the upper and lower surface is found a layer of parallel palisade cells, containing chlorophyll, the central part of the mesophyll consists of spongy parenchyma, in which the vascular bundles are imbedded. These bundles are closed, collateral, and are surrounded by a sheath of thick-walled collenchyma, gradually passing into the hypoderma of the upper and lower surface of the leaf. Rather large resin ducts are put within this collenchyma layer.

The involucre of the flower head consists of spirally arranged scales. A transverse section through the top portion of these scales is nearly circular, and is covered with an epidermis, bearing glands and stomata upon the outer surface, and covering several tiers of palisade cells, both on the outer and inner surface. A vascular bundle in the centre of the scale is surrounded by a layer of collenchyma containing resin ducts.

The transverse section through the middle of the involucral

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Grindelia Robusta and Grindelia Squarrosa. W. H. Clark. (*Amer. Journ. of Pharm.*, 433–441.) *Grindelia robusta* has the reputation of being almost a specific for certain forms of asthma, and externally in rhus poisoning. *G. squarrosa* has similar properties, but is less known and used. The author has not been able to confirm Rademaker's statement that *G. robusta* contains an alkaloid and a peculiar organic acid. He finds that the substance described as an alkaloid possesses all the properties of a glucoside. In the place of the organic acid he found saponin, or a saponin-like body, amounting to 2 per cent. in *G. robusta*, and to 0·82 per cent. in *G. squarrosa*. *G. robusta* was found to contain 1⅓ per cent. of tannin, while this constituent proved entirely absent in *G. squarrosa*. The former plant was found to contain a somewhat larger proportion of wax, fixed oil, and volatile oil, but a smaller proportion of resin than the latter.

The Alkaloidal Constituent of Fumaria Officinalis. M. Reichwald. (*Pharm. Zeitschr. für Russland*, March and April, 1889.) The author's investigation throws some further light on the alkaloid fumarine, the active principle of the plant, and disproves the alleged identity of this body with corydaline, an alkaloid separated from plants of the nearly allied genus *Corydala*. A full description of the distinguishing characters is given. The yield of fumarine was only equal to 0·04 per cent. of the dried herb used.

Antiaris Toxicaria. Prof. Bettink. (*Nederl. Tijdsch. voor Pharm.*, April, 1889, 107.) The juice of the upas tree, *Antiaris toxicaria*, concerning which such extraordinary stories were formerly told, has been examined by the author, who reports that he has separated from it three physiologically active substances, which he designates "antiarin," "oepain," and "toxicarin." Neither of the amorphous substances has been yet obtained in a condition that would allow of a satisfactory analysis being made.

Hydrangea Arborescens. H. J. M. Schroeter. (*Amer. Journ. Pharm.*, March, 1889.) The author has re-investigated this drug, with the object of ascertaining the ultimate composition of hydrangin, the active principle isolated by C. S. Bondurant in 1887. The results of his analyses of this principle lead to the formula $C_{34} H_{35} O_{11}$. His observations on the physical and chemical properties of hydrangin are fairly in accord with the description given by Bondurant.

Composition and Toxic Action of Urechitis Suberecta. M. Egasse. (*Nouv. Rem.*, 1888, 555.) From *Apocynee Urechitis sub-*

erecta occurring in Jamaica, Bowrey isolated a crystalline and very poisonous glucoside, urechitine, $C_{28}H_{42}O_8$, also a body resembling the glucoside urechitoxin, $C_{23}H_{20}O_5$, equally poisonous. Minkiewicz also found a resious acid smelling like vanillin. This acid kills cats in doses of ·006–·01 gram per kilo. of animal weight, though no remarkable change was noticed in the dead body by autopsy. Solutions containing ·002 per cent. of the glucoside contract the vessels of warm-blooded animals. Both the glucoside and the resinous acid are true heart-poisons. They are antidotes for curare, and closely resemble strophanthus.

Morphine in Escholtzia Californica. H. Adrian and M. Bardet. (*Chem. Centr.*, 1889, 197.) This plant, which belongs to the *Papaveraceæ*, has been used in America as a substitue for opium. The author have found morphine in it, in addition to another base and a third substance, probably a glucoside.

Symphoricarpus Vulgaris. Dr. Newton. (*Med. Bull.*, March, 1889. From *Pharm. Journ.*) The *Symphoricarpus vulgaris*, or "coral berry" tree, is recommended by the author as a new and valuable alterative and diuretic. The plant belongs to the natural order *Caprifoliaceæ*, and is said to be common, in the south-western United States, over a large tract of country. It is described as a low undershrub with oval leaves, seldom exceeding an inch in length, and red fruit persistent during the winter. The twigs are the portion used in medicine, and they are said to yield their virtues readily to water or dilute alcohol.

The Loco Weed (Crazy Weed). J. Kennedy. (*Pharmaceutical Record*, July, 1888.) No other plant in the Flora of Texas has enjoyed greater notoriety than the famous "loco," which is the herb of *Astragalus molissimus*, natural order *Leguminosæ*. Popular superstition has accredited it with a most remarkable property, viz., the power of producing insanity. The author gives the following botanical description of the plant:—

An herbaceous perennial from 8 to 12 inches in height. Its numerous branches being closely crowded upon exceedingly short decumbent stems. The leaves are compound (oddly pinnate) alternate, with long and pointed stipules. The leaflets are elliptical, with entire margin, pubescent, and less than 1 inch in length.

Inflorescence.—The flowers, which are of a purplish colour, are sessile upon a common peduncle of considerable length. The peduncles are rather large, and arise from the axils of the leaves, calyx 5-toothed, inferior. Corolla papillionaceous, long and narrow. Stamens, 10; diadelphous (9 and 1); pistil, 1; ovary, 1;

2-celled; ovules numerous. At the base of each flower is a small bract.

The description is illustrated by woodcuts.

The author also gives a full account of his chemical and physiological examination of this drug. He arrives at the conclusion that it is non-poisonous, and does not possess any of the properties ascribed to it by popular superstition.

Hydrocotyle Asiatica. (*Zeitschr. des. oesterr. Apoth. Ver.*, 1889, 93.) This tropical umbelliferous plant contains a thick, pale yellow, bitter and acrid oil. Small doses of the powdered plant have a diuretic action occasionally accompanied by an itching sensation in the skin. Larger doses (1 to 2 grams) produce headache, dizziness, and dysentery. It is used as a remedy for skin diseases and syphilis.

Adhatoda Vasica. Dr. H. H. Rusby. (*Chemist and Druggist*, June 15, 1889.) The author considers this Indian drug to merit close investigation on account of its power to destroy bacteria in the human system. It has been found harmless to dogs in 15-gram doses, but fatal to flies, fleas, mosquitoes, leeches, the pupæ of aquatic insects, and even to frogs. In the vegetable kingdom it is harmless as applied to the higher orders, but immediately fatal to various classes of submerged and floating aquatics, to mould, etc. It has been proposed to try it in diphtheria, and the most promising method of application would seem to be in connection with, or following the application of, pepsin to the membranes, supplemented by its internal administration.

Pycnanthemum Linifolium. H. T. Painter. (*Amer. Journ. Pharm.*, 1888, 610.) The plant is known in some parts of the United States as dysentery-weed, and is recommended for the treatment of dyspepsia and intestinal affections. A fluid extract is obtained by extraction with a menstruum composed of one part of alcohol and three parts of water. The syrup is made by mixing 25 parts of this fluid extract with 75 parts of simple syrup. The infusion is credited with diaphoretic properties.

Hysterionica Baylahuen. Dr. Baillé. (*Bull. gén. de thérap.*, February 23, 1889; *Amer Journ. Pharm.*, April, 1889.) The author examined samples of this plant obtained by Prof. Dujardin-Beaumetz from Chili, where it is thought to have special action in certain gastro-intestinal troubles (especially in chronic hemorrhagic rectocolites), indigestion, flatulent dyspepsia, etc. A close analogy was found to exist between this plant and *Grindelia robusta*. The author made a tincture by macerating 100 grams of

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scent scales, the solution of which introduced into the eye dilates the pupil. Although isomeric with atropine, hyoscyamine and hyoscine, the double chlorides with the following metals possess different melting-points: with Au, 153–155°; with Pt, 194–196°; with Hg, 160–161°; the crystalline forms of these double salts are not identical with those of the three alkaloids mentioned. The conversion of mandragorine into atropine by the action of sodium hydrate could not be effected. A second alkaloid in very minute quantity was extracted by treating the residue of the above alcohol extraction with water acidulated with H Cl, concentrating, adding $K_2 C O_3$ in excess, and agitating with ether; the residue after evaporating the ether was also mydriatic and formed double chlorides with Au, melting point, 147–153°; with Pt, melting point, 179–181°.

Some Reputed Medicinal Plants Indigenous to New South Wales. J. H. Maiden. (*Pharm. Journ.*, 3rd series, xix. 116–119, 133–136; 150–152, and 178–180.) This paper contains notices of the following plants:—*Acacia falcata*, *A. implexa*, *A. penninervis*, *A. salicina*, var. *varians*, *Achras laurifolia*, *Acpryanthes aspera*, *Adiantum æthiopicum*, *Alstonia constricta*, *Atherosperma moschata*, *Boronia rhomboidea*, *Brasenia peltata*, *Casuarina equisetifolia*, *Cedrela Toona*, *Codonocarpus cotinifolius*, *Colocasia macrorrhiza*, *Croton phebalioides*, *Cryptocarya australis*, *Cucumis trigonus*, *Cymbonotus Lawsonianus*, *Duphnandra micrantha*, *Doryphora sassafras*, *Drimys aromatica*, *Duboisia Hopwoodii*, *D. myoporoides*, *Erythræa australis*, *Eucalyptus* species, *Eugenia Jambolana*, *Euphorbia Drummondii*, *Evolvulus alsinoides*, *Exæcaria Agallocha*, *Flagellaria indica*, *Flindersia maculosa*, *Frenela Endlicheri*, *Geijeraa slicifolia*, *Goodenia* species, *Gratiola pedunculata*, *G. peruviana*, *Guilandina Bonducella*, *Hardenbergia monophylla*, *Herpestis Monnieria*, *Hydrocotyle asiatica*, *Indigofera enneaphylla*, *Ionidium suffruticosum*, *Ipomæa Pes-capræ*, *Justicia procumbens*, *Laportea gigas*, *Mallotus philippinensis*, *Melaleuca uncinata*, *Melia composita*, *Mentha gracilis*, *Mesembryanthemum æquilaterale*, *Mucuna gigantea*, *Myriogyne minuta*, *Petalostigma quadriloculare*, *Piper Novæ-Hollandiæ*, *Pittosporum undulatum*, *Plumbago Zeylanica*, *Polanisia viscosa*, *Portulaca oleracea*, *Pteris aquilina*, var. *esculenta*, *Rhizophora mucronata*, *Sarcostemma australe*, *Sebæa ovata*, *Sida rhombifolia*, *Smilax glycyphylla*, *Sophora tomentosa*, *Tabernæmontana orientalis*, *Tephrosia purpurea*, *Typha angustifolia*.

Vicia Faba. Dr. Bouloumié. (*Bull. de la Soc. méd.*, May 31, 1888.) The flowers of the horse bean, *Vicia faba*, constitute a

popular remedy in some parts of France. The author has verified their good effects in sub-acute nephritic colics with uric and phosphatic gravel, and in the pains symptomatic of renal calculus; also in a case of urethral pains from enlarged prostate. It failed to relieve in a diabetic case of acute nephritic colic. The dose is 50 or 60 flowers per cup of water, two cupfuls to be taken at beginning of pain.

The Hungarian Daisy as an Adulterant of Dalmatian Insect Powder. G. M. Beringer. (*Amer. Journ. Pharm.*, January, 1889.) The author calls attention to this adulteration, and gives a botanical description and woodcut illustrations of both the adulterant and the genuine article. He also gives the results of his chemical examination of both as embodied in the following table:—

	Chrysanthemum cinerariæfolium.	Hungarian Daisy.
Yield to Petroleum Ether . . .	2·49 per cent.	3·37 per cent.
„ Ether.	2·85 „	3·68 „
„ Alcohol	6·57 „	9·45 „
„ Water	16·70 „	13·43 „
Yield of Ash	6·50 „	9·30 „

The Hungarian daisy yields a powder, somewhat darker in colour than the genuine insect powder. Used upon flies and cockroaches, it appears to have no value as an insecticide. Microscopically no difference could be detected between the two powders.

Insect Flowers. J. Schrenk. (*Amer. Journ. Pharm.*, June, 1889.) The author has investigated the structural characteristics of the commercial insect flowers, and has pointed out certain differences which may be useful in determining the purity of commercial insect powder, and also its origin. The most important results may be summarized as follows:

The stem of the Dalmatian plant (*Chrysanthemum cinerariæfolium*) consists in the ridges of collenchyma tissue, which is also found in the depressions in the Persian plant (*C. roseum*); but in a good insect powder fragments, composed of collenchyma cells, should be met with only sparingly.

Fragments of the involucral scales, composed of sclerenchyma cells, are much more numerous in the Persian than in the Dalmatian powder.

The outer surface and edges of the scales of the Dalmatian

flowers contain numerous hairs consisting of a long cell with attenuated ends placed horizontally upon a one- to three-celled stalk. The Persian flowers are almost entirely glabrous, a white hoariness being found only at and near the base of the scales, and very few hairs near the apex; the hairs of the same structure as the preceding, only the terminal cell being much longer.

These hairs are entirely absent from the involucre and stem of the so-called Hungarian or Russian daisy; but the scales contain hairs consisting of from four to ten cells, and, terminating with a much elongated thin-walled, or with an inflated cell. Another form of glandular trichome consists of ten or twelve cells forming a globular head supported on a short stalk.

Besides the usual fluids for clearing up or bleaching the tissues, Schulze's reagent (chloride of zinc) will prove very useful in examining the powder. It will bring out very clearly the hairs and collenchyma cells, which are stained blue, while the sclerenchyma cells and the pollen grains will assume a yellow colour. At the same time, of course, starch, a very common adulteration of insect powder, will become plainly distinguishable if present.

The author also directs attention to the presence in the powder of conspicuous fragments consisting of papillæ covering the upper epidermis of the marginal corolla. The petals of other related species are similarly constructed. The pollen grains of the species mentioned are likewise similar in structure. Moeller (*Mikroskopie*, etc., 1886) stated that the petals contain no stomata; but the author found stomata quite numerous on the marginal corolla of *C. cinerariæfolium*, especially on the lower side.

A New Adulteration of Saffron. H. Adrian. (*Journ. de Pharm. et de Chim.*, February, 1889.) The author calls attention to the adulteration of a sample of saffron with *soluble* salts. It was found to yield 26·4 per cent. of ash consisting chiefly of borate, chloride and sulphate of sodium, and carbonate of potassium. The saffron also contained ammonium nitrate. The potassium found in the ash as carbonate was present in the saffron as tartrate.

A New Adulteration of Saffron. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xix. 666.) A similar adulteration to that mentioned in the preceding abstract was observed by the author. The sample reported upon occurred in the London market, and was of excellent colour and odour.

When placed in water it *immediately* gives out an orange-yellow colour, true saffron under the same circumstances giving out a lemon-yellow tint more slowly.

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Congo Coffee. E. Fricke. (*Journ. Soc. Chem. Ind.*, June, 1889.) A sample of the so-called Congo coffee was obtained in a form resembling ordinary ground roasted coffee, but an infusion of it possessed an extremely astringent taste, and no caffeine or other crystallizable alkaloid could be found. A quantity of the natural bean was subsequently received, and this was found to be a species of *Phaseolus*, of shining black colour, and of such a size that 100 grams contained 214 beans. The great difference in the percentage of woody fibre between the roasted material and the beans showed that a partial removal of the meal of the bean had been effected preliminary to the roasting process.

Artificial Coffee Berries. J. König. (*Zeitschr. für angew. Chemie*, No. 22, 1888. From *Analyst*.) A sample submitted to the author for analysis looked very much like the real article, only the berries had all precisely the same shape, which is not the case with the genuine product. The result of the analysis was as follows: moisture, 5·14; nitrogenous matter, 10·75; fat, 2·19; non-nitrogenous matter, 76·76; woody fibre, 3·96; matters soluble in water, 29·88; ash, 1·20. The microscope revealed the presence of wheat starch. The berries, therefore, consisted no doubt of roasted wheat-flour dough of low quality. They are sometimes mixed with genuine berries to the extent of 50 per cent.

Anthelmintic Properties of Cocoa Nut. Prof. Pariso. (*Lancet*, 1888, 341.) The author records the accidental discovery of the tænicidal property of the cocoa nut while he was resident in Abyssinia, and its confirmation by a number of observations made subsequently, after his return to Athens. The tape-worm was discharged in each case quite dead. He suggests that pharmacists might make cocoa-nut preparations, which would be a great improvement on the nauseous oil of male fern.

Constituents of Areca Nut. E. Jahns. (*Ber. der deutsch. chem. Ges.*, xxi. 3404–3409.) The areca or betel nut is the fruit of the areca palm (*Areca catechu*), and is an important article of commerce. It contains tannin, fat, and alkaloid substances. The latter are extracted as follows:—The powdered seeds are extracted three times in the cold with water to which 2 grams of concentrated sulphuric acid are added for every 1 kilo. of seed. The filtrate is evaporated, and after filtration, potassium bismuth iodide, and sulphuric acid added. The red crystalline precipitate is decomposed with barium carbonate and water. The alkaloids dissolve, whilst bismuth oxyiodide, colouring matter, etc., remain undissolved. The filtrate is evaporated, baryta solution added, and

extracted with ether. The latter extracts an oily substance called *arecoline*. The residue is neutralised with sulphuric acid, and the remaining alkaloids extracted by treating successively with silver sulphate, baryta, and carbonic acid, and extracting the dry residue with absolute alcohol or chloroform. A second alkaloid goes into solution, and a third, *arecaine*, remains undissolved. The yield of *arecoline* is ·07 to 1 per cent., of *arecaine*, ·1 per cent.

Arecoline is a colourless oily liquid, with a strongly alkaline reaction, soluble in the usual solvents. It is volatile, and distils at about 220°. The hydrobromide has the formula $C_8 H_{13} N O_2$, H Br. The hydrochloric forms double salts with auric and platinic chlorides.

It acts as a strong poison. Arecaine forms colourless crystals soluble in dilute alcohol and water. It contains one molecule of water of crystallization, which it loses at 100°. Its formula is $C_7 H_{11} N O_2 + H_2 O$. Like arecoline, it forms double salts with platinic and auric chlorides.

Immature Cubebs. C. B. Lowe. (*Amer. Journ. Pharm.*, March, 1889.) The author describes a suspicious looking sample of cubebs, apparently consisting of the genuine drug in a very immature condition. They were about one-third the size of true cubebs, with a stipe about one-third longer than their diameter, were of a dark purple colour, quite shrunken appearance, and of a cubeb odour, but much weaker taste. On examination with the microscope, they were seen to contain numerous oil cells in the mesocarp, but the layer of stone cells which forms the endocarp in the true cubebs could not be discerned. They contained a very rudimentary seed.

A New Pepper Adulterant. F. W. Stoddart. (*Analyst*, Feb., 1889.) The adulterant in question consisted of rice starch, barytes, calcium carbonate, and lead chromate, all finely ground and intimately mixed. The lead chromate amounted to about 10 per cent. of the whole compound. By the addition of about 5 per cent. of this mixture, the colour of the pepper is greatly improved. The method of examination adopted consisted in agitation with chloroform, by which means the mineral ingredients of the adulterant are obtained in their natural combinations.

The well-washed residue is gently warmed until the chloroform has evaporated, treated with a very little sodium carbonate solution, and allowed to cool. A few drops of ether, which has been agitated with aqueous hydrogen peroxide, are then added, and the mixture carefully acidified with hydrochloric acid, when the deli-

cate blue coloration is readily obtained, and the barium and lead remain to be estimated in the usual way.

A Volatile Alkaloid in Pepper. W. Johnstone. (*Chemical News*, November 16, 235.) Pepper is shown by the author to contain a volatile alkaloid probably identical with piperidine. Black pepper yielded 0·56 per cent., and the husks alone 0·74 per cent, of this base. White pepper yielded it also, but in smaller quantity, and the larger proportion of piperidine in the husk, the author considers to be an explanation of the greater pungency of black pepper as compared with white pepper. Long pepper was found to yield 0·34 per cent. of the alkaloid.

Capsicum Annuum. A. Meyer. (*Pharmaceutische Zeitung*, 1889, 130.) The author finds that the pungent principle in *Capsicum annuum* is entirely confined to the placenta, the other portions of the fruit being entirely free from it. The placenta of 5000 grams red pepper weighed 110 grams, which contained 0·9 per cent. capsaicin, or for the whole fruit 0·02 per cent. The isolation was effected by extracting with boiling ether, evaporating, mixing with oil of sweet almonds (to retain the red colouring matter), extracting with 70 per cent. alcohol, evaporating, dissolving in solution of potassium hydrate free from carbonate, filtering, and passing into the filtrate CO_2 to saturation; after standing some days the capsaicin crystallizes out, and is purified by washing with water and cold benzin.

Contents of the Aril of the Nutmeg. A. Tschirch. (*Pharm. Journ.*, 3rd series, xix. 411.) The author states that the aril of *Myristica fragrans* furnishes a good illustration of the presence of amylodextrin as a normal cell-content in the place of starch. It is distinguished from true starch by being stained reddish brown instead of blue by an aqueous solution of iodine. The grains of amylodextrin do not appear to contain even a nucleus of starch. They have usually somewhat the form of a rod, and are often curved or coiled; less often they are roundish or disc-shaped; they do not usually exhibit any evident stratification. The matrix in which the grains of amylodextrin are imbedded consists chiefly of oil, but contains also small quantities of a protoplasmic substance which is stained by rosin and some dextrin, with a small quantity of sugar. Scattered through the parenchymatous tissue are a large number of round oil-cells. They have suberized cell-walls, and in the mace of commerce are partially filled by an oily or resinous mass of a yellow or yellowish brown colour, the yellowish red pigment of which can be extracted by alcohol. When living,

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formula $C_{30}H_{46}O_{12}$, $7H_2O$, and part with 6 molecules of water at 100° C. The yield obtained from the seeds amounted to as much as 4·7 per cent.

The Relative Merits of Strophanthus and Digitalis as Cardiac Remedies. Dr. D. G. Evans. (*Chemist and Druggist*, December, 1888.) The author gives particulars of a number of cases which he has treated with strophanthus, and from the experience gained he asserts that the new remedy is much superior to digitalis, especially in mitral complaints and cardiac failures. In his opinion, when a patient is properly under the influence of strophanthus, it prevents an already dilated heart from assuming the same amount of dilatation after each systole as there previously existed, and this depends on the power which strophanthus possesses in maintaining the cardiac muscular fibres in a state of contraction. The author has never found strophanthus to cause the heart to beat irregularly, or to make the pulse more rapid in action, even when given in very large and continued doses, as is repeatedly observed with large doses of digitalis; neither is it cumulative in its action. The addition of nux vomica seems to accelerate and aid the therapeutical effects of strophanthus.

The Diuretic Principle of Strophanthus. E. Catillon. (*Soc. de Thérap.*, December 26; *Répert. de Pharm.*, January 10, 1889; *Amer. Journ. Pharm.*, March, 1889.) After having separated strophanthin from the seeds, the author isolated a non-toxic, nitrogenous principle, which, tried first upon rabbits and then upon himself, he found to be the diuretic principle of the plant. To obtain it, the author, after first exhausting the seeds with alcohol, treats them with distilled water, afterwards adding milk of lime, and filtering. A current of carbonic acid is then passed through the filtered liquid, which combines with the excess of lime. The liquid is then evaporated to a syrup, again filtered, and then evaporated in vacuo. The product is soluble in water and in alcohol at 70°; less soluble in stronger alcohol. The product is a sort of strophantate of lime, which gives a precipitate with hydrochloric acid.

Tanghinia Venenifera. A. Arnaud. (*Comptes Rendus*, June 17, 1889.) Tanghinin, the poisonous principle of this tree is found by the author to be concentrated in the kernel of the fruit. The oily matter, which forms about 75 per cent. of the kernel, is perfectly harmless. Tanghinin is a heart-poison, approximating to strophantine and ouabaïne, but, unlike these two, it has a general convulsive action. From 2·550 kilos. of the kernels the

author obtains 25 grams of pure crystalline tanghinin. It is colourless, and crystallizes in rhombs from its alcoholic solution. It is anhydrous, and gives no coloured reactions. It melts at 182° to a transparent liquid, and if heated more strongly it burns without any residue. It is very sparingly soluble in water, moderately soluble in ether, and freely soluble in strong alcohol. It deflects the plane of polarised light to the left. If heated with dilute acids it is decomposed, yielding a yellowish resinous product. No reductive sugars are formed, such as are obtained from ouabaïne, strophantine, and the other glucosides. It contains rather more carbon than ouabaïne and strophantine, but like the two latter, no nitrogen. It is therefore neither an alkaloid nor a glucoside.

Pharbitis Triloba as a Substitute for Jalap. M. K. Hyrano. (*Pharm. Journ.*, 3rd series, xix. 270.) The author discusses the value of this species, a native of Japan, for medicinal purposes. He states that the purgative properties of the official species of convolvulaceæ are due to the presence either of convolvulin, $C_{31}H_{50}O_{16}$, or of oxyzabin, $C_{34}H_{56}O_{16}$ (jalapin of W. Meyer). The drugs used in commerce are jalap root, orizaba root, scammony root and turbit root. Jalap root contains convolvulin, but that of *Ipomœa Orizaba* jalapin, which has a homologous composition with convolvulin, but differs from it by its solubility in ether and chloroform. Scammony root also contains orizabin; the resin contained in turbit root appears to consist at least partially of the same substance as that of orizaba root. The purgative properties of the seeds of *Pharbitis Nil* are due to convolvulin. The native name of *Pharbitis triloba*, of Japan, is "asagawo," and its seeds have long been used as a purgative under the name "kengashi."

A full botanical description of the plant, and in particular of the seeds, follows.

To extract the active principle, 400 grams of the finely powdered seeds were twice boiled in alcohol of 90 per cent., filtered, and the pure filtrate decomposed by acetate of lead. The liquid filtered from the lead precipitate, after removing the excess of lead by sulphuretted hydrogen, was evaporated in the water-bath, by which a resinous mass was obtained. This was kneaded in warm water in order to rid the resin from its soluble impurities; and it was further purified by again dissolving in alcohol and precipitating by water. The resin thus finally obtained in the water-bath weighed 27 grams. It was a brittle, friable substance; ether extracted from it 10·3 per cent. of almost pure oil. The

portion remaining insoluble in ether gave all the reactions of convolvulin. The pure resin was easily soluble in alcohol, but insoluble in bisulphide of carbon or chloroform; after treatment with dilute hydrochloric acid it reduced alkaline copper solution. Like convolvulin, it exhibited the chemical properties of a glucoside, splitting up, under the action of mineral acids, into sugar and convolvulionic acid, $C_{18} H_{28} O_8$, which forms a crystallizable salt with barium, soluble with difficulty in water, but readily in alcohol.

The author concludes that the resin obtained from *Pharbitis triloba* may be used in the place of resina jalapæ.

Jambul in Diabetes. Dr. C. Graeser. (*Centralblatt für Klinische Medicin; Chemist and Druggist*, xxxv. 85.) The author describes a series of experiments with the extract of the fruit of *Syzygium jambolanum* on dogs, which had previously been made diabetic by the administration of phloridzin. His results lead to the following conclusions:—

1. Phloridzin diabetes is considerably lessened by jambul extract.

2. Jambul extract is non-poisonous, and does not cause any ill effect.

3. The active principle contained in jambul is not yet known. It will have to be determined by careful analysis and further experiments.

Assay of Nux-Vomica. A. Kremel. (*Archiv der Pharm.* [3], xxvi. 899, from *Pharm. Post.*, xxi. 534.) Five grams of the finely-powdered nux-vomica seeds is treated in an extraction apparatus with 40 c.c. of a mixture of three parts of chloroform and one part of alcohol for two to three hours. The extract is agitated with 25 c.c. of 10 per cent. sulphuric acid, and again with 15 c.c. of the same acid, the acid solution is separated from the chloroform in a separating funnel, and made alkaline with ammonia, after which the free alkaloid is shaken with 25 c.c. of chloroform. The chloroform solution is evaporated in a tared glass dish, and the residue is weighed. Numerous results obtained during the year have varied from 1·84 to 2·76 per cent., the average being 2·5 per cent.

The Bitter Principle of Catalpa Bignoniodes. E. Claassen. (*Amer. Chem. Journ.* x. 328–330.) *Catalpin*, the bitter principle of *Catalpa bignonioides* may be isolated as follows:—The fruit or bark is extracted with alcohol, the solution evaporated, the residue dissolved in water, precipitated by lead acetate, the filtrate mixed

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Posselt's hederic acid, obtained from the fruit of the ivy, is not an acid. Posselt's results were confirmed as to the presence of hederatannic acid, oleic acid, and another acid, and glycerol. Cholesterin was also found in the fruit. From the leaves was obtained *hederaglucoside*, $C_{33}H_{52}O_{10} + 2H_2O$, which loses 1 mol. of water at 100°.

Constituents of Lupin Seeds. G. Baumert. (*Archiv der Pharm.* [3], xxvi. 433–440.) All lupins contain several alkaloids, amounting to 0·04 to 0·81 per cent. The author has found in yellow lupin the crystallizable alkaloid lupinine, $C_{21}H_{40}N_2O_2$, and the liquid lupinidine, $C_8H_{15}N$. In the blue lupin only a liquid alkaloid has been investigated, which Hagen has named lupanine; its composition is $C_{15}H_{25}N_2O$. Campani has obtained yet another alkaloid from the seeds of *L. albus*.

Other nitrogen compounds of the amide-group have not been isolated from the ungerminated seed; but after germination a series of compounds produced by the decomposition of the albumen has been obtained by Schulze, Barbieri, and Steiger: asparagine is the principal product, and there are besides phenylamidopropionic acid, amidovaleric acid, leucine, tyrosine, xanthine, hypoxanthine, lecithin, peptone, and arginine, $C_6H_{14}N_4O_2$, a base analogous to creatinine. Choline also was detected.

Schulze and Barbieri found a new glucoside in *L. luteus* of the composition $C_{32}H_{32}O_{16}$, which they named lupinin, but it is better called lupiniin, to distinguish it from the similarly named alkaloid. It crystallizes in fine needles, dissolves in alkaline solutions with a yellow colour, and on treatment with acids takes up 2 mols. H_2O with the formation of lupigenin, $C_{17}H_{12}O_6$, and glucose. Hot water also produces the reaction.

Plantago Psyllium. R. W. Bauer. (*Annalen*, ccxlviii. 140–144.) The author has isolated a carbohydrate from the epidermis of *Plantago psyllium* by boiling the aqueous extract with dilute sulphuric acid. The product was identified with xylose.

Dialium Nitidum. E. Heckel. (*Répertoire de Pharm.*, 41; *Pharm. Journ.*, 3rd series, xix. 508.) The fruit of *Dialium nitidum*, a small African leguminous tree, has been examined by the author, who finds it to contain tartaric acid, bitartrate of potash, tannin, glucose, and colouring matter. It is eaten by the negroes in Western Africa, and approaches in character the fruits of the baobab in possessing cooling and antifebrile properties. In the Mandingo language it is called "solomé," but is also called in other dialects solom or sorom, kocito, monké, and méka.

Adansonia Digitata. E. Heckel and F. Schlagdenhauffen. (*Nouv. Rem.*, 1888, 385.) The pulp of the fruit of the baobab tree (*Adansonia digitata*) is successfully used by the natives as a remedy in dysentery. It contains 12 per cent. of potassium bi-tartrate, and 2 per cent. of free tartaric acid, besides tannin, gum, mucilage, and glucose. The seeds contain albuminous matter associated with 38 per cent. of fat.

Adulteration of Linseed Meal. Dr. E. Eidam. (*Biedermann's Centralblatt*, xviii. Part 2.) The adulterant is the residue of castor-oil seeds, a poisonous purgative. The recognition of this fraud is effected by means of low microscope powers, when the characteristic longitudinal marbling of the castor-oil seeds is detected.

Muffe. E. Perroncito and L. Varalda. (*Pharm. Journ.*, 3rd series, xix. 108.) In the neighbourhood of the thermal springs of Valdieri, near Cuneo, in Piedmont, a substance is largely used for curative purposes under the name of "muffe" (mould), and is for this purpose extensively cultivated on the surface of wet inclined rocks. It occurs as a scum on the surface of hot springs of a temperature from 56° to 69° C., more or less impregnated by sulphuretted hydrogen; an establishment in the neighbourhood of the springs of St. Martino and St. Lorenzo having a speciality for the cultivation and export of this substance. The authors have investigated the composition of this singular substance, and contribute the results to the Italian botanical journal *Notarisia*. They find it to consist almost entirely of a dense weft of filaments of a filiform schizomycete, *Leptothrix valderia*, among which are interspersed filaments of an *Oscillaria*, and cells of a *Glœocaspa*.

Constituents of Lycopodium Spores. M. Langer. (*Chem. Zeit.*, 1888, 912; *Pharm. Journ.*, 3rd series, xix. 64.) A commercial sample of lycopodium was found to contain 93 per cent. of pure dried spores, and to yield 1·555 per cent. of neutral ash, consisting principally of phosphates of potassium, sodium, calcium, magnesium, iron, and aluminium, with small quantities of chlorides, sulphates, and silica. The ash contained 45·17 per cent. of phosphoric acid and only traces of manganese. The ready inflammability of the spores, and their resistance to moisture, are attributed to an oil having an acid reaction, which was found present to the extent of 49·34 per cent. This oil is easily altered by atmospheric oxygen, becoming turbid and separating a crumbling, unctuous mass, and the oxidation probably goes on in the spores when kept. The oil contains 80–86·7 per cent. of α-decyl-β-isopropylacrylic acid, besides solid fat acid, probably consisting principally of

myristic acid. The glycerine found varied from 2·8 to 5·2 per cent. The author thinks it probable that the oil from fresh spores would be neutral. Besides the foregoing constituents, 2·1 per cent. of cane sugar was found, and the nitrogen amounted to 0·857 per cent. Upon warming the spores with potash solution, methylamine was given off, and upon fusing caustic potash with them a small quantity of a white crystalline benzol compound was formed, that was coloured red-brown by ammonia, and appeared capable of being used as an indicator.

The author also records the curious observation that alcohol, with which the spores were left in contact for fourteen days in loosely-closed vessel, was oxidized to aldehyd.

A New Constituent of Ergot. C. Tanret. (*Comptes Rendus*, cviii. 98–100.) On treating ergot with several times its weight of alcohol, then removing the alcohol by distillation, extracting the residue with ether, and allowing the ethereal solution to evaporate, an oily residue containing crystals is obtained. These crystals were formerly regarded as cholesterin. If these crystals are drained, and re-crystallized first from alcohol containing alkali, and afterwards from pure alcohol, they are obtained in a pure state. The yield of the pure product from ergot is about 0·2 per cent.

These crystals are a new principle described by the author under the name of "*ergosterin*." They have a composition corresponding to the formula $C_{26} H_{40} O_2 + H_2 O$, and lose their water at 110° C. They are lævogyrate, fuse at 154° C., and are soluble in alcohol, ether, and chloroform. They completely dissolve in sulphuric acid without discoloration, and this solution, when agitated with chloroform, imparts no colour to the latter. This behaviour distinguishes them from cholesterin.

Ergotin. J. C. Husband. (*Pharm. Journ.*, 3rd series, xix. 498–500.) In a lengthy note on this subject, the author calls attention to serious variations occurring in the nature and composition of this preparation, and traces these variations to the vagueness in the directions given in the Pharmacopœia. Instead of evaporating the fluid extract to a "syrupy consistence," he advocates evaporation to a definite volume or a definite specific gravity before the addition of the rectified spirit. He also suggests that a character or test should be introduced, requiring the finished product to be soluble in a mixture of spirit and water of a certain definite strength.

Lactucarium. A. Kremel. (*Pharm. Centralhalle*, 1888, 512, *Amer. Journ. Pharm.*, December, 1888.) The author has found in

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Ludwig. He finds it to contain about 8·3 per cent. of glucose, 4·1 per cent. of cane sugar, or an analogous sucrose, and about 50 per cent. of a new sugar, which he proposes to call chirkhestite. He separated it by removing the glucose and sucrose by fermentation with beer yeast. Chirkhestite has a composition represented by the formula $C_6H_{14}O_6$, and appears to belong to the mannite group: it is nearly related to sorbite, sorbite melting a little below 100° C., and chirkhestite at 112° C. Sorbite does not affect polarized light, but chirkhestite does, although it appears doubtful whether or no this action is due to impurities Chirkhestite dissolves in less than half its weight of cold water. There seems to be some mistake about the origin of the chirkhest, which is probably identical with the shirkhist described in "Pharmacographia," and which Haussknecht affirms is derived from *Cotoneaster Nummularia*. This source has been since confirmed by Dr. J. E. Aitchison, who brought both the manna and the plant yielding it back from Afghanistan. The relationship of chirkhestite to sorbite would thus become more clear, since cotoneaster and the tree yielding sorbite, *Pyrus Aucuparia*, both belong to the pomiferous section of *Rosaceæ*. The author gives an illustration of the crystals formed by the action of nitric acid on the new sugar, and of the crystals of bidenguebinose, which may prove useful for future reference to students of the group of sugars, a group which at the present time seems to be receiving a considerable amount of attention. The second variety of manna, bidenguébine, is said to be also derived from the leaves and young branches of a willow, and to have a feebly saccharine taste, It affords about 12 per cent. of sugar, estimated as glucose, and a considerable quantity of a sugar crystallizing in opaque hard crystals, like those of sugar of milk. It melts at 150° to a transparent liquid and dissolves in 5·5 parts of water at 15° C. The formula is given as $C_{12}H_{22}O_{11}$. This sugar possesses considerable affinity to melezitose, from which it differs, according to the author, in not being efflorescent, and in the greater rotatory power of the glucose derived from it by inversion over that obtained from melezitose. The inversion by means of dilute hydrochloric acid also takes place more rapidly. He therefore proposes to call the new sugar "bidenguebinose." The similarity in name of this manna, as well as in its composition, to the alhagi manna or tur-anjabin (the product of *Alhagi Camelorum*, Fisch.), is remarkable. Villiers showed that manna to contain cane sugar, a dextro-gyrate glucose and melezitose.

Assay of Manna. A. Kremel. (*Pharm. Post*, 1888, 454.) According to the German Pharmacopœia, manna, when boiled with alcohol of 90 per cent., should not leave more than 20 per cent. of insoluble residue. The author considers it better to dissolve 1 part of manna in 1 part of water by the aid of gentle heat, then to add 10 parts of alcohol of 90 per cent., and to boil the mixture and filter. The filtrate, upon evaporation on a water-bath, leaves pure mannite, which should not amount to less than 75 per cent.

Catechu and Gambier. H. Trimble. (*Amer. Journ. Pharm.*, October, 1888.) The extract of *Acacia Catechu* is known in commerce as *cutch*, and that from *Uncaria Gambier* as *gambier*; the former of these is officinal in the U.S.P., and the latter in the B.P. Catechu is a term applicable to either or both. In order to determine the question which of these two articles is to be preferred for therapeutic purposes, the author undertook a chemical examination of six representative samples.

No. 1, Cutch. "S.M." brand, in good repute in United States.

No. 2, Cutch. "M.M." brand, in good repute in England, and obtained from a Bradford dyer.

No. 3, Cutch. Brand not known, purchased of a wholesale drug firm in Philadelphia.

No. 4, Gambier. In masses, from a wholesale drug firm of Philadelphia.

No. 5, Gambier. In cubes, dark, direct from importer.

No. 6, Gambier. In cubes, light, direct from importer.

The results are embodied in the following table:—

Sample No.	Cutch.			Gambier.		
	1	2	3	4	5	6
Catechin	2·80	1·70	10·70	12·64	7·76	19·76
Catechu-tannic acid	31·94	33·74	25·50	33·34	47·18	45·90
Total valuable constituents . . .	34·74	35·24	36·20	45·98	54·94	65·66
Mucilage	27·40	29·01	20·50	10·13	15·20	16·05
Ash	2·29	2·27	2·10	4·74	3·37	3·50
Moisture	12·50	12·20	15·36	10·33	11·03	9·90
Colouring and other inert matter . .	23·07	21·28	25·84	28·82	15 46	4·89
	100 00	100·00	100·00	100·00	100·00	100·00

The catechin was determined by agitating the aqueous solution with ether. The catechu-tannic acid was estimated by treating

the samples with "hide powder" in the well-known manner. After estimating these two main constituents, as well as the gum, ash, and moisture, the colouring and other inert matter was found by difference.

The author arrives at the following conclusions :—

1. Gambier has more available astringency.
2. If in cubes it cannot be so easily adulterated.
3. Being more carefully dried, it is more easily powdered than cutch, and without the further application of heat.
4. The cubes are more uniform in composition, and are not liable to contain mordants added for the use of dyers.

The Soluble Gum of Tragacanth. J. M. Maisch. (*Amer. Journ. Pharm.*, February, 1889.) The author calls attention to the fact that the gummy constituent dissolved from tragacanth by cold water is precipitated by alcohol, and points out that though this fact has been known for a long time, erroneous statements to the contrary which occurred in older text-books have been repeated in modern works, and have again found their way into modern Pharmacopœias. The evident object of this paper is to prevent a further perpetuation of an obvious and acknowledged error.

Note on a New Adulterant of Pulvis Acaciæ. J. H. Wilson. (*Pharm. Journ.*, 3rd series, xix. 969–970.) The adulterant detected by the author in a sample of powdered gum arabic consisted of rice starch, and amounted to about 15 per cent.

Sonchus Oleraceus. S. F. Landry. (*Med. Bull.*, July, 1888. From *Pharm. Journ.*) According to the author, the brownish gum formed by evaporation of the juice of the common sow thistle (*Sonchus oleraceus*), when taken internally in a dose of two to four grains behaves as an "intensely powerful hydragogue cathartic," and acts powerfully upon the liver, duodenum, and colon. In its general effects it is said to most resemble elaterium, producing large and watery discharges, so that it has proved a valuable therapeutic agent in ascites and hydrothorax. It requires, however, great care in its administration, since it has the disadvantage of griping like senna, and producing tenesmus like aloes. To counteract this, and to "correct its fierce attacks on the mucous membrane of the intestinal tract," the author recommends that the gum should be administered in combination with manna, aniseed and carbonate of magnesia, or with stimulants and aromatics.

Note on Gamboge. G. H. Hurst. (*Pharm. Journ.*, 3rd series, xix. 761.) The author has made an analysis of a sample of gamboge with the following results :—

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Adulterated Asafœtida. M. Moerner. (*Journ. de Pharm. et de Chim.*, 1889, 241.) The sample reported upon contained only about 5 per cent. of the genuine drug, the remainder being composed of resinous-looking pieces or fragments, consisting of alabaster, more or less coated with a thin layer of asafœtida resin. The mineral matter amounted to 86 per cent.

Composition of the White Resin from Pinus Sylvestris. V. Shkateloff. (*Journ. Russ. Chem. Soc.*, 1888, xx. 477–485; *Journ. Chem. Soc.*, April, 1889.) Owing to the discrepancies in the results obtained with the resin of *Pinus maritima*, *P. larix*, and *P. abies*, and the uncertain composition of pimaric, sylvic, pinic, and abietic acids, the author has investigated the crystalline acid from the Russian resin obtained from *Pinus sylvestris*, growing in the Archangel and Wologda Governments. In order to remove the uncrystallizable substances, the resin, ground fine, was extracted with alcohol of 50–60 per cent. (Maly, *J. pr. Chem.*, lxxxvi. 111), and the residue, which was much whiter than before, was now treated with boiling spirit; the filtered alcoholic solution, after remaining some time, becomes almost entirely converted into a crystalline mass. The crystals were washed with alcohol of 85 per cent., and again recrystallized. After thrice repeating this process, 30 per cent. of a perfectly white product was obtained; whereas on repeating the same process with a resin that had been exposed to the action of air for one year, only 20 per cent. was obtained. In order to prevent this from becoming yellow and oxidizing in the air, the operations have to be carried on as quickly as possible; finally, a compound, melting at 143°, was obtained. The acid, $C_{40}H_{58}O_5$, is insoluble in water, but easily soluble in alcohol, ether, acetic acid, and liquid hydrocarbons. After fusion, it solidifies to an amorphous, transparent mass, and when heated above 360°, a colourless, uncrystallizable distillate passes over.

The acid agrees in its properties with Maly's abietic acid, but differs from it in composition. The resinification of the acid when exposed to the air consists in an oxidation accompanied by loss of water.

The Oleoresin of Male-Fern. W. G. Greenawalt. (*Amer. Journ. Pharm.*, April, 1889.) The author has tested the relative efficacy of both the clear fluid portion and the sediment of the ethereal extract of male-fern. He finds both to be active tænicides, the sediment being the more active of the two. The latter is also considered by him as more convenient for administration.

Resin from the Flower Buds of Populus Tremuloides. R. Glenk. (*Amer. Journ. Pharm.*, May, 1889.) On macerating the coarsely-cut fresh buds with alcohol, a dark amber-coloured tincture was obtained, which on concentration by evaporation and pouring into water precipitated a yellowish brown resin with a strong hop-like odour, and melting at 51° C.

It is soluble in glacial acetic acid, acetic ether, and amyl alcohol; only slightly soluble in chloroform, ether, carbon disulphide, terpentine, and benzol.

In alcoholic solution it has an acid reaction. On adding 1 drop of tincture of chloride of iron to 3 c.c. of an alcoholic solution (1–50), a dark green colour is produced, and the addition of a solution of chlorinated soda to the alcoholic solution produces a jet black colour. It is completely soluble in K O H, 5 per cent., to a brown-red solution, and is reprecipitated on the addition of an excess of acid. On oxidizing the solution in 2 per cent. caustic potash, a peculiar play of colours was noticed from an emerald to a dark green, then to violet, and after five minutes to a deep carmine red, with a distinct odour of oil of bitter almonds (due probably to cinnamic acid or some anthracene derivatives).

The resin is not entirely soluble in an excess of water of ammonia even on warming; on filtering and evaporating the filtrate, part of the resin is reprecipitated, while a portion remains soluble in water and on addition of a neutral solution of ferric chloride to the aqueous solution a brown precipitate is produced which on addition of dilute hydrochloric acid is changed to a light yellow colour.

On adding to 1 grain of powdered resin 1 c.c. of fuming nitric acid, a dark green solution is formed, afterward changing to dark brown, reprecipitated on adding water. With H_2SO_4 specific gravity 1·82, a dark red solution is formed which is precipitated on adding water. With HCl, specific gravity 1·160, no change; and with a solution of bromine in chloroform (1–20), no change was observed.

Heated on platinum foil, the resin burns and leaves but a minute residue of Na_2CO_3.

Shellac. R. Benedikt and E. Ehrlich. (*Monatsh.*, ix. 157–164.) When shellac, previously freed from fat by boiling with sodium carbonate, is boiled with caustic alkalies for two hours, and the cold solution acidified with sulphuric acid, about 70 per cent. of a viscous, liquid shellac is precipitated. The product is extracted with ether, and purified by means of the magnesium

salt ($C_{46}H_{70}Mg_2O_{13}$). It is a thick viscous liquid, which becomes mobile when heated, and is only very sparingly soluble in boiling water, but dissolves readily in alcohol and ether. The alcoholic solution is precipitated by water. When heated, water is evolved, and on cooling a solid mass, very similar to ordinary shellac, is obtained. The acid value of liquid shellac is nearly three times as great as that of ordinary shellac, 1 gram requiring 0·204 gram of potash for complete saturation. From this datum, and from the elementary analysis, the formula of liquid shellac is probably $C_{46}H_{72}O_{12}$. A mixture of ordinary and liquid shellac is obtained by boiling two portions of shellac, one with sodium carbonate, the other with soda, separating the wax and acidifying the cold mixed solutions with acetic acid. It is a plastic resin, which when free from acid retains its plastic condition for a considerable time, but after several months gradually begins to harden at the surface. The alkaline-earth salts of liquid shellac are soluble in cold water in all proportions; they are precipitated as thick liquids when the solution is boiled, but redissolve completely on cooling. When an aqueous solution is evaporated over sulphuric acid, a completely transparent residue is obtained, which after some time becomes opaque. These salts are very brittle, and even in the dry state are very readily soluble in cold water. The *barium* salt is obtained by neutralising an alcoholic solution with baryta-water. A solution of the magnesium salt gives with lead, silver, and zinc salts white precipitates which form resinous masses when warmed.

Shellac freed from wax yields 20 per cent. of azelaic acid when boiled with potash and potassium permanganate, products smelling like butyric acid being also formed. Shellac is completely converted into azelaic acid and fatty acids by potassium permanganate, when the residual resin is again boiled with the permanganate, and the process repeated until the whole is oxidized.

Chemical Examination of Resins, Gum-resins, and Balsams. E. Dieterich. (*Pharm. Post.*, 1889, 336; *Amer. Journ. Pharm.*, 1889. 357.) The suggestion made by Kremel to examine the above classes of substances by Hübl's method of examining waxes (see *Amer. Journ. Pharm.*, 1888, 561), was carried out by the author with results which indicate the value of the method in examining the balsams. The figures given represent the extremes:—

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somewhat deficient in chloroformic extract. No. 3, an unsatisfactory specimen. No. 4, typically pure podophyllin.

The B.P. allows resin of podophyllum to vary in colour "from pale yellow to deep orange brown," and practically the colour has little to do with the matter, providing the resin is in all other respects satisfactory. The conditions producing such different results are (1) the length of the time the spirituous solution has been treated during the recovery of the bulk of the spirit; (2) and the heat employed in drying the final product. The B.P. article is required to be "soluble in rectified spirit and ammonia," and the official process gives a product answering completely these tests. The process, however, is worked with considerable difficulty, as the bulk of the precipitated resin remains suspended in the liquid and clogs up the filter when filtration is attempted.

As regards the acid process of the 1867 Pharmacopœia and that of the U.S.P., the author considers the proportion of acid in both cases to be greatly in excess of what is repuired. He recommends a modified acid process, in which a much smaller quantity of acid is employed, and which yields a very good pale straw-coloured product, perfectly soluble in rectified spirit and ammonia.

The commercial bright yellow varieties obtained with the aid of alum are all imperfectly soluble in spirit. A tincture made from alum-podophyllin is very distinctly fluorescent, reminding somewhat of a tincture of tumeric made with strong spirit.

Assay of Podophyllin. A. Kremel. (*Pharm. Post.*, 1889, 105.) Podophyllin may be assayed by extracting 1 gram with cold chloroform, evaporating the greater portion of the solvent, and pouring the solution into twenty volumes of petroleum ether; the podophyllotoxin is collected upon a tared filter, dried, and weighed. Commercial samples of podophyllin yield from 20 to 30 per cent. podophyllotoxin.

Examination of a Sample of Green Euonymin. H. S. Collins. (*Chemist and Druggist*, 1889, 337.) Physical appearance: a rather light, somewhat sticky powder, of a pea-green colour, with small black particles, as if a mixture of two substances, and of a peculiar heavy odour.

Under the microscope the "euonymin" was seen to consist of a large percentage of lycopodium coloured green; the black particles had no definite formation. Broken, transparent, colourless crystals were also observed, which were very slowly dissolved by a drop of water placed upon the slide. A drop of solution of potash dissolved them immediately.

An analysis was made, with the following result:—

	Per cent.
Lycopodium	29·8
Dark green resin, consisting chiefly of extract Indian Hemp	15·2
Water extract: Bitter extractive matter	20·6
Sugar of Milk	30·0
Water	4·4
Total	100 0
Ash	1·2

Note on Green Euonymin. J. W. Thomson. (*Pharm. Journ.*, 3rd series, xix. 769, 770.) A recent statement by Collins (preceding abstract) respecting the occurrence of extract of Indian hemp as an adulterant, has induced the author to publish the results of his analyses of commercial samples of green euonymin. One of these samples seemed to have been made by first exhausting the bark with strong spirit, and then with weak spirit, mixing the two tinctures, and precipitating with alum; while the other samples proved to be true euonymin mixed with lycopodium and sugar of milk as diluents, and coloured with some green colouring matter, using oil as a medium. No extract of Indian hemp was found in any of the samples. The author regards the use of this extract as an adulterant of euonymin as very unlikely; and unless its presence in the sample reported upon by Collins was merely accidental, he is inclined to regard the observation as due to an error.

Note on the Colouring Matter in Green Euonymin. W. Gilmour. (*Pharm. Journ.*, 3rd series, xix. 852.) The anthor finds that the green colouring matter in euonymin is chlorophyll, which is changed from the ordinary chlorophyll to a brighter green by the action of copper.

Proximate Analysis of Green Euonymin. A. Percy Smith. (*Chemist and Druggist*, June 29, 1889.)

Petroleum Ether extract	21·38
Ether extract	30·28
Alcohol extract	11·47
Residue	35·47 (ash 19·14)
Moisture	1·40
	100·00

The extracts and residue are green; the ethereal and alcoholic extracts show evidence of the presence of a glucoside; the ash

consists of carbonate of lime, soda, a little alum, with traces of iron and copper.

Note on Two Resins used by the Ancient Egyptians. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xix. 387–389.) The resins described by the author date from the sixth century B.C. and the second century A.D. The former is shown to be identical with Chian turpentine, and the latter as probably with Siam benzoin. For particulars respecting this very interesting account, we refer the reader to the original article.

Benzoin. T. F. Moody. (*Amer. Journ. Pharm.*, 1888, 606.) The author assayed ten commercial samples of benzoin, by digesting and afterwards boiling in each case 20 grams with 10 grams of slaked lime and 200 grams of distilled water; the decoction was filtered, the residue well washed with hot water, the filtrate cooled and acidulated with hydrochloric acid. The precipitate was collected on a filter, washed with cold water, the filtrate agitated with chloroform, the chloroform solution evaporated, and the residue added to the contents on the filter. After drying, the benzoic acid thus obtained was weighed, amounting for the samples examined to 2·14, 3·20, 3·40, 3·55, 4·0, 5·02, 5·50, 9·05, 9·72, and 10·45 per cent. In each case the presence of cinnamic acid was shown by the bitter almond odour produced on treatment with potassium permanganate. The author also states that he observed the white tears to yield a much smaller amount of benzoic acid than the brown mass, but analytical figures are not given.

A Simple Test for some Impurities of Balsam of Tolu. R. A. Cripps. (*Pharm. Journ.*, 3rd series, xix. 422.) About 30 grams of the sample are digested in bisulphide of carbon for about fifteen minutes, keeping it gently warm by occasional immersion in hot water. The clear liquid is poured off, evaporated to dryness, and when cold, sulphuric acid added to dissolve the resinous extract. A bright red-rose coloration is produced, which in the case of genuine tolu remains of a distinctly rose hue for some considerable time. If, however, the sample be adulterated with either storax or ordinary resin, the rose colour rapidly becomes more brown in tint. The best way to apply the test is by performing the operation upon a genuine sample by the side of the suspected one. In this way a distinct difference in tint can be observed if only 1 per cent. of the adulterant be present; with 4 per cent. of resin, or rather more of storax, the difference in tint can be readily distinguished without the blank experiment. If to the sulphuric

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by a disengagement of heat, which is sufficient to raise its temperature from the point at which solidification begins up to its *ordinary or true congealing point*. The solidifying points of star-anise oil hitherto quoted have been *abnormal ones*, due to their determination whilst the fluid was at rest. The *true congealing point* is the temperature to which the thermometer immediately rises, on this solidification taking place. The oil of pimpinella does not present such a marked difference in respect of its *abnormal and true* congealing points, but that of star-anise presents a strange dissimilarity. The fact is illustrated by the following determinations :—

Source of Oil.	Abnormal Solidifying point.	True Solidifying point.	Colour reaction with Alcoholic H Cl
	Degrees, Fahr.	Degrees, Fahr.	
Star-anise (German) . . .	31	52	Yellowish-brown
Star-anise (own distillation)	24	49	Yellowish-brown
Star-anise (direct import from Macao, China) .	34	56	Pale brown
Star-anise (broker's sample)	36	54	Brown
Anise fruit (German) . .	50	59	Manganese pink
Anise fruit (own distillation)	50	59	Manganese pink, (fading quickly).

This table shows that the margin allowed by the Pharmacopœia for the pimpinella oil, viz., from 50° to 60° F., is practically the difference between the abnormal and normal solidifying points, and is therefore correct; but that the congealing point quoted for star-anise oil is its *abnormal one*, and is therefore incorrect. Moreover, that between the true or *normal* solidifying points of pimpinella and illicium oils there is practically no difference, and it is only between their *abnormal* congealing points that a wide divergence exists.

In framing "characters and tests" for distinguishing these oils, it is necessary either to give the *abnormal congealing points* (about 50° F. for "pimpinella" oil, and about 35° F. for "illicium" oil) or an easily applicable distinguishing test, such as the one proposed by Eykmann, which the author finds very serviceable, and which consists in the application of a saturated solution of hydrochloric acid gas in absolute alcohol. This reagent yields with "pimpinella" oil a beautiful manganese pink, whilst with "illicium" oil only a pale brown colour is obtained. The test is

more strikingly apparent with the "natural" oils than with oils that have been subjected to rectification, but even in the latter case it is still sufficiently delicate to admit of no confusion.

The author also calls attention to the very marked difference in the odour of authentic specimens of the two oils.

Myrrhtol. Prof. Eichhorst. (*Chemist and Druggist*, January, 1889.) Myrrhtol is distilled from the oil of myrrhta at from 160° to 170° C. It is best given in capsules containing 2½ grains, two or three being administered about every two hours. Thus applied, myrrhtol promises to be of great use in phthisis, as, directly after its administration, the fœtid odour of the patient's breath is quite removed—a most desirable result both for the sufferer and those who are associated therewith. Myrrhtol is not supposed to have any influence on the tubercle bacillus.

Oil of Cajeput. R. Voiry. (*Comptes Rendus*, cvi. 1538–1540; *Journ. de Pharm. et de Chim.*, August, 1888, 149.) The author reports upon a sample of this oil of a beautiful green colour, having a slightly agreeable penetrating odour, a sp. gr. of 0·934, and being lævogyre. It was found to present considerable analogy to oil of *Eucalyptus Globulus*. When submitted to fractional distillation two-thirds of the oil passed over between 175° and 180° C., and proved to be cajeputol, identical with eucalyptol. Below that temperature were obtained butyric, valerianic, and benzylic aldehydes, and a lævogyre terpene ($C_{10}H_{16}$) that formed a crystalline monohydrochlorate. After 180° the distillation was continued at a reduced pressure, and there were separated small fractions of terpilenol ($C_{10}H_{18}O$, isomeric with borneol), acetate, butyrate and valerianate of terpilenol, and a hydrocarbon ($C_{15}H_{24}$) that appeared to approximate to one occurring in the oils of copaiba and cubebs.

Oil of Peppermint. A. Jandous. (*Chem. Centr.*, 1888, 581.) The absence of the usual characteristic odour in some genuine samples of this oil is confirmed by the author, and is attributed by him to the inclination of *Mentha* to form hybrids.

Camphor from the Essential Oil of Ledum Palustre. B. Rizza. (*Journ. Chem. Soc.*, August, 1888, from *Journ. Russ. Chem. Soc.*) A. Gorboff has examined the posthumous papers of B. Rizza, and in his diary finds data according to which the camphor from *Ledum palustre* has the formula $C_{15}H_{26}O$. On heating the camphor with acetic anhydride, two layers are obtained, of which the lower consists of acetic acid, whilst the upper contains a hydrocarbon of the composition $C_{15}H_{24}$, belonging to the class of

sesquiterpenes, $(C_5 H_8)_3$; this is a liquid of sp. gr. 0·9349 at 0°, and 0·9237 at 19°, and boils at 264°. It combines with bromine. The camphor is regarded by the author as a sesquiterpene hydrate. The oil of *Ledum palustre*, seems to be identical with the above hydrocarbon, as after drying it distils in a current of hydrogen at 260–270°.

Oil of Eucalyptus Amygdalina and Eucalyptol. E. Gildemeister. (*Pharm. Zeit.*, 1888, 499.) The author finds that the principal constituent of the essential oil of *Eucalyptus amygdalina* is phellandrene, which has recently been shown by Prof. Wallach to occur also in elemi and in water-fennel (see this volume p. 39). He also confirms the presence in this oil of a considerable proportion of eucalyptol, as well as the identity of that body (eucalyptol) with cineol and cajeputol. The same body is obtained when terpin hydrate is boiled with dilute sulphuric or phosphoric acid.

Composition of the Oil of Cussambrium Spinosum. L. van Itallie. (*Nederl. Tydschr. v. Pharmacie*, May 1889; *Analyst*, June, 1889.) The seeds of *Cussambrium spinosum* contain about 36 per cent. of a soft fat easily soluble in ether, petroleum spirit, and benzol, but slightly so in alcohol. On warming the bulk of the fat melts at 22° C. The author obtained on analysis the following results: Iodine number 53. Insoluble fatty acids, 91·4 per cent. Specific gravity of these acids, ·922 at 15° C.; their melting point, 55° C. One gram of the fat contained free fatty acid corresponding with ·0166 gram of caustic potash. The saponification equivalent was found to be 230. The glycerin was estimated by Hehner's bichromate method, and amounted to 6·3 per cent. The volatile acids were found to be acetic and butyric acids. The presence of oleic acid was proved by dissolving out the lead soap with ether, and weighing the lead oleate. Some of the oil was saponified and the acids thrown up with hydrochloric acid. They were then treated with alcohol of 70 per cent. to remove the bulk of the oleic acid, and next with alcohol of 90 per cent. The insoluble portion proved to be arachidic acid, whilst the neutralised solution gave with magnesium acetate a precipitate which, from its percentage of magnesia and other properties, was found to be a salt of lauric acid. The fat therefore consists of the glycerides of lauric, oleic, arachidic, acetic, and butyric acids. A sample of the oil which had been kept for twenty years had not in the least deteriorated.

Oil of Myrtle. E. Jahns. (*Archiv der Pharm.* [3], xxvii. 174–177.) The sample of oil of myrtle examined was of Spanish

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Colour Reactions of some Essential Oils. A. Ihl. (*Chem. Zeit.*, xiii. 264; *Journ. Soc. Chem. Ind.*, May, 1889.) *Peppermint-oil* mixed with alcohol and a little powdered sugar assumes a bluish green colour when heated with dilute hydrochloric or sulphuric acid. Menthol, which is contained in this oil, does not give the reaction. Phloroglucinol is a very delicate reagent for these essential oils which contain eugenol. Thus *clove-oil*, which consists of eugenol and a sesqui-terpene, $C_{15}H_{24}$, gives a bright red colour when treated with alcoholic phloroglucinol and concentrated hydrochloric acid. Resorcinol employed in the same manner causes a red-violet coloration, and pyrogallol a violet one. *Cinnamon-oil* (cassia-oil) treated as above with phloroglucinol gives a a deep red colour, and with resorcinol a cinnabar red. *Pimento-oil* is coloured pink by phloroglucinol, and dirty violet by resorcinol in alcoholic solutions and with addition of hydrochloric acid. The three last named essential oils, when mixed with alcoholic aniline sulphate and dilute hydrochloric acid, assume a yellow colour, especially on boiling. It is probable that this reaction is due to eugenol contained in these oils.

Tests for the Purity of Essential Oils. R. Eck. (*Chemist and Druggist*, May 11, 1889.) The author founds a process for detecting the oil of pine when used for sophisticating the oil of juniper-berries upon the power of the latter of at once decolorizing a very dilute alcoholic solution of iodine, whilst many essential oils do not show this reaction. The method of applying the test is to dissolve a drop of the oil in question in 3 c.c. of alcohol at not less than 90 per cent., and to add a drop of the tincture of iodine. In a check experiment, in which he added directly oil of turpentine to oil of juniper, and applied the iodine test as above described, the iodine was nevertheless decolorized. In consequence, he distils the oil on the water-bath, and applies the test to the first drop which comes over. Iodine is instantly decolorized by oil of peppermint (Mitcham); in a minute by the oils of ginger and juniper; in two minutes by oils of mint and cardamom; in three to eight minutes by oil of mace. The oils of coriander, caraway, turpentine, rue, sassafras, roses, rosemary, orange, aniseed, fennel, angelica, and wormwood do not decolorize iodine.

Tests for the Purity of Essential Oils. A. Kremel. (*Pharm. Centralhalle*, October 4, 1888; *Pharm. Journ.*, 3rd series, xix. 348.) The author proposes to utilize the differences in the behaviour of essential oils towards alcoholic potash solution as a means of determining their identity and purity. He stated that he had

applied this test to a large number of essential oils, with the following general results. Genuine rose oil contains scarcely any saponifiable constituent, but eight or ten samples of geranium oil, from different countries, each gave tolerably high saponification numbers. Lavender oil gave very high saponification numbers; lemon oil, on the contrary, did not. Artificial bitter almond oil gave higher saponification numbers than the natural oil, and upon decomposing the saponified mass from the latter with acids, a crystalline precipitate was formed amounting to 40 or 50 per cent. of the oil used. A similar precipitate was formed, but in smaller quantity, upon decomposing the soap from peach-kernel and other similar oils, but not from the soap of artificial bitter almond oil. It was thought that probably this reaction might also furnish a basis for a test for aqua amygdalarum and aqua laurocerasi.

The Iodine Absorption Equivalent of Essential Oils. R. H. Davies. (*Pharm. Journ.*, 3rd series, xix. 821–824.) This paper furnishes valuable data respecting the absorption of iodine by a great number of volatile oils. But since the paper is not suited for useful condensation, we must confine ourselves here to a mere reference, and recommend the original to the reader's attention.

Estimation of Carbon Bisulphide in Oil of Mustard. P. Birkenwald. (*Schweiz. Wochenschr. für Pharm.*, 1888, 277.) The author employs the following mode of examination: 1 c.c. is measured into a tared stoppered flask, the weight of the oil ascertained, 10 c.c. absolute alcohol added to dissolve the oil, and agitated after addition of 20 drops of an alcoholic potassium hydrate solution until the odour of the oil has entirely disappeared. The contents of the flask are then dissolved in water, acidulated with acetic acid, and titrated with $\frac{1}{10}$ n. copper sulphate solution (12·47 gram per litre). The end of the reaction is ascertained by obtaining a red coloration or precipitate if a drop of the solution is placed on blotting paper and a drop of potassium ferrocyanide solution added. Each c.c. of the copper solution represents 0·0086 gram carbon bisulphide.

Estimation of Mustard Oil in the Seeds of Cruciferæ. O. Förster. (*Journ. Soc. Chem. Ind.*, March, 1889.) Twenty-five grams of seed or cake prepared from it is rubbed to a thin magma with water, and placed in a 250 c.c. flask, connected with an inverted condenser, the upper end of which is bent so as to dip a few millimetres below the surface of 50 c.c. of alcohol saturated with ammonia, contained in a flask. After half an hour steam is

passed into the magma until the liquid in the upper flask amounts to about 200 c.c., and after twelve hours standing in the closed flask, this is transferred to a beaker, boiled, treated with coarse, flocky precipitated mercuric oxide, and boiled and stirred for a few minutes. Sufficient potassium cyanide is now added to dissolve the excess of mercuric oxide, and the mercuro-ammonium hydroxide. The mercuric sulphide is then collected on a tared filter, washed, dried, and weighed, the weight multiplied by 0·4266 gives the amount of mustard oil decomposed.

Maize Oil (Oil of Corn). J. W. Lloyd. (*Amer. Journ. Pharm.*, July, 1888.) The author's examination of this oil leads him to infer that it is in many respects preferable to cotton-seed oil as a substitute for olive oil. He finds it to be particularly adapted in the making of ammonia liniment, for which cotton-seed oil is practically useless. It saponifies with ammonia immediately, forming with it a smooth, creamy and permanent emulsion. It is found to be useful for all pharmaceutical purposes for which olive oil or cotton-seed oil is used at present.

Laurel-nut Oil. D. Hooper. (*Pharm. Journ.*, 3rd series, xix. 525, 526.) The Alexandrian laurel (*Calophyllum Inophyllum*) is distributed throughout India and Malaya, and is especially abundant on the western coast and in the native State of Travancore. Its thick green and glossy leaves resemble those of a laurel, but the tree is far removed from this family of plants, as it is really a *Guttifer*, belonging to the natural order *Clusiaceæ*. The fruit is about the size of a bantam's egg when ripe, and of a greenish yellow colour; when dry it is brown or black, and has a hard, wrinkled surface. The seed, consisting of two white, closely united hemispherical cotyledons, loses in drying 30 per cent. of water, and the dried seed yields 68 per cent. of fixed oils. This oil is largely used for burning, and is occasionally used for making varnishes and soap. In medicine the oil is employed either alone or mixed with more powerful remedies as a liniment for rheumatism, and is applied to ringworm and various skin eruptions.

The oil has a greenish yellow colour, thick consistence, fragrant odour, and bitter taste. It commenced to congeal at the temperature of 19° C., and became quite solid at 16°, when it had a specific gravity of 0·9315.

The author's chemical examination leads to the conclusion that the laurel-nut oil cannot be regarded as a drying oil, nor altogether as non-drying, but that it must take up an intermediate position between the two. Most of the experiments described in his paper

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cholesterin and small quantities of formic, acetic, and butyric acids were also detected.

Detection of Sesame Oil in Cocoa Butter. P. Zipperer. (*Chem. Zeitung*, xi. 1600.) This adulterant may be detected by gently warming 2 c.c. of the suspected cocoa-butter with a freshly prepared mixture consisting of 1 c.c. hydrochloric acid, sp. gr. 1·18, and 0·05–0·1 gram of cane-sugar; the production of a raspberry-red coloration indicates the presence of sesame oil; pure cocoa-butter under similar circumstances gives a yellowish to dark-brown colour. In this manner, an admixture of $\frac{1}{50}$th per cent. of sesame oil may be detected.

Margosa Oil. C. J. H. Warden. (*Pharm. Journ.*, 3rd series, xix. 325.) Margosa oil is the oil extracted from the almonds of the *Melia Azadirachta*, natural order, *Meliaceæ*, a tree common in India, and known under the name of "nim." The bark, leaves, fruit, and oil are held in high esteem by native and many European practitioners as remedial agents of value, a tincture and a decoction of the bark and a poultice of the fresh leaves being officinal in the Pharmacopœia of India. Preparations of the bark are considered effectual as antiperiodics, chiefly in the milder forms of periodical fever, and as tonics in convalescence after febrile and inflammatory affections. The poultice of "nim" leaves is a common domestic remedy with natives, and is used as a stimulant application to indolent and ill-conditioned ulcers. The oil is used as an external application in rheumatism and as an anthelmintic, and is reported by Dr. A. Hunter to be an insecticide.

Margosa bark was examined by Cornish in 1857, who isolated an alkaloid, which he described under the name of "margosin." The later researches of Broughton, however, indicate that Cornish's bitter alkaloid is probably an amorphous resin. From the bitter oil of the seeds Cornish extracted an acid which he termed "margosic acid," but which he doubted to be capable of affording crystallizable salts. Lepine, who examined the oil, found it to have a specific gravity of ·921, and he describes it as possessing a bitter taste and a garlic-like odour, to congeal at +7° C., and to yield by saponification 35 per cent. of fatty acids, melting at 30° C., and 65 per cent. melting at 44° C.

The oil expressed from the seeds in the author's laboratory had a yellowish colour, a powerful garlic-like odour, and a very bitter taste. The specific gravity at 15·5° C. was 9235; at about 10–7° C. the oil congeals, without losing its transparency. After standing for about thirty-six hours, the recently expressed oil deposited a white

sediment, which, examined microscopically, was found to be amorphous. The soluble and insoluble fatty acids were determined in the manner recommended in Allan's "Commercial Organic Analysis;" the former amounted to 89·1 per cent., the latter to 3·5 per cent. No attempt at separating the fixed fatty acids was made; they probably consisted of a mixture of stearic and oleic acids, with a small amount of lauric acid. The volatile acids consisted of butyric and a trace of valeric acid. The oil was also found to contain a principle possessing the properties of an alkaloid, and besides this a neutral resin, two acid resins, and 0·42 per cent. of sulphur.

Ucuhuba Fat. E. Valenta. (*Zeitschr. für angew. Chem.*, 1889, 3; *Journ. Soc. Chem. Ind.*, March, 1889.) This fat, according to Schädler, obtained from the seeds of *Myristica becuhiba*, Humb., and according to Tschirch from those of *M. Surinamensis*, is of a deep brown colour, and is tolerably firm; it possesses a peculiar aromatic odour, due to the ethereal oils it contains. On heating to 39° it melts, and at higher temperatures it possesses a somewhat disagreeable acrid smell. Treatment with steam removes the ethereal oil and small quantities of volatile acids.

A sample, after treatment with steam, contained 93·4 per cent. of total fatty acids, 8·8 per cent. free of fatty acids. A quantity of the fat was saponified, and the soap decomposed with sulphuric acid. The fatty acids so obtained melted at 46°, and possessed a saponification equivalent of 219–220, and an iodine equivalent of 9·5. Treated with hot alcohol of 96 per cent., and after a time filtered, they left a resinous mass, having somewhat the odour of Peru balsam.

The crystals which separated from the clear liquid melted at 53–53·5°, their saponification equivalent was 245–245·4, and their iodine equivalent 0. They thus consisted of myristic acid. Fractional precipitation with magnesium acetate showed that no other acid was present, with the exception of oleic acid. From the iodine equivalent the author concludes that the fatty acids consist of 89·46 per cent. of myristic acid and 10·54 per cent. of oleic acid.

This is, at all events, favourable to the use of the fat for making candles.

Cod-liver Oil and other Fats. G. Marpmann. (*Apoth. Zeit.*, July 28 and Aug. 1, 516 and 528.) The author arrives at the conclusion that cod-liver oil contains a substance, precipitable by alcohol or ether, which in aqueous solution is capable of imparting to other fats the assimilative properties of cod-liver oil. Further,

that this substance occurs also in the pancreatic juice, and that it is precipitated by tannic acid and reduces copper solution.

A New Constituent of Cod-liver Oil. H. Marpmann. (*Pharmaceutische Centralhalle*, August, 1888.) By repeatedly washing liver oil with alcohol of 95 per cent., the author obtained a peculiar substance, which is soluble in water and insoluble in alcohol, ether, and benzene. In its rotatory power and its behaviour towards Fehling's solution, this substance resembles gum, sugar, and albuminoids, from all of which, however, it can be readily distinguished by the orcin test, which is fully described in the original paper. It has proved identical with a substance obtained by the author from pancreatic juice by the same process. Both products possess alike the property of causing fatty oils to emulsify with water. Liver oils of all shades and from the most diverse commercial sources were found to contain this substance.

Fish Oils. M. Heyerdahl. (*Journ. Soc. Chem. Ind.*, 1889, 54.) The following substances were prepared from 400 kilos. of cod-liver oil, extracted by steam: stearic acid having a constant melting point of 69° C., palmitic acid containing traces of other fatty acids, m.p. 62° C., oleic acid, glycerin, gaduin (formed by a secondary action from some substance still unknown), iodine to the extent of 0·0002 per cent., and traces of bromine. A portion, heated in a current of CO_2, which was then led into hydrochloric acid, yielded trimethylamine, identified by means of its platino-chloride. On a second experiment being made, none was obtained; so that it does not appear to be a constant characteristic product. Volatile acids were detected, but in extremely small quantity.

The influence of the length of time during which the livers were heated on the proportion of free fatty acid in the resulting oil, was then made the subject of experiment. It was found that, contrary to expectation, the percentage of free fatty acid decreased slightly but perceptibly as the time of heating was increased (from 20 to 80 min.) and the temperature raised (from 62° to 85° C.). This effect might be due to the first portions of the extracted oil being richer in fatty acids, or to the presence of volatile fatty acids which were gradually driven off. To settle this point, measured volumes of air were driven through samples of oil heated on the water-bath, when it was found that the percentage of free fatty acid decreased up to a certain point, and then slowly rose to or beyond its original value. This accords with the second hypothesis. (In all these experiments the total amount of free fatty acid was small, never exceeding 0·7 per cent.).

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Adulteration of Spermaceti. M. Farbi. (*Journ. de Pharm. et de Chim.*, xix. 76.) This drug is stated to be frequently adulterated with stearin. This falsification may be detected as follows: The sample is melted, mixed with ammonia, and well stirred. After cooling the ammonia soap is separated from the congealed spermaceti, and acidified with hydrochloric acid, which causes the stearic acid to separate. 1 per cent. of the adulterant may thus be detected.

Adeps Benzoatus. E. Utescher. (*Zeitschr. des oesterr. Apoth. Ver.*, 1889, 145.) The author finds a preparation, made by dissolving one part of sublimed resin-benzoic acid in 100 parts of melted pure lard, keeps as well in every respect as the official *adeps benzoatus*, to which it is superior in appearance.

Detection of Cotton-seed Oil in Lard. M. Bishop and L. Engé. (*Journ. Pharm. Chim.*, 1888, 348; *Journ. Chem. Soc. Ind.*, 1889, 63.) American lard frequently contains as much as 50–60 per cent. of foreign fats, such as olein, "oleomargarin," cotton-seed oil, and cotton-seed stearin, while hard tallow is added to give the product the requisite consistency.

The best means of detecting cotton-seed oil is by the use of Bechi's test, of Labiche's reaction with lead acetate and ammonia, and of the rise of temperature with sulphuric acid. These are executed by the authors as follows:—

1. Bechi's test:—5 grams of the clear melted fat are heated with 20 c.c. of absolute alcohol and 3 c.c. of an alcoholic solution of silver nitrate, containing 2 grams in 250 c.c., for 10 minutes on the water-bath, with continuous shaking. In the presence of cotton-seed oil a coloration appears, which may also be observed in the fat itself on solidifying, and—if the alcohol be decanted off and the cake of fat dissolved in ether or petroleum spirit—in its cold solution.

2. Labiche's test:—25 c.c. of a solution of lead acetate containing 500 grams per litre (heated to about 35° C.) are mixed with 25 grams of the clear melted fat, and 5 c.c. of ammonia (22° B. or sp. gr. ·924), added, with vigorous stirring for some minutes. The colour (orange-red) is observed after twenty-four hours.

3. Rise of temperature with sulphuric acid:—20 grams of the clear fat are allowed to cool to about 30° C., the temperature exactly taken, and 20 grams of sulphuric acid of a specific gravity not less than 1·836 run in, while the mixture is stirred vigorously with a thermometer; when the temperature ceases to rise, it is read off,

and the total rise in temperature thus ascertained. Treated thus, genuine lard gave a rise of temperature of 35° C., with an acid of specific gravity of 1·837; and of 42° C. with one of specific gravity 1·842; while with the former acid a very old sample of cotton-seed oil gave 70° C., and a new one 66° C.

In all three tests the age of the sample does not much affect their value, though with Bechi's test a greater reduction of silver nitrate takes place with a new than with an old oil, and with Labiche's reaction the coloration is more marked in the case of an old oil.

The authors conclude that the *detection* of cotton-seed oil in lard is easy, but that no reliable method exists for its *estimation*.

Wax. M. Hübl. (*Pharm. Zeitschr. für Russland*, 1888, 579.) White wax obtained from yellow wax by sun bleaching does not differ from this in composition; if, however, yellow wax be bleached by use of chemicals, the product is altered considerably, so that it may even be pronounced adulterated by the analyst. The author finds that the ratio of *acidity* to the *compound ether* is as 1:3·7, and this has been confirmed by other investigators.

Acidity represents the number of milligrams of K O H required to neutralize a warmed alcohol mixture containing 1 gram wax; this figure should be between 19 and 21. The *compound ether* figure is obtained by boiling for one hour the above neutralized wax with excess of alcoholic K O H; the neutralized K O H, in milligrams, furnishes the figure, varying between 73 and 76. The *saponification* figure is the sum of the *acid* and *compound ether* figures, and should be between 92 and 97.

The following figures, have been ascertained by the author for wax and some of the possible adulterants :—

	Acidity.	Compound Ether.	Saponification.	Ratio.
Yellow Wax	20·00	73·80	93·88	1 : 3·67
White Wax, sun bleached . .	19·87	74·95	94·82	1 : 3·77
Ditto, chemically ditto, I. .	22·02	76·15	98·17	1 : 3·45
Ditto, ditto, ditto, II. . . .	24·00	74·56	98·66	1 : 3·10
Japan Wax	20·	200·	220·	1 : 10
Carnauba Wax	4·	75·	79·	1 : 19
Tallow	4·	176·	180·	1 : 44
Stearic Acid	195·	—	195·	—
Rosin	110·	1·6	112·6	1 : ·015
Paraffin	—	—	—	—
Ceresin.	—	—	—	—

The Testing of Wax. G. Buchner. (*Chem. Zeit.*, xii. 1276.) Allen has shown that chemically bleached wax differs from wax bleached by exposure to sunlight, in having a greater sp. gr. and higher melting and solidifying points, the author now shows that when examined by Hübl's method, it also has a higher percentage of acid (mean 23·01) and a higher saponification equivalent (98·36), whilst the ratio (1·32) of these numbers is lowered, the corresponding numbers for sun-bleached wax being 20, 95, and 1·37 respectively.

Mel Depuratum. C. Becker. (*Pharmaceutische Zeitung*, 1888, 313.) The author recommends 5 lbs. crude honey, 3 lbs. distilled water, and 2 lbs. alcohol to be mixed, allowed to stand a few days, filtered, the alcohol distilled off, and the residue evaporated. The product indefinitely preserves its light colour.

Dextrogyre Honey. Von Lippman. (*Zeitschr. für angew. Chemie*, 1888, No. 22; *Analyst*, January, 1889.) The author confirms the observation that bees swarming in the neighbourhood of sugar-refineries and feeding on the sugar produce a honey which is very clear and thin, and without the usual aroma. Four samples of such honey, analysed by the author, contained respectively 4·88, 3·92, 16·38, and 9·93 per cent. of saccharose. Samples showing such percentages cannot, therefore, be legally called adulterated.

Food of Larval Bees. A. V. Planta. (*Zeit. physiol. Chem.*, xii. 327–354. From *Journ. Chem. Soc.*, July, 1888.) The substance investigated was the juice or pap, the whitish sticky substance which the working bees store in the cells of the larvæ of the queens, drones, and workers. Leuckart (*Deutsche Bienenzeitung*, 1854, 1855) regarded it as the product of the true stomach of the working bees, which they vomit into the cells, in the same way that honey is vomited from the honey-stomach. Fischer and others regarded it as the product of the salivary glands of the bees. Schönfeld, in numerous papers, references to which are given, has more recently shown that Leuckart's original view is the correct one. He showed that the saliva can be easily obtained from the salivary glands of the head and thorax, and that it is very different from the food-juice deposited in the cells by the bees; and that, moreover, the juice is similar, both chemically and microscopially, to the contents of the bee's true stomach; he showed also from the consideration of certain anatomical and physiological peculiarities of the bee, such as the position of the mouth, the inability of the bee to spit, etc., that the view of this substance being saliva is quite untenable. Certain observers have to this replied

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All kinds are thus rich in nitrogen; all were of a greyish white colour; that of the queen-bee was the stickiest, that of the workers the most fluid. Peptone appeared to be absent; the greater part of the nitrogenous material present was proteïd. The ethereal extract was in all cases acid, but formic acid was absent.

The sugar present was, in all cases, invert-sugar, whereas the sugar in pollen grains is invariably cane-sugar.

The table shows certain differences in the composition of the different kinds of larval food, more especially in the composition of the solids present. Its composition is, moreover, quite different from that of the bee's saliva, which, for instance, contains no sugar. The difference between the proportional amount of the different solids present in the different forms of larval food is a constant one, and no doubt this variation has in view the particular requirements of the larvæ in question. Certain small but constant differences were also observed in the chemical composition of the food of the larval drones during the first four days and at subsequent periods.

Not only is there a difference in the quality, but there is also one in the quantity of the food supplied. The juice from 100 queen-bee cells yielded 3·6028 grams of dry substance, that from 100 drones' cells 0·2612 gram, that from 100 workers' cells 0·0474 gram.

Haya-Poison and Erythrophleine. L. Lewin. (*Archiv für path. Anat.*, cxi. 575–604.) The author discusses arrow poisons in general, and then describes, under the name of haya-poison, an amorphous substance sent by J. Hay from Abyssinia. Alcohol extracted from it the toxic principle, the chemical and physiological properties of which were found to resemble those of erythrophleine from the bark of *Erythrophlæum guineense*.

Haya-Poison. O. Liebreich. (*Verhandl. der Berlin. med. Ges.*, 1888, ii. 28–44.) The author regards the poison reported on by Lewin (preceding extract) as identical with the snake poison of *Naja Haje*. Both agree in their action through the blood, their indifferent action through the stomach, and the anæsthetic effect produced on the eye. The author denies that erythrophleine exercises any such anæsthetic action in the genuine sense of the term.

Toxic Action of Ouabaïn and Strophanthin. E. Gley. (*Comptes Rendus*, cvii. 348–351. From *Journ. Chem. Soc.*) The characteristic effect of both substances is the rapid effect on the heart of a

frog which is arrested in systole. 0·025 of a milligram of ouabaïn produces this effect in six minutes, whilst the same quantity of strophanthin requires twelve minutes. With 0·012 milligram of ouabaïn, the arrest takes place in nine minutes. To the rabbit, ouabaïn is twice as poisonous as strophanthin, to a dog three times, to a guinea-pig four times. Moreover, strophanthin is always less rapid in its action. Both compounds act less energetically when introduced into the stomach than when injected into the veins.

Physiological Action of Hyoscine. M. Gley and M. Rondeau. (*L'Union Méd.*, October 4, 1888.) According to the authors, hyoscine causes dilatation of the pupil, nerve paralysis, arrestation of the heart, suppression of the salivary secretion, paralysis of the cord of the tympanum, and of the excito-secretory nerve. Sleep caused by hyoscine is accompanied with great muscular agitation. The experiments were made on dogs and rabbits.

Therapeutic Action of Sulphate of Sparteine. Dr. Pawinsky. (*Bull. gén. de thérap.*, July 15, 1888; *Amer. Journ. of Pharm.*, September, 1888.) The author, in an elaborate study of this drug (*Gaz. Lekars*, 1888), arrives at the following conclusions, based (clinically) upon experiments in thirty-three cases. In small doses of 2 or 3 cgm. or 6 to 8 cgm. daily, it slows and strengthens the cardiac contractions. Doses of 8 to 12 cgm. or 1 gm. daily paralyse the heart-action; the pulse becomes slow, weak, and arhythmic. Small doses irritate the pneumo-gastric, large ones paralyse it. Small doses augment the tonicity of the vessels; the effect is observed in forty minutes after ingestion. No cumulative action was observed, or gastric disturbance. The author cannot say that sparteine has a direct diuretic action, but it favours diuresis and dissipates œdema and sanguineous stasis.

Physiological Action of Ulexine. J. R. Bradford. (*Journ. Physiol.*, viii. 79–85; *Chemist and Druggist*, December, 1888.) Ulexine is an alkaloid originally prepared by Gerrard from the seeds of the common gorse (*Ulex Europæus*). The author reports that he has found it to have a powerful and wide-spread action, being a nerve and muscle poison, a respiratory poison, raising arterial tension and producing diuresis. The paralysis of respiration is produced by the smallest doses, and is apparently the most important action of the drug.

(The chemical properties of this base are described on page 66.)

The Physiological and Therapeutic Importance of Creatine. R. Kobert. (*Chem. Zeit.*, xii. 1662; *Journ. Soc. Chem. Ind.*, February, 1889.) The physiological action of creatine is still far from settled. Some physiologists look upon it as a waste product, and as valueless to the muscles; others again as an important muscle-strengthening agent. The author adheres to the latter view. Experiments of his have led him to the conclusion that creatine exerts a very beneficial influence on muscular activity, and that, accordingly, meat broths are not only pleasant appetisers but important muscle-strengtheners. The author has experimented with numerous other substances, but so far hypoxanthine and caffeine are the only ones which exert an influence similar to that of creatine. Lehmann has pointed out that the above action would explain the invigorating properties of Liebig's extract. J. Mays has further shown that solutions of creatine and creatinine excite an exhausted heart, and hypoxanthine and xanthine behave similarly; but on the other hand other meat constituents do not have such an effect. Creatine is a substituted guanidine, and Baumann and Gergens have shown that the latter is a specific though practically useless and dangerous muscle-irritant. The author further holds that creatine has important digestive properties, increasing the activity of the smooth muscles of the stomach and the intestines. For therapeutic purposes he therefore recommends 0·1 gram of creatine taken 4–6 times daily: (1) for increasing the activity of the muscles in cases of weakness; (2) in cases of weak heart; (3) in chronic weakness of the digestive organs. The dry powder is placed on the tongue and washed down with water. Liebig's extract, freed from salt crystals, exerts a similar action, but the gelatins in it have an injurious influence in intestinal disorders.

Borates of Alkaloids for Therapeutic Purposes. A. Petit. (*Répertoire*, May 10, 1889.) For some purposes, especially in ophthalmic practice, the acidity of certain alkaloidal salts is an objectionable feature. To meet such cases the author proposes the use of borates prepared by dissolving one part by weight of the alkaloid (atropine, hyoscyamine, eserine, cocaine, etc.) in a small quantity of alcohol, mixing this solution with a strong alcoholic solution of boracic acid, and evaporating the mixture to dryness. The resulting products are very soluble in water, slightly alkaline, and free from irritating effects.

Therapeutic Application of Hydroxylamine. C. Schwarz. (*Pharm. Zeit.*, xxxiii. 659.) Hydroxylamine has been recently

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ascertained to be 0·46 gram per kilogram of body-weight of the animal, the phenomena being those of impulsion, trembling, and paralysis of the respiratory organs. After non-toxic doses the sensibility to pain disappears, but the tactile sense remains. In addition, exalgin is said to possess antiseptic and antithermic properties, but the anodyne action appears to be the dominant one.

Pyrodin, a New Antipyretic. J. Dreschfeld. (*Journ. Soc. Chem. Ind.*, 1888, 765.) If the chemical constitution of antifebrin and phenacetin be compared, it is easy to see the possibility of producing other substances and substitution-products likely to possess temperature-reducing properties. The present subject of examination and physiological experiment is a substance prepared by A. Liebmann, and named "pyrodin," which as its active ingredient contains *acetyl-phenyl-hydrazin*, $C_6H_5.N_2H_2.C_2H_3O$.

It is a white, tasteless, crystalline powder, very sparingly soluble in cold water, possessing very little taste, and thus easily administered in powder form.

The results of the investigation are briefly summed up as follows:—

(1) Pyrodin is a powerful antipyretic.

(2) It reduces fever temperature quickly, and maintains the temperature at a low level for some hours.

(3) It is easily taken, and produces marked perspiration, but not nausea, vomiting, or collapse.

(4) It is especially applicable in cases of pneumonia, scarlet fever, and typhus. Given in small doses in the latter disease, it enables the patient to pass through the fever at a low temperature range without delaying the crisis, and it seems also to shorten the period of convalescence.

(5) It is less applicable in cases of typhoid, owing to the early exhibition of toxic symptoms.

(6) It appears to act equally well in migraine and neuralgia, but observations not extensive enough yet.

(7) Given in often repeated doses at short intervals it easily shows toxic properties, and these depend on the action on the blood, producing hæmoglobinæmia. It should not be given (unless the temperature be very high) oftener than once in eighteen or twenty-four hours, and it is not safe to continue its use for more than a few days.

(8) It is found to act in cases where other antipyretics have failed.

(9) The dose for children is 2–4 grains; for adults 8–12 grains.

(10) It is a much more powerful antipyretic than either antipyrine, antifebrin, or phenacetin, but it is also much more toxic than these bodies.

This disadvantage is reduced by the fact that it is rarely necessary to give more than one dose in twelve to eighteen hours, as the temperature is kept low for a longer period than if any other antipyretics are used.

(11) It reduces the pulse as well as the temperature, and often causes diuresis.

Pyrodin. Dr. Lepine. (*Répertoire de Pharm.*, January 10, 1889.) The proper doses of this antipyretic, said to be useful in pneumonia, scarlatina, typhoid fever, migraine, and the neuralgias, are given as follows:—For children, the quantity to be given daily should be from 10 to 20 cgm.; for adults, 40 to 60 cgm. It should not be given oftener than every eighteen or twenty-four hours. Administered repeatedly at short intervals it gives rise to toxic symptoms. It is said to be a powerful antiseptic as well as an antipyretic. The author proposes to call it acetylphenylhydrazin, as, under its present name, it is likely to be confounded with pyridine.

New Antipyretics. O. Liebreich. (*Amer. Druggist*, April, 1889, from *Pharm. Zeit.*) According to the author, pure acetylphenylhydrazin is reported by Prof. Dreschfeld to have an antipyretic power four times as great as that of pyrodin. Consequently the doses which Dreschfeld has indicated for pyrodin (2 to 4 grains for children, and 8 to 11 grains for adults) would be too large for acetylphenylhydrazin.

The author gives the doses of the last-named substance as follows:—

For children	½ to 1 grain.
For adults	2 to 3 grains.
Highest dose for adults per day . .	4 grains.

It follows from this that pyrodin and acetylphenylhydrazin are not identical, and that the latter may only be dispensed if it is prescribed under this name.

Hydracetin as an Antipyretic. G. Guttmann. (*Pharm. Centralhalle*, 1889, 311 and 341.) Hydracetin is the name proposed by the author for *pure acetylphenylhydrazin*, $C_6H_5NHNH(C_2H_3O)$, which was used in an impure condition under the name of pyrodin.

It forms a white crystalline, odourless and almost tasteless powder, difficultly soluble in water (1 : 50), easily soluble in alcohol, and possesses even in small doses decided antipyretic action. The dose should not exceed 0·1 gram per day, best given in two doses of 0·05 gram each. Hydracetin is a powerful reducing agent, especially on warming and in presence of alkalies; cupric solutions deposit cuprous oxide; silver and platinum solutions deposit metallic silver and platinum; mercuric solutions and ferric salts are reduced to mercurous and ferrous salts; potassium permanganate is decolorized. A fine carmine-red colour is obtained by dissolving hydracetin in a mixture of concentrated H_2SO_4, 98 parts, and HNO_3, 2 parts. The medicinal effects of this remedy are thought to be caused by strong reducing action; it has also been successfully used as ten per cent. ointment in the treatment of psoriasis.

Poisonous Properties of Pyrodin, the New Antipyretic. (*Lancet*, 1888, 1195.) The *Lancet* calls attention to the fact that under certain conditions the administration of this antipyretic may be followed by symptoms of severe poisoning, and utters a strongly worded caution against its use except in the most severe and critical cases, stating that even in such cases it should only be given in the smallest doses and at long intervals.

Pyrodin. E. Ghillany. (*Zeitschr. des Apoth. Ver.*, January 10, 1889.) The author reports that experiments made at the general hospital at Vienna prove that this new antipyretic compares unfavourably in its action with antifebrin, phenacetin, and antipyrine, and that it is more liable to produce unpleasant and even toxic symptoms.

Pyrodin and Acetylphenylhydrazin. M. Zerner. (*Zeitschr. des Apoth. Ver.*, February 20, 1889.) The author has studied the action of pure acetylphenylhydrazin, and confirms the observations referred to in the two preceding abstracts as to the liability of the substance to produce unpleasant effects in certain cases. He finds that even the pure preparation he worked with is inferior to antifebrin in its antipyretic action.

Methacetin, a New Antipyretic. F. Mahnert. (*Zeitschr. des oesterr. Apoth. Ver.*, April 1, 1889.) Methacetin, or paracetanisidin, is an acetyl compound of anisidin, and is represented by the formula:—

$$C_6H_4\begin{cases}OCH_3\\NH\cdot C_2H_3O.\end{cases}$$

It is a pale red, crystalline, odourless powder, having a slightly

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Therapeutic Properties of Camphoric Acid. Prof. Reichert. (*American Druggist*, February, 1889.) Camphoric acid is strongly recommended by the author as useful in the treatment of acute and chronic affections of the respiratory passages. Externally he has used solutions containing from ½ to 6 per cent. of the acid, and has observed that, when applied to the mucous membrane, it appears to exercise a constringent action within two minutes, and that, besides its antiseptic properties, it promotes granulation without irritation. He recommends, in acute angina, the use of a ½ to 1 per cent. solution every three hours; in pharyngo-laryngitis and tracheitis, the application, as a spray, of a ¼ per cent. solution, increasing in strenght to 1 per cent.; in acute catarrh, the introduction of wadding saturated with a 2 per cent. solution into the nose; in acute bronchitis, a 1 to 2 per cent. solution applied as a spray to the larynx. Camphoric acid forms white crystalline needles, having an acid taste; it is difficultly soluble in water, and readily soluble in alcohol, ether, or fixed oils (2 per cent.). In order to prevent it from crystallizing out from concentrated aqueous solutions, it is advisable to add about 11 per cent. of alcohol.

Therapeutic Application of Anisic Acid. (From *Chemist and Druggist.*) Anisic acid has recently been ascertained to be therapeutically valuable as an antirheumatic, antineuralgic, etc. Curci recommends it to be given in the same doses as sodium salicylate. It is said to be well tolerated, to be equal in medicinal virtue to salicylate of sodium, but destitute of the sometimes unpleasant effects of the latter.

Agaric Acid as an Anhydrotic. F. Hofmeister. (*Chemist and Druggist*, May 11, 1889.) The author reports favourably on the value of this acid as an anhydrotic. The pure acid is a dibasic, triatomic homologue, of the malic acid series, having the formula

$$C_{14}H_{27}(OH)\begin{cases}COOH\\COOH\end{cases}$$

It is slightly soluble in cold, and more soluble in boiling, water. The neutral alkaline salts dissolve readily, and, like the salts of the higher fatty acids, easily break up in solution into free acid and basic salt. It is a powerful irritant, and injected under the skin it causes intense pain, inflammation, and suppuration. When swallowed large doses produce vomiting and diarrhœa. As little as 1½ grain causes slight temporary nausea and signs of intoxication. Half a grain is a safe dose, and produces in phthisical

patients a decided decrease in the amount of perspiration, which continues for twenty-four hours.

Therapeutic Application of Guaiacol. C. Horner. (*Amer. Journ. of Pharm.*, August, 1888.) Guaiacol has been given in phthisis by the author, with the result of general improvement in many cases. The dose is from 0·2 to 0·5 gram, given in the form of pills.

Guaiacol exists in beechwood tar creasote, and may be prepared by the dry distillation of guaiac resin, or of vanillic acid and lime; it is also produced by heating pyrocatechin with potassa and potassium methylsulphate. It is methylpyrocatechin, is a colourless liquid of 1·117 sp. gr., boils at 200° C., and yields crystalline compounds with the alkalies and alkaline earths.

Salol as a Remedy in Cholera. J. Loewenthal. (*Comptes Rendus*, cvii. 1169.) The author's experiments show that salol will kill cholera bacilli already developed in a paste containing pancreatic juice, and that its addition to a paste before the sowing of the bacilli will render the paste sterile. He strongly recommends a thorough trial of this remedy.

Therapeutic Properties of Allyl Tribromide. (*Pharm. Post*, December 2, 780.) Allyl tribromide ($C_3 H_5 Br_3$) has recently been strongly recommended as a remedy for whooping-cough and also as being useful in the treatment of hysteria and asthma. In cases of whooping-cough it is administered internally in capsules containing about five drops, or injected subcutaneously.

Therapeutic Application of Iodide of Ethyl. Dr. E. R. Squibb. (*Pharm. Journ.*, 3rd series, xix. 46.) Iodide of ethyl is applied by inhalation, and the best way to administer it is to drop the dose into a small wide mouth vial, and inhale the vapour directly from the mouth of the vial through the nostrils, using the warmth of the hand around the vial to hasten the evaporation. Inhaling the dose from a handkerchief is a very wasteful and uncertain mode of administration, and although generally recommended it is not the best way or a good way.

The dose to begin with is from 15 to 20 drops, but when indicated at all it should be pushed to some distinct effect before being abandoned, and then if useful, the effective or useful quantity will be ascertained, and may be repeated several times a day.

Iodide of ethyl, under the name of hydriodic ether, seems to have been introduced to therapeutic use by Dr. Huette in a paper

published in the *Journal de Pharmacie* for October, 1850, and an abstract of this paper, and of another by M. Cap, is given in the *Amer. Journ of Pharmacy*, 1851, vol. iii., or new series xvii., p. 154. In the *Medical Record*, 1880, vol. xvii., p. 688, is a paper by Dr. Robert M. Lawrence, of Boston, on "The Therapeutic Value of Iodide of Ethyl," wherein may be found a good bibliography of the subject, supplemented by Dr. Lawrence's experiences.

It is the most convenient, and most rapid means known for saturating the organism with iodine. Iodine is found in the urine within a quarter of an hour after from fifteen to eighteen inhalations of the vapour, and continues to be so found for sixty hours (Huette).

Hence, as an adjunct to iodide of potassium when this is required in large quantities, as in syphiloma and other conditions of secondary and tertiary syphilis, it is well adapted to be useful. It does not weaken the digestive organs nor impair the appetite, as large doses of iodide of potassium often do when they have to be continued to saturation, but has a rather stimulant, tonic effect. With such considerations as guides to its general use, it has been successfully applied in many neuroses of the respiratory and circulatory apparatus—to chronic capillary bronchitis—to many forms of asthma, and to temporary relief of dyspnœa from whatever cause.

Comparative Effects of Spiritus Ætheris Nitrosi and Solution of Nitrite of Ethyl. D. J. Leech. (*Pharm. Journ.*, 3rd series, xix. 490, 491.) The author has been unable to detect any difference in the physiological activity or therapeutic action between the two preparations mentioned in the title of this paper. But in view of the variations in the strength of the spirit and its great liability to spontaneous changes, he considers it expedient that the time-honoured *spiritus ætheris nitrosi* should disappear from the list of official remedies, and should be replaced by a stable solution of nitrite of ethyl of definite strength.

Note on the Effect of Amyl Nitrite. T. Lauder Brunton and T. Jessop Bokenham. (*Pharm. Journ.*, 3rd series, xix. 491, 492.) The experiments described by the authors lead to the conclusion that pure amyl nitrites have less effect in lowering the blood-pressure, and are therefore less likely to afford relief in angina pectoris than the B.P. nitrite. The presence in the latter of iso-butyl nitrite, established by Professor Dunstan, and Professor Cash's observation that iso-butyl nitrite is more active than amyl nitrite, are cited in explanation of the author's results.

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strongly recommends the hypodermic injection of strychnine in cases of opium narcosis, or in any case of narcotic poisoning where there occurs any irregularity or interruption of the breathing that appears to threaten a failure of the respiratory centre.

Antagonistic Action of Cocaïne and Chloral Hydrate. M. Mosso. (*Archiv der Pharm.* [3], xxvi., 179.) Cocaïne is found by the author to be the best cerebro-spinal stimulant, and to possess in a marked degree the power of counteracting the effects of choral hydrate. In a like manner the action of cocaine is neutralised by chloral hydrate. The author therefore regards cocaïne as a useful antidote in cases of poisoning by choral, opium, morphine, and other narcotic substances.

Picrotoxin as an Antidote for Morphine. A. Bokai. (*Chemist and Druggist*, March, 1889.) The author records some interesting preliminary experiments which go far to show that picrotoxin, the active principle of *Cocculus indicus*, is probably the best antidote for morphia poisoning. Picrotoxin is said to prevent paralysis of the centre of respiration, by which death from morphia is caused. It has also exactly the opposite effect of morphia on the pressure of the blood. The author has promised further communications on this subject.

Incompatibility of Dry Antipyrine and Salicylate of Soda P. Vigier. (*Répertoire de Pharm.*, May 10, 1889.) The author finds that if these substances are mixed dry, an oily body forms within a few hours, thus injuring the powder or cachet, and showing in fact an undesirable decomposition. The reaction of the formed substance is alkaline. The reaction of aqueous solutions of these bodies is, when united, slightly acid. Mixed solutions of antipyrine and salicylate of soda remain limpid indefinitely and without apparent change.

Incompatibility of Potassium Chlorate and Iodide of Iron. (*L'Union Pharm.*, December, 1888.) Sesquioxide of iron is formed, and the iodine set free: $2\,FeI_2 + KClO_3 = Fe_2O_3 + KCl + 4\,I$. The administration of such a mixture is dangerous.

Doses of Sulphonal. M. Egasse. (*Bull. gén. de Thérap.*, March 15, 1889.) The author gives the doses as follows: For children, 15 to 25 cgm., two hours before bed-time. For women, 1 to 2 gm.; and for men, 2 to 5 gm., daily, either fractionally, or, as seems preferable, in massive doses, given during a meal, or two hours before the hour for sleep. It is best given, finely pulverized, in capsules, but may be held for some time in suspension in dense mucilaginous mixtures. It may also be given in wine or milk.

Maximum Doses of New Remedies. B. Fischer. (*Pharmaceutische Zeitung.*) The author gives the following maximum doses in grams:—

To be given with the utmost caution.

	Single dose.	In 24 hours.
Hydrochlorate of Erythrophlœine .	0·01	0·03
Carbolate of Mercury . . .	0·03	0·1
Formamidate of Mercury . . .	0·03	0·1
Peptonate of Mercury . . .	0·03	0·1
Salicylate of Mercury . . .	0·03	0·1
Hydrobromate of Hyoscine . .	0·001	0·003
Sulphate of Hyoscyamine . .	0·001	0·003
Nitroglycerin	0·001	0·005
Strophanthin	0·0005	0·003

To be given with caution.

	Single dose.	In 24 hours.
Hyperosmic Acid	0·015	0 05
Agaricin	0·015	0·05
Amylene Hydrate	4·0	8·0
Acetanilide (antifebrin) . . .	1·0	3·0
Tannate of Cannabin . . .	1·0	2·0
Cannabinon	0·1	0.3
Hydrochlorate of Cocaïne . .	0·1	0·3
Guaiacol	0·1	0·5
Hydroquinon.	0·8	1·5
Hypnon	0.5	1·5
Iodol	0·2	1·0
Osmate of Potassium . . .	0·015	0.05
Kairine	1·0	4·0
Methylal	4·0	8·0
Resorcin	3.0	10·0
Sulphate of Sparteine . . .	0·03	0·1
Sulphonal	4·0	8·0
Sulphate of Thalline . . .	0·5	1·5
Tartrate of Thalline . . .	0·5	1·5
Tincture of Strophanthus . .	1·5 (min.)	5·0

Spiritus Chloroformi. P. Wells. (*Pharm. Journ.*, 3rd series, xix. 567.) The author points out that if, instead of using 19 ounces of spirit to 1 ounce of chloroform, this quantity of chloroform is first mixed with 15 ounces of S.V.R. 60 o.p., and then 4 ounces of distilled water added, a spiritus chloroformi is obtained equal in its therapeutic effects to the B. P. standard.

Suggestions of the Pharmacopœia Commission of the German Society of Apothecaries. (*Archiv der Pharm.*, 1889, xxvii. 337; *Journ. Soc. Chem. Ind.*, 1889, 567.)

Bitter Almond Water.—To test the proportion of prussic acid, 10 grams of the liquid are treated with 1 c.c. of decinormal silver solution and a few drops of nitric acid, and filtered. The filtrate must give no immediate precipitate with silver nitrate. This test permits the presence of the small quantity of free prussic acid which may result from the decomposition of benzaldehyde during the distillation.

Chlorine Water.—A volumetric determination must show at least 0·4 per cent. of chlorine.

Distilled Water.—100 c.c. treated with 1 c.c. of zinc iodide starch solution and dilute acid must give no coloration in 10 minutes (nitrites). 100 c.c. treated with 1 c.c. of dilute sulphuric acid and 0·5 c.c. potassium permanganate solution must keep the red colour a long time, and must not be quite decolorized even on boiling (organic matter).

Creasote.—The specific gravity must not be under 1·07, whilst the present pharmacopœia allows 1·03. The alcoholic solution must give a deep blue colour with a little ferric chloride solution. Mixed with 10 volumes of alcoholic caustic potash (1 : 5), the creasote must congeal after a short time to a firm crystalline mass. An admixture with phenols would retard the solidification. 1 c.c. of creasote shaken with 2 c.c. of petroleum spirit and 2 c.c. of baryta water must give no dirty or blue colour to the petroleum, or red colour to the aqueous layer (pyrogallic ethers from beech tar).

Oil of Caraway.—The higher boiling portion of caraway oil—the carvol—of sp. gr. 0·96 must be employed. 8 drops of the oil must dissolve to a clear liquid in a mixture of 2 c.c. of alcohol and 1 c.c. of water.

Oil of Clove.—The specific gravity of 1·041 is increased to 1·05 or 1·06. 5 drops of the oil shaken well with 10 c.c. of lime water must separate in flocks, which tend to stick to the sides of the vessel.

Oil of Cinnamon.—1 drop well shaken with hot water and mixed with lead acetate may give a white turbidity, but no yellow precipitate, as would be produced if oil of clove were present.

Croton Oil.—Sp. gr. 0·94–0·96. Soluble in two volumes of hot absolute alcohol. An elaidin test is used to detect admixture with non-drying oils, and Hübl's test for the presence of drying oils.

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left doubtful by the official statement that it is to yield "not much less than five volumes," the fourth, we would say without hesitation, was below the strength which should be sanctioned.

The points about which care is required in the performance of this test are, to avoid loss of nitrous ether by evaporation, and to avoid continued contact of the nitric oxide gas with the air and with the solution containing the iodide, as the nitric oxide combines with oxygen from the air, and yields it up readily to the hydriodic acid, which has been liberated from the iodide of potassium by the action of the sulphuric acid. This latter source of error is sought to be avoided by the addition of chloride of sodium to the No. 1 solution—nitric oxide being less soluble in brine than in water—and by operating in a shallow dish, and blowing off the gas as it is liberated.

The loss by evaporation of nitrous ether is sought to be avoided by making the additions of the spirit of nitrous ether to an excess of the solution of iodide and hyposulphite until the terminal reaction is reached.

This process makes no pretension to scientific accuracy, but readily indicates whether or not the sample under examination would evolve such volume of gas as comes within the limits fixed by the authorities. Or if the percentage of nitrite of ethyl be defined, as has been recently suggested, the 7·4 vols. correspond to 2·6 per cent., and 3·7 vols. equals 1·3 per cent., this latter being as high as might be looked for in an article not sold as spiritus ætheris nitrosi, but as sweet spirit of nitre.

Relative Value of Different Processes for Assaying Pepsin. J. H. Stebbins. (*Amer. Journ. Pharm.*, 1838, 466–474.) The methods discussed in this paper are the test of the U. S. P., the Manwaring test and the Kremel test. The author decides in favour of the last-named process, which is as follows: One gm. of egg albumen (soluble) dried at 40° C. and pulverized, and 0·1 gm. of the pepsin to be tested, are placed into a 100 c.c. flask, and dissolved in 50 c.c. of 0·2 per cent. hydrochloric acid. The solution is heated to 38–40° C. for three hours, and then exactly neutralized with sodium carbonate; it is then heated on a water bath to 90° C., and cooled after coagulation has taken place. The flask is then filled to the mark with distilled water, and 50 c.c. are filtered off and evaporated to dryness in a platinum dish on a water bath.

The residue is dissolved in hot distilled water, filtered through a moist filter into a platinum dish, and the filter carefully washed.

The solution is again evaporated to dryness and weighed. The peptone is then incinerated with ammonium carbonate, and the weight of the ash deducted leaves the weight of the pure peptone, or the representative of the digestive power of the pepsin.

Testing of Pepsin. A. Percy Smith. (*Chemist and Druggist*, December, 1888.) The author discards the use of hard-boiled white of egg, and uses in its place dry powdered albumen. With this he succeeded in getting accurate comparisons between the digestive powers of various pepsins. Albumen in this form dissolves with rapidity, owing to its state of fine division. Any remaining undissolved can be filtered off on a counterpoised filter-paper, and heated in a water-oven until absolutely dry. It is, however, unnecessary to do this when two samples only are compared against each other, nor is it essential to know the actual weight of albumen employed, provided it be the same in each experiment. Place the albumen on the centre of the filtered liquid (composed, for example, of the proportions of water, hydrochloric acid, and pepsin, recommended by the Pharmacopœia), avoiding, if possible, contact with the glass of the beaker. It soon sinks, and after the lapse of some time a simple inspection will show which is dissolving with the greater rapidity. Agitation assists solution; therefore take the two beakers, one in each hand, and rotate the contents equally. When one sample has dissolved all the albumen, it is manifestly superior to the other which has failed to do so in the given time.

Estimation of Diastase in Malt Extract. A. Percy Smith. (*Chemist and Druggist*, June 29, 1889.) The method recommended by the author consists in estimating the reducing-power of the extract on Fehling's solution before and after digestion with an *excess* of starch, during a period of four hours, at a temperature of 60° C. Full details are given.

Examination of Malt Extract. E. Dieterich. (*Journ. Soc. Chem. Ind.*, May, 1889.) Solid matter is determined in 2 grams; the dried extract serves for the determination of the ash, and this latter for the determination of the phosphoric acid. Free acid is determined by titrating a solution of 10 grams of extract in about 50 c.c. of water with seminormal ammonia, using delicate litmus paper. In order to determine the albuminous substances, 2 grams of extract are well dried, and the nitrogen determined by Kjeldahl's method, and multiplied by 6·25.

Maltose.—A solution of 1 gram of malt extract is made up to 100 c.c., and the maltose determined gravimetrically and volumetrically by Fehling's solution. The result is only approximate, owing

to the presence of other substances, *e.g.* dextrin, which reduce Fehling's solution. The error due to the small amount of dextrin in good malt extract is, however, not of much moment.

Dextrin.—To a solution of 5 grams of extract in 25 c.c. of water are added slowly 400 c.c. of absolute alcohol, the whole being kept well stirred. This is allowed to stand for twelve hours, and is then filtered; the residue is washed with alcohol, dissolved in 60 c.c. of water, boiled, filtered, cooled, and made up to 100 c.c. 50 c.c. of this are titrated with Fehling's solution. The remaining 50 c.c. are heated for three hours on a water-bath with 0·5 c.c. of hydrochloric acid, then neutralized carefully with caustic soda and titrated with Fehling's solution. The difference of the two titrations is calculated as dextrin.

Diatase.—Into a number of test tubes are introduced 10 c.c. of a 1 per cent. starch solution; to the first tube is then added 0·2 c.c. of a 10 per cent. malt extract solution, to the second 0·3 c.c., and so on. The tubes are then heated for three hours to 60° in a water-bath, and are then tested for starch by adding a drop from each to an iodine solution. The percentage of diatase may be ascertained from the fact that one part of diatase decomposes 2,000 parts of starch.

Estimation of Dextrin in Narcotic Extracts. Prof. van der Marck. (*Nederl. Tydschr. v. Pharmacie*, April, 1889; *Analyst*, June, 1889.) The author tried Pannetier's process (see *Year-Book of Pharmacy*, 1888, 202), which apparently leaves nothing to be desired, and is performed as follows: Two grams of the extract are dissolved in 50 c.c. of water and precipitated with 5 c.c. of liquor plumbi. The filtrate is freed from lead by sulphuretted hydrogen, and concentrated to one-fifth of its bulk. An equal volume of spirits of wine is next added, which precipitates dextrin, and some alkaline salts. The precipitate is washed with alcohol, dried and weighed. To make sure, the dextrin may be inverted and estimated by Fehling's solution. Feeling no confidence in the method, the author tried the following experiments: Two grams of extract of belladonna were dissolved in 50 c.c. of water, precipitated with liquor plumbi, and filtered. After freeing the filtrate of lead and concentrating, alcohol was added and the fluid remained clear. Two mixtures were then made up containing respectively 5 and 10 per cent. of dextrin, but alcohol failed to produce a turbidity. With a mixture containing 15 per cent. of dextrin, a faint cloud was obtained, and, when 20 per cent. had been added, about one-third of the dextrin was recovered. On repeating the

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heating was continued for three hours, the loss amounted to 18·9 per cent. These results are, however, more satisfactory than those by Wertha and Payer, who respectively got a loss of 58 and 38 per cent. The author thinks, however, that this process may still be found useful in cases of serious frauds.

Assay of Extract of Henbane (Hyoscyamus Niger). L. v. Itallie. (*Journ. Soc. Chem. Ind.*, March, 1889.) Acidify 5 grams of the extract with 10 drops of dilute sulphuric acid (1 : 20), dilute with water to 50 c.c., and macerate for one to two hours. Add 25 c c. of a 10 per cent. solution of lead acetate, and allow to settle. Filter off 50 c.c. of the solution through a dry filter paper, add 10 c.c. of dilute sulphuric acid (1 : 10) to the filtrate, and again filter off 50 c.c. Transfer this second filtrate to a separating funnel, add ammonia to alkaline reaction, and extract three times with an equal volume of chloroform. Separate the chloroform extract, distil off the chloroform, dissolve the residue in 5 c.c. of dilute alcohol, and titrate with centinormal acid. This method may also be applied for the quantitative examination of belladonna and aconite extracts.

Extractum Glycyrrhizæ. A. Kremel. (*Pharm. Post*, 1889, 194; *Amer. Journ. Pharm.*, May, 1889.) The author states that the solubility of this preparation is not a sufficient test of purity, and advises determinations of the glycyrrhizin and the ash. It has been found that the ash of the unadulterated extract is always strongly alkaline. The glycyrrhizin is estimated by taking 5 grams coarsely powdered extract and 50 c.c. water, allowing to stand for several hours with frequent stirring, adding, after solution, 50 c.c. of 90 per cent. alcohol, which materially assists filtration, allowing to subside and filtering through a plated filter. The filter is well washed with 40 per cent. alcohol, and the alcohol removed from the filtrate by heating on a water-bath; after cooling, the glycyrrhizin is precipitated with sulphuric acid, collected on a small filter, washed with water, and dissolved off the filter by carefully dropping on ammonia water; the filtrate is collected in a small tared beaker or capsule, evaporated on a water-bath, and finally dried at 100° and weighed.

	1.	2.	3.	4.	5.
Glycyrrhizin . .	5·88	8·06	8·30	9·75	11·90
Ash	2·90	6·44	5·64	8·64	5·64

The ash of 1 was neutral in reaction and the percentage of glycyrrhizin so low as to be suspicious.

Fluid Extract of Hydrastis. E. Schmidt. (*Pharmaceutische Zeitung*, 1888, 572.) On standing this extract deposits a yellow precipitate, which is generally considered to be berberine or one of its derivatives. By recrystallization from glacial acetic acid this substance is obtained in colourless crystalline scales, melting at 133°, which on examination prove to be *phytosterin*, a vegetable cholesterin-like body. Fluid extract of berberis aquifolium also contains this principle.

Extract of Nux Vomica. W. Duncan. (*Pharm. Journ.*, 3rd series, xix. 625, 626.) Attention is called in this paper to the fact that the standardised extract of nux vomica of the British Pharmacopœia varies considerably in consistence, and soon becomes hardened and stronger through loss of moisture. The process of evaporating to dryness, powdering the residue, and mixing with sugar of milk, is suggested as a remedy for preventing this change.

The official process for assaying this extract is found inaccurate, unless the treatment of the alkaline solution with chloroform is repeated several times. The first treatment with chloroform always leaves appreciable quantities of alkaloids in the alkaline liquid.

Preparation of Infusion of Digitalis. M. Brocker. (*Journ. de Méd. de Paris*, May 27, 1889.) Maceration for two hours at a temperature of 20° C., gives the best results; less satisfactory is the infusion made at 70° C., though it is still better than an infusion made by submitting the leaves to the action of boiling water for from five to fifteen minutes.

Tinctures. (*Amer. Journ. Pharm.*, May, 1889.)

Tinctura Cantharidis.—Rob. A. Hatcher proposes maceration for preparing this tincture. He found that if prepared by percolation, a small amount of cantharidin may remain behind in the powder, which can be extracted by the process of Mortreux, viz: exhausting with chloroform, treating the extract with carbon disulphide, and crystallizing the undissolved portion from chloroform.

Tinctura Catechu Composita.—F. B. Quackenbush observed a difficulty in percolating the mixed powders of catechu and cinnamon; if much finer than No. 40, as directed by the Pharmacopœia, the powder would form a solid cake, which could not be properly exhausted with the requisite menstruum. This was, however, accomplished by passing the powder through a sieve several times while moistening it.

Tinctura Ferri Chloridi.—Griffith R. Lewis again directs attention to the reducing action of alcohol upon ferric chloride, and suggests that the alcohol be replaced by water as previously sug-

gested by Professor Attfield. The generation of ferrous salt was shown qualitatively, no quantitative determinations having been made.

Tinctura Kino was found by F. B. Quackenbush to filter very slowly if prepared according to pharmacopœial directions; but after prolonging the maceration to five days, the subsequent filtration was accomplished in less than one-fourth the time.

Tinctura Nucis Vomicæ.—Of twelve samples of this tincture examined by Edmund H. Watkins, one was whitish and opaque; two were of a distinct reddish tint, while the others varied from a light yellow to dark yellow. The percentage of extract obtained on evaporation was $\frac{3}{4}$, $1\frac{1}{2}$, 2 (three samples), $2\frac{1}{4}$ (two samples), $2\frac{1}{2}$ (two samples), $2\frac{3}{4}$, 3, and $3\frac{1}{4}$. The alcoholic strength of the menstruum was not determined, nor was it ascertained whether the extracts corresponded with that of the Pharmacopœia.

Tinctura Opii.—Arthur M. Leine examined twelve samples, by evaporating the alcohol, shaking with ether, filtering, precipitating with ammonia, washing with ether, and drying. One sample, obtained from a country grocery store, yielded only ·28 per cent. of morphine. The remaining samples yielded respectively 1·4, 1·2, ·96, ·80, ·76, ·70, ·68, ·65, ·60, ·54 and ·46 per cent. of morphine. The weakest samples appear to have been made of half strength for the purpose of retailing.

Tinctura Opii Deodorata.—W. H. S. Bateman proposes a modification of the pharmacopœial process, as follows: Percolate powdered opium, 10 parts, with stronger ether 28 parts; dry the powder; digest it for two hours at 175° F. (80° C.) with water 40 parts; repeat this operation twice; mix the expressed liquids, evaporate to 60 parts; filter, wash the filter with water to obtain 80 parts of filtrate, and add alcohol 20 parts.

Tinctura Scillæ produces a precipitate, which may be prevented according to F. B. Quackenbush, by putting quite a quantity of cotton in the neck of the percolator.

Tinctura Vanillæ.—The labour of powdering the vanilla is much lessened by the use of a small proportion of coarse sand previously sifted and washed. F. B. Quackenbush believes that maceration brings out the flavour better than percolation, and that the longer the maceration proceeds, the more delicate will be the aroma of the tincture.

Tincture of Opium. J. H. Hoseason. (*Chemist and Druggist*, March, 1889.) The author has examined a number of samples of tincture found in trade. The results were as follows:—

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Moisten the mustard with the water, added in small quantities at a time, in a porcelain evaporating dish or other non-metallic receptacle, and admix thoroughly. Cover well and leave standing for twenty-four hours. Remove and pack in a glass funnel or percolator; add 1 pint of alcohol and macerate for forty-eight hours. Then allow percolation to proceed, keep adding alcohol until the percolate measures 1 quart.

The finished liquid is a clear, transparent, yellow fluid, having a strong characteristic odour and a warm pungent taste. Mixed with water it becomes slightly opalescent or milky from the precipitation of a small quantity of fixed oil. Its dose is from $\frac{1}{4}$–$\frac{1}{2}$–1 teaspoonful, well diluted with water.

This preparation produces no emetic effects. It is stated to be a useful aromatic stimulant, similar in its action to tincture of ginger or capsicum.

Alteration of Liquor Morphiæ. Dr. Lamal. (*Amer. Journ. Pharm.*, May, 1889, from *Bull. de l'Acad. de Belg.*) The author finds that pure salts of morphine in distilled water are unalterable if kept from the action of light and dust. Cloudy solutions arise from the development of micro-organisms. The yellow coloration, acid reaction, and formation of crystals, are due to the action of light and of organic ferments. The colour arises from the transformation of morphine into an amorphous substance, which appears to be morphetine. The crystals are caused by oxidation of the salt. The acid reaction is due to morphetine and the salts of oxymorphine. Apomorphine is not formed in aqueous solutions of morphine. In the blood and tissues, morphine is partly transformed into oxymorphine, which is eliminated by the urine: but morphine, as such, may be found there. In organic researches for morphine, oxymorphine should be sought for as a first product of oxidation.

Liquor Calcis Saccharatus. C. Arthur. (*Pharm. Journ.*, 3rd series, xix. 849.) The author's experiments tend to show that the only effectual means of avoiding coloration in this preparation is to use a lime free from iron. Carrara marble would yield such a product.

Liquor Ferri Dialysati, and Liquor Ferri Oxychloridi. M. C. Traub. (*Schuz. Wchnschr. f. Pharm.*, 1888, 255.) The author finds that there are decided differences in the properties of these two preparations, and disapproves of the substitution of the latter for the former. The oxychloride solution is made by dissolving ferric hydrate in hydrochloric acid; it contains 0·8 per cent. H Cl,

is of a decided acid taste and reaction, and is not adapted for making the albuminate solution owing to its frequent gelatinization. The dialyzed solution contains only 0·25 per cent. H Cl, is of a mild taste and neutral reaction, and will form a permanent albuminate solution.

Glycerites of Ferrous Salts. C. Arthur. (*Chemist and Druggist.*) The author states that liquid preparations of ferrous salts, such as syrup of iodide of iron, have always been a source of trouble owing to the facility with which they absorbed oxygen and changed the iron into the ferric state. Glycerine has the property of preventing oxidation of ferrous salts, and even of reducing ferric salts to the ferrous state. The sweetness of glycerine, too, renders it an admirable substitute for syrup. The author has prepared several ferrous preparations with glycerine instead of sugar. Following the U. S. Pharmacopœia, he has designated them glycerites. The following is a working formula for

Glyceritum Ferri Iodidi.

Iron	1 ounce.
Iodine	2 ounces.
Water	3 fl. ounces.
Glycerine	27 fl. ounces or a sufficiency.

Mix 2 ounces of the water with an equal volume of glycerine in a flask; in this mixture digest the iodine and iron, heating slightly, and occasionally shaking until the froth becomes white; then filter the liquid into 26 fluid ounces of the glycerine; rinse out the flask and iron wire, and wash the filter with the remaining ounce of water; mix, and make up to 31 fluid ounces. Sp. gr. should be about 1·300. This glycerite contains 4·3 grains of ferrous iodide in a fluid drachm.

Glyceritum Ferri Bromidi.

Iron	270 grains.
Bromine	540 „
Water	3 fl. ounces.
Glycerine	26 fl. „

Proceed in the same way as for glyceritum ferri iodidi. Sp. gr. 1·300. Each fluid drachm contains about 5 grains ferrous bromide.

The principle of using glycerine may also be applied to liquid preparations of other ferrous salts, such as hypophosphite, phosphate, protochloride, or to mixtures containing any of these.

Note on Syrup of Hydrobromate of Iron and Quinine, B.P.C. R. A. Cripps. (*Pharm. Journ.*, 3rd series, xix. 586.) This syrup, as well as that with strychnia, contains when freshly prepared, one grain of acid quinine hydrobromate in the fluid drachm. Having made several quantities of this syrup, the author has noticed shortly after preparation, the time varying according to the temperature at which the syrup is kept, but generally in less than a fortnight, crystals appear on the sides and bottom of the bottle.

On examination, these crystals prove to consist of acid quinine hydrobromate, which would suggest that these syrups should be made considerably weaker. A small quantity of the syrup was also prepared containing half an ounce of hydrobromic acid, B.P. to the pint in excess of the prescribed quantity, but the deposition of crystals was not in the least retarded. A syrup of acid quinine hydrobromate, 1 grain in 1 fl. drachm, made without iron, but otherwise exactly like the B.P.C. syrup, has yielded *no* crystals after about a month, although kept in a cold place.

The syrup with iron does not lose strength if made two-thirds of the B.P.C. strength in regard to quinine.

Easton's Syrup. J. G. Wilson. (*Chemist and Druggist*, March, 1889.) The author gives the results of an examination of commercial samples, taking the Unofficial Formulary syrup as the standard.

Quinine Phosphate per fluid ounce.		Strychnine per fluid ounce.	Ferrous Phosphate per fluid ounce.	Phosphoric Acid per fluid ounce.
B.P.C. Standard.	Grains. 6·0	Grains. ·25	Grains. 8·0	Grains. 50
A	5·75	·25	7·1	47
B	5·75	·25	7·5	45
C	5·25	·25	6·4	48
D	4·25	·20	5·0	31
E	2·0	·10	5·0	26

The author considers that the B.P.C. formula is very satisfactory, but where large quantities of the syrup are made at a time, its keeping qualities may be improved by the addition of 2 drachms of diluted hydrochloric acid to the pint.

Permanent Syrup of Hydriodic Acid. J. W. England. (*Amer. Journ. Pharm.*, January, 1889.) The author suggests the following modified formula :—

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official powder, and is in consequence more readily taken by children.

(2) It is more readily miscible with water. On carefully placing a small portion of each sample in separate glasses containing water, the new formula sample sinks more rapidly than the other.

(3) It possesses diuretic and refrigerant properties, and this is a very decided advantage.

(4) The addition of the cream of tartar tends to counteract the griping action of the senna and to correct the objectionable effects of the sulphur.

(5) It is a more reliable and powerful aperient.

(6) In no single instance has the addition of cream of tartar been found to be objectionable in cases wherin compound liquorice powder is usually employed.

Gelatine Pill Coating. Dr. C. Symes. (*Pharm. Journ.*, 3rd series, xix. 717.) The author's experience indicates the following as the best mode of procedure: Roll the pill from a good stiff mass; coat thinly with a solution consisting of 1 ounce of resin of tolu in 5 fluid ounces of ether, without the use of powder of any kind; after fifteen or twenty minutes the pills may, by the use of the Porcupine or any other similar machine, be coated with the following solution: Opaque gelatine (such as Nelson's or Star), 1 part; mucilage of acacia, 1 part; water, 5 parts; the gelatine to be soaked in the water for half an hour, dissolved in a water-bath, and the mucilage added. There is no object in the addition of sugar, and nothing is gained by its use. The boric acid is only added to preserve the prepared gelatine in bulk, but the author prefers to omit it and use the fresh solution when any quantity of pills for stock are to be coated. If it is desired to set it aside and use from day to day, the addition of a few drops of chloroform after each occasion answers the purpose quite well, and is driven off on re-warming. It must, however, be borne in mind that gelatine solution is weakened each time it is heated, the small quantity of phosphate of calcium which it holds in solution becoming precipitated, and so impoverishing its solidifying power and tenacity.

Keratin and Keratinized Pills. E. Bourquelot. (*Journ. de Pharm. et de Chim.*; from *Pharm. Journ.*, 3rd series, xix. 1035.)

Keratin is prepared by Unna by steeping parings of horn in a digestive liquid, composed of pepsin, 1 gram; hydrochloric acid, 1 gram; and water, 11 grams, as long as the shavings yield anything to the solvent. The residue is then dissolved in ammonia

by maceration lasting several weeks, after which the solution is evaporated.

Gissmann boils the quills of birds' feathers in glacial acetic acid for twenty-four to thirty-six hours in a retort furnished with a return condenser. A thick yellow-brown liquid is thus obtained, which is filtered through glass wool, evaporated on a water-bath to the consistence of an extract, and afterwards dried.

Dieterich employs Gissmann's process, but before the treatment with acetic acid, he subjects the feathers to ten hours' digestion in water and then to eight days' maceration in a mixture of equal weights of ether and alcohol, to eliminate fatty matters and cholesterin.

Keratin obtained by one of the foregoing processes is dissolved with the aid of a gentle heat, either in acetic acid or ammonia, and the solution is allowed to clear by standing. Fischer recommends the employment of 7 parts of keratin with either 100 parts of acetic acid or a mixture of equal parts of ammonia and dilute alcohol.

If the pill mass should contain water, the pills would shrink and fissures would be produced in the keratin coating. It is therefore recommended to use in the making of these pills a mixture of yellow wax, 1 part, and suet or cacao butter, 10 parts. It is also necessary to avoid the use of vegetable powders and to employ in their place kaolin or charcoal powder.

When the pills are finished they should be dipped in cacao butter, rolled in charcoal powder, and then keratinized. For this purpose the pills, placed in a porcelain capsule, are sprinkled with a suitable quantity of keratin solution and then shaken together until the evaporation of the solvent. This moistening and drying requires to be repeated several times (as many as ten) before the layer of keratin is sufficiently thick.

(1) Medicines that can by prolonged contact cause irritation to the mucous membrane of the stomach: arsenic, salicylic acid, creasote, chrysarobin, quinine compounds, copaiba balsam, cubebs, ferruginous preparations, and especially perchloride of iron, opium, mercurial preparations, and especially biniodide and bichloride of mercury, phosphorus, and all the tænifuge preparations.

(2) Medicines that can injure the digestion by giving insoluble precipitates with pepsin and peptones: tannin, alum, acetate of lead, preparations of bismuth, nitrate of silver, corrosive sublimate, etc.

(3) Medicines that are rendered inactive or decomposed by the

gastric juice: alkali, bile, soap, sulphide of calcium, sulphide of iron, pancreatin, etc.

(4) Medicines which should arrive in the intestines as concentrated as possible: kousso, santonin, extract of male fern, alkali.

Emulsions. M. Hecker. (*Pharm. Post*, 1889, 229; *Amer. Journ. Pharm.*, June, 1889.) The author recommends the use of mucilage of acacia and powdered sugar in making this class of preparations instead of powdered acacia and water, and states that an emulsion can be made as quickly by this method as an ordinary mixture. It is immaterial in which order the substances are placed in the mortar, as by active stirring the familiar "crackling" sound of a perfect emulsion is almost immediately heard; no apprehension need be felt of such an emulsion separating into layers in less than twelve hours. For 10 grams of the substance to be emulsified are taken: *castor oil*, 10 grams mucilage and 5 grams powdered sugar; *almond*, *poppy*, *olive*, and *cod-liver oils*, 15 grams mucilage and 5 to 10 grams powdered sugar; *volatile oils*, 25 grams mucilage and 10 grams powdered sugar; *copaiba* and *Peru balsam*, 15 grams mucilage and 5 grams sugar. For *resins*, *gum-resins*, and *ethereal extracts*, an equal weight of mucilage is desirable, so as to have a consistent method of preparing emulsions.

Linimentum Chloroformi. P. Boa. (*Chemist and Druggist*, February, 1889.) The author finds that by using, instead of camphor liniment, an equivalent quantity of soft paraffin, a liniment was obtained which would pour easily, but was of such a consistence that it did not run when applied. The formula proposed is as follows:—

Camphor	1 ounce.
Chloroform	5 fl. ounces.
Soft Paraffin, sufficient to produce	10 fl. „

The camphor to be dissolved in the chloroform, the soft paraffin added, and the three shaken together.

Turpentine Liniment. D. Reid. (*Pharm. Journ.*, 3rd series, xix. 264.) The author suggests a simple modification in the preparation of this liniment, the adoption of which he finds to yield a liniment constant in character, of firm consistence, and presenting the appearance of a very white, soft, plastic jelly. He dissolves the soap in the water by the aid of heat, and after allowing to cool, finishes the product in the usual way.

The Preparation of Oleate of Mercury. A. P. Brown. (*Chemist and Druggist*, May 4, 1889, from *American Journal of*

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Lanolin in Pharmacy. H. Helbing. (*Chemist and Druggist*, 1889, 572.) Lanolin is now considered the best substitute for all ointment bases in official and non-official preparations. Its superior qualities are due to the following facts:—

1. It never turns rancid.

2. It does not exert the slightest irritating effect on the tenderest skin, and it rapidly penetrates the tissues, leaving no trace of a fatty nature.

3. It can be mixed with any proportion of fat or oils, with glycerine or with paraffin. It can be mixed with more than its own weight of water.

4. It is aseptic; no germs or microbes can live in it, as is the case with glycerine fats and oils. This ointment base the author names *Unguentum lanolini*, and the formula for its preparation is as follows:—

Anhydrous Lanolin	65 parts.
Liquid Paraffin	30 ,,
Ceresin	5 ,,

Melt together and then heat or knead in

Water	30 parts.

NOTES AND FORMULÆ.

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and the filtrate, after neutralization with hydrochloric acid, will give with ferric chloride a red-brown precipitate of ferric benzoate. The acid or the benzoate can be reduced by means of sulphuric acid and magnesium ribbon to benzaldehyd, which is recognisable by its characteristic odour of bitter almonds.

Artificial Koumiss. (*Chemist and Druggist*, 1889, 371.) A correspondent of the *Mineral Water Review* gives the following formula for this beverage:—

Swiss Condensed Milk . . .	100 grams.
Lactic Acid	1 gram.
Citric Acid	½ „
Cognac	15 grams.

Carbonated water at 60 or 80 lbs. pressure to measure 1 quart imperial.

Emulsifying Mixture. M. Nicot. (*Bull. Gén. de thérap.*, July 30, 1888; *Amer. Journ. of Pharm.*, September, 1888.) The following is recommended by the author for making emulsions and for neutralizing the taste of oily and resinous drugs:—

Bark of Quillaia Saponaria . .	20 grams.
Balsam of Tolu	200 „
Vanilla	5 „
Peel of two Lemons.	
Alcohol, of 80 per cent. . . .	1 litre.

The bark is bruised with the balsam and vanilla; the peel is added in small pieces, and the whole is then macerated with alcohol for 10 days; filter. This tincture will quickly emulsionize ol. ricini, copaiba, scammony, etc. For ol. ricini, 30 grams use 2 grams of the emulsive mixture; mix rapidly in a mortar, and add by degrees a syrup composed of syr. simp., 40 grams; aq. aurant. flor., 10 grams.

Linseed Gum as a Substitute for Gum Arabic. (*Chemist and Druggist*, September, 1888.) Linseed gum has been suggested as a substitute for gum arabic. The seeds are first boiled with water for an hour, the resulting thick mass filtered, and then treated with twice its volume of 90 per cent. of spirits of wine. A flocculent white precipitate separates, from which the dilute spirit can be readily decanted. A yield of 10 per cent. of dried gum on the weight of the seeds taken is obtained. The gum forms a clear, grey-brown, fragile mass, which dissolves in water without taste or smell, similarly to gum arabic. Two grams are sufficient to

form an emulsion with 30 grams of oil, which resembles the emulsion formed with gum arabic, both in taste and in appearance.

Coffee as a Vehicle for Antipyrin. Dr. R. S. Batterbury. (*Brit. Med. Journ.*) The author states that coffee almost entirely disguises the somewhat disagreeable taste of antipyrin. If a tabloid of antipyrin, or its aqueous solution, be added to a cup of coffee, made with milk and sugar in the ordinary way, the mixture may be drunk without tasting the drug.

Vehicle for Potassium Iodide. (*Zeitschr. des oesterr. Apoth. Ver.*, 1889, 81.) Blair states that the disagreeable taste of potassium iodide may be easily masked by administering each dose in a large draught of fresh milk.

Thiocamf. E. Reynolds. (*Chemical News*, June 22, 291; *Pharm. Journ.*, 3rd series, xix. 1049.) Under the name "thiocamf," the author has published an extremely laudatory notice of a new disinfectant, the basis of which is said to be a liquid formed when sulphur dioxide is brought into contact with camphor. It appears that although sulphurous acid gas alone requires a pressure of at least two atmospheres for its liquefaction, contact with camphor effects the liquefaction at once without any pressure. The principal feature seems to be that whereas the liquid can be kept in bottles without pressure at an average temperature, the mere exposure of it in a thin layer to the air determines the steady evolution of relatively enormous volumes of sulphurous acid gas.

Naphthol and Camphor. M. Desesquelle. (*Archives de Pharm.*, September, 1888, 385. From *Pharm. Journ.*) The use of a mixture of β-naphthol and camphor is suggested by the author as probably preferable in some cases to a mixture of carbolic acid and camphor, on the ground that naphthol is a more powerful antiseptic and less poisonous than carbolic acid. As in the case of several other compounds, when finely powdered β-naphthol is mixed with twice its weight of camphor, a syrupy liquid is formed, which is insoluble in water, but soluble in all proportions in fixed oils. In this respect *a*-naphthol is said to behave exactly similarly to β-naphthol.

A Compound Antiseptic. E. Rotter. (From *Therap. Monatsh.*) Since both corrosive sublimate and carbolic acid, though in dilute solution, sometimes produce toxic symptoms, and it has been demonstrated that very much smaller quantities may be used with equal effect, if combined with other antiseptics, the author has devised the following compound, which he states to be powerfully

antiseptic, and which may be kept in the form of powder or tablets to be dissolved in water when wanted:—

Corrosive Sublimate	5 parts.
Chloride of Sodium	25 „
Carbolic Acid	200 „
Chloride of Zinc	500 „
Sulphocarbolate of Zinc	500 „
Boric Acid	300 „
Salicylic Acid	60 „
Thymol	10 „
Citric Acid	10 „

One-half troy ounce of this mixture, dissolved in one quart of ordinary well-water yields a perfectly clear liquid.

In cases where both carbolic acid and corrosive sublimate are contra-indicated, these ingredients may be omitted.

Acid Solutions of Corrosive Sublimate. Dr. Laplace. (*Amer. Journ. of Pharm.*, August, 1888.) The author states that ordinary solutions of corrosive sublimate are inefficacious for fabrics used in surgical dressings, on account of the tendency to form mercuric albuminate; this is prevented by acidulating the solution. He also says that the antiseptic power of sublimate solutions is increased by such additions, so that weaker mixtures may be used with equally good effect.

Antiseptic Pastilles. F. A. Moerk. (*Pharm. Centralhalle*, 1888, 501.) *Antiseptic pastilles*, for use in diphtheria, are made by incorporating boric acid and borax, each 20 grams; citric acid, 12·5 grams; sodium benzoate, 1 gram; oil of lemon, 1·5 gram; oil of thyme, 1 gram; oil of peppermint, 0·5 gram, with glycerine and water as solvents, and gum, sugar, and gelatin as basis, and dividing into 500 pastilles.

Bisulphide of Carbon as an Internal Remedy. (*American Druggist*, 1889, 108.) Bisulphide of carbon has been used with apparent advantage in typhoid fever, and has been recommended in diphtheria and other diseases in which micro-organisms occur. Cases of acute and chronic dysentery, of atonic dyspepsia, of simple gastric ulcer, and of typhoid fever, have also been treated successfully with it. The dose given was generally about 2 ounces of a saturated solution of the bisulphide in water mixed with milk or a little syrup, taken half an hour or so before meals. In typhoid, enemas of a pint of water, containing about half a drachm of the bisulphide, were given in addition to the internal administration of iodide of potassium and kairin.

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drawn attention to the remarkably beneficial effects of antipyrine in whooping-cough, especially when given in the earlier stages.

Barium Chloride as a Cardiac Remedy. A. H. Hare. (*Practitioner*, 1889, 440.) The author confirms the observation that small doses of barium chloride slacken the action of the heart, steady its rhythm, and increase the volume of blood thrown out of the ventricle. He finds it to act as rapidly as digitalis, and not to disorder the stomach.

Papain in Indigestion. Dr. Grineritshi. (*Chemist and Druggist*, April 27, 1889.) The author speaks highly of the use of papain in dyspeptic conditions characterised by an habitual failure of digestion, by acid eructations, and by the painful symptoms of gastric fermentation (*Bull. Gén. de Thérap.*). He administers 1 to 2 grains of papain (Finkler) mixed with 4 to 6 grains of sugar of milk. This dose is taken an hour or two after food in a tablespoonful of an alkaline mixture containing bicarbonate of sodium, carbonate of ammonium, carbolic acid and glycerine. The author states that the pain due to acid fermentation is by this treatment completely relieved, the excess of acid being neutralised as digestion proceeds. He considers that papain is without a rival as a digestive ferment, and reports the cure by its use of the most obstinate cases of chronic dyspepsia, even though associated with pain and with constipation.

Chloride of Ammonium in Neuralgia. W. T. Greene. (*Medical Press and Circular*, September 19, 1888, 255.) The author re-directs attention to the value of 20-grain doses of chloride of ammonium as a remedy for neuralgia. The efficacy of this salt is also confirmed by several correspondents of the *Pharmaceutical Journal*.

Sodium Salicylate in Toothache. (*Zeitschr. des oesterr. Apoth. Ver.*) Salicylate of sodium is recommended in doses of 10 grains every half-hour as an internal remedy for toothache. It has been found effective both in rheumatic toothache and in caries or periosteal inflammation. Though its effect is not lasting, it is nevertheless capable of alleviating or removing the pain for one or several days.

Pilulæ Odontalgicæ. (*Apoth. Zeitung*, 1888, 921.)

Cocaine Hydrochlorate	16·0
Powdered Opium	64·0
Menthol	16·0
Powdered Althæa	48·0

Mix with glycerin and mucilage of acacia, and divide into pills each weighing 0·03 gram. One pill to be placed in the cavity of the tooth.

Antineuralgic Ointment. (*Pharm. Rundschau*, 1888, 453.)

Menthol	75 parts.
Cocaine	25 „
Chloral Hydrate	15 „
Petrolatum	500 „

Mix.

Liniment for Neuralgia. (*American Druggist*, January, 1889.) *L'Union Médicale* gives the following formula:—

Tinct. Camphor.	90 parts.
Ether	30 „
Tinct. Opium	6 „
Chloroform	20 „

Apply with flannel covered with an impervious material.

Application of Carbolic Acid for Corns. Dr. Salemi. (*Chemist and Druggist*, January, 1889.) The author recommends the following mode of application:—After bathing the feet in soapy water, dry the affected part. Melt the carbolic crystals by a gentle heat, and apply a thickish layer over the softened surface of the corn, taking care not to touch the surrounding sound flesh. After a few minutes apply to the layer of acid a piece of wadding or blotting paper, to absorb the excess of acid. Before applying the acid, surround the corn with a stout layer of soft collodion. Repeated at intervals of three or four days, this simple remedy is stated to effect a complete cure.

Removal of Warts. G. B. Pullin. (From *British Medical Journal*.) The author recommends the administration of 3-minim doses of liquor arsenicalis twice a day, continued for some time. This treatment is stated to have the effect of causing the disappearance of the warts.

Application for Warts. The following formula is given by the *Union Médicale*, October 30, 1888.

Protochloride of Mercury	15 grams.
Pulv. Boric Acid	7·50 „
Pulv. Salicylic Acid	2·50 „

Mix.

Apply three times daily.

Lanesin. (*Arch. de Pharm.*, September 5, 1888.) Lanesin is a product analogous to lanolin, for which a patent has been obtained

in Germany. The bleaching waters from wool are treated with lime, and the product with alkalies. The dried product is then treated with "appropriate solvents" which are evaporated, when the residuum is treated with the ethylic and methylic ethers of oleic or ricinic acid. A soft, smooth product is obtained which does not become rancid, and is "applicable to pharmaceutic and cosmetic uses."

Unguentum Boroglycerinatum. H. Koehler. (*Schwz. Wochenschr. of Pharm.*, 1881, 261; *Amer. Journ. Pharm.*, 1888, 556.) *Unguentum boroglycerinatum*, a substitute for iodoform and carbolic acid ointments, and a superior preparation of boric acid, is made by taking of boric acid, 10 parts, and glycerin (sp. gr. 1·23), 30 parts, boiling for ten minutes; after cooling to 50° make an ointment by addition of lanolin, 40 parts; finally add paraffin ointment (sp. gr. 0·890), 20 parts. This last addition has the effect of diminishing the rapid absorption of lanolin. In appearance the ointment resembles cold-cream.

Hypodermic Application of Caffeine. F. J. Mays. (*Journ. de Pharm. et de Chim.*, February 1, 1889.) In chronic neuralgia and rheumatism, the author prescribes caffeine in hypodermic injections of doses varying from 2 to 6 cgm. He recommends the following formula:—

Caffeine and Benzoate of Sodium .	āā 3·75 grams.
Chloride of Sodium	50 cgrms.
Aq. Dest.	30 grams.

Of this solution, 0·36 gram contains 0·03 of caffeine.

Carbolate of Caffeine. A. Petit. (*Journ. de Pharm. et de Chim.*, April 1, 1889.) The mixing of equal equivalents of pure phenol and crystallized caffeine gives a true crystalline combination which is very soluble in water. Concentrated solutions of this produce no irritation when applied to mucous membranes. For hypodermic injections a solution of 10 per cent. phenic acid, with sufficient quantity of caffeine may be used.

Unalterable Solution of Iodide of Iron. M. Nicot. (*Bull. gén. de Thérap.*, July 30, 1888.) The formula recommended by the author is:—

Sugar	4 grams.
Iodine	5 „
Iron, reduced by Hydrogen . . .	8 „
Distilled Water	40 „
Pure Glycerin	110 „

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hours. Then allow percolation to proceed, keep adding spirit until the percolate measures 32 ounces.

The finished tincture is a clear, transparent, yellow fluid, having a strong characteristic odour and a warm pungent taste. Mixed with water it becomes slightly opalescent or milky from the precipitation of a small quantity of fixed oil. Its dose is from ¼ to 1 teaspoonful, well diluted with water.

Note on Tincture of Litmus. (*American Druggist*, Jan., 1889.) It is well known that tincture of litmus gradually loses its colour when it is kept in tightly closed bottles. The cause of the bleaching has recently been made the subject of an investigation by Dubois. According to him, tincture of litmus possesses a perfect fauna and flora, consisting of infusoria, zoospores, algæ, fungi, and other micrococci. The author examined three separate samples of the same tincture of litmus, each contained in a separate vessel. One of these was sterilized by mercuric chloride, another by heat, while the third was not sterilized. It was found that the sterilized samples retained their blue colour completely. The other sample gradually lost its tint, and finally contained only a living, very small globular micrococcus. The decolorization of tincture of litmus in closed vessels is therefore due to the presence of micro-organisms, which, when deprived of the access of air, cause a reduction of the blue colouring matter to a leuco- (or colourless) compound. If the latter is again oxidized, its blue colour is restored.

Elixir of Black Currant (Elixir Ribis Nigri). L. A. Creuse. (From *Druggists' Circular.*) The following formulæ are recommended:—

1.

Black Currant	4 pounds.
Alcohol, 95 per cent	4 pints.
Sugar	4 pounds.
Water, sufficient for	16 pints.

Crush the currants with a wooden pestle, introduce them into a wide-mouthed bottle, add about 2½ pints of alcohol, and set the whole aside for a week, with an occasional agitation. Then press out the liquid, reserve the first maceration, and add to the dregs the remainder of the alcohol. After another week's maceration, express the liquor with strong pressure, mix the two macerates together, add the sugar, complete the measure with water, and after forty-eight hours' contact, filter the finished elixir.

2.

Black Currant	3½ pounds.
Raspberries	½ pound.
Alcohol	4 pints.
Sugar	5 pounds.
Water, sufficient for	16 pints.

Operate as above.

3.

Black Currants	3½ pounds.
Raspberries	½ pound.
French Brandy	8 pints.
Sugar	5 pounds.
Water, sufficient for	16 pints.

Make two successive macerations of the fruits, previously crushed, in different portions of the brandy, and complete as above.

Elixir of Theine Hydrobromate. (*Chemist and Druggist*, December, 1888; From *Amer. Journ. Pharm.*) Take of—

Theine	℥iss.
Dilute Hydrobromic Acid	f. ℥j.
Water	f. ℥j.
Elixir of Orange	q. s. ad Oj.

Dissolve the theine in the water and hydrobromic acid with the aid of heat, filter, and add the orange elixir. Dose: 1 to 3 teaspoonfuls.

The product is a clear, transparent, water-white liquid; pleasantly bitter in taste, almost neutral in reaction, miscible with an equal volume of alcohol without precipitation.

Each teaspoonful contains 1 grain of anhydrous theine hydrobromate: ($C_8 H_{10} N_4 O_2 H Br$).

Formulæ for Elixirs. (From *American Druggist.*) The following modifications of some French formulæ are suggested:

Hydrochloric Acid Elixir.

Elixir of Black Currant	14 fl. ozs.
Simple Syrup	2 fl. ozs.
Hydrochloric Acid, pure	160 drops.

Dose: half an ounce, taken in water.

Pepsin and Acid Elixir.

Elixir of Black Currant	14 fl. ozs.
Simple Syrup	2 fl. ozs.
Pepsin	102 grs.
Hydrochloric Acid, pure	100 drops.

Dose: half an ounce, in water.

A Solution of Santonin. Dr. Bayon. (*Chemist and Druggist*, December, 1888.) The author states that a good solution of santonin is obtained from the following formula:

Crystallized Santonin	1 gram.
Strong Alcohol	120 grams.
Castor Oil	240 grams.

Dissolve the santonin in the alcohol, mix with the oil, and remove 80 grams of the alcohol by distillation.

The product is a very clear and active preparation, which has been administered with the best results.

Salol Preparations. (*Zeitschr. des oesterr. Apoth. Ver.*, 1889, 6.)

Salol-Collodion.—This is prepared by dissolving 4 parts of salol in 4 parts of ether, and adding 30 part of flexible collodion. It is applied to cuts with a camel-hair brush.

Salol Mouth Wash.—The preparation recommended in the *Bull. gén de Thérap.* consists of: salol, 3 parts; rectified spirit, 150 parts; oil of star anise and oil of rose geranium, of each 5 parts; oil of peppermint, 1 part.

Salol Liniment.—This is used for burns, and is prepared as follows: salol, 10 parts; olive oil, 60 parts; lime water, 60 parts.

Antiseptic Mouth-Wash. (From *American Druggist.*) The following formula is recommended:

Sarfol	360 min.
Oil of Pinus pumilio	120 „
„ Curaçoa	120 „
„ Vetivert	6 drops.
„ Wintergreen	24 „
„ Anise, Saxony	6 „
„ Rose Geranium, Afr.	6 „
Naphthol	60 grains.
Deodorized Alcohol	24 fl. ozs.
Solution of Saccharin	½ „
Glycerin	8 „
Purified Talcum	2 tr.
Water enough to make	6 pints.

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Vaseline Cold Cream. (*Bull. de Therap.* and *Chemist and Druggist.*) The author proposes the following formula:—

White Vaseline	500 grams.
Oil of Almonds	50 „
White Wax	50 „
Rose Water	50 „

Mix the first three ingredients and incorporate the rose water *secundum artem.* Add perfume according to taste.

Glycerated Lanolin Toilet Cream. H. F. Meier. (*Druggists' Bulletin.*)

Lanolin	1 oz. av.
Solution of Cocoanut-oil Soap	1 fl. oz.
Glycerine	1 fl. oz.

The ingredients can be incorporated by simply warming in a covered vessel until the lanolin melts, when union results from simple agitation or stirring. Perfume by adding four or five drops of oil of rose or neroli to the pint. The soap solution is made by dissolving one part of dry cocoanut-oil soap (in shavings) in eight parts of water, with aid of heat. The lanolin exists in this compound in an emulsified or finely divided condition, insomuch that, when the cream is allowed to dry on the hands, and they are then washed with water, the lanolin remains as a fine adherent layer, which replaces the natural fat removed by the previous washing with toilet soaps, and thus restores pliability of the skin. As an application for chapped hands, lips, or face, this cream is excellent. It may also be used as a vehicle for medicinal substances which are to be applied to the skin.

Inseparable Shaving Cream. (*Chemist and Druggist*, June 15, 1889.)

Cream d'Amande	30 parts.
Oil of Almonds	50 „
Glycerine	150 „
Rectified Spirit	150 „
Oil of Geranium	3·5 „
„ Bergamot	3·5 „
„ Neroli	3·3 „
„ Citronella	3·5 „
Distilled Water	725·0 „

M.S.A.

New Formula for Eau de Cologne. (*American Druggist.*)

Oil of Bergamot	630 min.
„ Neroli	80 „
„ Rose	60 „
Musk	10 grains.
Tincture of Vanilla	120 min.
Extract of Jasmin	630 „
„ of Violet	630 „
Triple Distilled Spirit	112 fl. ozs.
Water	10 „

Mix the oils and extracts with 104 ounces of the spirit; digest the musk with the remaining 8 ounces at a gentle heat, in a closed bottle, for twenty-four hours; then add to the other liquid, add the water, cool, and filter. If convenient, set aside for some weeks before filtering.

Practical Formulæ for Perfumes. (*Chemist and Druggist*, March 23, 1889 from *Druggists' Circular.*)

White Rose.

Rose Spirit	4 ozs.
Violet Essence	2 „
Jasmine Essence	1 „
Patchouly Extract	½ „

Ess. Bouquet.

Rose Spirit	4 ozs.
Ambergris Tincture	1 „
Orris	2 „
Bergamot Oil	½ „
Lemon	⅛ „

New-Mown Hay.

Tonka Tincture	4 ozs.
Musk	1 „
Benzoin	1 „
Rose Spirit	1 „
„ Geranium Oil	40 min.
Bergamot Oil	40 „
Alcohol (S.V.R.)	1 oz.

West End.

Rose Spirit	6 ozs.
Verbena Extract	1 „
Benzoin Tincture	2 „
Civet	1 „
Musk	2 „
Sandal Oil	20 min.

Verbena.

Lemongrass Oil	½ oz.
Lemon Oil	½ „
Alcohol (S.V.R.)	1 pt.

Heliotrope.

Vanilla Tincture	8 ozs.
Rose Essence	4 „
Orange-flower Essence	2 „
Ambergris Tincture	2 „
Civet	½ „
Bitter Almond Oil	10 min.
Alcohol (S.V.R.)	2 ozs.

Heliotrope Perfume. (*Chemist and Druggist*, March 30, 1889.)

Vanillon (wild Mexican Vanilla)	¼ lb.
Benzoic Acid	1½ drachm.
Balsam of Peru	1½ „
Oil of Neroli	1½ „
Oil of Rose	1½ „
Oil of Bitter Almond (Allen's English)	1½ „
Oil of Ylang-ylang	10 drops.
Tonquin Musk (finest)	10 grains.
Orris Root	½ lb.
Alcohol (95 per cent.)	144 oz.
Orange-flower Water (triple)	16 „

Cut the vanillon in small pieces, and bruise with the orris-root and musk to a moderately fine powder; introduce into a covered conical percolator, and cover with spirit. When the tincture begins to drop cork the percolator, macerate twenty-four hours, and draw off what will run. Again cover with spirit, and macerate as before, so continuing until the whole of the spirit is used. Displace with water at the last to obtain 144 ounces of tincture, add the other ingredients, shake, and after twelve hours filter through 20 grains of carbonate of magnesia.

Sachet Mixture. (*Chemist and Druggist*, April 27, 1889, from *American Druggist*.)

Coriander	4 ozs.
Orris Root	4 „
Rose Leaves	4 „
Lavender Flowers	2 „
Mace	½ „
Cinnamon	½ „
Cloves	½ „
Calamus	4 „
Tincture of Musk	30 min.

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rate in the package like a cream of tartar powder—its keeping quality is far above the latter; (3) though burnt alum does not dissolve in water, during the baking process it sets free the gas from bicarbonate of soda slowly, and with greater regularity than cream of tartar, and therefore does much better and more effective work. He shows further that 80 grains of burnt alum decompose as much bicarbonate (84 grains) as 188 grains of cream of tartar, and while the dry residue in the latter case weighs 210 grains, in the case of the alum it is 110 grains (71 grains sulphate of soda, 22 grains sulphate of ammonia, and 17 grains alumina). The author considers that alum baking powders are the best, not only because a given quantity will raise more bread than the same quantity of cream of tartar baking powder, but because of the small quantity and innocent character of the residue they leave in the bread. A suitable formula for alum baking powder, based on the figures given above, would be as follows:—

Burnt Alum, in fine powder	8 ozs.
Bicarbonate of Soda	8 ozs., 3 dr.
Rice Flour	1 lb.

M.

Preparation of Phosphorescent Sulphides of Calcium and Strontium. E. Becquerel. (*Comptes Rendus*, cvii. 892–894; *Journ. Soc. Chem. Ind.*, February, 1889.) The author has previously shown that by adding to a mixture of lime and sulphur before igniting, a small quantity of certain substances, a much more brilliant phosphorescence is obtained. He has since discovered that the action of the latter compound is often only observed when that substance is impure or consists of a variety of different bodies. Thus, on calcining perfectly pure carbonate of lime with sulphur, the product is but slightly phosphorescent. If, however, previous to heating, traces of soda be added, the product becomes strongly luminous with a green light after the exposure. On the other hand, if traces of manganese or bismuth be added to the carbonate, after igniting with sulphur, the sulphide is hardly luminous, but becomes so if before calcining 0·5 to 1 per cent. of soda be added, showing a brilliant yellow or blue phosphorescence. Lithia acts like soda on carbonate of lime, causing the sulphide to emit a very intense green light after exposure. Potash, when quite pure, has no effect. On calcining oyster and other shells a phosphorescent fiery red mass is often obtained. The same effect was observed by the author when sodium carbonate containing

traces of rubidium were added to the lime and sulphur before igniting.

The sulphide of strontium is, generally speaking, less luminous than that of lime. When prepared from the pure carbonate it shows a slight bluish green phosphorescence; when traces of soda are present the colour is green.

New Method of Preparing Soluble Prussian Blue. C. E. Guignet. (*Comptes Rendus*, cviii. 178–181.) Soluble Prussian blue is most conveniently prepared by gradually adding to a boiling solution of 110 grams of potassium ferricyanide a hot solution of 70 grams of ferrous sulphate. Only one-half of the ferricyanide enters into the reaction. The mixture is now boiled for two hours, filtered, and washed with pure water until the wash water assumes a deep blue shade. The residue is dried at 100°. This blue dissolves readily in water, and is very suitable for anatomical injections, as it remains in solution in presence of considerable quantities of gelatin.

Vanadium Ink. (*Dingl. Polyt. Journ.*, cclxxi. 423.) Dissolve 10 parts of tannic acid in 100 parts of water, and 0·4 part of vanadate of ammonium in 10 parts of water. Mix the two solutions, and shake moderately.

This ink flows with a deep-black colour from the pen, without spreading or striking through the paper, although it contains no gum. It has a pleasant gloss, cannot be copied, dries quickly, and, even if the writing is laid in water for twenty-four hours, does not change its black colour. It is very useful for writing addresses of letters, post cards, etc., when used fresh. Dilute acids do not alter it, but solutions of chlorinated potash (or soda) bleach it completely. After a few weeks the tint of the ink begins to change, writing executed with it becomes lighter and somewhat yellowish, and in about three months the change is completed, when it has a foxy yellow tint. The writing is still plainly legible, however, and cannot be removed either by water or by acids.

Blue-Black Writing Ink. (*Chemist and Druggist*, January, 1889.) A correspondent of the *Scientific American* submits the following formula :—

Tannic Acid	200 grains.
Gallic Acid	50 „
Protosulphate of Iron	1 oz.
Indigo Carmine (neutral) . . .	320 grains.
Powdered Cloves	5 „
Water	1 pint.

Dissolve the tannic and gallic acid in the water. To this solution add the iron salt, and filter through cotton. Then add the indigo, carmine, and lastly the cloves. One good copy can be obtained from this ink.

Red Copying Ink. E. Dieterich. (*Chemist and Druggist*, December, 1888, from *American Druggist*.)

	Imperial Ink.	*Crown Ink.*	*Coral Ink.*
Extract of Logwood, French, extra fine	100 parts.		
Oxalate of Ammonium	30 „		
Sulphate of Aluminium	30 „		
Oxalic Acid	8 „		
Bichromate of Potassium	5 „		
Salicylic Acid	1 „		
Pure Water	q. s.		

Reduce the first four ingredients to a coarse powder, and heat the mixture with 800 parts of water to boiling in a copper vessel. Then add a solution of the bichromate of potassium in 150 parts of hot water, next add the salicylic acid, and set the whole aside for fourteen days. Pour off the clear liquid, and fill it in half-pound or one-pound bottles.

In thin layers this ink has a fine red tint, and writes with violet-red colour, which copies dark violet, and also assumes the last-mentioned shade when drying. It is one of the best copying inks in existence. Writing done with it can be copied many weeks afterwards.

Ink Extract. (*Chemist and Druggist*, December, 1888, from *American Druggist*.)

Tannic Acid	50 parts.
Tersulphate of Iron, dry	20 „
Sulphate of Sodium, dry	10 „
Sugar	20 „
Aniline Blue, water soluble, I B	4 „

Reduce to a coarse powder and keep in a tin box.

When using it, pour the contents of the box into an earthen jar, add 1 quart of pure hot water, and stir until everything is dissolved. When cold the ink is transferred to bottles. This ink writes with a bluish colour and turns rapidly black.

The dry tersulphate of iron for the present purpose is best prepared by evaporating 250 parts of liquor ferri persulphatis on a water-bath to a syrupy condition, then adding the dry sulphate of

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Black Varnish. (*Chemist and Druggist*, March 30, 1889.)

Shellac	12	ozs.
Resin, powdered	8	„
Lampblack	1½	„
Spirit	48	„

Mix.

Black Leather Varnish. (*Chemist and Druggist*, December 1888; from *American Druggist*.)

Shellac	150	parts.
Venice Turpentine	15	„
Yellow Wax	15	„
Nigrosin, alcohol-soluble	40	„
Alcohol, enough to make	1,000	„

Melt the Venice turpentine and yellow wax at a gentle heat, and gradually add the shellac previously dissolved in 800 parts of alcohol. Next add the nigrosin, in very fine powder, and, lastly, enough alcohol to make 1,000 parts. In place of the nigrosin, 50 parts of lampblack may be used. This should first be triturated with a small portion of the alcoholic solution, so as to get a perfectly smooth mixture.

Amber Varnish. W. Sonne. (*Zeitschr. für angew. Chemie*, No. 18, 1888.) Commercial amber varnish is made by dissolving amber or colophony-amber in linseed oil, varnish, and turps. In many cases it is made without the expensive amber, and an analyst is sometimes asked his opinion, whether a sample is genuine, *viz.*, really made with amber. The best way is to try for succinic acid, although even a genuine article only contains small quantities of this substance, as a large quantity volatilizes during the heating of the varnish. The detection is, however, difficult, owing to the nature of the article. Neither boiling with hydrochloric acid nor treatment with alcoholic potash extracts any succinic acid. The author's plan is to treat the sample with nitric acid of 1·20 specific gravity. He proceeds as follows:—20 grams of the varnish are put into a flask of about 300 c.c. capacity, and heated on a sand-bath with 50 c.c. of the nitric acid. When action sets in, the flask must be somewhat cooled to prevent a too fierce oxidation, when it may be again gently heated for about fifteen minutes. The acid, which holds all succinic acid in solution, is now poured off, and the insoluble resinous mass washed with water. The acid is evaporated in the water-bath, a little water being from time to time added. When the acid has been completely expelled, the

remaining syrup is dissolved in about 10 c.c. of water, and this solution shaken with 100 c.c. of ether. After distilling off the ether, the residue is put in a watch-glass and put under a dessicator. After about twelve hours, crystals of succinic acid separate out and the amount gradually increases. The mother-liquor being removed by means of blotting paper, the crystals may now be tried by the usual tests for succinic acid. It is thus possible to answer within twenty-four hours the question whether a sample of amber varnish is really deserving of the name.

An Improved Varnish-removing Compound. E. Oates. (*Journ. Soc. Chem. Ind.*, 1889, 552.) Twenty lbs. of solution of caustic soda of 40° B., 1 lb. of potato starch, and 20 pints of water are introduced into a closed boiler. The mixture is thoroughly agitated, which effects spontaneous heating of the same with conversion into a gelatinous mass. This is treated with 57¾ pints of water and 1¼ lb. of potato starch, to form a total weight of 100 lbs. of final product. This composition constitutes the most concentrated type of varnish-remover, and may be reduced with water to any desired percentage of alkali, if required.

An Improved Paint-removing Compound. E. Oates. (*Journ. Soc. Chem. Ind.*, 1889, 552.) The paint-remover is prepared by introducing 50 lbs. of caustic soda solution of 40° B., and 8 lbs. of Iceland moss into a closed boiler, and, after thorough stirring, heating the liquid gently to boiling, at which point it is maintained for an hour. When completely cold, 100 lbs. of caustic potash are added to the mixture, which is then again heated up to boiling. It is now left to cool, and treated with a quantity of potato starch in the proportion of from 6 to 8 per cent. of the mass.

Castor Oil versus Olive Oil as a Lubricator. (From *Journ. Soc. Chem. Ind.*) The Italian Admiralty have recently caused to be carried out a number of experiments with a view to testing the comparative merits of castor oil and olive oil for lubricating purposes on board ship. From the results obtained, they have given orders that henceforth all exposed parts of machinery are to be lubricated exclusively with castor oil, while mineral oils are to be used for cylinder and similar lubrication.

Properties and Industrial Value of the Juice of Bassia Latifolia. E. Heckel and F. Schlagdenhauffen. (*Comptes Rendus*, cviii. 103–105; *Journ. Soc. Chem. Ind.*, February, 1889.) This juice is a pale pink mass, hard at the ordinary temperature, but becoming soft when worked up. It loses nearly 60 per cent. of its weight of water at 105°. It was purified by agitation with hot water and

dilute sulphuric acid, and then formed a soft, sticky mass. When heated till all its water has been expelled, it is brown, hard, and transparent, and after some days' exposure to the air becomes covered with white patches, which dissolve in chloroform and carbon bisulphide, but do not crystallize. Strong sulphuric acid colours it yellow and then brown, and a trace of ferric chloride develops in the mixture a fine red colour, becoming blue on standing; a reaction very similar to that yielded by cholesterin, but this substance is not present.

This gutta yields no picric acid when boiled with fuming nitric acid, and is not attacked by strong hydrochloric acid, aqueous potash, or fused potash. Its formula is $C_8 H_{12} O$, and its ash is white, containing sodium chloride, and calcium phosphate and sulphate.

It could not be used as a substitute for ordinary gutta, but if mixed with an equal quantity of this latter, it might be used for the vessels of galvanic batteries.

Preparation of Wines from Fruits and Berries. J. Nessler. (*Journ. Soc. Chem. Ind.*, February, 1889.) Good and ripe fruit should be used; worm-eaten or bad fruit gives the wine a flavour, and yields wine either difficult to clear or which will subsequently become turbid. The fruit may be crushed, or ground in a mill, and immediately pressed. Pears often contain too little acid, but frequently mucic matter and much tannin, and therefore wines prepared from them are generally more difficult to deal with and not so good as wines prepared from apples and pears together. With good, juicy, ripe fruit, the best wine is obtained without the addition of water; but with unripe and very sour apples or very hard pears, it is best to press, mix the residues with water, and after some hours press again and mix the liquors. For every hectolitre of water used, 10 to 12 kilos. of sugar are added; in cold weather the sugar is dissolved in warm water so as to bring the temperature of the must to 15–20°. To prepare an ordinary house-wine 200 kilos. of fruit are used to 1 hectolitre of water and the necessary amount of sugar.

When the chief fermentation is over and most of the yeast has settled, the wine should be left to undergo a second fermentation, which makes it fit for keeping; if this fermentation do not set in of itself, and the wine be not thick, 1 to 1½ kilos. of sugar must be added, which then ferments.

Wines which are brown or black, or which become black or turbid, can be improved by mixing with 5 to 10 per cent. of good

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Art. I.—This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following :—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

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1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.
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4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.
5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.
6. At each Conference it shall be determined at what place and time to hold that of the next year.
7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.
8. The Executive Committee shall present a report of proceedings annually.
9. These rules shall not be altered except at an annual meeting of the members.
10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

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YORK.—Chemists' Association (1865). Mr. Montague Folkard, 9, High Ousegate, York.

PRESENTATION COPIES OF THE YEAR-BOOK OF PHARMACY ARE FORWARDED TO THE FOLLOWING:—

The Honorary Members.

Libraries.

American Pharmaceutical Association; Chemical Society of London; Ecole Supérieure de Pharmacie, Montpellier; Ecole Supérieure de Pharmacie, Paris; Massachusetts College of Pharmacy; The Mason College, Birmingham; Missouri College of Pharmacy; New Zealand Board of Pharmacy; North British Branch of the Pharmaceutical Society; Pharmaceutical Society of Great Britain; Pharmaceutical Society of Ireland; Pharmaceutical Society of New South Wales; Ontario College of Pharmacy, Toronto; Pharmaceutical Society of Australasia; Pharmaceutical Society of Queensland; Royal Society of London; Société de Pharmacie, Paris; State of Illinois Board of Pharmacy; Yorkshire College of Science.

Provincial Associations (having Libraries).

Aberdeen Society of Chemists and Druggists; Brighton Chemists' Association; Bristol Pharmaceutical Association; Colchester Association of Chemists and Druggists; Coventry and Warwickshire Pharmaceutical Association; Dover Chemists' Association; Dundee Chemists and Druggists' Association; Edinburgh Chemists' Assistants' Association; Glasgow Chemists and Druggists' Association; Halifax and District Chemists and Druggists' Association; Hastings Chemists' Association; Hawick Chemists' Association; Hull Chemists' Association; Leeds Chemists' Association; Leicester and Leicestershire Chemists' Association; Liverpool Chemists' Association; London Chemists' Assistants' Association; Manchester Chemists and Druggists' Association; Midland Counties Chemists' Association; North of England Pharmaceutical Association; Nottingham and Notts Chemists' Association; Oldham Chemists and Druggists' Assistants and Apprentices' Association; Sheffield Pharmaceutical and Chemical Association; Sunderland Chemists' Association; York Chemists' Association.

Journals.

American Druggist; American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; Lancet; Medical Press and Circular; The Microscope; The National Druggist; Nature; Pharmaceutical Journal; Pharmaceutische Centralhalle; Répertoire de Pharmacie; Revista Farmaceutica.

THE FOLLOWING JOURNALS ARE RECEIVED FROM THEIR RESPECTIVE EDITORS:—

American Druggist; American Journal of Pharmacy; Archives de Pharmacie; Archiv der Pharmacie; Australasian Journal of Pharmacy; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; National Druggist; Pharmaceutical Journal; Pharmaceutical Record; Pharmaceutische Centralhalle; The Microscope; Proceedings of the American Pharmaceutical Association; Répertoire de Pharmacie; Revista Farmaceutica.

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MONDAY, 9th SEPTEMBER.

The EXECUTIVE COMMITTEE met, according to notices from the Honorary General Secretaries, at 10 p.m., at the University of Durham College of Science, Newcastle-on-Tyne.

TUESDAY, 10th SEPTEMBER.

The CONFERENCE met at 10 o'clock a.m., adjourning at 1 p.m.; and at 2 o'clock p.m., adjourning at 4 p.m.

Order of Business.

Address of Welcome by Principal GARNETT.
Reception of Delegates.
Report of Executive Committee.
Financial Statement.
Report of Treasurer of the "Bell and Hills Library Fund."
President's Address.
Reading of Papers and Discussions thereon.

PAPERS.

1. *Note on Tincture of Senna.* By B. S. PROCTOR, F.I.C.
2. *Papain as a Digestive Agent compared with Commercial Pepsins.* By A. BALL.
3. *Are Glass Bottles Soluble?* By R. REYNOLDS, F.I.C., F.C.S.
4. *Note on Extract of Stramonium.* By A. W. GERRARD, F.C.S.
5. *Ferri et Ammonii Citras.* By B. S. PROCTOR, F.I.C.
6. *Easton's Syrup.* By T. MALTBY CLAGUE.
7. *Note on the Effect of the use of Nitrous Vitriol in making certain Aërated Waters.* By JOHN PATTINSON, F.I.C., F.C.S.
8. *Ipecacuanha Fluid Extract and Wine (Standardized).* By J. O. BRAITHWAITE and J. C. UMNEY.
9. *Ipecacuanha Wine (British Pharmacopœia).* By J. O. BRAITHWAITE and J. C. UMNEY.
10. *Note on a Volumetric Process for the Assay of Ipecacuanha Wine.* By T. P. BLUNT, M.A., F.C.S.
11. *Note on Hypophosphorous Acid as a Solvent of Strychnine and Morphine.* By H. W. JONES, F.C.S.
12. *Note on a New Mode of Applying Chloride of Methyl.* By W. MARTINDALE, F.C.S.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the Cambridge Hall.

At 4 p.m. afternoon tea was provided at the College, after which members and their friends drove through the Parks to Jesmond Dene.

WEDNESDAY, 11th SEPTEMBER.

The CONFERENCE met at 10 o'clock a.m., adjourning from 1 p.m. till 2 p.m. The whole of the business of the Conference was completed this day by about 4 p.m.

Order of Business.

Reception of Delegates.
Reading of Papers and Discussions thereon.

PAPERS.

13. *Chemical Observations on the Root Bark of Euonymus.* By W. A. H. Naylor, F.I.C, F.C.S., and E. M. Chaplin, F.C.S.
14. *Medical and Chemical Misconceptions about Lithia.* By Louis Siebold, F.I.C., F.C.S.
15. *Arsenic in Glycerine.* By Louis Siebold, F.I.C., F.C.S.
16. *Negative Evidence of Lead in Drinking Water.* By R. Reynolds, F.I.C.,F.C.S.
17. *Vermin Killers containing Strychnine.* By A. H. Allen, F.I.C., F.C.S.
18. *Note on a Scale of Small Residues.* By B. S. Proctor, F.I.C.
19. *Strophanthus Plants.* By T. Christy, F.L.S.
20. *The Chemistry of Strophanthus.* By Prof. T. R. Fraser, F.R.S.
21. *Narceine and its Salts.* By D. B. Dott, F.R.S.E.
22. *Note on Lemon Juice.* By T. Howell Williams, F.C.S.
23. *Tannin—Its Solubilities, etc.* By B. S. Proctor, F.I.C.
24. *Wild Cherry Bark and its Preparations.* By L. W. Hawkins.
25. *Infusion of Gentian.* By William Johnston.
26. *Tincture of Lemon Peel.* By William Johnston.
27. *Exact Formulæ for the Official One Per Cent. Liquors.* By C. A. Macpherson.
28. *Liquor Morphinæ Meconatis.* By C. A. Macpherson.
29. *The Strength of Commercial Specimens of Scheele's Prussic Acid.* By R. Wright.
30. *The Relative Value of Alcohol and Chloroform, and Mixtures of the two, for the Extraction of Aconite and Belladonna Roots.* By R. Wright.
31. *Note on an Impurity in a Commercial Sample of Sodium Salicylate.* By R. Wright.
32. *Casearia Esculenta.* By Dr. P. S. Mootooswamy, F.L.S., Tanjore,

Place of Meeting for 1890.
Election of Officers for 1889-90.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon at the Cambridge Hall.

THURSDAY, 12th SEPTEMBER.

A large party of members and their friends left the Central Station at 9 a.m., by special train for Hexham, where, under the able guidance of Messrs. Gibson & Riddle, of that town, they visited the Abbey Church and other places of interest. After luncheon at the Town Hall, the train journey was resumed to Rothbury, *viâ* the picturesque North Tyne Valley. Here they rambled through the beautiful grounds of Craigside, the seat of Lord Armstrong. After taking tea at the Jubilee Institute, the return journey was made direct from Rothbury.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING AT NEWCASTLE-ON-TYNE, 1889.

THE Twenty-sixth Annual Meeting of the British Pharmaceutical Conference commenced its sittings on Tuesday, September 10th, in the Physical Lecture Theatre of the University of Durham College of Science, Newcastle-on-Tyne. Chas. Umney, Esq., F.I.C., F.C.S., in the chair.

The following members and visitors were present during the meeting:—

Aberdeen—Broomhead, G. E.; Giles, W.; Johnson, J.; Kay, J. P.; Pattison, J.

Alnwick—Newbigen, J. L.

Bath—Bird, Miss.

Barnet—Young, R. F.

Bedlington—Foggan, G.

Berwick—Carr, W. P.; Lyle, W.

Birmingham—Barclay, T.

Bolton—Forbes, J. W.

Bonnyriggs—Hatcham, W.

Brighton—Leigh, Marshall; Savage, W. D.

Bristol—Shenstone, W. A.; Strond, J.

Cardiff—Coleman, A.

Chester—Baxter, G.; Shepheard, T.

Chester-le-Street—Greenwell, R. H.

Chicago, U.S.A.—Wheeler, C. G.

Clifton—Schacht, G. F.; Towerzey, A.

Coleraine—Baxter, W. J.

Consett—Milner, T.

Dalkey, Ireland—Beggs, G. D.

Dublin—Brown, Miss Harriet C.; Wells, Miss Mary A.; Wells, W. F., jun.

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Oldham—Wood, C. G.
Radcliffe—Smith, J. T.
Ripon—Perkins, J. B.
Salisbury—Atkins, S. R.
Settle—Shepherd, J. W.
Sheffield—Allen, A. H.; Newsholme, G. T. W.
Shrewsbury—Cross, W. G.
Spennymoor—Farthing, J.
Stanley—Robinson, J.
St. Ives—Burton, H.
Stockton—Brayshay, T.
Sunderland—Harrison, J.; Kitchenson, J.; Rankin, C.; Todd, W. J.
Swansea—Grose, H. M.; Hughes, Jas.
Tarporley—Aston, W.
Taunton—Wrenn, W. A.
Tynemouth—Atkinson, J.
Wakefield—Chaplin, J. L.; Chaplin, Mrs. J. L.
Weymouth—Groves, T. B.
Wigan—Johnson, J.; Phillips, J.
Woolwich—Gwinnel, E.

Meeting of the Executive Committee.

A meeting of the Executive Committee was held at the Durham College of Science, Newcastle-on-Tyne, on Monday, September 9, 1889, at 10 p.m.

Present:—Mr. Umney (President) in the chair, Messrs. Atkins, Benger, Brady, Clague, Conroy, Dott, Gerrard, Maben, Martin, Reynolds, Schacht, Woolley, and Mr. Martindale (Hon. Treasurer), Dr. Thresh and Mr. Naylor (Hon. Gen. Secs.), and Mr. J. C. Nightingale (Assist. Sec.)

The minutes of the previous meeting were read and confirmed.

Intimations of inability to attend were announced as having been received from Professor Attfield, Messrs. Brunker, Davies, Greenish, Stephenson, and Symes.

The Treasurer's financial statement for the year 1888–89 was read and approved.

A draft report for presentation at the annual meeting was submitted by the Hon. Gen. Secs., and after correction of a clerical error was agreed to.

The Hon. Gen. Secs. reported that with reference to two of the papers to be read at the general meeting, they had suggested that

the authors should make certain alterations, so as to leave no doubt as to their suitability and their acceptance by the Committee. In each case the suggestions had been kindly received and promptly acted upon.

Copies of a draft programme of the business of the general meeting were placed before the members.

This was discussed and finally arranged.

Mr. Naylor then stated that the MS. of the *Year-Book* for 1889, as far as it could be completed, was in the hands of the printers.

The place of meeting for 1890 was considered.

Mr. Reynolds announced that he had been deputed by the Leeds Association to extend to the Conference a cordial invitation to hold its next sessions in that town, and if the invitation were accepted, he could bespeak for them a characteristic Yorkshire welcome.

The President commended this invitation to the members, who expressed it as their pleasure that it should be recommended to the meeting for acceptance.

Mr. Martin informed the Committee that Principal Garnett would attend the meeting at ten o'clock in the morning to welcome the members of the Conference.

The following nineteen gentlemen were duly nominated and elected to membership.

Armistead, Mr. W., Wolverhampton.
Axford, Mr. J. W., Coventry.
Bain, Mr. John, Liverpool.
Ball, Mr. A., London.
Christie, Mr. R. A., London.
Duncan, Mr., Newcastle-on-Tyne.
Hartridge, Mr., London.
Hudson, Mr. Thomas H., Liverpool.
Lyons, Mr. P. J., Belfast.
Milner, Mr. Thomas, Consett.
Potts, Mr. Robert, Newcastle-on-Tyne.
Priest, Mr. B. W., London.
Simpson, Mr. T., Newcastle-on-Tyne.
Smith, Mr. S. H., Leamington.
Stark, Mr. A. C., London.
Todd, Mr. J., Sunderland.
Webb, Mr. J. H., Luton.
Wise, Mr. J. N., Durham.
Wrenn, Mr. W. A., Taunton.

GENERAL MEETING.

Tuesday, September 10*th.*

Professor GARNETT, Principal of the College, commenced the proceedings by welcoming the Conference in the name of the President and Council of the Durham College of Science. He said that in the erection of that structure it had been the hope of the College Council and Governors that it should prove to be a centre from which literary and scientific education might radiate over the north of England, and a home towards which the literary and scientific institutions of the district might naturally converge. In that hope they had not been disappointed, for during the short time that that building had been in existence, it had been used by a large number of the scientific societies of the town. The Pharmaceutical Conference had already done much valuable work, but there still remained much for it to do, especially in the direction of systematizing the scientific education of candidates for the position of pharmaceutical chemists. The President had conferred upon science and on his profession, by his researches into the chemistry of drugs, such benefits, that if this meeting were the means of inducing some few others to follow in his steps, the College authorities would feel they had done really valuable work in inviting the Conference to assemble in the premises. Professor Garnett then gave a brief *résumé* of the history of the College of Science, which was formed eighteen years ago, but which had only recently been able to secure ground and buildings of its own, the latter being at present still far from complete, though thoroughly so in the department of chemistry and physics, and there being also a building which was largely used for technical classes for the museum and fine art department, and which was also used by the North of England Pharmaceutical Association. The members of the Conference would be welcome to inspect the building and arrangements of the College, and in conclusion he repeated the welcome he had offered in the first instance to the Conference.

Mr. N. H. MARTIN, Vice-President, having thanked Professor Garnett for the interest and kind courtesy which he had always shown in and towards pharmacists, and the facilities he had placed at their disposal on all occasions, welcomed the Conference

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Hull Chemists' Association:—Messrs. C. B. Bell and W. H. Hammond.

Leeds Chemists' Association:—Messrs. F. W. Branson, P. Jefferson, R. Reynolds, G. Ward, and G. W. Worfolk.

Leicester and Leicestershire Chemists' Association:—Mr. J. W. Clark.

Liverpool Chemists' Association:—Messrs. A. N. Samuel, A. C. Abraham, John Bain, M. Conroy, C. Symes, and W. Wellings.

London Chemists' Assistants' Association:—Messrs. T. A. Ellwood, E. J. Millard, E. Richards, and C. J. Strother.

Manchester Chemists' Association:—Messrs. F. B. Benger and G. S. Woolley.

Sunderland Chemists' Association:—Messrs. Askew, Fowler, Harrison, Mitchinson, Ranken, Todd, and Turnbull.

Dr. THRESH stated that letters of apology and regret at not being able to be present had been received from Prof. Attfield, Prof. Bentley, Messrs. Bottle, Brunker, Davies, J. Greenish, Moss, Stephenson, Symes, C. Thomson, Tyrer, and Wylie,

Mr. W. A. H. NAYLOR (Hon. Gen. Sec.), next read the Report of the Executive Committee, as follows:—

REPORT OF THE EXECUTIVE COMMITTEE.

Your Committee, in presenting a summary of the business it has transacted during the year, is glad to be able to report that the numerical strength of the Conference has been more than maintained, and that there are not wanting signs of increased activity.

The results of the biennial whip issued two years ago having fallen short of the success it was expected to achieve, your Committee deemed it advisable to try some other mode of appeal. After much deliberation it was agreed that the best form the appeal could take would be that in which the personal element was prominent. It was ultimately resolved that the Honorary Secretaries should address, in due course, a communication to the Secretaries of the various Local Associations to which *Year-Books* are annually sent, requesting their co-operation in obtaining additional members. This resolution will be carried into effect at an early date, when it is hoped it will elicit a hearty and general response. In this connection it may be usefully pointed out that the principle involved in this tentative scheme is not new, but one that commands only a too limited practice. Its application in the

direction of securing nominations for membership is commended to every member of the Conference. It is a pleasure to your Committee to supplement the announcement made last year of the resignation of Mr. A. H. Mason, F.C.S., as Honorary Secretary for Canada, by the further statement that Mr. Joseph Bemrose, F.C.S., of Montreal, Canada, has consented to act as his successor.

In order to assist willing workers in the choice of suitable subjects requiring investigation, the familiar Blue List has been subjected to a painstaking and extensive revision. It is gratifying to find that of the papers to be read at this meeting a not unimportant proportion afford proof of the indebtedness of the authors to the suggestions therein contained. That the number is not larger may be reasonably attributed to the shortness of the interval between its issue and the present gathering.

The absence during the year of any application for a money grant in aid of research is a subject of regret. Your Committee would improve the occasion by reminding capable contributors of its readiness to provide funds to assist in defraying the cost of materials connected with the conduct of original researches suitable for reports to Conference.

The Committee of the Unofficial Formulary has, through its Chairman, reported to the Executive Committee that the work it has in hand has not reached a sufficiently advanced stage to justify a recommendation for its publication this year.

The Honorary Treasurer of the Conference, with the sanction of your Committee, has effected a change in the consols of the Bell and Hills Fund, a step necessitated by the conversion scheme of the Government.

Mr. Louis Siebold, F.I.C., F.C.S., was last December reappointed Editor of the *Year-Book*. The manuscript of Parts I., II., III. and IV. of the 1889 volume is now in the hands of the printers.

It is the painful duty of your Committee to report officially the death of Mr. John Williams. Five years ago he honoured our Association by his occupancy of the Presidential chair, and for three consecutive years he filled the office of President of the Pharmaceutical Society of Great Britain. To the latter body and the Conference he was a liberal contributor. Mr. Williams in his career supplied added proof of the possibility of a practical pharmacist being also a sound chemist. He was possessed of a kindliness of disposition, the depth of which only those could form an approximate estimate whose privilege it was to know him intimately, whilst he was also unobtrusively generous, a characteristic which

FINANCIAL STATEMENT FOR THE YEAR ENDING JUNE 30TH, 1889.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1888.	DR.	£	s.	d.
July 1.	To Assets forward from last year :—			
,,	,, Balance in hand at Bank	105	0	3
,,	,, Cash in Secretary's hands	2	9	6
,,	,, Messrs. Churchill's Account	154	0	11
1889.				
June 30.	,, Sale of Year-Book by Publishers . . .	18	13	4
,,	,, Advertisements, 1888 vol. . £107 7 11			
,,	,, ,, 1887 vol. . . 1 16 0			
		109	3	11
,,	,, Members' Subscriptions, Amount received for year ending July 1, 1888, to June 30, 1889	538	10	4
,,	,, Index to Year-Book, sale by Secretary	1	10	0
,,	,, Outstanding Liabilities, Messrs. McCorquodale & Co.	6	17	9
,,	,, Unofficial Formulary, sale by Publishers	30	12	0
		£966	18	0

1889.	CR.	£	s.	d.
June 30.	By Expenses connected with Year-Book :—			
	Printing, Binding, Publishing, etc. £280 6 9			
	Postages and Distribution . 24 8 9			
	Advertising and Publishers' charges 30 13 0			
	Editor's Salary . . . 150 0 0			
	Foreign Journals for Editor . 5 15 6			
		491	4	0
,,	,, Unofficial Formulary :—			
	Printing and Binding . . 16 12 0			
	Advertising and Postage . 7 6 6			
	Publisher's Commission . 3 1 0			
		26	19	6
,,	,, Sundry Expenses :—			
	Grant to Formulary Committee 10 0 0			
	Expenses of Assist. Sec. at Bath 10 0 0			
		20	0	0

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induced him to impart freely knowledge which had taken him long years of patient toil to acquire.

The number of Notes and Papers which have been received for this meeting is larger than in any previous year since 1885. From the standpoints of usefulness and suitability they fulfil in an admirable degree the scientific requirements of the Conference. Among the contributors are to be found old friends whose productions are ever welcome, and these will join heartily in the congratulation due to the fact that several of the papers represent maiden presentations to the Conference, a circumstance which augurs well for its future.

The Reception last evening by the President and officers of the Conference, and the Conversazione which followed, may be pronounced not only a well-deserved but a brilliant success.

Your Committee cannot conclude its Report without a reference to the loss the Conference is about to sustain in the departure of its late senior honorary secretary to Melbourne, to undertake the responsible duties of Lecturer on Chemistry and Materia Medica in the College of Pharmacy, Melbourne, and Demonstrator of Pharmacy to the University of Melbourne. It congratulates Mr. Plowman on his appointment and elevation, and is assured that the best wishes of every member of this Conference will accompany him to his new sphere of labour. It also feels, in wishing him health and success, that he will do much by his presence and personal endeavour towards strengthening the attachment to this Conference of our fellow members in Victoria, which he successfully initiated five years ago.

Mr. MARTINDALE (Hon. Treasurer) read the financial statement (see pp. 338, 339) :—

Mr. RHEEDER (Newcastle) one of the auditors, having testified to the correctness of the accounts and to the securities being all in order,

The PRESIDENT moved that the report of the Executive and the Balance Sheet be received and adopted.

Mr. C. B. ALLEN seconded the motion, which was at once agreed to.

The PRESIDENT then delivered the following address :—

THE PRESIDENT'S ADDRESS.

Ladies and Gentlemen,—It was at Newcastle, after the meeting of the British Association in 1863, that a few leading pharmacists met with the object of inaugurating an annual Pharmaceutical Conference.

At this first meeting the desirability of having at intervals an opportunity of conferring upon matters of interest and importance to pharmacists was shown, and it was thought that a stimulus to intellectual exertion would be given by the prospect of periodical gatherings, and that many who had time and opportunity for research would be induced to contribute papers, while the majority when associated would look forward to an annual gathering as an opportunity of good fellowship.

We are indebted to Schacht for the idea of our annual Conference, to Attfield, Brady, and Reynolds for our excellent organization, and to the indefatigable Secretaries for the success of our annual meetings through a series of years.

Reference to the list of members who have been called to the Presidential chair reminds me not only of the honour you have done me in electing me to this office, but fills me with misgivings lest I should unworthily occupy the post which has been so ably filled by my predecessors.

It is to be regretted that death removed some of our Presidents while capable of active work, but gratifying to know that their labours live after them, and that their published researches are ornamental to our *Year-Books of Pharmacy*, and of great practical value to medicine and commerce.

Presidents Deane, Hanbury, Stoddart, Southall and Williams took the greatest interest in this Conference, and other Presidents who are happily among us to-day, as well as those that are absent, are still in sympathy with this Association and its objects.

We who have seen the "blue ribbon" that it is customary for the Royal Society to confer on workers in science, given to some of our past Presidents, have reason to feel proud of the distinction conferred upon Pharmacy through them.

Your late President, when speaking at Bath of the "silver wedding" of the Conference, had a most felicitous topic. I am fortunate in having what should prove an attractive occasion, one indeed which should enlist an enthusiasm equal to that of last

year's meeting, arising out of the fact that it was in this very town twenty-six years ago that the British Pharmaceutical Conference had its birth.

"Breathes there the man, with soul so dead,
Who never to himself hath said,
This is my own, my native land?"

The Conference, as you are aware, has met in many important cities and towns in England, Scotland, and Ireland, and on this occasion we are responding to an invitation given twenty-six years ago, when Brady expressed his satisfaction that Newcastle had had the privilege of receiving the first meeting of the Conference, and promised a hearty welcome whenever its members were again disposed to visit his town.

Those good friends I see around me to-day evidently had not forgotten the past, and thus it was that at Bath their colleagues said, "that the heart of Newcastle beat with parental affection to the Conference," and, as if to remind us of the geographical position of their town, and to entice our North British friends to come over the border, they said—

"Better loved ye canna be;
Will ye no come back again?"

The subjects upon which my predecessors have addressed you have been most varied. Some Presidents reviewed researches in those sciences having a direct bearing upon pharmacy which had been published during their year of office; others spoke to you upon pharmaceutical ethics and politics; some upon revision of the British Pharmacopœia; while others directed your attention to the study of some particular science upon which they spoke as experts.

In casting about for a topic upon which I might address you, I came to the conclusion that one of the articles of association of the British Pharmaceutical Conference agreed to in this town in 1863, viz., "*That one object of the Association should be to maintain uncompromisingly the principle of purity of medicine,*" would not be an inappropriate theme on which one might say something concerning our every-day life that would lead to fresh lines of thought, and such a modelling of our ideas and actions that might tend to make us more accomplished pharmacists and not less successful men of business.

In the days when sophistication was rampant there were to be

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them aware that for anything other than crude or garbled drugs, but little reliance could be placed in the wholesale druggist, and thus it was, notwithstanding mechanical appliances were vastly improved for pulverization and other processes, the dispenser had to produce his powders by pestle and mortar if the physician's prescriptions were to be reliably dispensed.

Now in those days it was the practice of the wholesale druggist to send his drugs to a drug miller, who, it is to be regretted, was not so scrupulous of the purity of his products as are the firms who carry on similar businesses to-day; and it is certain, moreover, that the wholesale druggist set a bad example to the miller, for it was not an uncommon practice (as I was once informed by a wholesale druggist who was in business at the end of last century) to send comparatively inert substances to the mill to be ground and mixed with potent drugs.

Early in this century guaranteed powdered drugs were introduced in trade by Thomas Herring, who claimed that his soft, impalpable, bright-looking vegetable powders were as pure as the unsightly powders that compounders were then producing for themselves by pestle and mortar.

Others followed upon parallel lines with marked success, and the good example of several well-disposed men, striving for excellence, was one of the important steps which have been instrumental in producing the purity, uniformity, and perfection so generally to be met with in the powdered drugs of to-day.

Compounded medicines at this period consisted largely of galenicals; and notwithstanding chemical substances were used in medicine, their preparation was imperfectly understood.

Chemical science, it is true, had already started on its triumphant march, for Phillips, when reviewing the Pharmacopœia of his time, wrote most ably thirty pages upon the preparations of antimony.

Tricks were resorted to in the adulteration of simple chemical substances which leave but little doubt that notwithstanding there was a want of chemical knowledge and manipulative skill, there was no lack of deliberate intention to defraud.

The success attendant upon the production of pure powdered drugs was an incentive to some of our historic houses, and it came about that not only were chemical substances prepared with due regard to their medicinal purity on a larger scale than heretofore, but organic novelties, such as quinine, morphia, strychnia, which were now finding uses in medicine, were produced on a manufac-

turing scale of a purity, which, considering the chemical knowledge of the manipulators, was highly creditable.

For half a century prior to our first Conference a gradual but steady advance in the direction of purity for medicinal substances was made, and the pharmacists of 1863 did not fail to take cognizance of this; moreover, they saw that the sphere of their labours was being constantly enlarged, and if pharmacy in the future was in any way to be a credit, then their work as chemists and pharmacologists must be unceasing.

Since the first Newcastle meeting the rival pharmacopœias of London, Edinburgh, and Dublin have been fused into a national pharmacopœia. This has been advantageous in helping forward and maintaining uniformity and purity in medicine. Those of us who have been in harness during the publication and use of three or four pharmacopœias know the effect a well revised edition has upon the commercial standard of crude and manufactured drugs. The British Pharmacopœia, 1885, is an excellent type of what such a book should be, for it adopts a standard that insures efficiency, and does not attempt to introduce rare and exceptional quality that is only occasionally obtainable, to the exclusion of that which is to be had of uniform excellence without difficulty.

There is perhaps no work upon which an expert has to use his judgment with so much tact and skill, so that he may keep both in touch and tune with the medical profession, the pharmacist, the drug merchant and manufacturer, as when he is called upon to edit a national pharmacopœia. He may be misled by statements based on imperfect information or defective manipulation, and he cannot in all cases obtain facilities for checking the accuracy of published results. The suitable editing of a pharmacopœia becomes apparent when the Editor, knowing the requirements of the medical profession and the capabilities of pharmacists and manufacturers, adopts standards and frames "characters and tests" which are acceptable to all concerned, and this without in any degree imperilling that principle which this Association has at heart, viz., to maintain without compromise the purity of medicine.

Pharmacists should do all in their power not only when in their own business premises, but also in their public and private capacities, etc., to impress upon the public that household remedies should invariably be purchased of a similar strength and quality to those medicines physicians direct to be used in compounding their prescriptions.

If pharmacists would thus aid in educating the public they would

rid themselves of much outside competition in which weaker and inferior preparations are sold in lieu of the preparations of a higher standard vended by themselves; and this might be done quite apart from the question as to whether, legally, it is compulsory to retail British Pharmacopœia preparations or not.

Is it not also desirable that pharmacists should co-operate with the Medical Council in their desire to make the British Pharmacopœia preparations legal for sale, and those of old Pharmacopœias obsolete and illegal? In my opinion it is most desirable.

The Sale of Food and Drugs Act has materially aided in maintaining and advancing purity in medicine.

As a rule it is a thankless and almost hopeless task to make communities good by Act of Parliament, and oftentimes the striving of the few will act more beneficially as an incentive to the attainment of a higher standard than any coercion that can be devised. There is a residuum nevertheless, holding either different or no definite views, that prefers not to take action unless under compulsion.

This must have been true in reference to traffic in medicines in the past, or "Drugs" would not have been tacked on to the Sale of Food Act, and our business signalled out as one in which it was necessary that supervision should be exercised for the public good.

The working of this Act, in so far as it concerns the drug trade, has not been without friction, due in many cases to the imperfect knowledge of officials, but the novelty now having passed away and the superabundant zeal toned down to a reasonable pitch, only those cases are heard of which indicate fraud on the public. One often wonders when one reads of the number of samples of drugs that have been purchased for chemical examination, most of which seem to turn out satisfactorily judging from the absence of prosecutions, whether in all districts the analysts are so conversant with the characters and tests and commerce of drugs as to enable them efficiently to test substances submitted to them, or to advise the authorities when prosecutions should be unflinchingly carried out or not instituted.

The highly trained pharmacist has neither sought nor obtained the post of Public Analyst in anything like the number of instances he should have done.

It may be that, notwithstanding his acquaintance with pharmacy, he lacks chemical and microscopical skill. If this be so, more complete instruction should be given in these subjects, and students should give themselves up to systematic instruction for a period of

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recently the authorities were not aware that the manufacturer of medicines had any grievances to be redressed.

Happily, within the past year, on account of the broader views prevailing, and the interest taken in our work by the practical men at the head of the Inland Revenue department, there has been an amendment, and the Excise regulations which so trammelled us in the past have now to some extent been removed, and at last there is an opportunity of producing most of our alcoholic medicinal preparations, with permission to export them under suitable drawbacks. These concessions will be of commercial value, and the manufacturing pharmacist will have an opportunity in the future of guaranteeing that his products are what they profess to be, and the standard of purity in medicine will thereby be legitimately maintained and advanced.

The Board of Inland Revenue has taken a good work in hand, and it must not look back.

England produces chloroform, ether, and other substances from alcohol without opportunity of competing with Germany and other countries, for the Excise take no account of the heavy pecuniary loss entailed in manufacturing such liquids from duty-paid alcohol, and give no rebate either for loss, or for duty, to the manufacturer on exportation.

Why England should be driven to Germany and elsewhere for so many of its alcohol derivatives, of which hydrate of chloral is an excellent type, and why alkaloids, as atropine, veratrine, aconitine, and a legion of other preparations should be imported to the detriment of our trade and the demoralization of our rising chemists and pharmacists as manufacturers, I cannot conceive.

In my opinion, alcohol free of duty for medicinal purposes, or some facility to work with pure alcohol under supervision, is a most serious and urgent necessity. We are surely all desirous that we may not continue mere purveyors of potent remedies, but that we may be producers also, with a complete knowledge of the products we handle, whether as dispensers or traders.

There should be no attempt in the direction of obtaining concessions from the Inland Revenue that are impracticable. The department has recently shown a desire to aid rather than to hamper our manufacturers, and there must not now be permitted, even if it should be wished, any lethargy or retrograde movement. Did not Germany for years take tea (valueless for dietetic purposes) out of our bonded warehouses without paying duty, and extract caffeine therefrom, selling it to the world, England in-

cluded? and has it not been from recent concessions of our Customs authorities that we (thanks to the agitation of a shrewd business man) are now in a position to manufacture caffeine as advantageously as our Continental opponents?

The late President of the Chemical Section of the British Association referred at the Bath meeting to the decline of chemistry in this country. While I am not in a position to give an opinion on this subject as a whole, I fully concur in Professor Tilden's views in so far as the study of chemistry and its application to the manufacture of substances for use in medicine is concerned.

If one seeks the reason why in medicine this has come about, when a generation ago England was quite abreast of other nations in the production of inorganic and even organic medicinal substances, one can only come to the conclusion that something must have militated against advancement.

In my opinion two causes, at least, have been at work, viz., the stringent regulations with which we have been hemmed in by the Excise, and the meagre opportunities of education in research that have, up to a very recent date, been afforded in this country.

Our historic drug houses, who have always acted more or less as manufacturers, have, much to their own detriment, neglected research. Each establishment should have had its chemist engaged in the chemical examination of new remedies for the discovery of active principles, etc., which must have tended to have kept us out of the arms of foreigners for most of our alkaloids and other organic substances now in such increasing demand in medicine.

Manufacturers may state that had men educated for such purposes been forthcoming, they would have gladly embarked capital, with the objects of research and manufacture in view, rather than have remained apathetic; and to some extent this is true. In the future, however, such an excuse ought not to hold good, inasmuch as the Pharmaceutical Society has at a considerable cost equipped a research laboratory, which should before this century closes produce many men competent to undertake research and manufacture.

There should be no lack of students in the Society's research laboratory; applications should outnumber vacancies, and men when trained need have but little fear of a demand for their skilled labour.

The Pharmaceutical Society has not unlimited funds, and its moneys cannot all be spent to aid research, but "ways and means" would be no barrier if men were forthcoming.

Let this laboratory be in such demand that there be no vacan-

cies, and the research of such a nature as to be of benefit to medicine and pharmacy, and I have but little doubt that the good friends who honour us by delivering annual addresses to our students, and who hold positions in the House of Commons, our universities and elsewhere, would co-operate to obtain pecuniary aid in furtherance of our object, and it is not at all likely that our rich city companies, who do so much for education, endow scholarships and vote funds for special researches connected with medicine and surgery, would stand aloof.

One would imagine, if one did not know to the contrary, that we were all agreed upon the desirability of a good scholastic and scientific education, backed by business training for those who practise pharmacy. In my opinion no simpler method can be devised in aiding pharmacists as a body to maintain the excellent principles of this Association, as this thorough training, accompanied by the higher education of some in its ranks in research.

It is quite certain that the pioneers of the British Pharmaceutical Conference had not two opinions on this point, and while it is true that few of the black clouds which threaten us as a trade to-day had gathered in their time, still the path is now, as then, in the direction of education, and I hold that our juniors must have every facility for such a training and thorough education in all those sciences having a direct bearing on pharmacy, as will enable them to take up their proper position with the medical profession and the public.

It was not required of the men who met at Newcastle, in 1863, that they should prove their qualification by the possession of the Pharmaceutical Society's diploma. In those days there were no compulsory examinations, as you are aware.

Examinations are not an unmixed blessing, subject as they are to no inconsiderable abuse, and the craze to pass examinations against time has created a state of things which may in the end prove anything but a boon to the pharmaceutical body of the future. It is to be feared that if the students of to-day were asked why they studied, that by far the larger proportion would be bound to acknowledge that they were only occupied in cramming into themselves in the most rapid and easy fashion the minimum amount of information that would help them to pass their examinations.

One cannot help regretfully remarking upon this abuse of education, and the failure of the majority to thirst after knowledge for its own sake.

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I have passed in rapid review a few of the leading features connected with the purity of medicine during this century, and in my divergence to matters connected with or around the subject, I have endeavoured to show what has been done spontaneously, and under coercion, and from force of good example, together with the commercial results of applied botanical and chemical knowlenge.

Notwithstanding the divergence of the various paths over which pharmacy has been trodden during the last three-quarters of a century, most of the roads have finally led to one goal, around which there is one of the fairest portions specially and attractively laid out for the maintenance of the purity of medicine. We who are assembled on this pleasant and reputable spot to-day have gained more speedy access than we should otherwise have done, had not steps on easy paths been thoughtfully bewn for us.

Let us not "rest and be thankful" for the small advance we have made, but rather use our position as a ledge upon which we may firmly plant ourselves, with a determination to advance to heights which, without our present vantage ground, would have been inaccessible, and may we zealously toil to so maintain and advance pharmacy as to be worthy of those who at Newcastle twenty-six years ago founded the British Pharmaceutical Conference.

Mr. ATKINS (Salisbury) proposed a cordial vote of thanks to the President for the admirable, thoughtful, and instructive address he had delivered. It was highly important on the historic occasion of the revisit to Newcastle that there should be a President worthy of the occasion, and though he could have said more on this point in the absence of Mr. Umney, he might say that he regarded him as a typical, ideal pharmacist; a man who had a broad sweep of his subject, with a good knowledge of detail; a chemist, a pharmacist, a man of business, and a man of boundless energy; and possessing these qualities he need not say how confident all who knew the history of the Conference were, that its traditions would be safe in his hands. As an early student of the Pharmaceutical Society, Mr. Umney had done work in its laboratories, museums, evening meetings, and literature, which had been of the greatest value, and coming to the practical side of life, in that direction also they were much indebted to him. In the concessions obtained from the Inland Revenue for the use of spirit for export he had

done great service; and also in the Drug Committee of the London Chamber of Commerce with reference to the new Railway Rates Bill. With reference to the address itself, and the variety of topics which it treated, the thoughtful *résumé* of the past and the investigation of the present aspect of science, education, and commerce, he thought they could not do better than thoughtfully peruse it and well weigh its suggestions. To the young men who were so largely represented that morning it would be an incentive to follow in the steps laid down, and to the seniors it would be a subject of constant refreshment in perusal.

Mr. T. M. CLAGUE esteemed it a great honour to be allowed as Local Secretary to second the proposition. As practical north countrymen they were all very glad to have just the very man they wanted for President. Although a chemist of very considerable ability and a pharmacist who had laid them under great obligations, Mr. Umney was also a first-rate man of business, and the assistance he had given to the manufacturers of pharmaceuticals in the matter to which a brief reference was made in the address—only leaving his own efforts out of sight—was of great value. He had recently come across a curious and interesting fact. As they had already heard, the Conference was established in Newcastle in the year 1863, and he found that in the same year Michael Carteighe and Charles Umney were bracketed together as prizemen at Bloomsbury Square. Since then Mr. Umney had never slackened rein, but had gone on from year to year doing good work in pharmacy. All north countrymen were glad to see him in the Presidential chair, and to thank him for the earnest, practical, and sensible address with which he had inaugurated the session.

Dr. BRADY, as Senior Vice-President, put the motion, which was carried by acclamation.

The PRESIDENT then called for the first paper to be read, which was a

NOTE ON TINCTURE OF SENNA.

By B. S. PROCTOR, F.I.C.

At the last revision of the blue list I suggested the question as to the activity of the tincture of senna.

I consider that it is discreditable to the medical profession that an inert preparation of an active drug should remain in the

Pharmacopœia, and discreditable to the pharmaceutical body that it should remain there without a protest.

Personally, I have been convinced for some years of the worthlessness of tincture of senna as now prepared, and have protested, though ineffectually, against its retention among the official preparations. My desire in bringing the subject before the Conference is that further experience and expression of opinion from our members may lead either to a modification of the formula or its deletion from the Pharmacopœia.

Christison, in his "Dispensatory," says of senna: "Its active part is easily dissolved out by water, either cold or warm, by rectified spirit, and by proof spirit."

Flückiger and Hanbury quote the words of Dragendorff and Kubly: "The active substeance is a colloid body, easily soluble in water, but not in strong alcohol. A syrupy aqueous extract of senna mixed with an equal volume of alcohol throws down mucilage; after this is removed a further addition of alcohol causes a precipitate of brown matter, almost tasteless, and possessing purgative properties, containing cathartic acid, which is almost insoluble in water in the absence of bases, and insolube in alcohol; soluble in warm dilute alcohol."

Various other authorities might be quoted as to cathartic acid, or cathartogenic acid, as some call it, being the purgative principle of senna, and as to its insolubility in water and alcohol, coupled with the statement that its alkaline salts are soluble in water and are active cathartics. There would, however, be no great advantage in multiplying any testimony which was not a direct statement of the data upon which conclusions had been built. The use in the "Pharmacographia" of the expressions "strong alcohol" and "dilute alcohol" leave us in doubt as to the meaning of the writer. Is "alcohol" rectified spirit or absolute alcohol? If we suppose the alcohol to be rectified spirit, an equal volume of which throws down the mucilage but not the active principle, we would conclude that the spirit for making tincture of senna might be equal volumes of rectified spirit and water. The further addition of "alcohol," which throws down the active matter, may be the quantity which is necessary to raise the strength up to that of proof spirit; and this would bring the statement of Dragendorff and Kubly into accordance with my experience, and confirm my impression that tincture of senna ought either to be abolished or made of a weaker spirit than that now official.

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These suggestions did not meet with the acceptance to which in my conceit I thought them entitled, and of which I still think them worthy.

My desire in bringing this subject before the present meeting is that others should experiment upon similar lines to those I have indicated, and by personal trial test the efficacy of senna preparations made with spirit, more or less dilute, and thus determine the question whether tincture of senna should be abolished or amended.

The PRESIDENT, in moving a vote of thanks to Mr. Proctor, said this was a very practical subject, with which Mr. Proctor was well qualified to deal. He should be glad to know whether the variety of senna used was Tinnevelly or Alexandrian, as it was pretty generally agreed that the latter was the more active. He believed that was shown by Henry Deane many years ago.

Mr. GROVES (Weymouth) said he made a long series of experiments some years ago on senna, and succeeded in isolating the active principle; but unfortunately for his priority, Prof. Dragendorff had done the same thing a few weeks earlier. He was rather surprised to hear that the tincture made with proof spirit was entirely inert, because he found that with equal measures of rectified spirit and water he succeeded in extracting the active principle very completely. The method in which he succeeded best in obtaining the mixed cathartates, was by making a strong tincture with equal measures of rectified spirit and water, and then adding to the tincture expressed from such a maceration an equal volume of rectified spirit. The cathartates were then thrown down in a state of purity, and quite free from odour. He could quite understand that treating senna with rectified spirit would fail to extract any of the active matter, but it would be very effective in removing the nauseous odour and taste of senna. When the cathartates were thrown down by alcohol, the nauseous odour and taste were retained in the supernatant fluid. He did not, however, think it would be wise to eliminate the tincture from the Pharmacopœia; such a measure would be too radical and unnecessary; it would be much better to dilute the spirit, using equal measures of spirit of wine and water. Senna was a useful drug, and a good tincture should be prepared. He believed the syrup was a worse preparation than the tincture, its efficacy being almost all destroyed by the boiling and stewing it underwent.

Mr. DOTT was rather surprised that no reference had been made to the work of Dr. Stockman, a distinguished member of the Conference, on senna. Dr. Stockman had found that a very powerful effect on small animals was produced by pure cathartic acid, which is soluble in alcohol. Mr. Proctor's results did not appear to be altogether in accordance with those of Dr. Stockman, but it was a very interesting and practical paper.

Mr. BALL said he had recently made some experiments on commercial cathartic acid, and found it inactive, but cathartate of soda or magnesia produced decided catharsis. He had taken 8 grains of ordinary commercial cathartic acid with no result at all. He should presume that in the ordinary tincture of the Pharmacopœia the cathartic acid was precipitated, and there was not sufficient water to dissolve it, nor sufficient alkali in the senna to form a cathartate of the alkali. This would to a great extent account for the inactivity of the product.

Mr. GERRARD said his experience of this tincture did not altogether agree with Mr. Proctor's. It was used occasionally in the institution to which he was attached, and he never heard any complaints of its action, but that might be from want of observation on the part of those prescribing it. They must, however, have an idea that the official dose was not sufficient where a purgative effect was required, as they invariably ordered half an ounce for a dose. One point of the paper was to show the necessity for having in the Pharmacopœia a greater variety of strength of alcohol, instead of only three, absolute alcohol, rectified spirit, and proof spirit. In the American Pharmacopœia there was a "dilute alcohol," which contained 45 per cent. by weight (the English proof spirit containing 49 per cent.), and that was used in certain cases where a weak spirit was more efficient in extracting the active principle.

Mr. WRENN said Mr. Gerrard had anticipated what he was about to say as to the advantage of using a dilute alcohol for the manufacture of such tinctures as the one now under notice. Senna had already established a reputation for itself amongst the public, especially the aqueous preparations, and he believed that even a lower strength of spirit than Mr. Gerrard had suggested might be used, viz., 60 per cent. under proof, such as was universally used in the manufacture of concentrated infusions. There was a paper to be read on infusion of gentian, and then no doubt the question of concentrated infusions would be raised.

The PRESIDENT said there was no question that the rule of thumb

had been very much followed in giving the directions in the Pharmacopœia as to the strength of alcohol. The suggestion of Mr. Gerrard was a very good one, and probably a mixture of half water and half rectified spirit, or 20 under proof, would be about right for the tincture of senna. It would not do for the Conference to recommend, however, that the tincture should be so made immediately, or they might get into difficulties with the Excise, or with public analysts; still, it was a matter which should be settled without delay. The Americans had made a great study of the particular strengths of alcohol which were best suited for the extraction of the medicinal properties of various drugs, and it might be well to take a leaf out of their book. The Conference was much indebted to Mr. Proctor for this paper.

Mr. PROCTOR in reply said he by no means wished what he had said to be taken as a settlement of the question, but rather as an opening of it. He did not consider that half and half spirit, as taken by himself and some others, should be taken as the right strength. His idea was that the right method would be to macerate senna with a small quantity of water, to make pressure first with the water alone, and then to add to the strong aqueous solution as much spirit as would throw down the mucilage, falling short of that which would precipitate the active principle, and then after filtration use that instead of the present tincture. He should have been disposed to experiment in that line, if he had not felt that if he commenced experimenting again, he must try a dose; but he had already taken about plenty, including senna, aloes, scammony, *Rhamnus Frangula*, *Rhamnus Purshiana*, and others, and he had suffered from it. He wished the subject should be taken up, and did not think it could be undertaken by a more competent body than the Formulary Committee. If the members of that Committee would take the doses he would make the drugs. He must not be supposed to say that cathartic acid was the native principle; probably it was a cathartate of some kind, possibly of lime, but the business of the pharmacist was to get the activity in solution, no matter whether it were cathartic acid, cathartate of lime, or of magnesia, soda, or anything else. They were perhap rather too much inclined to refined chemistry, where the practical results was the important thing; and they were so long settling the theory that in the meantime they lost the practice. It was for them to get the good practical result, and let the high scientific gentlemen, who loved science for its own sake, settle questions of theory. With regard to the activity of different kinds of

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water bath for three hours. The amount of fibrin dissolved was 60 grains.

Sample B, yellowish colour, possessing peculiar odour of indol, subjected to same test, digested 44½ grains of fibrin.

Sample C, light brown colour, distinct odour, when subjected to same test digested 22 grains of fibrin. The experiments were repeated with coagulated egg albumen; 100 grains of egg albumen, carefully cleared of any adhering yolk, were passed through a fine hair sieve, and placed in an acidified solution containing 1 per cent. per volume of H Cl in distilled water, 1 grain of papain added, and the whole kept at a temperature of 100° F. in a water-bath for three hours.

Sample A dissolved 94 grains, B 80 grains, and C 30 grains. The action of the three samples with milk was marked in the same ratio, a quarter of a pint of fresh milk with 2 grains of the papain, to which was added 2 ozs. of distilled water, containing 1 per cent. per volume of H Cl, the whole digested for two hours at a temperature of 100° F. in a water-bath. In the case of sample A, the curd of casein formed when the acid solution was added commenced to dissolve slowly, and at the end of the time was all digested excepting a granular precipitate of the curd. The fat liberated by the digestion of the enveloping casein was not in the least emulsified. With sample B the digestive action was considerably less marked. With sample C hardly any action was exerted upon the curd of casein.

With regard to the digested product, when albumens are acted upon by papain in acidified solution, the dried residue obtained by careful evaporation of the filtered solution does not appear to be readily soluble in water, and when mixed with water and placed upon a membranous dialyser, floated on distilled water, this product, unlike peptones obtained by the digestive action of pepsin upon proteids, does not in the least degree diffuse through the membrane into the water, but diffusion commences when acid or alkali is added; in this respect, it would seem to be more nearly allied to the globulin series.

Pepsin is prepared by a great variety of methods hereinafter detailed. The term "pepsina porci, B.P.," really means nothing, and as regards the proteolytic test prescribed by the British Pharmacopœia, viz., "2 grains of pepsin with an ounce of distilled water, to which 5 minims of hydrochloric acid have been added, forms a mixture in which at least one hundred grains of hard boiled white of egg, passed through a wire gauze sieve of 26

measures per linear inch will dissolve, on their being well mixed, digested and stirred for about thirty minutes at a temperature of 130° F.," I suggest that the test should be 1 grain to digest 500 grains of coagulated albumen in the same acidulous medium. Insomuch that I have found 1 grain of the best pepsins in the market will digest from 500 to 1500 grains when subjected to the prescribed test, I am at a loss to understand why pepsins containing a variable amount of milk sugar and starch or peptones should be the only ones made official. Doubtless when a physician orders pepsin he means pepsin of the highest digestive power and most likely to give satisfactory therapeutic results. Some intelligent pharmacists do now dispense the pepsin guaranteed pure and free from any admixture, and it is sincerely regretted the majority do not do the same. The following table represents the activity of the various pepsins and papains in the market when coagulated albumen is to be digested.

No. sample.		Amount used.	Digested.
1	Pepsin	1 grain	1·308 grain.
2	,,	,,	1·200 ,,
3	,,	,,	1·105 ,,
4	,,	,,	·980 ,,
5	,,	,,	·430 ,,
6	Papain	,,	·342 ,,
7	,,	,,	·108 ,,
8	Pepsin	,,	·103 ,,

In each case 5 ounces of distilled water containing 1 per cent. per vol. H Cl was used, to which 2000 grains coagulated egg albumen, finely divided by passing through a hair sieve, were added, and the whole kept agitated in a water-bath at 100° F. for three hours. The difference in amount of albumen dissolved by the papains is accounted for by the increased amount of surface exposed to the action of the ferment by the greater number of particles. The different amount of proteolytic action exerted upon finely divided fibrin obtained from lean rump steak is shown in the photograph of the different bottles exhibited. In each case 9 drachms of fibrin, 6 ounces of distilled water with ½ a drachm H Cl, and 10 grains of the ferment were digested together for three hours in a water-bath at a temperature of 100° F.; the undigested fibrin is shown by the sediment in each bottle. Fibrin seems to me to be the most reliable test of the activity of a

pepsin to be used in medicine, its action successfully performed upon derived albumen being more desirable than its activity upon native albumen when testing its activity as a medicine, the native albumen being generally converted into acid-albumen by the acid of the gastric juice. Further, the activity of a digestive ferment should be estimated by the amount of pure peptones actually obtained, that is peptones perfectly soluble and diffusible, the diffusibility being the chief test. If a solution containing peptones is placed in a membranous dialyser floated on distilled water, the whole of the peptones will quickly diffuse through into the water. The product from papainized fibrin will not dialyse through. This goes to prove that papain does not wholly digest the fibrin whether in acid or alkaline media, but its action renders the fibrin more easily digested by the natural ferments.

The activity of pepsin is doubtless due in a great measure to the method adopted in its manufacture. The best pepsins are prepared by extracting the ferment from the secreting membrane through maceration in glycerine, but it is a method impossible excepting by experts in manufacturing operations. The solution is extremely difficult to filter, scale, and pulverize, and finally to obtain a pepsin free from albuminous matter. Physiologists obtain a little pure pepsin experimentally by the employment of alcohol as a precipitant, allowing the membrane to stand in alcohol and then extracting the ferment with glycerine. This process is extremely unreliable, as strong alcohol exerts an injurious action upon the ferment. Another method is to precipitate the pepsin with salt; the magma which separates floats upon the macerating fluid and is largely impregnated with salt. This is partially removed by expression and by allowing the salt to effloresce upon the surface of the expressed magma cake. The entire purification can only be obtained by dialysis, and this washes away a good quantity of the ferment itself, therefore the process is not recommended for commercial use; and should the product not be entirely freed from salt, it is unjust to place it upon the market as a pure pepsin, when a purchaser would be paying so much per ounce for salt. There is another process yielding what are termed peptone-pepsins, in which the lining membrane of the stomach is subjected to acidulous digestion with heat, when the whole tissue in which the pepsin is secreted is converted into peptones. The acid is precipitated in the form of a salt, and the syrupy solution of peptones and pepsin clarified and reduced to a dry form; by this method a larger yield is obtained, consequently it can

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whilst others were extremely active. If a large quantity of acid solution were used, an active pepsin would dissolve a very large quantity of white of egg or fibrin, so that the statement sometimes made in advertisements that 1 grain would dissolve so much white of egg meant almost nothing, because the conditions of the experiment were not given.

Mr. SCHACHT said he should be glad to known if any gentleman could afford any information as to the best way of determining whether the result of adding pepsin to white of egg was a peptone or not. Dissolved albumen was not necessarily peptone. The only available means of determining the quantity of peptone produced with which he was acquainted was by dialysing it, which was very troublesome, and he should be very glad to known if there were any better or more readily applicable method. Fehling's solution gave the colour, and so forth, but he had not satisfied himself that there was any process by which it could be readily ascertained whether a solution contained peptones or was merely soluble albumen.

Mr. NAYLOR said the question in which he was most interested was this, that the author had had an opportunity of experimenting with a pepsin which he pronounced to be absolutely pure. He wished, therefore, to ask Mr. Ball how much fibrin or white of egg absolutely pure pepsin would dissolve. He begged to dissent mildly from the inference which Mr. Ball drew, that the intelligent pharmacist should discard altogether the Pharmacopœia article. So long as they had such an article in the Pharmacopœia and a test given for it, he hoped they would be loyal to the Pharmacopœia, and where pepsin was ordered (apart from any particular make) would use it according to the authoritative standard. He did not quite catch whether the pepsins were tested by the Pharmacopœia method or by the one in which 5 ounces of distilled water containing 1 per cent. by volume of hydrochloric acid was used. Had Mr. Ball found in the market pepsins which when tested by the Pharmacopœia method gave as a result that 1 grain would dissolve 1500 grains of white of egg?

Mr. MARTINDALE remarked that pepsina porci, B.P., had been spoken of, but there was no such thing in the Pharmacopœia; very often the official pepsin was not made from the pig. The pepsin of the B.P. seemed to be a different article altogether from that described in the paper. So long as there was an official article they should adhere to it, and if other modes of making pepsin were introduced, let them take different names.

Mr. GERRARD said he had had some experience in the use of pepsin and to some extent of papain, with regard to which he could confirm what Mr. Benger had said. It seemed to have an eroding action, breaking up the substance to which it was applied rather than dissolving it, in the way in which pepsin dissolved albumen or fibrin. Working with pepsin of good quality, which he prepared himself by scraping and roughly cleansing the complete stomach, drying it very carefully, or precipitating it by alcohol, he found that in a ·2 per cent. hydrochloric acid solution at a temperature of 130° F., which was a far better temperature to experiment with than anything below it, one grain would dissolve 1000 grains of white of egg. At 130° the process went on most rapidly, and what he had described would take place in fifteen minutes, but if it were desired to imitate the process of digestion and form a peptone, the process must be continued about three hours. The first action of pepsin on the acid mixture was to produce acid albumen, and then it went on to the gradual production of peptone, and as the peptone developed its presence could be indicated by a colour reaction, the intensity of which was a measure of the total peptonization. After digesting about half an hour, if you took a little of the peptone and added to it about an equal volume of solution of potash, Pharmacopœia strength, and one or two drops only of a 10 per cent. solution of sulphate of copper, it gave a fine pink tinge, and if tested from time to time every ten or twenty minutes, the intensity increased until it reached the climax in about three hours. That was a test which any one could apply, and he had demonstrated it to more than one gentleman present.

Mr. BARCLAY asked if Mr. Ball had tested any samples of commercial pepsin and found them to be of the Pharmacopœia standard? Also, if he had ascertained whether or not any change occurred in keeping.

Mr. WRENN said some experiments he made a few years ago, when he read a paper before the Chemists' Assistants' Association, led him to confirm the opinion expressed in the paper that commercial pepsin was readily found of which 1 grain would dissolve 1000 grains of coagulated albumen. Papain was a commercial failure compared to pepsin. He agreed with Mr. Benger as to the temperature to be used; if the Pharmacopœia directions were followed much valuable time was wasted. In the preparation of pepsin he should not introduce glycerine, as Mr. Ball suggested; for how was it to be got rid of in preparing the pure pepsin?

Some makers put on their labels, "This pepsin is guaranteed to be made from the stomach of a pig in our laboratory." Whether the pig was always there he did not know, but pepsina porci was certainly more active than that made from the stomach of a sheep.

The PRESIDENT said Mr. Ball had expressed himself at a loss to understand why pepsins containing a variable amount of sugar of milk and starch were the only ones official, but he did not remember any directions in the Pharmacopœia for the dilution of pepsin with these substances. Probably there were such pepsins, but he did not know that they were official.

Mr. MARTINDALE: Not in the Pharmacopœia. There was one such in the French Codex.

Mr. BALL, in reply to Mr. Naylor's question, why he did not use the test of the B.P., could only say that he wished to test the activity of the pepsin at the temperature of the stomach, which was said to be 100°, and he continued the digestive process for a longer time, three hours in every case, instead of thirty minutes; he wished to have a parallel process to that which went on if pepsin were taken internally for medicinal purposes. In reply to Mr. Martindale, he might say that he applied to four wholesale houses for Pharmacopœia pepsin, and in each case the bottle came to him labelled "Pepsina porci, B.P." On testing these he found in each case it contained starch, which he took to be an adulterant, as it was not generally found in the mucous membrane of the pig or any other animal. With regard to peptone, the test mentioned by Mr. Gerrard was an excellent test for the presence of peptone but did not answer for quantitative purposes. If albumen were digested with pepsin in an acidulated solution, the resulting product filtered and the solution evaporated, a dry residue was obtained; of course the heat must be kept very low, so that the product should not be burned. If this residue were then mixed with water and placed on a dialyser, the whole of the peptones would dialyse through, but the albuminous and other intermediate bodies would not, and would be left on the membrane. This, therefore, was a good quantitative test. It was quite true that the B.P. did not contain such a process as he had described, but he maintained that starch or sugar of milk when added were simply adulterants, as they were not then there for any therapeutical purpose. If they did not aid the digestive process, why were they added, except to increase the weight and amount of profit attaching to the sale? It was suggested that they were added as a diluent, to get the

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The next paper read was entitled,—

ARE GLASS BOTTLES SOLUBLE?

By R. Reynolds, F.I.C., F.C.S.

The *Pharmaceutical Journal* for August 31, 1889, p. 163, contained a somewhat startling statement as to the action of chloral hydrate upon a glass bottle in which it had been stored for a long time. The case was reported by Herr Reuter, who found the crystals of choral hydrate lying next to the glass to be intensely blue. The colour was proved to be due to nickel, doubtless contained in the smalt employed in the manufacture of the blue glass.

Such an instance recalls the older illustrations of the liability of glass to attack by substances preserved in vessels of that substance. That strong alkaline solutions should attack flint glass does not cause us any surprise. The influence, too, of the prolonged action of a relatively weak volatile alkali in the atmosphere has long been known, and old glass windows in stables have been pointed to as examples of the action of air containing free ammonia.

Glass long submerged in water and mud may show the action of disintegrating influences. The most striking illustration of this which I have met with was a portion of an antique bottle taken from the moat of Walton Hall, near Wakefield, at the time when it belonged to the late Charles Waterton, the naturalist. The specimen had probably lain in the mud for two centuries. For still older illustrations of metamorphosed glass, as that recovered from buried cities, it is only needful to refer to our public museums.

The decomposition of hydrocyanic acid when kept in white flint bottles would appear to be due to the influence of the glass. It would be interesting to know if any of the troublesome cases of decomposition of organic solutions, such as those intended for hypodermic use, are in any instance referable to this cause. It will doubtless be necessary to recognise that there are bottles—and bottles. The more faulty sort may, fortunately, not be of every-day occurrence.

I recently met with a little evidence favouring the idea of the chemical interference of a bottle with its contents, and bring it forward as indicating one of the possible directions for further inquiry. This occurred in connection with the interesting subject

of the acidity of the gastric juice. Professor Riegel, of Giessen, has undertaken the investigation of this subject clinically. He uses small sponges, encased in gelatine, one of which is swallowed, and is withdrawn in about ten minutes, when the gelatine will have dissolved. The sample of gastric fluid thus obtained is tested for H Cl by Congo red paper. Congo red assumes a deep blue colour on contact with acids. This is much more pronounced in the case of inorganic than organic acids; acid salts produce no alteration of colour. It is stated that the delicacy of the test is such that 0·002 per cent. ($=\frac{1}{50000}$) of free H Cl can be found. One minim of H Cl in 20 fluid ounces of distilled water (or, say $\frac{1}{10000}$) is certainly appreciable. It was a solution of this strength which, after keeping for a day in a flint-glass bottle, failed to give its previous reaction with Congo red paper. So far as I am aware, very weak solutions of H Cl are supposed to be stable, and I did not think it unreasonable to refer the disappearance of the trace of acid to a possible action of the glass of the bottle. This line of inquiry may be worth the notice of any one disposed to investigate the interesting and not unpromising question of what is the action of a glass bottle upon its contents?

The PRESIDENT having moved a vote of thanks to Mr. Reynolds,

Dr. THRESH said he had noticed a similar action some years ago when he was investigating the action of rain in a certain district on vegetation. It was supposed that some limekilns which had been recently erected materially affected the vegetation, and he collected the rainfall at many different points. When he collected the rain on litmus and other papers, he almost invariably found that it had an acid reaction, but strange to say, when collected in bottles, it was either neutral or distinctly alkaline. On investigating the cause of this, he discovered that in all the bottles he employed—he tried all kinds, and found the result the same—some decomposition took place in a very short time, and the free acid disappeared. His impression was that it was a decomposition of silicate of soda or of lime, in which the acid combined with the base and the silica was thrown down. That this was the case was the more probable, because in evaporating samples of rain water he found that when collected in platinum dishes the solid residue per gallon was 1 to 4 grains less than when collected in glass, and this residue was chiefly silica. He also noticed, in making further experiments, that in titrating an acid solution, if the acid

were run in until a faint tint was produced with litmus, and then the liquid was boiled for a few minutes in a glass vessel, the colour would disappear. Upon adding acid the colour would again be obtained, which would again disappear on boiling, and so on; and he had seen students in the examination room go on repeating that process for an hour, thinking they were increasing the accuracy of the result, evidently not having observed that this naturally occurred when these solutions were boiled in glass flasks. Another thing still more interesting was this: if in one of these bottles (and they varied considerably, though they were all acted upon) a mixture practically neutral and containing tincture of cardamoms was placed in it, and kept in it for some time, it would vary considerably in colour in the course of say a month, and it was quite possible that the complaints sometimes made as to the colour of such a mixture were due to this cause.

Mr. LINFORD said most chemists must have noticed that hydrochloric acid acted very considerably on the glass bottles in which it was kept, turning the glass white, while the sulphuric acid bottle was not affected so much. No doubt sulphuric acid must act on the glass in the same way, but the question was why the action ceased so much sooner.

Mr. PROCTOR had repeatedly observed that new bottles had an alkaline reaction in a much more marked degree than old ones. This probably arose from something on the surface, or else the solvent action of the water only penetrated a very short distance from the surface.

The PRESIDENT said it was necessary in these cases to be sure that the bottles had not been washed in alkaline solutions, such as washing soda, traces of which might be left behind.

Mr. PROCTOR said he referred to bottles which had come directly from the glasshouse. He attributed the smokiness to which he referred to the volatilisation of something of an alkaline nature which was then condensed on the surface of the glass.

Mr. MARTINDALE remarked that osmic acid very much affected white glass bottles of English make, whilst foreign white glass bottles were comparatively unaffected, except the stoppers. He held this action was due to the presence of lead in the glass, and it was desirable, therefore, to avoid bottles of glass containing lead for such purposes.

Mr. MABEN remarked that the action of water and acid on glass might often be very well observed in syphon tubes.

Mr. WEDDLE thought perhaps the action of acids and alkalies on

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of seed were exhausted by maceration and percolation with proof spirit, the solutions on evaporating yielding extracts almost free from fixed oil, having merely a slight greasiness; in fact, less fixed oil had been dissolved by cold proof spirit than by hot, as would be expected. The extracts of the above operation, after washing with ether and drying, gave an average yield of 4·4 per cent. extract. So far the results were decidedly in favour of omitting ether percolation, and although ether had been used, it did not amount to one-fortieth the volume required to remove the oil from the seeds. Moreover, it is my opinion that in a general way, even washing the extract with ether might be dispensed with, for the extract does not contain anything like the amount of oil present in extract of nux vomica.

The next step was to prove that so far as strength and active principle were concerned, the new extract was identical with that of the B.P., a matter about which there could be very little doubt. For this purpose fifty grains of each extract was dissolved in a little water, a large excess of ammonia added, and the mixture well shaken with three successive quantities of chloroform. The chloroform, on separation and evaporation, gave from the official extract a residue of daturine weighing 2·2 grains, and from the extract by the new process 2·15 grains, practically no difference, except what may be ascribed to experimental error. As it is thus evident that the active principle is present in the new extract in the same proportion as in the old, it may be fairly asserted there would be no difference in therapeutic action.

From the evidence resulting from the above experiments, we may reasonably submit to the compilers of our Pharmacopœia the desirability of amending the official process for making extract of stramonium, suggesting that percolation of the seeds with ether be discontinued, that proof spirit alone be used as the solvent, and the resulting extract, if containing oil, washed with ether.

As a further remark bearing upon this subject, it may be stated that in a general way, where a drug contains a fixed oil, and it is desired to prepare from the drug an alcoholic extract, the most economical process is to exhaust the drug first with alcohol, finally removing any oil present in the alcoholic extract by washing with ether.

The PRESIDENT, after moving a vote of thanks to Mr. Gerrard, said for years he had given up percolation by ether, which he

looked upon as merely a waste of ether, just as it was in the treatment of ergot, as was formerly directed. He hoped that in the next edition of the Pharmacopœia, the direction for the use of ether in the case of stramonium, which only had the effect of extracting the valueless fixed oil, would be omitted.

Mr. CONROY said he had adopted the same practice as had been mentioned by the President for some years, and he could confirm Mr. Gerrard's statement that the product was fully equal to that obtained when ether was used.

The next paper read was on—

FERRI ET AMMONII CITRAS.

BY B. S. PROCTOR, F.I.C.

In the early part of 1887, I had repeated complaints that mixtures containing this salt speedily went wrong. Two of the mixtures specially noted were as follows:—

℞ Ferri Ammon. Cit. . . . . ʒi.
Ammon. Brom. . . . . ʒss.
Syr. Aurantii . . . . . ʒvi.
Aq. . . . . ad ʒvi.
M.

(A. 970).

℞ Ferri Ammon. Cit.. . . . . gr. xl.
Aq. . . . . ʒviii.
M.

(A. 985).

The latter mixture most quickly changed, gradually becoming turbid, depositing a brown precipitate, and the liquor at last becoming colourless, or nearly so.

For comparison, a bottle of the same was made with hard water instead of distilled. Decomposition took place, but this time the precipitate was of two natures, one part being buff, another part black.

The precipitate treated with HCl gave off carbonic acid and H_2S. This experience was new to me, probably because the salt in question is most frequently prescribed with other matters which add to its stability or mask its change.

I obtained samples from some of my neighbours, but found there

was no notable difference in their behaviour, my own sample going bad rather more quickly than that from one of my neighbours, and more slowly than the sample from another firm. Two of these, when burnt off, left of ferric oxide 32 per cent. and 30·7 per cent. respectively, the latter being the sample which had spoiled most rapidly. Mr. Umney, in the *Pharmaceutical Journal* of December, 1873, has expressed the opinion that the proportion of citrate of ammonium is the point upon which stability chiefly depends, and that the present official salt, which contains a less proportion than those of two previous Pharmacopœias, is less stable in consequence; hence the trouble springing up now which did not arise in former years. But the fact just noted that the sample containing 30·7 per cent. of ferric oxide decomposed more rapidly than those which contained 32 per cent., would imply that at any rate this is not the only circumstance upon which stability depends. But while I say this, I must also add that I acted upon the suggestion of Mr. Umney's paper, adding citrate of ammonium to the sample which had troubled me, and by so doing improved its keeping quality, the addition being made in such proportion as reduced the ferric oxide to 30 per cent., which the Pharmacopœia says is about what it ought to contain. But with this addition the stability was still inferior to that of two other commercial samples which I had meanwhile obtained.

A solution of the citrate, rendered alkaline by a small addition of ammonia, kept quite clear and unchanged for several months, and another solution, rendered acid with citric acid, kept quite clear for a similar time, but gradually became paler, and was found to have part of the iron in the ferrous state.

At a subsequent date, when estimating the iron in another sample of the same salt by burning 50 gr. in a platinum capsule, my object being to ascertain under what circumstances the residue of the combustion could be depended upon as being ferric oxide sufficiently pure to be accepted as evidence of the proportion of ferric oxide present in the sample, it was anticipated that the first effect of the heat would be to reduce the iron, or part of it, to either the ferrous or magnetic oxide, and with the view of determining this, the contents of the capsule, when imperfectly burned, were tested with a magnet, and treated with hydrochloric acid. They were found to contain magnetic oxide, and to evolve an odour of H_2S by the action of the acid. Clear evidence, not only that reduction of the ferric oxide had taken place, but that the sample under treatment contained a sulphate. The presence of this impurity was

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from the solution of chloride, and equally important to avoid an excess of the lime water used as a precipitant, as it spoiled the colour of the pigment, the two solutions were run into one another in thin streams, so regulated that the correct equivalent proportions were pretty closely maintained.

Though the official formula for citrate of iron and ammonium may work perfectly when you pour 10 ounces of solution of ferric sulphate into 23 ounces of solution of ammonia, it is very likely to fail when hundredweights are substituted for ounces. Minutes, instead of seconds, will elapse before perfect mixture is effected, and while the stream of iron liquor is flowing into the alkali, the centre of the stream will always contain iron in excess over alkali for a period which, though short, may be long enough to result in the formation of some basic ferric sulphate, which may escape decomposition after the mixing is complete. The result is a brown precipitate, suspended in a solution distinctly alkaline, and though to all appearances correct, it may contain basic sulphate along with ferric hydrate, and thus account for the faulty product being obtained, while there has been no deviation from the official process but that which every manufacturer is bound to adopt, namely, to work upon larger quantities.

The time involved in chemical action is a point difficult to define, difficult to investigate, but not to be overlooked.

In connection with this subject, it is worthy of note that the sulphate present in the citrate was not readily detected or estimated by direct addition of barium chloride to a solution of the scales in water. It is unnecessary to describe all the experiments in detail, but the results I obtained, briefly stated, are as follows:

Five samples examined for the percentage of ferric oxide gave,—

P	32·0
B	30·7
A	30·0
D	32·5
H	28·0

With regard to the sulphate present as an impurity, the first observation was the finding of sulphide in one of the mixtures dispensed, after it had been kept for some time; to this I may now add the results of several other experiments:

A. A sample of the citrate, ignited in a platinum capsule, left a residue containing magnetic oxide of iron.

B. A similar result was obtained, and the residue being treated with hydrochloric acid, yielded hydrogen sulphide.

C. A sample of the citrate dissolved in water gave no immediate precipitate with barium chloride.

D. A sample of the citrate, ignited with potassium nitrate and barium chloride, yielded barium sulphate equal to 2 per cent. of sulphuric anhydride.

E. The same repeated with the same results.

F. Twenty grains of the citrate, not burned, dissolved in water and hydrochloric acid, and barium chloride added, on standing two days deposited barium sulphate equal to 1·2 per cent. of sulphuric anhydride.

G. Twenty grains, not burned nor acidulated, on the addition of barium chloride gradually deposited a precipitate, which on standing two days amounted to barium sulphate equal to 1 per cent. of sulphuric anhydride.

I. Fifty grains of the citrate dissolved in an ounce of water, four grains of barium chloride added and set aside for twenty hours, and then filtered; the precipitate contained 0·7 of barium sulphate. The mother liquor, with a free addition of hydrochloric acid, yielded 2·0 of barium sulphate. This shows that the barium salt very slowly precipitates the sulphuric radicle in the presence of neutral or alkaline citrate of iron and ammonium, but that the precipitation is effected on adding hydrochloric acid enough to convert the citrates into chlorides and free citric acid. The total barium sulphate obtained in this case corresponds with the yield from the preceding combustion experiments and others I had tried, except that there was a loss involved in filtering out the first precipitate, the second precipitate being obtained from the filtrate without the washings.

M. Fifty grains of the same sample dissolved in an ounce of water, two fluid drachms of hydrochloric acid added, and four grains of barium chloride, yielded a precipitate, not instantaneously, but speedily, which, on standing twenty hours, amounted to 2·9 or 5·8 per cent., against 5·4 per cent. in the last preceding experiment.

As I have not met with any statement of this effect of citrates in retarding the precipitation of barium sulphate, I think it worth while to emphasize the observation by recording a confirmatory experiment.

To about 100 grains of solution of ammonium citrate, a drop of dilute sulphuric acid was added, and then a drop of solution of

barium chloride. The solution remained clear for some time, a very faint opalescence developing in course of an hour, and a milky appearance in the course of a day; but by appearances only about one-tenth of what is produced with the same quantity of sulphuric acid and barium chloride in the absence of the citrate.

Tartrate of ammonium has a similar retarding effect to a rather smaller degree.

The PRESIDENT, having moved a vote of thanks to Mr. Proctor, said he was glad to learn that the ammonio-citrate of iron in use in the trade now was found to be more uniform than it was some fifteen years ago, when he examined one official salt, and found it contained 26 per cent. of ferric oxide, whilst some manufacturers put in as much as 32 per cent. The presence of basic sulphate of iron in the salt was certainly objectionable. This matter was by no means new, having been dealt with by Dr. Redwood many years ago, when he emphasized particularly that students should learn how to precipitate ferric hydrate with an alkaline solution. Mr. Proctor had shown how even manufacturers, operating on a large quantity, might deceive themselves as to the alkali being always in excess. Operating on a large scale, he always tried to keep it in excess, but there were chances that some of the solution of the persulphate of iron would sometimes be rather in excess of the alkali. If makers took greater care in the precipitation of the ferric hydrate, they would not have complaints of an objectionable quantity of 2 per cent. of basic sulphate in the ammonio-citrate of iron.

Mr. MABEN would have expected a solution containing 40 grains of ferri ammon. cit. in 8 ounces of water would go wrong in any case, for stock solutions of that drug would not keep, and he should therefore expect a weak solution would certainly go wrong, owing to the presence of an organic acid in ferri ammonii citras.

Mr. PROCTOR said he had tried three samples, his own make, and that of two neighbours, and they all went wrong rapidly. He got some from another maker, and it did not go wrong with the same mixture. He did not understand the difference, and should be glad to know if any one else did, but he could not get this last mixture to go bad.

Mr. MARTINDALE thought that probably the solution before scaling had been allowed too long an exposure, and that organic germs or growths had been formed in the solution before it was scaled.

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the results he had described, he tried ordinary tap-water, and that went bad just in the same way. Mr. Umney suggested that an alkaline condition of the bromide of ammonium might affect the product, but as he had said he had tried another specimen, making one portion alkaline and another acid, and neither of them went wrong. He was more inclined to attach weight to what Mr. Martindale said about the possibility of explaining the decomposition as taking place in the preparation of the article before it was scaled, from the circumstance that the batch which was in his hands and in those of his neighbours all went wrong at the same time, but none of them had gone wrong since. It might have been a manufacturer's batch which got into the hands of himself and his friends at that time. He did not know whether others had met with the same difficulty, but if they had not, it might arise from the character of the mixtures they had to dispense being less liable to change, there being spirit in their composition, which would tend to prevent decomposition. With regard to Mr. Dott's remark, he would say that if the reduction took place in the first part of the operation, a very considerable time and a good red heat would be required to get the whole of the iron into the ferric state; it maintained its magnetic property, and a certain small trace of the lower oxide for a considerable time. If it could be said that the oxide remained magnetic after it had had the whole dose of oxygen, which was possible, it was a point he had to learn; so far he was not aware of it.

The conference then adjourned for luncheon.

On resuming, the next paper read was on :—

EASTON'S SYRUP.

By T. Maltby Clague,

Pharmaceutical Chemist.

This useful and popular compound has been prolific in the production of difficulties for the pharmacist and dispenser, and correspondingly fertile in the matter of literature upon itself and its faults.

Originally devised by Dr. Easton and published in Aitken's "Science and Practice of Medicine," vol. ii., it stood thus :

℞	Ferri Sulphat.	ʒv.
	*Sodii Phosphat.	ʒvj.
	Quin. Sulphat.	gr. 192
	Acid. Sulph. dil.	q. s.
	Aq. Ammoniæ	q. s.
	Strychnin.	gr. vj.
	Acid. Phosphoric. dil.	ʒxiv.
	Sacch. Alb.	℥xiv.

The instructions are to dissolve ferrous sulphate in water and precipitate with sodium phosphate, wash, drain, and press; dissolve quinine sulphate in water by aid of ac. sulph. dil., and precipitate with aq. ammon., wash and press. These precipitates and the strychnine are to be dissolved in the ac. phosph. dil., and in this solution the sugar is to be dissolved without heat. Although not given, it is evident from the context that the bulk is to measure twenty-four ounces.

For a ready consumption this formula leaves nothing to be desired; but on keeping the preparation a brown colour is developed, causing undesirable differences in its appearances at various times.

In the *Year-Book* for 1871 is a paper by Mr. Michael Carteighe, which included a ready method for its preparation from a solution which preserves its colour better. But why the author doubled the quantity of ferrous phosphate present is not apparent.

In the "Extra Pharmacopœia," Mr. Martindale gives a convenient mode of preparing this syrup from iron wire, and this, when in the form of syrup, does not precipitate so much or darken in colour so rapidly as when it is prepared from the precipitated ferrous phosphate.

My reason for again directing attention to this subject is that during the past two winters I have met with samples of this syrup in a condition most unsightly in appearance and discreditable to pharmacy; these have been sent out by different makers, but all have been exposed to cold. The first and the second of these that came under my notice I could not work with because of my ignorance of the mode in which they had been prepared; but later on I obtained possession of some the history of which was known. Instead of a syrup it was a jelly-like mass with long needle-shaped crystals and tufts of crystals, and a smaller amount of a fine precipitate showing. Warmth brought about solution, but on cooling to about 32° F. precipitation again began.

* A little, say ʒj., more gives better result.

The addition of 25 per cent. of water sufficed to maintain solution when again exposed to cold. The addition of the requisite quantity of quinine, strychnine, and ferrous phosphate to make this up to Easton's strength was next tried, solution was permanent. The fact just mentioned and the high specific gravity of all the samples led me to suspect the quantity of the sugar as the cause of the trouble. . . . .

Samples were next prepared by, 1st, Easton's original formula, 2nd, Martindale's, and 3rd, one containing more sugar than either, and it was found that the precipitation and gelatinous appearance was in proportion to the quantity of sugar present.

	Easton.	Martindale.	Offending Sample.
Quin. Phosph.	1·0	1·0	1·0
$Fe_2(PO_4)_2$	1·0	1·0	1·0
Total P_2O_5	4·04	4.0	4·1
Sugar	35·0	37·5	42·0
Water	28·4	26·4	23·0

The above table gives in grains the quantities present in each fluid drachm.

Another experiment to confirm this view. Using Martindale's solution of ferrous phosphate and of alkaloids, but with sugar in the proportions of 4, 5, 6 and 7 drachms to the fluid ounce, and submitting these repeatedly to freezing mixture, precipitation showed in direct proportion to quantity of sugar present. Or rather the first named gave none, the second a trace, while the third was marked, and the fourth considerable.

The gelatinous syrup was dealt with in the following manner. Thrown upon a muslin strainer, the syrup passed through and left upon the strainer a mass of soft crystals matted together. Drained, pressed, and dried at 90° F., it weighed 8·4 grains; dried at 212° F., it weighed 7·5 grains. Submitted to quantitative analysis, it showed :—

Insoluble in Water	6·66
Quinine Phosphate	44·53
Ac. Phosphoric. (pur.)	13·33
Sugar	35·48
	100·0

The portion insoluble in water responded to tests for iron and

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be found solidified, looking like a crystalline mass of phosphate of quinine, but no doubt the principal cause of the evil complained of was the use of beet sugar instead of pure sucrose from cane.

Mr. LINFORD, having had a good deal of experience in the manufacture of Easton's syrup, agreed perfectly with what Mr. Clague had said as to the excess of sugar. When he first made it it was constantly going thick in cold weather, forming a mass of soft crystals. Then he adopted the plan of using less sugar, when it left off crystallizing, but readily changed colour. It was necessary, therefore, to find some method of making it by which it would keep its colour, and he adopted Mr. Martindale's method of making the phosphate of iron about eight times the strength, so that one-eighth the quantity was necessary to make Easton's syrup. He kept that in a small 6-oz. bottle with no cork in, but adopted the Italian method of filling the bottle right into the neck, and then put about half a drachm of oil on the top. That was easily thrown off when wanted for use, and he had found it would keep certainly six months in that way without any change of colour whatever. In making Easton's syrup he always dissolved the quinine and strychnine in phosphoric acid, glycerine, and water, but he could not give the exact proportion. That was also made of such a strength that one part of the solution and three of syrup of phosphate of iron made Easton's syrup. It was always freshly made when it went out, and was always sent out perfectly bright. The action of the glycerine was that syrup so made would keep at least three times as long without changing colour.

Mr. CONROY said this paper was a most important one, and he could entirely agree with Mr. Clague's remarks with reference to the reduction in the quantity of sugar having the desired effect. He had worked with sugar which was guaranteed to be real cane sugar, and had no reason to doubt it, but in using the full amount of cane sugar he still found the syrup solidified. This solidification might be overcome by reducing the amount of sugar, but the greater difficulty was the discoloration, especially when the syrup had to be exported to a hot climate. He could also confirm the statement that the concentrated liquor used for making syrup, when made with the full amount of quinine, also became discoloured. That was more important than the point mentioned by Mr. Clague. His experience was that when the full amount of quinine was put in, whether to liquor or syrup, the syrup always became discoloured. With reference to the last speaker's remarks, he would say that the quantity of quinine in Mr. Martindale's

formula was only three-fourths the amount in the original, but it was really phosphate of quinine. In the original formula the precipitation and subsequent washing would reduce the amount specified to about that ordered in Mr. Martindale's formula.

Mr. MARTINDALE said this was a formula with which he had had a great deal of experience; the formula which he published first and modified afterwards as published in the B.P.C. Formulary, he had been perfectly satisfied with. It was impossible to prevent discoloration. The preparation was not intended to be kept any length of time, but by the process published in the Formulary it could be made in ten minutes at any time, and that being so, what was the object in keeping it? The syrup of phosphate of iron could be kept very well, and the addition of phosphate of quinine and strychnine could be made at any time. He differed from the B.P. process in making the syrup of phosphate of iron, as the present formula was so exceedingly acid that it was unpalatable to take, especially for children. Even the formula of the 1867 edition was excessively acid, but it was a good reasonable formula. If made by the direct solution of pure iron wire in phosphoric acid, the preparation underwent little oxidation or conversion into perphosphate; it would keep very well, and upon adding the amount of phosphate of quinine and strychnine to that with a slight excess of phosphoric acid, he had never got that deposit, which many writers complained of, of a little whitish precipitate at the bottom of the bottle. If the full quantity of phosphate of quinine it was supposed to contain were put in, one grain in the fluid drachm, it would crystallize, probably because quinine was purer now than it used to be when the formula was originally devised. He rarely found it crystallize out unless the syrup were exposed to much cold. Once during last winter one sample which was more exposed to cold than others did become changed into a block of crystals, but it was hardly the formula Mr. Clague had given, as he put in only $\frac{3}{4}$ths of a grain of phosphate of quinine in place of one grain to the drachm. The formula said it should contain an equal quantity of phosphate of quinine and phosphate of iron, but it was not possible to keep such a preparation; if it was pure phosphate of quinine that was used, it would crystallize if the temperature were reduced below 40° F. Any other deposit than that crystallization he had not seen for years, and he imagined this was because he used a syrup made by the direct combination of phosphoric acid and iron, not by the precipitation process. He only made about 2 lbs. at a time, and seeing that it could be made

in ten minutes, there was no reason why it should be kept a long time. It was much better to keep drugs in a condition in which they could be kept properly than to make a compound which was liable to change. If the syrup did turn brown, the best way was to throw it away and make fresh.

Mr. WRENN could hardly agree with the last remark, that when a preparation went brown it should be thrown away. It was a better plan to guard against it turning brown. When washing the precipitate of iron he kept adding water, so that it did not acquire a blue colour. If care were taken in making up the bulk, it could be made perfectly accurate, and then there would not be any precipitate. By all means he should advise chemists only to use Martineau's sugar.

Mr. NAYLOR said there was another point of view from which this question had not been sufficiently studied, which at first sight did not appear a promising one, but at any rate it would be an instructive one, and that was the amount of phosphoric acid that was used. He had not observed a precipitation so much of the syrup, but he had been many times puzzled by the appearance of this deposit in the corresponding concentrated liquors. So far as he had been able to ascertain from a limited number of experiments, from examining the quinine used and determining the amount of iron and quinine present in the liquor itself, and knowing the kind of sugar which had been used, he had been led to the conclusion that the deposit might not have occurred through a deficiency but through an excess of phosphoric acid. He remembered having separated this quinine body some time ago, and submitted it to a gentleman thoroughly conversant with the examination of quinine preparations, who distinctly pronounced it to be an acid phosphate of quinine. Being a maker of quinine, he also informed him that there were different kinds of phosphate of quinine, and that it was very important that the amount of phosphoric acid should be kept within due limits. He was rather inclined to think that this question might be studied with profit from that point of view, as well as from the sugar side of the question.

Mr. DOTT said there was no question that the amount of sugar used in this preparation had a great effect on the precipitation of quinine or any alkaloidal salt, but as Mr. Naylor had remarked, the degree of acidity was a more important question. He believed preparations were often made under the belief that alkaloidal salts were more soluble in an excess of acid, but according to the

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The next paper read was a—

NOTE ON THE EFFECT OF THE USE OF NITROUS VITRIOL IN MAKING CERTAIN AERATED WATERS.

By John Pattinson, F.I.C., F.C.S.

A manufacturer of aërated waters in the neighbourhood of Newcastle-upon-Tyne recently found that the ginger ale he was making assumed a milky opalescence or turbidity a day or two after it had been aërated and bottled. The same materials, with the exception of the vitriol used for generating carbonic acid, had been used for some time without showing this objectionable turbidity in the ginger ale, and this naturally threw suspicion on the vitriol as being the cause of the change. On examination I found this vitriol contained nitrous compounds equivalent to 0·027 per cent. of nitrous anhydride (N_2O_3) by weight. In order to ascertain if the presence of these nitrous compounds was the cause of the turbidity, a stream of carbonic acid, generated from marble and pure oil of vitriol, absolutely free from nitrous compounds, was passed through a solution containing the same proportions of ginger essence, syrup, etc., as were used in the manufacture. The solution remained perfectly clear for several days. Then through another portion of the same solution a stream of carbonic acid made by acting on marble with the suspected vitriol containing nitrous compounds was passed. In this case the solution assumed the objectionable milky opalescent appearance in about twenty-four hours. Through a third portion of the solution I passed a stream of carbonic acid made from pure vitriol, to which I added nitrite of potassium equal to 0·06 per cent. of nitrous anhydride. In this case also the milky opalescence appeared in about twenty-four hours. It was thus shown that the objectionable turbidity was caused by the nitrous compounds in the vitriol which had been carried over with the carbonic acid.

Further experiments showed that the objectionable action was upon the ginger essence and not upon the syrup and other ingredients used. It was also found that the nitrous compounds discharged nearly the whole of the colour from the ginger essence.

I have not had an opportunity of ascertaining if the same effect is produced on the other essences used in the making of aërated waters, but it is possible that this may be the case.

Fortunately there is no difficulty in obtaining vitriol absolutely

free from nitrous compounds, so that this objectionable result in the manufacture of aërated waters may be easily avoided.

The PRESIDENT, after moving a vote of thanks, said the members of the Conference were much indebted to Mr. Pattinson, the public analyst of Newcastle, for coming to contribute something to their knowledge of the defects in the manufacture of aërated waters, the more so as Mr. Pattinson's experiments quite agreed with those which had been previously made by Mr. Naylor, who some three or four years since worked in the same direction, although he was not so fortunate as Mr. Pattinson in having his attention directed to the oil of vitriol. He had to work over the essences and all manner of things before he could find the cause of the turbidity of the aërated waters he examined. That paper was published in the *Year-book* for 1875, page 143, and the experiments now made quite corroborated the results there narrated. One point alluded to was the presence of nitrous compounds in the oil of vitriol of trade. He had been much impressed the day previously, in visiting the chemical works of Messrs. Alhausen, to see that they were putting up plant for the utilization of sulphur from alkali waste. He had no doubt whatever that even at the present time oil of vitriol could be procured much purer than the ordinary sulphuric acid. The acid produced by this process, which had been worked out by Messrs. Chance, of Birmingham, was a very beautiful, elegant acid, perfectly white. He did not know that it was actually free from nitrous compounds, but it was much purer than the ordinary brimstone acid met with in the trade, and he hoped manufacturers would have the opportunity, when this acid was procurable in quantity, which no doubt it would be soon, of using it for their aërated beverages.

Mr. NAYLOR did not know that he could add anything to what the President had said, except to remark that while his experiments travelled over the same ground as those of Mr. Pattinson, so far as his memory served him, it was not with the same object, his endeavour being not so much to point out the cause of the opalescence as to account for a defect in the pungency. He had not observed that Mr. Pattinson had referred to that in his paper, and he would ask him whether the effect of the nitrous acid in the oil of vitriol was to at all destroy the pungency in the ginger ale?

Mr. T. HOWELL-WILLIAMS, as a manufacturer of mineral waters, had found a difficulty many years ago in accounting not so much for the opalescence as for the loss of flavour in

ginger ale referred to by Mr. Naylor. Although this effect was most marked in ginger ale it occurred at the same time to some extent in almost every other beverage they prepared. After a long examination of almost everything likely to lead to this result, he found it was due to the nitrous or nitric acid fumes in the carbonic acid gas. The opalescence did not trouble them; they noticed a little dulness, but no opalescence, and having satisfied themselves of the cause, they got over the difficulty. For some time they tested the oil of vitriol very carefully, but they did not find it now necessary to do so, because they simply passed the gas through a scrubber containing an alkaline solution of permanganate of potash. The small trace of nitrates and nitrites might be disregarded if this precaution were adopted.

Mr. PATTINSON said he observed on referring to the paper read by Mr. Naylor, that his experiments were undertaken for the purpose of throwing light on the utter loss of aroma and pungency in ginger ale, whilst his attention had not been directed at all to that point, but simply to the cause of the turbidity in the samples shown him. It was very likely, however, that the pungency also would be affected. With regard to the President's remarks about oil of vitriol, he would say that that made from pure sulphur might contain nitrous compounds, and was just as likely to do so as ordinary oil of vitriol made from iron pyrites, but it would be free from arsenic. Manufacturers could easily destroy the nitrous contamination by heating the sulphuric acid with a little sulphate of ammonia. The presence of nitrous compounds could easily be ascertained. A drop or two of permanganate of potash put into 20 c.c. of oil of vitriol mixed with water would retain a pink colour if free from nitrous compounds, but if it contained them that drop and many others besides would be completely decoloured.

The following three papers were then read and discussed together:—

IPECACUANHA, FLUID EXTRACT AND WINE (STANDARDIZED).

By J. OLDHAM BRAITHWAITE and JOHN C. UMNEY.

A perusal of the literature relating to ipecacuanha and its preparations, which has been published in this country since the appearance of the present Pharmacopœia, shows that attention

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was effected an unsatisfactory extract resulted. It may be mentioned that, among others, acetic ether, with and without the admixture of lime to the root, and alcohol of various strengths with and without lime, and also aromatic spirit of ammonia, were employed, but finally rectified spirit was found to give the most satisfactory results.

In estimating the amount of emetine in these fluid extracts, it was found that Ransom's method was not directly applicable, owing to the chloroform producing an inseparable jelly with the solutions of these extracts. Acetic ether was similarly tried, but gave results much in excess of the amount of emetine originally found in the root. The following modification of Ransom's process, which has given excellent, and in every case, concordant results, was finally adopted.

Twenty cubic centimetres of a fluid extract is mixed with 40c.c. of water, and the volatile solvent driven off by cautious evaporation on the water-bath. The resulting solution is filtered, washed and precipitated with basic acetate of lead. The lead precipitate is removed by filtration, well washed, and excess of the precipitant removed by sulphuretted hydrogen and the sulphide filtered out. The filtrate is then rendered very faintly alkaline with ammonia, and shaken with chloroform, which readily separates; the alkaloid is washed out of the solvent in the usual way with acidulated water, and titrated by means of Mayer's solution.

The following was the final experiment which led to the adoption of rectified spirit as the most suitable menstruum:—

One hundred parts of the root in No. 20 powder were moistened with rectified spirit and packed in a percolator. More spirit was added and percolation continued until 80 fluid parts were obtained. This was reserved, and percolation proceeded with until the root was exhausted. The drained marc was then mixed with 10 parts of recently-slaked lime and again percolated to exhaustion. The spirit was recovered from the last two percolates, the resulting extracts dissolved in the reserved portion, and the whole made up to measure 100 fluid parts with rectified spirit.

Twenty cubic centimetres of this extract (equivalent to 20 grams of root), estimated by the modified chloroform process previously mentioned, were found to contain 0·257 gram of emetine, equivalent to 1·285 grams from 100 grams of root. Twenty-two grams of the dry marc = 20 grams of root, exhausted by ammoniated chloroform, contained only 0·009 of emetine, equivalent to 0·045 per cent.

The sum of these two figures, viz., extract 1·285 per cent., and the marc 0·045 per cent., is equal to 1·33 per cent. of emetine, whereas the original assay of the root gave 1·32 per cent. This shows an experimental error of 0·01 in these estimations, demonstrating most clearly in our opinion the reliability of these processes for comparative use. Of this fluid extract one volume was then taken and made up to twenty volumes with sherry, the resulting wine being cloudy in appearance. After allowing to stand for forty-eight hours, a permanently bright wine (possessing to a very marked degree the characteristic odour of ipecacuanha) was obtained by filtration, the feculence being removed without the slightest difficulty. Estimated by the modified Ransom's process, to be described later on, it was found that a volume of this wine, equivalent to 100 grams of root, contained 1·285 grams of emetine.

It is proposed that the standard extract should be so adjusted in strength, that 100 fluid parts should contain 1·25 part by weight of emetine. This figure is suggested as being easily attainable from all samples of root that are fit for pharmaceutical use, and although lower than the average percentage of emetine as stated by Ransom, yet giving a wine considerably stronger than the present official one, as will be shown subsequently. The following, then, is the formula we propose for the fluid extract:—

Take of—

Ipecacuanha Root in No. 20 powder.	. 10 parts.
Slaked Lime, freshly prepared	. . 1 part.
Rectified Spirit	a sufficiency.

Moisten the drug with a small portion of the menstruum, pack firmly in a percolator, add more spirit, and when percolation commences, close the lower end of the percolator, and macerate for twenty-four hours. Then allow the liquid to pass until 8½ fluid parts have been collected; set this aside, continue percolation until the root is exhausted, drain well, and mix the lime with the marc. Allow them to stand in contact for twenty-four hours, then continue percolation until final exhaustion is completed. Recover the spirit from the last two percolates by distillation, dissolving the residual extract in the reserve. Take 20 cubic centimetres of this solution, and estimate the amount of emetine therein as described above. From the result of this assay, finally adjust the strength of the fluid extract, so that 100 fluid parts shall contain 1·25 parts by weight of emetine.

The standard wine is then prepared as follows:—

Take of—

Standardized fluid extract of Ipecacuanha	1 fluid part.
Sherry, sufficient to produce .	20 fluid parts.

Mix, allow to stand for forty-eight hours, and filter.

In the preparation of the fluid extract, it will be remarked that the amount of extractive obtained after the addition of the lime is not very great. We have found, however, that it is, relatively, exceedingly rich in alkaloid. It may be suggested that it would be preferabl to mix the lime with the drug at the commencement of the process, but we have found that exhaustion is more complete, and the resulting extract more satisfactory, when the method we have indicated is followed. When the wine from the fluid extract was prepared, a sample was also made according to the official process from the same root. These were filtered at the same time, and have since stood for six weeks side by side. We exhibit a specimen of each.

We have found that after standing for some weeks, the liquid extract of the original experiment has thrown down a deposit, consisting of a mixture of amorphous matter, with a small crop of very distinct crystals. This deposit was collected and examined for alkaloid, from which it was found to be entirely free. The crystals were separated by washing cautiously with absolute alcohol, and when submitted to analysis were found to be a sugar, which, as it exists, sparingly reduces Fehling's solution, but gives a very copious reduction after inversion.

We have again assayed the fluid extract after six weeks, and have found it to be of the same alkaloidal strength as when first prepared; viz., 100 fluid parts contain 1·285 per cent. of emetine, proving that the matter deposited in no way deteriorates the emetine strength of the preparation.

This we have adjusted to the proposed standard strength, viz., 1·25 per cent. of emetine.

IPECACUANHA WINE (BRITISH PHARMACOPŒIA).

By J. Oldham Braithwaite and John C. Umney.

From the experience gained in the experiments just enumerated, it was thought probable that some definite information might be obtained by applying the lead acetate modification of Ransom's process to the wine itself.

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ment was performed :—Fifty grams of root were mixed with 50 c.c. of acetic acid, and exhausted precisely in the official manner. The percolate was cautiously evaporated to 100 c.c., and divided into two equal volumes.

One 50 c.c. was treated at once with basic lead acetate, and the emetine estimated as described above, when 0·308 gram was found.

The other half was evaporated to dryness, powdered, redissolved with dilute acetic acid, and then treated in a similar manner and estimated. The amount of emetine found was 0·255 gram, showing a loss of 17·2 per cent. of the alkaloid. This extract was twelve hours upon the water-bath before it could be powdered. On the large scale it is our experience that it is necessary to expose the extract to a full water-bath temperature for from forty to forty-eight hours before a dry residue, which will keep permanently in powder, is produced.

In order to determine if we were singular in our results, we have obtained a series of "trade samples" of the wine, and submitted them to examination as to the amount of emetine contained.

In each case 200 c.c. of wine was treated by the basic lead acetate process described above.

No.	Emetine in 200 c.c. = 10 grams of root.
1	0·1077
2	0·0945
3	0·085
4	0·0756
5	0·0718
6	0·0699
7	0·0699
8	0·0699
9	0·0661
10	0·066
11	0·0378

These figures show that there is a general loss of alkaloid in the preparation of the wine. Seven out of the eleven samples examined, however, are very nearly of the same alkaloid strength. At the same time the variation between the first sample and the last is very wide.

Simultaneously we prepared a pint of the B.P. 1867 wine from our assayed root, and found that it contained 0·1228 emetine from the equivalent of 10 grams of root, showing that the old process practically exhausted the drug.

From these experiments we conclude—

(1) That the process of the present Pharmacopœia extracts, practically, all the alkaloid.

(2) That a considerable amount of the alkaloid so extracted is lost by the process of drying and powdering the acetic extract.

(3) That the wine produced is therefore far inferior in relative alkaloidal strength to the root, from which it is prepared.

(4) That the wine of the present Pharmacopœia, although undoubtedly a more "elegant" preparation than that of the 1867 edition, is considerably inferior to it in its chief therapeutic ingredient.

NOTE ON A VOLUMETRIC PROCESS FOR THE ASSAY OF IPECACUANHA WINE.

By Thomas P. Blunt, M.A., F.C.S.

Emetine, in common probably with other alkaloids, appears to react with Mayer's solution by removing the mercuric iodide from its solution in iodide of potassium; it is possible, therefore, to measure the amount of mercuric iodide thus removed by determining the solvent power of the potassium iodide set free upon more of the salt. In practice it is more convenient to add a solution of mercuric chloride of known strength, though in this case the mercury added is not equivalent, but only proportional to that removed. The process suggested consists in evaporating the ipecacuanha wine considerably, to remove alcohol, in which mercuric iodide is slightly soluble, adding excess of Mayer's solution, which must of course be saturated with the mercuric salt, filtering, and adding to the clear filtrate centinormal mercuric chloride solution until a permanent precipitate appears; this part of the process resembles that given in the Pharmacopœia for the assay of hydrocyanic acid. After several trials the following plan was adopted:—50 c.c. of the wine are evaporated on the water-bath to 20 c.c., 10 c.c. of Mayer's solution are added, the precipitate is allowed to subside, and the solution passed through a dry filter 3 inches in diameter. From 25 c.c. to 27 c.c. will be recovered, according to the amount of the precipitate and its consequent absorptive power on the solution.

To the filtrate is now added cautiously, and with constant shaking, a centinormal solution (2·71 parts in 1,000) of mercuric chloride, until a faint permanent cloudiness is observed. The

quantity required will be from 4 to 6 c.c., and is most conveniently dropped in from a pipette graduated in tenths of a c.c.

The wine first tested by this process was a few months old; two trials gave in each case 4·2 c.c. as the quantity of mercuric chloride necessary to re-saturate the solution with mercuric iodide.

The second sample was a guaranteed one, obtained from a first-class wholesale house. The amount of the precipitate with Mayer's solution showed at once that it was much stronger in emetine than the previous specimen; two successive assays required 6·9 and 6·7 c.c. respectively of the mercury solution for saturation of the filtrate. The Mayer's solution is prepared by taking 100 parts of 10 per cent. solution of potassium iodide, adding saturated solution of mercuric iodide until there is a slight permanent precipitate, filtering, and making up to 200 parts with distilled water. It is clear that the exact strength of the solution is immaterial, but it must be added in excess to the evaporated wine.

The principle involved in the process given above is evidently capable of a much wider application; time, however, has not served for further work upon the subject, and in the meantime it seemed worth while to bring this preliminary note before the Conference, as supplying the pharmacist with a tolerably easy process for testing from time to time the quality of a preparation which is peculiarly liable to deterioration on keeping.

The PRESIDENT, having moved a vote of thanks to the authors of these papers, remarked that preparations of ipecacuanha seemed to be as much the *bête noir* of pharmacy now as they were twenty-seven years ago. He found one of the old papers sent out at Newcastle contained, amongst other things, as a suitable subject for examination, the deposit in ipecacuanha wine, and pharmacists were still working very much in the same direction, although no doubt in the meantime a great deal had been done. There were several gentlemen present who had worked on this subject, amongst them being Mr. Ransom, who had done a great deal with reference to the standardizing of drugs, and they all knew that his investigations were most thorough, and this was not the only subject he had dealt with with very great success. Sir Dyce Duckworth had also given a paper on the exhaustion of ipecacuanha root by acetic acid, Mr. Carteighe having made the preparations for him. The mischief, no doubt, of using acetic acid in extracting ipecacuanha for the production of wine was the destruc-

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desirable to get rid of the vegetable acid with which it was combined, which had been looked upon as being mostly the cause of the deposit that formed in the old ipecacuanha wine.

Mr. REYNOLDS also congratulated Mr. John Umney upon his paper, which seemed to be especially fortunate in its practical results, and the thoroughness with which the experiments had been carried out. It was most unsatisfactory that after a quarter of a century progress in this matter seemed to be backwards, for they had been making ipecacuanha wine under the authority of their rulers worse than it was before. He believed if the formula now in the British Pharmacopœia had been submitted to a meeting like that, the amount of doubt thrown upon it, especially with regard to the desirability of heating such a substance too long, would have prevented its being officially adopted; but so long as pharmacists were not allowed to have much to say about pharmacopœias, these mistakes would occur. He hoped, however, that the circumstance of one mistake of this kind being corrected might be some protection against a future crop.

Mr. NAYLOR said he had not made many experiments on ipecacuanha since those he reported to the Aberdeen meeting, the result of which pointed to acetic acid as being the best solvent. A short time afterwards he found that some of his results were rather low, because in estimating the alkaloids he treated the fluid with lime, and evaporated down the residue to dryness. On seeing Mr. Ransom's results, he made further experiments, and found that his results were much too low. Still they were strictly comparative. What he wished to point out was this: he had, he was afraid, ever since been guilty of a gross departure from the official formula in making the vin. ipecac. of the British Pharmacopœia, as he always used acetic acid as there stated, but he never evaporated quite to dryness and reduced it to powder, because he knew by direct experiment that the emetine really suffered by that process. He was extremely gratified to find that Messrs. Braithwaite and Umney now brought the matter forward in an official form, and hoped it would receive recognition in another quarter, so that they might no longer labour under the delusion that they had emetine in the wine, when in point of fact it had been decomposed. He hoped also that before long they would gain a recognition of a standardized fluid extract, that of the American Pharmacopœia being very defective.

Mr. CONROY heartily congratulated Messrs. Braithwaite and Umney on the excellence of their paper. He was very pleased

to find that the wine of the old Pharmacopœia of 1867 turned out so well. That preparation had always being a great favourite with him, when made in a way he explained at a previous meeting, namely, to macerate the whole root in the wine, using a wine of good alcoholic strength. At the same time he was pleased to see the excellent results obtained by the authors of this paper. The extracts which had been shown seemed everything that could be desired, and the sample of wine also. The process in the Pharmacopœia ought certainly to be discarded, and they should either revert to the old process of making and using the whole root, or having a standardized fluid extract like this.

Mr. BARCLAY (Birmingham) congratulated not only the authors of the paper, but also the President, and ventured to predict that if Mr. John Umney continued to work in the same direction as he was doing now, some of the younger members would live to see him occupy a very distinguished position in connection with the Conference. Now it was made plain that heat had the effect of destroying the emetine, one practical outcome of the paper would be to show that it was not only necessary to standardize the drug, but to standardize the preparation. Even if drugs themselves were standardized, preparations made in different ways by different houses would be found to vary very much, and it would be necessary in the next Pharmacopœia that many preparations should also be standardized. He hoped that in future Conferences this question would be kept to the front, as it was of the utmost importance.

Mr. MABEN thought that after this excellent paper ipecacuanha need not be their *bête noir* much longer. He was rather glad to find that it had been proved that evaporation to dryness destroyed a certain amount of emetine, for he had suspected that in the beginning. Like Mr. Proctor he had experimented *in corpore vili*, and found ipecacuanha wine not so effective as it was said to be. After that he did not evaporate to dryness, but always retained a certain portion of the fluid, and since that time the wine had been very good. He took the additional precaution of separating the tannin from the wine that he employed, because he had an impression that that tended to precipitate emetine. With all deference to Mr. Conroy and to the authors of the paper, he did not think the 1867 wine was so good therapeutically, at least it did not keep so well, as the present wine did, and he believed the experience of pharmacists would corroborate what he said.

The PRESIDENT said no doubt Mr. Conroy and others who

operated on a large scale would bear him out that they were very much at sea at times on account of the varying yield of the products. Sometimes it was as low as about 15½ per cent. with the acetic acid extraction when dried and powdered, and sometimes it went up to 23½ per cent., and to bring it to something like uniformity they diluted it up to 25 per cent. with sugar of milk. He therefore hailed the introduction of a standardized fluid extract very heartily.

Mr. J. C. UMNEY, in reply, said Mr. Maben had misunderstood him with regard to the 1867 wine. The only remark he made about it was that it was very good as far as the emetine strength was concerned, but as to its elegance he said nothing, except that the present wine was more elegant. With regard to Mr. Naylor's remarks, he could only repeat that they found that acetic acid completely exhausted the ipecacuanha.

In the absence of Mr. Jones, the following paper was read by Dr. Thresh—

NOTE ON HYPOPHOSPHOROUS ACID AS A SOLVENT OF STRYCHNINE AND MORPHINE.

By H. W. JONES, F.C.S.

In searching for readily soluble salts of strychnine and morphine for hypodermic medication, I was struck with the extreme solubility of both alkaloids in dilute hypophosphorous acid; and the ease with which these alkaloids dissolve to form neutral, or practically neutral solutions when hypophosphorous acid is employed points to a possibly advantageous use of such compounds for hypodermic injections.

In the case of hypophosphite of strychnine it appears to be a very stable salt in solution; and hypophosphorous acid might, I think, be usefully employed, not only to form a hypodermic injection, but in place of the hydrochloric acid ordered for making liq. strychninæ (B.P.), as the official preparation sometimes gives trouble in cold weather from separation of crystalline matter.

The morphine combination also appears to keep better in solution than the acetate, and would more easily afford a stronger solution than the official *inject. morphinæ hypoderm.* in cases where such was required. A solution 1 in 6 is sometimes wanted, and the ready solubility of hypophosphite of morphine allows of

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When allowed to escape from the cylinder into an open vessel, it begins to boil, and in a few moments the temperature of the liquid is lowered by the ebullition about 75 degrees Fahrenheit below the boiling point of the chloride. It is therefore employed in the arts like ether, for freezing purposes. For medicinal use, a pulveriser is attached to the portable cylinder, so that as the chloride is emitted, it vaporises and produces intense cold. It can thus be applied in a direct stream, which should fall obliquely, not perpendicularly, on any part requiring its congealing action, either as a local anæsthetic or for relieving neuralgia, sciatica, and other affections. Without the use of a pulveriser, the jet of gas is apt to take an uncertain direction, owing to the aperture becoming blocked with particles of ice.

Another form of applying it, to which I more particularly wish to draw your attention, is that in which the chloride of methyl is contained in a liquid form in what is called a thermo-isolator. If a little of the liquid chloride be drawn into a beaker, it boils rapidly and is volatilized almost immediately, but in the thermo-isolator it may be retained for some time at the ordinary temperature, so that tampons may be dipped in it and applied to any part of the body requiring its use. The thermo-isolator is simply a glass test-tube, fused at the top to a larger outer surrounding tube, with a vacuum intervening, which acts as a non-conductor of heat, or as it is termed, a thermo-isolator.

The application of chloride of methyl requires care, as, if freely used, it is liable to cause ecchymosis, but it appears to be non-poisonous, as I recently witnessed in Paris a patient suffering from facial neuralgia apply a jet of it freely along the lower jaw and side of the face, afterwards repeating the process along the gum inside the mouth. This he applied daily, and said it was the only thing that gave him relief.

At the conclusion of this paper, Mr. Martindale demonstrated the use of the apparatus. The President proposed a vote of thanks to Mr. Martindale, and the Conference adjourned until the next day.

Wednesday, September 11*th*, 1889.

The President took the chair at 10 o'clock, and the proceedings commenced with the reading of a paper entitled—

CHEMICAL OBSERVATIONS ON THE ROOT BARK OF EUONYMUS.

By W. A. H. Naylor, F.I.C., F.C.S., and E. M. Chaplin, F.C.S.

Mr. W. T. Wenzell appears to be the only chemist who has published the results of a systematic examination of the bark of the root of *Euonymus atropurpureus*. His monograph on this subject is to be found in the *American Journal of Pharmacy*, September, 1862. In initiating an inquiry into the proximate principles of this drug, it seemed advisable that we should follow the plan marked out by Wenzell, carefully go through his experiments, and see to what extent we could confirm the results he obtained.

A. The bark was first treated with 95 per cent. alcohol, and the tincture thus obtained set aside for future examination.

B. The marc was then thoroughly exhausted with cold water. This solution was heated, in order to coagulate the albuminous matter present, and afterwards filtered. The liquid thus freed from albumen was evaporated over a water-bath to the consistence of a thin syrup, when it was observed that a white deposit adhered to the bottom of the basin; this, after the liquid had been poured off, was found to consist of citrate of lime.

The decanted solution, after suitable dilution with water, was then precipitated with neutral acetate of lead, and the precipitate (α) thus formed was taken up in suspension with water and decomposed with sulphuretted hydrogen; the liquid after the sulphide had been filtered off proved to be composed of tartaric and malic acids. (β) The filtrate from the neutral acetate of lead precipitate was then treated with subacetate. From the precipitate thus produced, Wenzell states that after separating the inorganic salts present, he was able to obtain a small amount of a crystalline body of the nature of an organic acid, which he termed euonic acid. The quantity, however, was insufficient for him to examine thoroughly as to its properties. Although we have very carefully followed his method of procedure, we have not succeeded in detecting this body.

The filtrate from the subacetate of lead precipitate (β) was then freed from lead by sulphuretted hydrogen. After the sulphide of lead was filtered off, the liquid was evaporated slowly down to a small bulk on the water-bath, and then put in a warm place for spontaneous evaporation. A large crop of crystals soon formed. These crystals were drained on bibulous paper, and taken up with water. The greater portion dissolved, leaving behind a white sediment consisting of lime and alumina.

These inorganic salts were filtered off, and to the filtrate was added twice its own volume of strong alcohol. A flocculent precipitate was formed, and after a few minutes, on pouring the liquid off, a small quantity of the organic crystals came out of solution and deposited on the sides of the vessel. The flocculent precipitate consisted of salts of potash. After the potash salts had been filtered off, the solution was evaporated and the resulting crystalline deposit drained on bibulous paper as before. This process o purification was repeated until the crystals were practically colourless. Under the microscope they exhibited a needle-shaped form, and with the aid of the selenite plate could be seen to polarize beautifully. This body was distinctly sweet to the taste, and when quite dry was much less readily soluble in cold water; when once dissolved, however, it did not easily fall out of solution. It was very sparingly soluble in alcohol and ether. Hot water dissolved it freely forming a neutral solution. Its aqueous solution was not precipitated by tannic acid. It melted at about 182° C., and it did not become red by contact with sulphuric acid. We would here draw attention to the fact that though the body we have just described was obtained by following Wenzell's plan exactly, still few of the reactions, beyond the solubilities, agree with those that he gives to the crystalline substance which he separated and pronounced to be asparagin.

The body we have isolated, and which may be provisionally called *atropurpurin*, differs from asparagin in the following particulars. Nitrogen does not enter into its composition. When boiled for an hour or more with a 2 per cent. solution of aqueous sulphuric acid it reduces Fehling's solution, indicating that it is of the nature of a glucoside. It has a fixed and well-defined melting point.

Further, we are unable to harmonize certain of Wenzell's statements of the behaviour of his crystalline substance with his inference that "that there is no doubt of its identity with asparagin." The statements we refer to are these:—Solution of ammoniacal

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and the liquid filtered off. After ether has been added to separate out the glucose, the solution is gently evaporated down, when he states that crystals of euonymiu separate out. As he gives no properties or reactions of this body, whether it is acid, alkaline or neutral, or whether it has a bitter taste or not, we are unable at present to say if the product we obtained by this method is identical with Romm's euonymin.

D. A fresh portion of comminuted bark after treatment with boiling water was extracted with 65 per cent. alcohol. On the alcohol being distilled off a dark brown mass was left behind. When this was treated with petroleum ether, part dissolved (*a*); (*β*) was the portion undissolved. (*a*) This portion, soluble in petroleum ether, was evaporated down to dryness, when a dark brown acid residue remained. This was boiled for about an hour with a 5 per cent. solution of caustic potash in proof spirit. The spirit was then driven off and the aqueous portion left behind shaken up with ether.

Three layers separated out :—

(*a* 1) The top layer contained the portion soluble in ether.

(*a* 2) The middle layer was composed of rosy-red flocculent matter.

(*a* 3) The bottom layer contained the part soluble in water and was of a dark brown colour.

(*a* 1) The ethereal layer was then taken and evaporated, and the residue treated with alcohol, which dissolved it. A portion of the alcohol when drawn off and evaporated yielded a yellow resin free from bitterness, neutral in its reaction and tasteless. Potash salts were tested for and proved to be absent. The remainder of this alcoholic solution was allowed to stand for some hours. When again looked at a crop of colourless crystals had separated boldly out from the solution, in the form of long silky needles. They were insoluble in boiling water and also in diluted hydrochloric acid, but were soluble in ether and in a less degree in alcohol. When incinerated they left no ash, and when placed in contact with strong sulphuric acid were turned red. The melting point was found to be about 129° C. From the fact that we have not met with this crystalline body by the use of simple solvents, we are inclined to believe that it is to be regarded as a product rather than an educt.

(*a* 3) To the aqueous layer hydrochloric acid was added to set free whatever fat and acid resins might be present. This separated mixture of free acids was taken up with ether, which on evapora-

tion, left a brown oily substance. When treated with proof spirit part dissolved (*a* 4), leaving the fat acids of the oil undissolved (*a* 5). These fat acids crystallized in fine needles assuming a fan-like arrangement.

The portion soluble in proof spirit (*a* 4) filtered through animal charcoal, yielded on evaporation an acrid uncrystallizable principle, to be again referred to.

(*β*) The part of the residue from the 65 per cent. alcohol extract insoluble in petroleum ether consisted of a dark brown resinous substance, which dissolved completely in ether. It was possessed of a disagreeably bitter taste. When dissolved in alcohol it precipitated with neutral lead acetate (*β* 1). The filtrate after getting rid of the excess of lead was evaporated and yielded a yellow, uncrystallizable resin, having a slightly acrid and bitter taste. (*β* 1) the lead precipitate was suspended in alcohol and decomposed with sulphuretted hydrogen; the liquid, after the separation of the sulphide of lead, gave on evaporation a yellow, uncrystallizable resin, soluble in ether and insoluble in petroleum ether, having an acid reaction.

Viewing the results from the extraction with 65 per cent. alcohol in the clearer light of after experiments, it is evident that the method adopted fails to effect a sharp separation of principles. The educts are more or less contaminated with their associated bitter and acrid principles respectively.

E. The marc, after the treatment with 65 per cent. alcohol, was further treated with 84 per cent. alcohol. After the alcohol had been distilled off, the residue was treated with petroleum ether. This dissolved out a fixed oil, which after washing with 60 per cent. alcohol was quite bland to the taste and of a brownish yellow colour. The portion insoluble in petroleum ether was identical with D*β*.

F. The marc was finally treated with ether, which gave a mixture of wax contaminated with oil. This was not further examined.

A. From the knowledge we have already gained, and from subsequent experiments, we recommend the following method for isolating the proximate principles of euonymus dissolved in the tincture of 95 per cent. alcohol (*A*), alluded to at the commencement of the paper as having been set aside for future examination.

The residue obtained by the distillation of this tincture was exhausted with ether. The part which remained undissolved, and which Wenzell describes as a soft resin, when treated with water,

completely dissolved, and presented the characters of "bitter extractive."

The portion taken up with ether was then evaporated to dryness, and to the residue was added just sufficient alcohol to effect its solution. It was allowed to stand for three days, when the larger portion of the neutral fixed oil it contained separated out. The oil, after washing with 60 per cent. alcohol, was practically tasteless.

The solution from which the oil originally separated, after evaporation to dryness, was treated with petroleum ether, when a portion dissolved (α). This (α) was evaporated to dryness, the oily residue was shaken up repeatedly with 60 per cent. alcohol.

The insoluble portion (α 1) consisted of neutral oil.

The soluble portion (α 2), after being evaporated, was treated with proof spirit, which dissolved out an oily principle (α 3). This was acid, and markedly acrid.

(α 4) The portion which did not dissolve in proof spirit crystallized readily from the mixture of stronger alcohol, and consisted of free fat acid or acids, a condition in which they exist naturally in the oil.

(β) The portion insoluble in petroleum ether. This was treated with 60 per cent. alcohol. That which passed into solution (β 1) consisted of Wenzell's golden yellow resin, uncrystallizable, having an acid reaction associated with a pronouncedly bitter principle. The removal of the latter was effected by repeated digestions with warm water, and the filtration of the decanted liquors when cold. The filtrate on evaporation left a light yellow residue, which after treatment with ether was practically colourless. It was intensely bitter, neutral, not crystalline, and was precipitated by tannic acid when not added in excess, and by basic acetate of lead. In all these respects it agrees with Wenzell's neutral body euonymin. Dissolved in water without the intervention of an acid, it reduced Fehling's solution.

(β 2) The portion of (β) insoluble in 60 per cent. alcohol was a brownish resin, hard and pulverizable, which after repeated washing with water was not perceptibly bitter. This corresponds with the resin insoluble in petroleum ether, from the 65 per cent. extract by alcohol (Dβ).

We have searched for an oleoresin, but have failed to find one. We may also add the observation that an aqueous extract reduces Fehling's solution.

To summarize the results of our examination of the root bark of euonymus, we find the following organic principles:—citric,

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The next paper read was on—

MEDICAL AND CHEMICAL MISCONCEPTIONS ABOUT LITHIA.

By Louis Siebold, F.I.C., F.C.S.

For many years it has been an established article of faith with the medical profession to regard lithium compounds as powerful agents for preventing the deposition of uric acid in the tissues, or for dissolving and removing such deposits when already formed. These salts have been generally credited with being greatly superior for these purposes to the corresponding potassium salts; and they therefore enjoy a correspondingly greater reputation as remedies in chronic gout, calculus, etc. They owe their place in the materia medica originally to the observation that, as compared with potash or soda, a smaller amount of lithia suffices to form a soluble salt with uric acid, and that this salt is more readily soluble in water than the corresponding potassium and sodium salts. From a chemical point of view, the relatively greater power of lithia to dissolve uric acid or—what practically comes to the same thing—its greater antacid or neutralizing power, presents itself as a matter of course, owing to the low atomic weight of lithium. It follows from the atomic weights of lithium and potassium that lithium carbonate will go nearly twice as far in this respect as potassium carbonate, or, to put it more exactly, that 74 parts of the former salt possess the same acid-saturating power, and are likely to dissolve as much uric acid, as 138 parts of potassium carbonate. This is a natural conclusion apparent to every chemist; and if the medicinal fame of lithium salts went no further than appears warranted by this conclusion, I should not now trouble you with any observations on this subject. But that fame extends further, and the faith that many medical practitioners, and chemists along with them, have in the superior virtue of lithia amounts to a belief that its superiority is far greater than is indicated by the ratio of molecular weights. Were this not so it could have hardly come to pass that so much preference is given to the not so harmless and much more expensive lithium preparations. Nor is this faith in the superior efficacy of the latter confined to the carbonate, which is a direct antacid, and to the citrate, which though a neutral salt becomes converted into carbonate within the organism, and thus acts as an indirect antacid. It is extended also to a number of mineral waters containing

lithia, generally mere traces of it, notwithstanding the fact that what there is of lithium in these waters generally occurs in them as chloride or as sulphate, salts which neither directly nor indirectly act as alkalies and possess no solvent action on uric acid. This seems quite irrational, and the question arises whether this fame, so far as it exceeds the reasonable chemical conclusions alluded to, really rests on a solid foundation, or whether it has no such foundation, but is based on misconceptions. Experiments which I conducted a few years ago, and which were then left unfinished, strongly inclined me to the latter view; and a further investigation of this subject carried out quite recently confirms me in this opinion. It is not my intention to trouble this meeting with a description of the numerous experiments made, though I shall be glad to give any information I may be asked for in the discussion. I shall simply give, in the briefest form, the conclusions I have arrived at from these experiments. They are as follows:—

(1) The relative solvent action of solutions of lithium, sodium, and potassium carbonates on a given weight of uric acid, under equal conditions of dilution and temperature, is strictly proportional to the ratio of the molecular weights of these solvents. (The determinations were made at 37° C., and the proportion of water to uric acid was not much greater than that occurring in urine.)

(2) Equivalent proportions of the three solvents named dissolve equal quantities of uric acid under equal conditions of dilution and temperature. (Experiments conducted on the same lines as in 1.)

(3) Crystals of uric acid deposited from urine show the same behaviour towards the solvents named as the pure uric acid used in 1 and 2.

(4) Equal weights of a urinary sediment consisting of acid urates, are dissolved by quantities of the three solvents named, proportional to their molecular weights.

(5) Lithium chloride and lithium sulphate exercise no solvent action on uric acid and acid urates.

(6) Natural mineral waters containing lithium chloride have no solvent action on uric acid beyond that exercised by basic constituents simultaneously present, and by the water.

(7) The degree of alkalinity of urine produced by the internal administration of medicinal doses of lithium citrate is not greater than that produced by equivalent doses of potassium citrate. It

is greater than that produced by equal doses of the corresponding potassium salts, but only so in proportion to the molecular weights. (All these experiments were conducted under strictly equal conditions of diet. The alkalinity was determined in the urine of twenty-four hours.)

To the foregoing conclusions I may add that lithium salts are known to be more toxic than potassium salts, and hence less suitable for prolonged administration. Altogether, the superiority of lithium salts as remedies in calculus, gout, etc., appears to me much overrated.

The PRESIDENT, having proposed a vote of thanks to Mr. Siebold, said the Conference was fortunate enough to have one or two gentlemen belonging to the medical profession present who possibly might throw some light on the question from a medical point of view. From the chemical point of view, Mr. Siebold had certainly raised some queries which would indicate that lithia waters had no advantages over some other waters, and had probably some disadvantages.

Mr. SIDNEY PLOWMAN said he agreed in great measure with what Mr. Siebold had said. At the same time some allowance should be made for believing in tradition with regard to the therapeutic value of medicines. If one examined the pharmacist's bible, the Pharmacopœia, and went through its contents, all would agree that it would be impossible for a medical student or practitioner to test rationally all the statements and traditional beliefs he has had to listen to from the lecture platform concerning the drugs therein contained. The Pharmaceutical Conference was doing splendid work when it induced such investigators as Mr. Siebold to come forward and show the fallacies of tradition, even with regard to one series of drugs, viz., the salts of lithia, and if other workers would come forward in the same way, a great many of these traditional errors might be done away with, and they might get some exactitude in the science of medicine, which, though it had been said to be an exact science, was in fact the most inexact of all. He must say this, however, that in spite of tests and experiments, and so on, it must always be remembered that the human body was not an enlarged test-tube, and, though these experiments might be very exact, yet the result of experience must always be taken into account.

Mr. PROCTOR asked whether a lithia water did not become

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The next paper read was entitled,—

ARSENIC IN GLYCERINE.

By Louis Siebold, F.I.C., F.C.S.

Attention has been called by Jahns in the *Chemiker Zeitung* (1888, 293), and subsequently by Vulpius in the *Apotheker Zeitung* (April 10, 1889), to the frequent occurrence of arsenic in glycerine. More recently R. A. Cripps, in a letter to the *Pharmaceutical Journal*, has pointed out that this contamination is not confined to glycerine of German manufacture, but occurs also in glycerine made in this country. These statements, and the absence of any information respecting the quantity of this objectionable impurity, induced me to submit a large number of samples of both English and Continental manufacture to a careful qualitative and quantitative analysis. My experiments, however, were not extended to low qualities of commercial glycerine, commonly used for technical purposes, but were confined to colourless and odourless samples sold for toilet and pharmaceutical purposes. The majority of the samples tested proved to contain arsenious acid varying in proportion from 1 part in 4000 parts to 1 part in 6000 parts; a few samples somewhat exceeded this proportion, while about 10 per cent. of the samples contained smaller proportions than 1 in 6000. The samples which were found free from arsenic nearly all represented, as far as I could ascertain, the product of one process of manufacture, viz., the steam distillation process, and this product is the very kind of glycerine which, I believe, is universally used by pharmacists in this country in the dispensing of prescriptions.

The process I adopted for the estimation of the arsenic consists in the conversion of the latter into arseniuretted hydrogen in a Marsh's apparatus, and the passing of the gas through a solution of silver nitrate. From the weight of the silver precipitate thus obtained the proportion of arsenic is readily calculated.

As a very ready and delicate means of detecting this impurity in glycerine, Vulpius recommends the mode of testing first suggested by Gutzeit, and recently reported upon in detail by Flückiger (*Archiv der Pharmacie*, ccxxvii., p. 1). I agree with Vulpius as to the extreme suitability of this test for the purpose in question, but would recommend a much smaller proportion of acid as more conducive of success. I find an acid even weaker than that suggested by Flückiger to give the best results, and

invariably employ a mixture of 1 volume of pure hydrochloric acid of 1·16 sp. gr. with 7 volumes of water, or in other words an acid containing about 4 per cent. of H Cl gas. The following is a very safe and successful way of applying the test:—

Place a mixture of 5 c.c. of the dilute hydrochloric acid and 15 to 20 drops of the glycerine to be tested in a very long, narrow test-tube or cylinder, together with about 1 gram of metallic zinc perfectly free from arsenic. Before adding the zinc, place 1 drop of saturated solution of mercuric chloride, by means of a thin glass rod, in the centre of a small white paper filter, and allow it to dry up by gently warming the paper over a flame. As soon as the zinc is added to the mixture of acid and glycerine, turn the paper over the mouth of the tube, and allow the latter to stand in an upright position. In the presence of $\frac{1}{100}$ of a milligram or more of arsenious acid in 1 gram of glycerine, a distinct yellow stain will be produced on the under surface of the paper within a quarter of an hour, while with quantities of $\frac{1}{50}$ of a milligram and more this result is attained within a few minutes. Exceedingly small traces, such as $\frac{1}{200}$ to $\frac{1}{500}$ of a milligram of arsenious acid in one gram of glycerine may take from half an hour to one hour to produce a visible stain, but such minute traces may, I think, be disregarded. For all practical purposes I consider that the sample of glycerine under examination may be passed as pure if a distinct yellow stain fails to show within a quarter of an hour. In the presence of more arsenic than the proportions named the stain passes from yellow through orange to brown. In the place of mercuric chloride Vulpius used a saturated solution of silver nitrate, which Flückiger has shown to give still more delicate indications, showing the presence of as little as $\frac{1}{1000}$ milligram of arsenic. But the test with mercuric chloride is amply delicate enough, and has the marked advantage of not being interfered with by light or by the organic matter of the paper, and of being much less affected by minute traces of sulphuretted hydrogen. The absence of sulphur compounds in the glycerine as well as in the reagents can, of course, be demonstrated by repeating the experiment with a piece of lead paper, which is much more readily affected by sulphuretted hydrogen than the mercury paper. If the lead paper remains unstained after ten minutes' exposure, or if it should only show a very faint or doubtful stain, it may be taken for granted that there is no sulphur present sufficient to stain the mercuric paper in the test for arsenic. Should, however, the lead paper give a decided indication of sulphur, the latter may be

rendered harmless in the test for arsenic by adding to the mixture of glycerine and acid, previous to the introduction of the zinc, a drop of weak iodine solution, or just enough to produce a visible coloration, as recommended by me many years ago in connection with the testing of wall-papers.

The drying up of the drop of mercuric chloride solution on the filter paper, instead of using the paper wet, seems to me to increase the delicacy and distinctness of the test, and renders unnecessary the introduction of a layer of dry filtering paper between the mouth of the tube and the test-paper, as recommended by Flückiger.

Arsenic in glycerine is considered to emanate from the sulphuric acid used in the manufacture of the latter; and I have little doubt that this is the main, if not the only source. A few days ago it occurred to me that this impurity might possibly also emanate, partly at least, from the glass of the bottles in which the glycerine is kept. It will be within the recollection of members of this Conference that years ago I traced the presence of lead in *liquor ammoniæ acetatis* to the solvent action of this liquid on the lead of the glass. What suggested to me a similar action in the present case was the well-known and very powerful solvent action of glycerine on arsenious acid, and the observation during my recent experiments that samples of a certain brand of glycerine which had been kept in bottles for a long time contained arsenic, while this impurity was absent from samples of the same brand drawn from tins. This difference may have been purely accidental, but it certainly renders it desirable to study the action, if any, of pure glycerine on bottles of various kinds of glass; and this I am at present engaged in investigating. Up to the present my experiments in this direction have given negative results; but as they have only extended over a few days, they do not as yet admit of any conclusion. With reference to the bottled glycerine in which I found arsenic, while a sample of the same make from a tin contained none, I may add that this glycerine was contained in bottles in the glass of which I had no difficulty in demonstrating the presence of arsenic. It is well known that certain kinds of glass used extensively for chemical apparatus contain arsenious acid; and according to recent observations the proportion of the latter in such glass occasionally amounts to as much as 0·1 to 0·4 per cent. I shall refer to this subject again as soon as my experiments now in progress are completed.

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to be extremely pure. In that case the glycerine had no chance of being contaminated by arsenic from any acid, because none was used in the manufacture. There might be some used to neutralize the lime subsequently, but that was after the glycerine was distilled over, and where it was obtained by such means it was likely to be pure. On the other hand, a large quantity was made under very different circumstances, and from different materials—soap leys. These were now concentrated and distilled for the sake of the glycerine, and the largest works in England were those in Lancashire. This glycerine was chiefly employed for the manufacture of dynamite. Messrs. Nobel used several tons of glycerine a day to make nitroglycerine; and this being so, it would be seen there might be a large quantity of arsenic pass off in that way, but they insisted on a certain known quality of glycerine for this purpose, and would resent any appreciable quantity of arsenic being present. Otherwise there would be arsenical hydrochloric acid used for neutralizing the soap leys, and those sort of things, in the production of glycerine. The glycerine was tested rigidly for certain impurities which were dangerous in the manufacture of nitroglycerine. Amongst the tests used was a nitrate of silver test, which would be likely to detect any arsenic existing in the distilled glycerine; and he did not think distillation would remove any arsenious acid previously existing in the glycerine. Mr. Siebold had suggested various sources of arsenic, and the President others, such as the solder of the tins. He did not think this was very probable; and as to the arsenic in glass, at Castleford, which was a glass-making town, they used more than a ton of arsenic a week, but he always had the idea that the greater part of that went into the air and poisoned the inhabitants, and not into the bottles. At any rate, it was rather a novelty to hear that ordinary glass contained so large a proportion as 0·4 per cent. of arsenic, and he should like to know whether that was the proportion of material used in making the glass, or what remained after the glass had been heated to a white heat. Mr. Siebold had shown the way to detect arsenic in glass, but he was not aware of any published series of analyses showing such large amounts of arsenic in glass, and could hardly think that glass was the source of the arsenic found in certain specimens of glycerine, because, as Mr. Siebold said, the glycerine which he had traced to one process of manufacture was free from arsenic although kept in bottles. There were other ways by which arsenic could get into glycerine. It was mentioned in connection with a late popular heroine that

glycerine was found containing arsenic, and although that might have been introduced purposely, it was a curious matter in connection with this paper that arsenic should occur accidentally in connection with glycerine, and it gave rise to a train of thought which would naturally occur to every one.

Dr. THRESH said he had listened to Mr. Allen's remarks with great interest, and they would all recognise the great importance of the subject. To medical men it was of great importance to have pointed out all the possible sources by which their patients might receive into the system traces of poisons like arsenic and lead. He had seen numbers of cases of lead poisoning in which the medical attendants had been utterly baffled in tracing the source of the lead. He remembered distinctly two cases, a father and son, in which the physicians were perfectly certain they were suffering from arsenical poisoning. Though they had seen similar cases traced to wall papers, in this case they could not trace it to anything. It might possibly have been that they had been taking some mixture containing glycerine which also contained arsenic. At any rate, if he had known at that time that such considerable quantities of arsenic might have been found in a drug like glycerine, his attention would have been directed to that point. The importance of the paper from a toxicological point of view could not be over-estimated, but he did not think it desirable to dwell at any length on that point. He should agree with Mr. Allen that it was due to the process of manufacture rather than to anything else. Glycerine distilled with superheated steam was very unlikely to show any trace of arsenic. It was probably found in specimens prepared by other processes in which chemicals well known to contain arsenic were used.

The PRESIDENT said it was desirable to avoid bringing into the discussion the question of arsenic which might be present in raw crude glycerine. Those present cared nothing about what was used for manufacturing dynamite, whether it contained arsenic to the extent of 1 part in 1000 or 2000; they were more concerned with the presence of arsenic in minute quantities in glycerine used for medicinal purposes.

Mr. A. H. MASON said with regard to the possibility of the arsenic being derived from glass bottles, if he understood correctly, arsenic was only used in the manufacture of white flint glass. Ordinary bottles were not made with arsenic.

Mr. CONROY said most of them would be very much relieved by the last remarks made by Mr. Siebold, viz., that he found the

class of glycerine used medicinally to be free from arsenic. He urther understood, and this was at variance with the remarks of Mr. Allen, that Mr. Siebold was able to trace the source of the contaminated glycerine. It was implied in what Mr. Allen said that Mr. Siebold was able to trace the source of the glycerine which was free from arsenic, and that was a most important point which he should like Mr. Siebold to further elucidate in his reply.

Mr. SIDNEY PLOWMAN agreed that the Conference should be very careful to avoid anything like a scare in connection with the presence of arsenic in glycerine, but when it was found that it existed to a considerable extent—1 in 4000 or 1 in 6000, and in some cases to a larger extent still—they were bound to admit that that was a serious quantity, and they must not shut their eyes to the fact, but if possible find out the source of it, and prevent it occurring. He remembered some time ago Mr. Fletcher reading a paper on the presence of arsenic in solution in chloride of iron, and a considerable discussion arose as to whether the whole of the arsenic came over as arseniuretted hydrogen, and reduced the nitrate of silver. He kept the suspected solution together with the reagents in a generating bottle for five or ten minutes, and certainly got very fair results. He wished to ask Mr. Siebold what length of time he kept the suspected solution in contact with the zinc and hydrochloric acid in his quantitative experiments, and whether he considered nearly all the arsenicum came off as arseniuretted hydrogen. If not, whether he could give any idea of the allowance to be made for the arsenicum remaining in the generating bottle.

Mr. BENGER asked if it was not possible that slight contaminations arose from the soldering liquor used. He knew by some practical experience in the manufacture of tins that the men were very careless in the use of that liquid, which consisted of zinc dissolved in common hydrochloric acid. They brushed it very freely along the joint and then ran their iron over it. Of course the quantity which got inside the tin would be very small, but it might give a trace of arsenic in some cases.

Mr. PROCTOR thought it was quite clear that the quantity of arsenic spoken of by Mr. Siebold could only get into the glycerine in the manufacturing process by which it was produced. These theories of the arsenic being contained in the tin or the soldering solution or glass were all outside the question of the presence of arsenic in so large a proportion as 1 in 4000; it was quite inconceivable that glass should yield so much as that to the

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ing arsenic could be freed from it by such distillation. But there was no necessity for pharmacists to resort to any process of purification, as he had shown that there was no difficulty whatever in obtaining a supply of glycerine free from even the smallest traces of arsenic, and that the very kind of glycerine generally used in the dispensing of prescriptions was of that high degree of purity. As to the source of the arsenic, he was afraid he had been misunderstood by some of the speakers, who seemed to think that he regarded the glass of the bottles as the most likely source of contamination. This was not the case; he believed the sulphuric acid used in the manufacture of the glycerine to be the main if not the only source, but he thought it possible that some arsenic might also be dissolved from the glass bottles. His experiments, as far as they went at present, had not established this supposition, but they required to be carried on further in order to definitely settle this point. The occurrence of arsenic in glass used for bottles and chemical apparatus was no new observation, attention having been drawn to it by W. Fresenius, in the *Zeitschrift für analytische Chemie*, six years ago. It was well known that arsenious acid is often used in the manufacture of glass, as a decolorizing agent, and now-a-days it was more generally and more abundantly present in glass than formerly, either from a more copious addition of arsenious acid, or from the use of strongly arseniferous materials. The proportion of 0·1 to 0·4 per cent., which he had mentioned, was found in a number of determinations by J. Marshall and C. S. Potts, whose report on this subject would be found extracted in the current volume of the *Year-Book of Pharmacy*. He could not tell how the proportion of arsenic found in glass compared with the quantity introduced in the making of it. He had repeatedly convinced himself of the presence of arsenic in German and Bohemian glass apparatus, and had also found it in some French and German glass bottles. If glass thus contaminated were finely powdered, intimately mixed with potassium cyanide and soda, and then heated in a suitable combustion tube, a distinct arsenical mirror would be obtained. As to the determination of arsenic in glycerine by passing it in the form of arseniuretted hydrogen through a solution of silver nitrate, he found that from three to four hours were amply sufficient to complete the process. The current of hydrogen ought to be a slow and steady one all through. He believed this process to be the most rapid and convenient for estimating minute traces of arsenic occurring as an impurity in pharmaceutical preparations, and to be sufficiently accurate for

such purposes. He found that the qualitative test he had described at full length for the detection of arsenic in glycerine could also be turned to account for the purpose of approximate qualitative estimations, by performing the test simultaneously with samples of pure glycerine to which various known quantities of arsenious acid had been added, and comparing the results; but great care had to be taken in such a case to see that all other conditions were strictly equal. As to the question of arsenic being dissolved by glycerine from the tin or solder, he did not regard this as a likely mode of contamination, since he had found certain samples of glycerine kept in tin to be quite free from arsenic. He had also heated pure glycerine in tin bottles by the heat of a water-bath for twenty-four hours, and found it to be still quite free from arsenic. To Mr. Dott's question he would reply that he had not solely relied in his experiments on the test described, but had also carefully verified the results by Marsh's test; but he could assure the meeting that the test he had particularly recommended was as trustworthy as it was convenient and sensitive, and it seemed to him to deserve to be strongly recommended to the general attention of pharmacists.

Mr. N. H. MARTIN asked if Mr. Siebold satisfied himself that all the reagents he used were chemically pure, because reagents sold as pure for analysis very frequently contained traces of arsenic or some other impurity.

The PRESIDENT said this was a very important point.

Mr. SIEBOLD said he ought really to have mentioned in the course of his paper that it was necessary in performing this test to precede it by a blank experiment, in order to make sure of the purity of the zinc and hydrochloric acid employed. If no stain was produced in such an experiment within a quarter of an hour, the reagents might be considered as free from arsenic.

The next paper read was entitled:—

NEGATIVE EVIDENCE OF LEAD IN DRINKING WATER.

By R. REYNOLDS, F.I.C., F.C.S.

At the outset, I will disclaim the possession of any new discovery with reference to the action of drinking water upon lead. But there are cases in which no new discovery can be announced,

where the importance of the subject, as affecting the public welfare, may have enormously increased. It seems to me that the question of the contamination of drinking water by lead is one of these, and I trust that this enhanced importance will justify the present communication.

In the West Riding of Yorkshire it has been found during the past few years, that the public water supplies of some very important towns are capable of acting energetically upon lead, and the almost universal employment of lead for service pipes places vast populations under conditions of much peril. The water supplies of Sheffield, Bradford, Huddersfield, and Keighley may be especially named as having furnished many cases of lead poisoning. The neighbouring county, Lancashire, can supply similar illustrations.

The general principles upon which these water supplies have been selected have been the endeavour to secure water beyond the suspicion of contamination by impurities of human origin, or from agricultural land, combined with the possession of the smallest possible amount of solid matter. The example of Glasgow in taking the soft water of Loch Katrine has been emulated, as a standard to be aimed at in the interest of economy of soap and for the advantage of various manufactures. The absence of organic impurity might have been secured by taking the supplies from springs where these furnished an adequate volume, but the combined conditions of organic purity and softness were found only in waters gathered in high moorland districts. These waters are now recognised as frequently having acid qualities, which cause them to attack lead.

The literature of the subject is now indicating that its practical importance is realized, and during the past few months some valuable papers and reports of discussions have been published. Amongst these is a paper "On the Action of Water on Lead," by Professor Percy F. Frankland, Ph.D., etc., read before the Society of Chemical Industry, April 1, 1889, whilst the discussion which followed its reading brought out valuable facts and opinions from Mr. A. H. Allen, of Sheffield, whose knowledge of the subject is exceptionally comprehensive. At the meeting of the British Medical Association in Leeds, August, 1889, Dr. Sinclair White, lecturer on state medicine, etc., Sheffield Medical School, gave a valuable paper on the subject, with notices of the experiments made by Mr. Allen. It was clearly established that the new factor in such waters is a free acid. They are appreciably acid to

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		Grains of lead per gallon.
Source A.		
Sample drawn	7 a.m.	0·35
,,	10 a.m.	0 10
,,	3 p.m.	0·10
Filtered water		0 00
Source B.		
Sample drawn	6.30 a.m.	0·15
,,	9.0 a.m.	0·05

Special vigilance should be shown in the case of hot water supplies, as these have often been found contaminated by lead where the cold water was free from it. The bad habit, too common amongst servants, of filling tea-kettles from hot water cisterns, has, in several instances that have come under my observation, been productive of much injury to health. Again, there are the cases where varying amounts of the scale or coating which forms a protective covering to the inner surface of the lead-piping, are detached and suspended in the water, although no lead is found in solution. Such a case is before me now.

The moral which seems justified by the present position of the subject is, that an analyst reporting on the presence or absence of lead in drinking water ought to make it plain to his client that he speaks only of the sample placed before him, and if that sample has not been taken under the conditions most favourable to the presence of a maximum amount of lead, the analysis and report may have failed in their object. In the case of a commercial analysis of some article of trade, the technically skilled client who sends it will take care that a pound sample fairly represents a ship's cargo. But the client who wishes to know if his family may safely drink any particular water has no knowledge of the technicalities affecting the reactions of lead with water in all the varying moods and tenses of the latter. I think it follows that the analyst should direct that samples ought to have been in contact with the ordinary service pipes for a fixed period, say twenty-four hours. Where samples are delivered without the opportunity having been given for this injunction, it is desirable that a short printed statement should accompany the report, explaining the conditions which favour the action of water upon lead.

The PRESIDENT proposed a vote of thanks to the author, and said this was a matter in which all present were very much interested, coming as they did between the public and the medical profession

Mr. A. H. ALLEN (Sheffield) had listened with much pleasure to all Mr. Reynolds had said, and agreed with him entirely. There was no doubt it was extremely important, especially as very frequently the effects of lead poisoning were very serious, though the origin of them was so obscure that the medical men did not suspect lead poisoning. Of course the report on any particular sample could only refer to that sample, and it was a great pity that the public could not be educated into a more intelligent way of selecting things to be sent to the chemist for analysis, because a great deal of their money and the chemist's time was wasted, and suspicion and doubt was occasionally thrown on the accuracy of analyses, simply because the parties had not taken the trouble to insure the proper conditions being present. There was one point not referred to by Mr. Reynolds which came very much home to him, because it occurred in his own household. Unfortunately at one time all the water which reached the inside of his house passed through a lead pipe and was contaminated. They had none uncontaminated; all they could do was to go down to the tap in the cellar, and after having let the water run for some time they could draw water containing as little as $\frac{1}{1\,8}$th of a grain per gallon, but the other water was liable to contain as much as $\frac{3}{1\,0}$ths, and it had been as much as one grain. This therefore became a serious matter. He had no further personal interest in it, because he cured it entirely by filtering. On that point he was not quite clear whether Mr. Reynolds said that wood charcoal or good charcoal would do; but if he said wood charcoal, that was insufficient, it must necessarily be animal charcoal. The wood charcoal exercised a certain physical action in removing lead for a certain length of time, but it was the phosphates in the animal charcoal which really did the duty. The lead could be removed equally well with a bone-ash filter as with animal charcoal, and the efficiency of the charcoal could be judged of, so far as lead removing was concerned, by noticing whether the charcoal had turned white. As soon as the charcoal was saturated with phosphate of lead it became white or grey in colour, so that as long as there was a distinct portion of the charcoal remaining black, it was still efficiently removing the lead; of course it might be desirable to change it for other reasons. That was a very important point, because it was quite clear that a

filter which was not doing its duty was almost worse than none. He had put up a high-pressure filter arranged above the sink, through which the water ran in a stream as thick as a pencil absolutely free from lead. It went in with a third of a grain to the gallon, and came out absolutely free. That was an animal charcoal filter, and had been at work for several years. But having taken all this trouble to remove the lead from the water, they were alarmed and troubled by finding that several members of his family still suffered from lead poisoning, and he could not for a long time fathom the mystery. At last the tea was found to contain lead. Their attention was directed to the tea leaves, which were found to be free, and ultimately the evil was traced to the kettle, which had been furred, and that fur contained a lead deposit, no doubt deposited there in the time before they knew what harm was being done. This deposit contained an enormous quantity of lead, and there was no cure for it except buying a new kettle, and he believed the ironmongers in Sheffield had made a good trade out of it. That showed how difficult it was to trace the source of lead poisoning, and how one might be thrown off the scent by finding there was no lead in the water which was being used, although there was actually death in the pot.

Mr. BRANSON said he had been examining the composition of water that caused a considerable epidemic at Pudsey this season, and on the authority of Professor Attfield it contained $\frac{7}{10}$ths of a grain of lead per gallon. That water was drawn the first thing in the morning, and probably contained the maximum amount. He found the quantitative results were as follows:—The water was distinctly acid, of course. The term of acidity in sulphuric acid per gallon was ·114 grain; the total amount of sulphuric acid combined amounted to $1\frac{1}{2}$ grains, so that there was plenty of sulphate present; but in the presence of free acid the sulphate was no protection against the action on lead. There was no temporary hardness; the permanent hardness was about 4 grains, and the total solids 6·7 grains; all the other constituents normal. That water caused a serious epidemic, in a large number of cases apparently suddenly. Last week another sample of water equally interesting came under his notice. It was proposed for a town supply, and it acted freely on lead. The terms of acidity were as much as ·9 grains of sulphuric acid per gallon; the total sulphuric acid present was less than one-tenth of the total acidity.

Mr. ALLEN asked how it was ascertained.

Mr. BRANSON said by precipitation with barium. The temporary

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necessary for the preservation of the aroma of the hop. He knew breweries where very soft water was used, where they were unable to brew bitter beers, and to them he recommended putting a shelf round the water cistern and filling it with lumps of gypsum. This acted perfectly, and they now brew as good beer as any one else. The public wanted educating to the idea that the softest water was not the best for drinking purposes.

Dr. THRESH said the question that they were considering was not so much whether soft or hard water was best for drinking purposes. Mr. Reynolds had offered a suggestion which was very valuable, which public analysts and others should take note of. It was desirable in all cases where an analyst was consulted in reference to a water supply, that the greatest importance should be laid on the point whether the water was likely to have any action on lead. The authorities who sent samples of water for analysis rarely seemed to think of it, and he had seen many reports sent in by analysts in which it had never been mentioned. He did not consider any report on water intended to be used for domestic purposes to be complete unless the analyst added something with reference to the action of that water on lead. In many cases it would be of the utmost value to the sender of the water to have this action pointed out. Mr. Linford's statement about the health of children being affected by soft water was a most startling one; they all knew that after Glasgow was supplied with soft water the death rate went rapidly down, and to be told now that the children were beginning to suffer was a somewhat alarming statement. He did not know what authority Mr. Linford had for the assertion.

Mr. LINFORD said two Glasgow medical men.

Dr. THRESH said he had never seen anything of that kind reported, and was much inclined to doubt it.

Mr. DOTT said he believed it was the case that the medical officer for Glasgow thought the soft water from Loch Katrine had a bad effect on the health of the children in the city, but that was not the opinion held by the best authorities on the subject. He had no doubt it was a delusion. There were children in other districts, where the water was as soft, who were in perfect health. He had no doubt any ill effects were due to insufficient nourishment, and not to the softness of the water.

Mr. KINNINMONT said there certainly was in the lower districts of Glasgow a good deal of limb distortion. Much of that depended on the want of lime, but that came from want of lime in the food;

there was not enough milk or porridge; they took tea and bread, and the consumption of sugar was very great, owing to its cheapness, which had the effect of eliminating the lime from the system. However, in the districts inhabited by the upper classes, where they did use porridge considerably, the children seemed remarkably healthy, though in the east end and the poorer districts there was a great amount of sickness, and many children with distorted limbs. In the better class districts, and even in the lower classes, there was a great increase in the consumption of lime water, as the people had got it into their heads that they should take lime. In Pollokshields a large quantity of lime water was sold, and in the poorer districts the people made it themselves and added it to children's food, as they thought it would gradually eliminate this distortion which existed. The health of Glasgow was much improved since the city had been supplied with Loch Katrine water. He could remember when every autumn there was an immense amount of diarrhœa, but such a thing was almost unknown now. As for the action of soft water on lead, that might be obviated.

Mr. CHAPLIN said there had recently been a new supply of water from the moor districts, and the public was rather inclined to be frightened, from the idea that such water had always an action on lead. Mr. Kinninmont said the water obtained from Loch Katrine had as great an action on lead as distilled water, and they knew that the water supply to Huddersfield had been attended with bad effects, which were attributed to that action on lead. Consequently, when the new supply was turned on to Wakefield, there were very great fears that there would be deleterious effects to the inhabitants. He had opportunities of looking into the subject, and although he had not examined it very minutely, he had done so roughly, and found, much to his surprise, that the water seemed to have no action on lead at all, or at any rate to a very slight extent. Comparing it with distilled water, the difference was extremely marked. He sent some of it to his son, who was an analyst, and he found that there was a certain amount of salts in the water, and on looking into Taylor's work on poisons, he found it there stated that a certain amount of salts in water would act as a protective against the action on lead, and comparing the analysis of this water with the amount of salts mentioned by Taylor, it was found that the water contained a little more than the quantity mentioned as being a protection from the action on lead, namely, about 1 in 6000. He thought they ought to disabuse the public mind as much as possible of the unreasoning

fear of the effect of water obtained from moorlands upon lead. It did not follow because it had an effect in one case that it would do so in every other. The strata over which the water flowed previous to collection must be taken into consideration.

Mr. REYNOLDS said, whilst the paper certainly suggested the somewhat discursive remarks, to which probably it was not necessary to attempt any reply, it was gratifying to him that such authorities as Mr. Allen and Dr. Thresh recognised the fact that something ought to be done to make the analyst more definite in his verdict with regard to the waters submitted to him. No one could doubt that there was a very extensive evil; medical men could hardly appreciate yet the extent of mischief which might be attributed to lead poisoning, for it was much more insidious than many were aware of, and unless guarded against it would be likely to increase, owing to the large scale on which these waters are now being used. The only directly contentious matter in the discussion was that coming from his friend Dr. Thresh, whose suggestion rather traversed his own in thinking it would be better, instead of informing the client how the water should be taken, that the analyst should himself make the experiments as to its maximum power of acting on lead. Now he would prefer that the conditions should be identical with those in the client's house. If the water came from Mr. Allen, he should like to have the very pipe and the very kettle that was used, instead of having a new pipe which would be used in the laboratory, which would be perhaps the more severe test, but not be so informative as if the client took a sample under absolutely fair conditions.

The next paper read was on—

VERMIN KILLERS CONTAINING STRYCHNINE.

By ALFRED H. ALLEN, F.I.C., F.C.S.

The composition of certain vermin killers containing strychnine as the active principle recently acquired an active interest for me in connection with a murder by poisoning which occurred at Swanwick, near Alfreton in Derbyshire. Kate Horton, a child aged eight, whose life was insured, died of suspicious symptoms, and, a certificate being refused, an inquest was held, and the viscera were subsequently submitted to me for analysis. From the stomach I isolated 0·3 grain of strychnine, from the intestines 0·2 grain, and from the liver 0·3 grain. Taking the amount of strychine absorbed

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Name or Mark.	Weight of Powder in Grains.	Price.	Strychnine.		Nature of Starch.	Colouring Matter.
			Weight in Grains.	Percentage.		
Local Preparations.						
A	—	2*d.*	—	—	Rice	Prussian blue.
B	—	—	—	—	Rice	Ultramarine.
C	14·7	3*d.*	1·05	7·2	Rice	Ultramarine.
D	—	1*d.*	—	—	Rice	Ultramarine.
E	11·5	3*d.*	0·60	5·4	Rice and Wheat	Carmine.
F	61·4	6*d.*	2·50	4·2	Rice	Ultramarine & Prussian blue.
G	14·5	—	—	—	Rice	None.
Wholesale Preparations.						
1	5·6	3*d.*	0·61	10·9	Wheat	?
2	11·8	3*d.*	0·80	6·7	Wheat	Ultramarine.
3	13·1	3*d.*	1·12	8·7	Rice	Ultramarine.
4	11·6	3*d.*	1·28	11·1	Rice	Ultramarine.
5	13·1	3*d.*	1·70	13·0	Rice	Ultramarine.
6	21·5	6*d.*	2·42	11·2	Wheat	Prussian blue.
7	49·2	3*d.*	2·85	5 8	Wheat	Soot.
8	30·5	3*d.*	3·45	11·3	Wheat	Prussian blue.
9	16·6	3*d.*	3·81	19·4	Rice	Carmine.
10	10·0	3*d.*	4·18	41·8	Rice	Ultramarine.

E is interesting as an example of a preparation containing two kinds of starch and coloured with carmine.

Of the preparations containing strychnine quoted in wholesale price lists, Battle's vermin killer is probably the best known and most extensively used. The colouring matter appears to have been uniformly prussian blue, but the following table shows that the composition ascribed to Battle's powder has varied in other respects at different periods:—

Authority.	A. S. Taylor.	A. J. Bernays.	T. Stevenson.	A. H. Allen.	Tardieu.	Woodman and Tidy.
Date	1862	1876	1882	1889	—	—
Price of packet . .	3*d.*	3*d.*	6*d.*	6*d.*	—	—
Weight of powder .	13 grs.	15 grs.	25 grs.	21·5 grs.	20 grs.	—
Colouring matter .	Prussn. blue	Prussn. blue	Prussn. blue	Prussn. blue	Prussn. blue	Prussn. blue
Starchy matter . .	Flour	Wheat flour	—	Wheat flour	Potato-starch	Flour
Strychnine; grains .	0·75	1 6	2·5	2·4	1·5	—
Strychnine; per cent.	5·8	10·7	10·0	11·2	7 7	23·0

Woodman and Tidy state that sugar is a constituent of Battle's vermin killer. It is certainly not so at the present time. The proportion of strychnine (23 per cent.) given by Woodman and Tidy is largely in excess of that found by other chemists, and is probably incorrect.

No. 7 deserves notice as a preparation having a distinct individuality. The colouring matter is some kind of carbon, apparently soot, but the quantity used is only sufficient to make the powder grey. The preparation is apparently variable in composition, for in 1876 Dr. Bernays found one packet to consist of a mixture of flour, soot, and strychnine, whilst in another packet the strychnine was replaced by barium carbonate. At the present time the powder contains both strychnine and barium carbonate, an analysis made in my laboratory showing :—

	Per cent.
Strychnine	5·8
Barium Carbonate (native)	45·0
Flour and Soot (by difference) . . .	49·2
	100·0

The association of strychnine and barium carbonate in the same preparation is remarkable, and it would be of interest to learn the real or supposed advantage of the combination.

With regard to the identification of the colouring matters, ultramarine is readily recognised by the peculiar shade of blue it communicates to the powder, and which is wholly destroyed on agitating with dilute acid. If a little of the powder be placed on a silver coin and moistened with dilute acid, a brown stain will be produced on the coin by the sulphuretted hydrogen liberated from the ultramarine. Ultramarine retains its blue colour after ignition, whereas prussian blue leaves a brownish residue of oxide of iron, and indigo is more or less perfectly consumed, according to its purity. A distinct ferruginous ash is left by some specimens of indigo. Prussian blue and indigo are of course unaffected by treatment with dilute hydrochloric acid. If the washed residue left after heating the powder with dilute hydrochloric acid be treated with a caustic alkali, it will be unaffected if composed of indigo; but prussian blue will be turned brown and the filtered liquid will contain a ferrocyanide, and hence will yield a blue or green coloration or precipitate when it is acidulated with hydrochloric acid and ferric chloride added.

The great variation in the amount and proportion of strychnine

contained in the different preparations deserves attention. I have used two methods for the determination of strychnine. One has been to exhaust the dry powder with chloroform, then evaporate the solution to dryness, and weigh the residue of strychnine. Benzene may be substituted for the chloroform. This process gives satisfactory results with free strychnine, but if the powder were to contain a salt of strychnine the extraction would be very incomplete. Error from such cause, however, may be readily avoided by testing the residual powder for strychnine by the taste and the oxidation-test. An alternative, and in many respects preferable, method is to treat the vermin killer with water acidulated with acetic acid, until the residual powder has no bitter taste and gives no coloration by the oxidation-test. The solution is then treated with excess of ammonia and shaken with a mixture of chloroform and ether. The ether-chloroform layer is separated from the aqueous liquid, evaporated to dryness, and the residual strychnine weighed.

It does not seem to follow that the vermin killer which contains the greatest weight or the largest proportion of strychnine is necessarily the best. Clearly, pure strychnine would be inefficient, and hence the object should be to compound a mixture which will have the most powerful poisonous effect compatible with its attractive and appetising character. To effect this, the bitter taste of the strychnine should be masked as far as possible, and a suitable odorant should be added. This object seems to have been recognised in one instance, for the powder contained sugar and had a powerful smell of asafœtida and oil of anise. In most instances, the vermin-killers examined were odourless.

But besides rendering a vermin killer attractive to the animals it is designed to kill, it is highly important that it should be so coloured as to preclude the chance of its being taken accidentally by a human being, and so as to facilitate its detection in cases where it has been used for the purpose of suicide or murder. It is not too much to say that had the blue colouring matter been absent from the vermin killer which Horton gave his child, the murderer would have escaped conviction, from the impossibility of connecting him with the administration of the poison.

From an inspection of the samples of vermin-killer of which I have given the analyses, it will be seen that many of them do not satisfy the condition which I maintain is necessary; namely, a colour sufficiently strong and characteristic to attract the attention of the taker. As already stated, sample G is 'purely white, and

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killers has not merely an academic interest, for the present facilities of obtaining and misusing poisons have recently attracted much attention, and it is not improbable that next session further legislation may be attempted with reference to the sale of poisons. Every pharmacist is aware that special restrictions exist with regard to arsenic, which cannot legally be sold in quantities of less than 10 lbs. unless coloured with soot or indigo. This provision is good in theory, but badly devised. It prevents the sale of an ounce of unmixed white arsenic to a professional chemist like myself, for strictly proper purposes, but it does not prevent a would-be murderer from obtaining a large quantity of the poison, provided he can give some plausible excuse for requiring it. It is interesting to note that all the solid arsenic found in the house of the late Mr. Maybrick was mixed with charcoal (not with soot or indigo), while two bottles were also found containing some of the coloured arsenic mixed with water. The discovery of a stained handkerchief in association with this coloured arsenic suggests that an attempt was made to filter the solution from the charcoal, which proving unsuccessful, the experimenter had recourse to an infusion of arsenical fly-papers. As already pointed out, charcoal and soot are by no means suitable pigments for colouring poison, and indigo is not the best for the purpose. Pharmacists can do much to prevent accidental and intentional misuse of vermin killers, and such preparations, if they will habitually add sufficient of a mineral pigment to colour the powder a decided blue or green, and will take more care to record sales of vermin killer in the poison-book than is at present the practice in some districts. But it would be useless to enact that all preparations of arsenic, strychnine, and other deadly poisons sold as vermin killers should be coloured with a certain proportion of mineral pigment if the sale of fly-papers containing a dangerous or fatal dose of arsenic or other poison is to be permitted with impunity. Clearly all such fly-papers should be impregnated with some soluble colouring matter which would colour the water in which they were soaked. Sulphonated indigo ("indigo-carmine") would be a suitable colouring matter for the purpose, though the coal-tar dye known as safranine would present some advantages.

But organic colouring matters can be removed from solution by simply immersing silk, wool, or mordanted cotton in the liquid, and hence are less suitable for the purpose in question than certain inorganic colouring matters. Of these the soluble salts of chromium present several advantages. Thus, if in the form of the double

tartrate of chromium and potassium (or a mixture of chrome-alum and Rochelle salts) the chromium is not precipitable from its solution by alkalies, acids, sulphuretted hydrogen, sulphide of ammonium, or phosphates or carbonates of the alkali-metals, and cannot be withdrawn from solution by either animal or vegetable fibres; on the other hand, the chromium will not interfere with the detection and determination of arsenic, strychnine, and other poisons, and can be itself determined with ease and accuracy after evaporating the liquid to dryness and igniting the residue.

I have to acknowledge the assistance I have received from Mr. Chas. Harrison, Mr. Wm. Chattaway, and Mr. T. H. Pearmain in making the analyses already referred to.

The PRESIDENT desired to thank Mr. Allen for his practical and very far-seeing paper, in which he actually went so far as to foresee what might come of cremation. He was sure gentlemen would think it over when they got home, and would act upon it, for the suggestions made seemed most valuable, not only to pharmacists, but to the public, the medical practitioner, the toxicologist, and all concerned either with medicine or the health of the public.

Mr. NICOLL asked if the mineral colouring matters suggested were not used in the manufacture of confectionery?

The PRESIDENT said he thought these colours were now quite discarded and replaced by vegetable colouring matters.

Mr. FOGGAN said he was about to put a similar question, for a few days before he had seen a blanc-mange coloured and ornamented with a beautiful green. He thought if Mr. Allen's suggestion were adopted, they might be laying a trap for themselves, and find strychnine mixed with their blanc-mange.

Mr. DAVID MACLAREN asked if confections were not coloured with that particular shade of colour which Mr. Allen suggested. If so, his theory that no article of food at present in existence bore that colour was not correct.

Mr. WARD thought some of the suggestions in this paper were well worthy of consideration. In listening to the paper it occurred to him that the colour of the vermin powder was not so important a matter as the percentage of strychnine it contained; but as Mr. Allen continued he saw that there was a very valuable suggestion in the idea of colouring with chromium compound. At the same time he did not see that any good would come of that unless it were enacted by Parliament that all vermin powders

should have a definite composition, and that the percentage of chromium oxide, as well as the percentage of strychnine, should be specified. If that could be done, then he could understand that the addition of a substance like oxide of chromium, which was difficult of solution and not assimilable, would be a matter of very great moment. He did not know whether the Conference had the means of representing the matter to any parliamentary committee, but the Pharmaceutical Society might take up the question, and see if anything could be done. It would very greatly strengthen the hands of the analyst if he had this coincidence of the presence of chromium to assist him in detecting very small traces of strychnine. Mr. Allen had said that he did not know why carbonate of barium should be used, and he did not either, unless it was that it was often used as a poison for rats, and perhaps some people who were making these vermin killers had an idea that it would answer as a poison for beetles also.

Mr. PROCTOR said there was always a negative side as well as a positive to a matter of this kind. One of the great advantages which Mr. Allen had pointed out as attending the use of oxide of chromium was that it was very difficult of solution; but on the other hand that might be a disadvantage, because a person who got a vermin killer might dissolve out all the poison and leave the chromium behind, and he would then have the poison free from all colouring matter, and therefore free from all evidence of its presence.

Mr. PLOWMAN said it struck him as most remarkable that any pharmacist should sell a vermin killer containing $2\frac{1}{2}$ grains of strychnine without the sale being registered; that was a most astonishing thing. He was interested in colouring matter contained in vermin killers from a case he recently had to investigate of a suicide in South Lambeth, in which the residue left in the glass had been brought to him for analysis. The person who had taken the stuff was not actually dead, and he found strychnine almost immediately. He then examined the blue colouring matter and found it mainly prussian blue, but there was some further blue colouring matter which he could not identify at the time, and he did not care to take it up again, but very possibly it was an admixture of ultramarine. He should like to ask Mr. Allen whether in examining these vermin killers he ever found a sample consisting of arsenic. He was under the impression that some vermin killers sold in old times used to consist of arsenic, but strychnine could be used now, and it was very cheap compared

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extended to vermin killers containing strychnine or any other active poison. It was very possible that the Act would not necessarily specify the exact colouring matter to be used or the exact amount, although it ought to do so, otherwise they would be coloured by a small quantity of ultramarine or carmine, which was not sufficient. It was very desirable to choose a colouring matter which could not be readily removed, which no doubt was intended by the framer of the Act, who gave the choice of indigo or soot. But on the other hand, he contended that the oxide of chromium was preferable to any other colouring matter; it was cheap, wholly insoluble, and could be detected with great facility; it was absolutely unacted on by any chemical reagent, except the most powerful oxidizing reagents, like strong nitric acid, and even then only with great difficulty. Fresenius classed the oxide of chromium amongst the few substances insoluble in all acids, and which had to be fused with sodium carbonate and nitrate to bring them into solution. The facility with which it could be detected in small quantities placed it above all others for the purpose. He had concluded his paper by suggesting that perhaps sulphonated indigo, or indigo-carmine, as it was sometimes called, would be a suitable colouring matter for colouring fly-papers. A soluble organic salt of chromium would be better even than the soluble indigo. Probably a mixture of one of these colouring matters and chrome green would be the best for solid vermin killers, and would get over Mr. Proctor's difficulty. There would be a blue or green solution and a green residue, and the colour of the solution could not be destroyed by an acid or by an alkali, and the general run of poisoners would find a great difficulty in dealing with it. Of course the more intelligent class of murderers would not have occasion to use coloured vermin killers at all. He was aware that carbonate of barium was a very successful poison in some cases, for poisoning fowls amongst other animals, but it struck him as a curious combination to mix it with strychnine. It looked as if strychnine was not thought good enough by itself, and carbonate of barium not good enough, and therefore the two poisons were united in the same powder. Of course Mr. Plowman was quite right in saying that his statement that what poisoned a person was what passed into the system and not that which remained in the stomach was open to considerable limitation. He was thinking at the moment of strychnine especially. When they took white arsenic, which he hoped they would not, or gave white arsenic to a person, which he was sure they would not do, the white arsenic

being in the solid state the coats of the stomach would necessarily be seriously irritated by contact with the poison ; again, strong mineral acids would act in the same manner. In other words, he intended to limit his remarks to strychnine, which might be absorbed, and pass out of the system, but the chromium green would remain.

The next paper read was a—

NOTE ON A SCALE OF SMALL RESIDUES.

By B. S. Proctor, F.I.C.

In washing precipitates or exhausting drugs by percolation, it often becomes important to judge the amount of solid matter which the solvent is extracting. It rarely happens that the washing can be carried so far that a drop of the liquor evaporated on a clean slip of glass leaves no palpable amount of fixed residue, and, indeed, distilled water itself is rarely free from this evidence of impurity. In washing a precipitate of morphia the process may be continued till a drop of the filtrate leaves a residue considerably less than that left by an equal quantity of a saturated solution of morphia. If the washing is being conducted with pure water, a point is reached at which the error involved by the solubility of the morphia is as great as the error resulting from the impurities which up to that time remain in the precipitate. If the washing be conducted with a saturated solution of pure morphia in pure water, the washing may be continued to any desirable extent, and the extent which is desirable may be judged by evaporating, side by side on a slip of glass, a drop of the washings and a drop of the saturated solution of morphia; if the residue of the former is not appreciably greater than that of the latter, the washing may be considered complete.

In many operations, where we have not this natural standard of comparison, it is convenient to be able to judge approximately whether a drop of filtrate or percolate contains $\frac{1}{1000}$, $\frac{1}{10000}$, or $\frac{1}{100000}$ of a grain of fixed matter. And with the view of aiding this judgment, I have constructed a scale of residues in which the evaporated drops contained $\frac{1}{1000}$th to $\frac{1}{1000000}$th of a grain of several fairly typical forms of soluble matter. The materials I have selected are calcium sulphate, potassium nitrate, gum acacia, and gum tragacanth. These afford generally useful stan-

dards for comparison; but any operator having frequent work in any particular line would naturally reap most advantage from a scale prepared with the material most frequently requiring his judgment in this way.

In illustration, I have prepared plates of these residues, and have added a fifth series showing the same weights of suspended alumina.

In all cases I used distilled water for the first two liquors and rectified spirit for the last two, the process being to adopt a dropping tube which delivered minims of water, and which was found to deliver half minims of spirit. A grain of the soluble matter was dissolved in 1000 minims of water, and a drop of this liquor evaporated on the glass plate formed the first mark on the scale; then 10 minims of this liquor diluted with 90 of water, and a drop of this second dilution yielded the second mark on the scale. Then 10 minims of the second dilution made up to 50 minims with rectified spirit. A drop of this third dilution (equalling $\frac{1}{2}$ a minim) gives the third mark, and 10 minims of the third dilution made up to 100 minims with spirit makes the fourth dilution, a drop of which leaves $\frac{1}{1000000}$th part of a grain as the fourth and last mark in the scale.

The necessity for using spirit for the third and fourth liquors arises from the difficulty of meeting with distilled water so free from fixed matter as not to add materially to the visible size of the $\frac{1}{100000}$th and $\frac{1}{1000000}$th of a grain. Rectified spirit, on the other hand, usually contains so little impurity as not to interfere with these highly minute residues.

The PRESIDENT, in conveying the thanks of the Conference to Mr. Proctor for his paper, said it was homœopathy and practical chemistry combined.

In the absence of the author, the following paper was read by Dr. Thresh :—

STROPHANTHUS PLANTS.

BY T. CHRISTY, F.L.S., ETC.

Having my attention called in 1878 to the value of strophanthus, I obtained through a gentleman at Mozambique all the seeds that could be found, but very few germinated. I afterwards received a small quantity from the African Lakes Company and

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end and has a tapering point at the other; a good name for this would have been "turtle" strophanthus.

In 1888 Dr. Blondel came to this country and worked up the sections of the plants growing in my greenhouses at Sydenham, and he visited the Natural History Museum, South Kensington, where Mr. Carruthers brought out the whole of the herbarium collection of strophanthus, flowers and foliage. He then went with me to Kew. Dr. Oliver kindly gave up considerable time to us, and went through the whole series of his specimens. We then saw clearly that what we had called *Strophanthus "kombe"* was really only a variety of the "hispidus."

In 1889 a small supply of *Strophanthus glaber* seeds from the Gaboon, with some of the pods, arrived in Paris, but unfortunately it amounted to only a few pounds. This established the fact that the pod of the glabrous strophanthus of Gaboon was of large size, smooth externally and very red in appearance, thus agreeing with an unnamed specimen in my own collection. It was also proved that this glabrous strophanthus of Gaboon yielded a crystallizable alkaloid, and further that this same seed was that employed by Professors Hardy, Gallois, and Polaillon, in their earliest researches, and who had found out and declared that the strophanthus yielded a "crystallizable alkaloid." Owing to the "kombe" only having reached Europe in commercial quantities during the past few years, no serious attempt could be made to isolate a crystallizable principle.

In 1889 I received a shipment of some 150 lbs. of the seed of the glabrous variety of Gaboon. I have got one plant from some thousands of the seeds planted; the leaf of this plant (now shown) is glabrous, shiny and pointed.

All the workers with strophanthus, both in Paris and in Germany, find that this glabrous strophanthus yields a crystalline compound with the greatest ease, and specimens were shown by me at a meeting of the Pharmaceutical Society early this year, and exist in their Museum. This variety, it will be seen, has leaves somewhat similar to some of the specimens of "kombe."

At the Therapeutical Congress in Paris, in August this year, there was a bowl of strophanthus seeds shown which I thought very beautiful and bold; but upon expressing this opinion to Dr. Blondel, he picked out for me several seeds of a "turtle" shape, as before referred to, and asked me to bite them; I did so, and found they had hardly any bitterness. He said that it was very singular that this shape of seed, not only in this variety, but in

others, such as the "minor," seemed to contain very little active principle. As far as the chemist is concerned, many are now working with medical men at the therapeutics of this interesting drug by mixing the strophanthus seed with other drugs, a combination of strophanthus and *Alstonia constricta* having been found to be valuable against obesity. In the Paris Congress, Dr. Dujardin-Beaumetz clearly put forward as the results of his experiments with the tincture of strophanthus, that he obtained entirely a different action when he employed strophanthin, and he strongly advised medical men to keep to the tincture, as giving the best results.

In conclusion, I would remark that any one looking at the seeds sent home originally as *Strophanthus "kombe"* cannot but be surprised at the different foliage of the plants raised from what appeared to be seed of one variety only, as shown in the first series exhibited.

The PRESIDENT then moved a vote of thanks to Mr. Christy.

The following paper, in the absence of the author, was read by Dr. Thresh:—

THE CHEMISTRY OF *STROPHANTHUS HISPIDUS*.

BY DR. THOMAS R. FRASER.

Seeds.—In order to ascertain the general composition of the seeds, a weighed quantity, after having been carefully triturated, was dried at 100° F. and extracted by percolation, first with petroleum ether, boiling below 50° C. (100° F.), and then with anhydrous ethyl ether. After the ether had been completely removed by exposure to the air and to a moderate heat, the residue was divided into two equal portions, one of which was extracted with rectified spirit, and the other with distilled water, and in the latter solution the mucilage and albumen were estimated. The water was estimated by heating a separate quantity of ground seeds to 212° F., and this also was used for the determination of the inorganic matter by combustion. Stated in percentages, the results were—

Analysis No. 1.

		Per cent.
Water		6·7
Petroleum Ether Extract (chiefly fat)		31·81
Ethyl Ether Extract (resin, chlorophyll, etc.)		0·845
Rectified Spirit Extract (20 of rectified spirit to 1 of seeds)		8·94
Water Extract	Mucilage	7·35
	Albumen	1·95
Ash		3·514
		61·109
Undetermined Constituents.		38·891
		100·000

In many other analyses no attempt was made to estimate the water, mucilage, albumen, and inorganic matter, but the seeds were merely extracted with ethyl ether, followed by rectified spirit, or by rectified spirit alone. It was early found that the fat and mucilage present in the seeds rendered water an inappropriate menstruum for removing the active principle; and for the same reason even dilute alcohol, in the form of proof spirit, could not conveniently be used, especially when extraction by percolation was attempted.

These and other analyses show that the ether extract, consisting mainly of fat, with a small quantity of chlorophyll and of resin, amounts to about 34 per cent., and that the alcohol extract, containing the active principle, amounts to about 9·5 per cent. of the seeds.

Ether Extract.—The ether extract, whether obtained with ethyl or petroleum ether, consists mainly of a liquid fat or oil containing chlorophyll and other colouring matters, and when obtained with ethyl ether, a small quantity also of resin. It gives a permanent translucent stain to paper. Its colour varies considerably, the lightest coloured specimens being very pale, greenish yellow, and the darkest brown with a faint tint of green, the chief intermediate shades being grass-green and pale and deep olive-green. The lighter coloured ether extracts were usually derived from the later percolates, and the dark-coloured from the earlier percolates of the same seeds. The extract is translucent and clear, but after standing for some time a nearly colourless sediment usually separates, which disappears when the extract is heated to 120° F. Ethyl alcohol, amyl alcohol,

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Composition of the Alcoholic Extract.

On adding to the dried alcohol extract a small quantity of rectified spirit, the extract does not entirely dissolve, but a residue remains, which is insoluble in a moderate quantity of rectified spirit. When the clear alcohol solution thus obtained is mixed with ether, it becomes densely opalescent, but in a short time the opalescence clears away, and a translucent, amorphous and intensely bitter deposit occurs. The decanted and usually clear alcohol-ether solution also yields a residue when distilled and evaporated.

The first of these products is freely soluble in water, forming a mucilaginous solution, which reduces Fehling's solution, after it has been digested for some hours with a little dilute sulphuric acid. The second product agrees with the active principle, for which I have proposed the name "strophanthin," in the chemical and pharmacological characters afterwards described. The third product is insoluble in water and in acids, soluble in rectified spirit and in dilute alkalies, and precipitated from the latter solution by acids, and it is, therefore, a resin.

The quantity of each of these products, in one out of several extracts that have been analysed, is stated below,—

Analysis No. 2.

Alcohol Extract of Analysis No. 1.—Total alcohol extract, 8·94 per cent. of seeds.

	P. c. of Alcohol Ext.
Impure Strophanthin	63·367
Mucilage	16·275
Resin	14·542
	94·184

The total extract (8·94 per cent. of seeds) was, however, the sum total of the extracts of three successive percolations of the same seeds; the first having been obtained by a percolation of 10 parts of rectified spirit to 1 part of seeds, the second by a subsequent percolation of 5 parts of rectified spirit to 1 of the same seeds, and the third by a subseqyent percolation of 5 of spirit to 1 of seeds. It is interesting to note the total quantity of alcoholic extract obtained from each of these percolates, and the composition of each extract.

The first percolate of 10:1, therefore, yielded 7·9 per cent. of

the 8·94 per cent. of total alcohol extract; and this 7·9 per cent. contained a much larger percentage of strophanthin than either of the subsequent percolates.

Analysis No. 3.

	1st Percolate, 10 : 1. Total Extract, 7·9 p. c. of Seeds.	2nd Percolate, 5 : 1. Total Extract, 0·674 p. c. of Seeds.	3rd Percolate, 5 : 1. Total Extract, 0·37 p. c. of Seeds. P. c. of Extract.
Impure Strophanthin .	68·16	27·44	25·67
Mucilage	12·27	42·28	52 7
Resin	13·79	23·36	14·18
	94·22	93 08	92·12

It appears from the above analysis, that by the process of percolation nearly all the active principle is extracted by the first small quantity of spirit, and that this percolate yields an extract consisting chiefly of active principle. Further percolates contain only small quantities of the active principle, even although they may be of decidedly bitter taste; but they contain much mucilage, resin, and other undetermined substances. It is also to be noted that the extract obtained from the first percolate of a moderate quantity of the rectified spirit differs from the extracts obtained from further percolates, not only in chemical composition, but also in physical characters. After having been dried by spontaneous evaporation and by exposure *in vacuo* over sulphuric acid, both extracts may be opaque, brittle, and only slightly coloured, although the extract from the first percolate is less coloured than those from subsequent percolates; but while the former retains for an indefinite time the appearance and physical characters it had acquired on becoming dry, the latter become much darker in colour, they lose their opacity and brittleness, and acquire a plastic amorphous character and a dark reddish brown colour. These changes occur independently of exposure, as they have been observed with extracts protected from exposure by being placed as soon as dried in well-stoppered bottles.

The impure strophanthin, precipitated by ether from an alcoholic solution of extract, is also a much purer substance when it is derived from the first percolate than when it is derived from

subsequent percolates. In the former case it is pale, brittle, crystalline, and opaque, and it retains these characters for an indefinite period; while in the latter case it is, from the first, of a brownish yellow colour and translucent, and if dried so as to admit of being reduced to a powder, it soon becomes an adherent homogeneous mass of dark colour.

Analyses of the separated Testa and Cotyledons and Embryos of the Seeds.

The next analyses were made in order to ascertain the quantity of each of the above ingredients present in the testa and in the combined cotyledons and embryos respectively, and especially to ascertain whether the former or the latter contains the largest quantity of active principle. When the testa was carefully separated from the rest of the seeds it was found, in 119·48 grains of seeds, that the testa weighed 52·6 grains, or 44 per cent., and the combined cotyledons and embryos, 66·88 grains, or 55·97 per cent., of the seeds.

Analysis No. 4.

52·6 grains of testa yielded—

Anhydrous ether extract (28 : 1), 9·58 grains = 18·212 per cent. of testa, or 8·016 per cent. of seeds.

Rectified spirit extract (20 : 1), 4·58 grains = 8·707 per cent. of testa, or 4·873 per cent. of seeds.

66·75 grains of *cotyledons* and *embryos* yielded—

Anhydrous ether extract (26 : 1), 31·15 grains = 46·666 per cent. of cotyledons and embryos, or 26·118 per cent. of seeds.

Rectified spirit extract (20 : 1) 4·865 grains = 7·288 per cent. of cotyledons and embryos, or 4·07 per cent. of seeds.

The testa therefore yielded a much smaller quantity of ether extract, but a somewhat larger quantity of spirit extract, than the combined cotyledons and embryos. Differences in composition between the alcoholic extract of the testa and that of the cotyledons and embryos are stated below.

Analysis No. 5.

Alcoholic extract of *testa*, 4·58 grains, yielded—

Impure strophanthin, 2·7 grains, = 58·95 per cent. of extract, or 5·13 per cent. of testa.

Mucilage, 0·875 grain = 19·104 per cent. of extract, or 1·663 per cent. of testa.

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5. Acetic acid (B.P.) produced a pale brownish solution.

6. Iodic acid produced a pale brownish solution, in which, however, no blue colour was developed by starch.

7. Strong sulphuric acid and bichromate of potassium produced a greenish brown colour.

8. No distinct effect was caused by strong sulphuric acid, rectified spirit, and neutral solution of ferric chloride, nor by sulphuric acid and bromine water.

9. Solution of potash, soda, or ammonia produced a bright yellow solution, but the yellow colour immediately disappeared on the addition of dilute sulphuric, hydrochloric, or acetic acid. When the alkaline yellow solution was boiled for a short time, it became reddish brown in colour.

10. Phosphomolybdic acid produced a green colour, which immediately changed to blue on the addition of an alkali.

Solution of Extract in Water (2 per cent.).

1. Acetate of lead produced a faintly yellow flocculent precipitate.

2. Subacetate of lead produced an abundant yellowish flocculent precipitate.

After the lead precipitates in 1 and 2 had subsided, the supernatant fluid was nearly colourless and intensely bitter.

3. Solution of ferric chloride (B.P.) caused a greenish yellow colour, and afterwards a slight precipitate.

4. Nitrate of silver produced a faint opalescence, which afterwards became a dark precipitate.

5. Mercurous nitrate produced a white cloudiness, which afterwards subsided as a slight grey sediment.

6. Cupric sulphate produced a slight haziness, which, on subsidence, left a pale green fluid.

7. Platinic chloride failed to produce any change within several hours, but on the following day a slight brownish opalescence had occurred.

8. Phosphomolybdic acid produced a very pale greenish yellow precipitate, permanent only with a considerable quantity of reagent. When the precipitate had subsided the supernatant fluid was seen to be emerald green, and the precipitate dissolved on boiling, and reappeared on cooling.

9. Molybdate of ammonium produced a faint yellow tint, and, after several hours, a considerable yellowish white precipitate, the

supernatant fluid continuing to be yellow. The precipitate dissolved on boiling and appeared again on cooling.

10. Tannic acid produced a copious white precipitate.

11. Solution of potash, soda, ammonia, lime and baryta, and of carbonate of potash and carbonate of soda, each produced a bright orange-yellow colour. Carbonate of ammonium, carbonate of baryta, and bicarbonate of potash produced a less marked yellow. In each case, the yellow colour was immediately discharged by dilute acetic acid. The alkaline yellow fluids did not reduce Fehling's solution when boiled with it.

12. Sulphuric acid (10 per cent.), dilute hydrochloric acid (B.P.), and dilute nitric acid (B.P.), and dilute phosphoric acid (B.P.), each rendered the solution paler, and slowly produced a slight flocculence, which disappeared in great part on boiling. When afterwards neutralized and tested with Fehling's solution, a well-marked reduction occurred.

13. Dilute acetic acid (B.P.) produced no obvious change, and after boiling for a few seconds, and neutralizing with sodium carbonate, only a slight reduction was obtained with Fehling's solution.

14. No obvious change was produced by picric acid, carbonate of baryta, phosphate of sodium, chloride of gold, mercuric chloride, potassio-mercuric iodide, metatungstate of sodium, tri-iodide of potassium, potassio-bismuthic iodide, nor potassio-cadmic iodide.

Absence of any Alkaloid from the Extract.

The failure, already described, of many reagents for alkaloids to produce change in the watery solution of the extract, although it is naturally acid in reaction, affords sufficient evidence of the absence from the seeds of any alkaloidal principle.

In addition to this negative evidence, ten grains of the extract were treated according to Stas's method for separating alkaloids, —ether and chloroform being used as the separating solvents; but the result was also entirely negative.

At the same time, the extract contains nitrogen in smal quantities, but this is by no means remarkable when its composition is borne in recollection.

Further, when the extract is made alkaline by solution of potash, and then heated, alkaline vapours, having a distinctly ammoniacal or rather trimethylamine, odour, are evolved.

Presence of a Glucoside in the Extract.

The reduction of Fehling's reagent by solutions of the extract in dilute acids having indicated the presence of glucose in these solutions, it became of importance to determine if this glucose exists in the unchanged extract, or is produced in it by the decomposition of one or more of its constituents.

Some alcoholic extract, prepared by percolating the seeds with ethyl ether and then with rectified spirit, was dissolved in distilled water, so as to constitute a 2 per cent. solution. When treated with Fehling's reagent it failed to give any evidence of reduction. A portion of the same solution of extract was then acidified with sulphuric acid, and left at the ordinary temperature. After three days, the now slightly turbid solution was filtered, and after having been neutralised with carbonate of sodium, it also was tested with Fehling's solution, when it immediately produced a copious reduction.

Evidence was thus obtained in an extract originally free from glucose, of a decomposition having been caused by dilute acid, of which one of the products is glucose, and the presence of a glucoside in the extract was accordingly indicated.

The production of this decomposition in the cold by the action of dilute acids was further examined. It was found that when a 3 or 4 per cent. solution of alcoholic extract in water is acidified with sulphuric acid, so that the acid is present as a 0·3 to 2 per cent. solution, the mixture in a short time becomes turbid, an apparently amorphous deposit forms in it, and in from two to four days the solution becomes clear and less coloured, and small crystalline tufts appear at the bottom and sides of the vessel, which increase in size until a considerable crystallization has been produced. To this crystalline substance I have given the name strophanthidin. On examining the solution in which the crystals have appeared, it is now found to contain much glucose.

When a minute quantity of the extract, dissolved in a drop of water, is placed on a microscope slide provided with a shallow cup, and a drop of 2 per cent. sulphuric acid added before the cover glass has been applied, in one or two days a large number of small and translucent globular bodies make their appearance, and in three or four days a beautiful crystallization of strophanthidin may be detected in the solution.

A well-defined crystallization produced in such circumstances in a solution of a pharmacological active substance, is of so rare

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when dried, they weighed 27·4 per cent. of the extract. The glucose produced amounted to 27·9 per cent.

By these and other experiments, it was shown (*a*) that the extract contains a glucoside, which is readily decomposed by weak solutions of acids so as to produce glucose, and the crystalline body, strophanthidin; (*b*) that glucose is produced in the extract by sulphuric hydrochloric, nitric, phosphoric, acetic, and oxalic acids, both in the cold and at an elevated temperature, but by 2 per cent. hydrocyanic acid only at an elevated temperature; (*c*) that crystalline strophanthidin was produced in the cold by sulphuric, nitric, and phosphoric acids; and (*d*) that cyrstalline strophanthidin is produced at an elevated temperature by sulphuric, hydrochloric, nitric, phosphoric, acetic, and oxalic acids.

Strophanthin.

The well-defined crystals produced during the evaporation of non-acidulated watery solutions of the extract are no doubt the active principle, strophanthin.

It is, however, extremely difficult to separate the crystals from adhering impurities by the use of any solvents; and even when that is accomplished, the great solubility of strophanthin in water and in rectified spirits, entails much loss, if separation by repeated crystallization be attempted. The crystalline product obtained when ether is added to a dilute alcoholic solution of the extract, or when ether is added to a strong solution of the alcoholic extract in water, also both represent nearly pure forms of strophanthin; but on several times repeating each process, it was found that sometimes only did it succeed in yielding a crystalline product, while frequently it failed to do so. Nice adjustments, extremely difficult to determine, are obviously required of the proportional quantities of active principles, water, alcohol, and ether, and of active principle, water and ether, respectively, in order to insure the separation of the active principle in the form of colourless crystals.

It was therefore found necessary to devise some other process. In the first place, at an early stage in the research, the removal of impurities and the isolation of the active principle by subacetate of lead was attempted; as it had been found that after the removal of the copious precipitate formed in solutions of the extract by subacetate of lead an intensely bitter, clear, and only slightly coloured filtrate, of great pharmacological activity, was obtained. When, however, sulphuretted hydrogen was passed through this filtrate, in order to precipitate lead, the active principle was

necessarily subjected to the action both of sulphuretted hydrogen and of free acetic acid; and accordingly it was decomposed, glucose appeared in the solution, and strophanthidin crystallized out in great abundance.

As the extract obtained by small quantities of rectified spirit from the seeds previously percolated with ether, appeared to consist chiefly of active principle, the removal of the inconsiderable quantity of impurity present in it was attempted by treatment with pure animal charcoal; but this process also proved unsatisfactory both in the quantity and quality of the product obtained.

After several other attempts, the following was adopted as a tolerably satisfactory, though, no doubt at the same time laborious, process for separating the active principle in a pure form.

The active principle was precipitated by a solution of tannin from a strong solution of the extract in water; the well washed tannate was thoroughly mixed with recently precipitated, carefully washed, and moist oxide of lead, which was added in the quantity calculated to be necessary for the conversion of the tannin into tannate of lead; the mixture was digested for several days at a low temperature; and after it had been dried, it was thoroughly exhausted with rectified spirit, and occasionally with proof spirit. If the alcoholic solution still contained any tannin, as it usually did, it was evaporated to a syrupy consistence, and again treated as above with a smaller quantity of oxide of lead. It was frequently necessary to adopt a third such treatment before every trace of tannin had been removed. The product was now dissolved in weak alcohol, and, if necessary, decanted and filtered from sediment; and through the clear and usually almost colourless solution, a gentle stream of well-washed carbonic acid was passed for two or three days, in order to remove traces of lead. The solution was then evaporated to dryness, and the residue dissolved in rectified spirit, and, after filtration, ether was added to the solution to precipitate the active principle. The precipitate was dissolved in absolute alcohol, which usually left a further slight sediment, and the clear alcoholic solution was finally dried by spontaneous evaporation, and by being placed in a partial vacuum over sulphuric acid.

By this process about 65 per cent. of the active principle, strophanthin, was usually obtained from the extract. This quantity, undoubtedly, does not represent the whole of the active principle present in the extract; but the result otherwise is satisfactory, in so far as the quality of the product is concerned.

Strophanthin thus obtained is a colourless, opaque, and brittle substance, having an appearance suggestive of a crystalline body, but exhibiting no crystals to the naked eye. Under the microscope, however, it is found to consist of minute irregular crystalline plates.

When ether is added to very dilute alcoholic solutions of it, and the faintly turbid mixture is put aside in a stoppered bottle for a few days, beautifully stellar groups of colourless and transparent crystals frequently form on the sides and at the bottom of the bottle.

Strophanthin is very freely soluble in water and in rectified spirit, losing its opacity when a very small quantity of either solvent is added to it, and becoming a viscous, clear, and faintly yellow solution on further minute additions. It is soluble in 55 parts of absolute alcohol (sp. gr. ·796), in 300 parts of acetone, and in 1000 parts of amyl alcohol (sp. gr. ·820). It is almost insoluble in chloroform (sp. gr. 1·497), in absolute (sp. gr. ·723) and common (sp. gr. ·730) ethyl ether, in petroleum ether boiling below 120° F., and in bisulphide of carbon.[1] Glycerine (sp. gr. 1·26) dissolves it freely; but when small quantities are placed in strophanthus oil and in olive oil, respec vely, they remain unchanged for several months, although afterwards the particles appear to dissolve very slowly.

Solutions in rectified spirit and in amyl alcohol are precipitated by the addition of chloroform, absolute or common ethyl ether, petroleum ether, and bisulphide of carbon. A solution in absolute alcohol is precipitated by ethyl and by petroleum ether, and is rendered slightly turbid by bisulphide of carbon; but neither chloroform nor acefone produces any change in the appearance of the solution. A solution in acetone is precipitated by ethyl ether, petroleum ether, chloroform and bisulphide of carbon, but not by absolute alcohol nor by amyl alcohol.

Strophanthin is intensely bitter. Its solution in water or spirit is acid in reaction. When a dilute solution in water is shaken, a persistent froth is produced.

It melts at a temperature of 343° F. Below this temperature, at about 295° F., it acquires a faintly yellow colour, which becomes yellowish brown at the melting-point. When the temperature is further raised it evolves fumes having at first a

[1] In the experiments that were made, chloroform dissolved 1 part in 10,000, and absolute and common ethyl ether, petroleum ether, and bisulphide of carbon, about 1 part in 20,000.

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few minutes afterwards it was grey, with a greenish tint; and in the course of an hour or two dirty brown without any green.

When strophanthin, moistened with strong sulphuric acid, was heated to between 110° and 120° F., the green colour first produced soon became dark olive, changing to very dark brown, with green at the parts which had dried, then to violet and dark violet-blue, and finally to black with a violet tint.

2. With 10 per cent. sulphuric acid a nearly colourless solution was produced, which remained unchanged in appearance for several hours.

When heated to between 110° and 120° F., with 10 per cent. sulphuric acid, it soon became light green, grass green, dark green, deep bluish green, deep greenish violet, very dark violet, and in about two hours, black with a violet tint. When allowed to cool the last colour remained for more than twelve hours.

These colour changes were quite distinctly obtained with even the $\frac{1}{1\,5\,0\,0\,0}$th of a grain of strophanthin.

3. Strong nitric acid in the cold produced a pale brown solution.

4. Dilute nitric acid (10 per cent.) merely dissolved strophanthin, without obvious change of colour.

When heated between 115° and 130° F., with 10 per cent. nitric acid, a violet colour was first developed, in which blue streaks appeared; the whole then became violet for a few minutes, then yellow appeared at the margins, the violet gave place to yellowish brown, and, finally, in about forty minutes, the whole became gamboge-yellow, and remained this colour for several hours.

5. Strong hydrochloric acid dissolved strophanthin, forming a pale yellow solution, which afterwards became brownish yellow.

6. Dilute hydrochloric acid (10 per cent.) dissolved it and produced a colourless solution.

When heated between 115° and 130° F., changes were very slowly produced; in about twenty minutes a yellow colour appeared, which, however, soon passed into green, and then into blue (Turnbull's), and the last colour remained for several hours.

7. Strong sulphuric acid and bichromate of potassium, in the cold, produced successively green, orange-brown, dark brown with green at the edges, and emerald green. When now heated between 115° and 120°, the green slowly became bluish violet.

8. When to a minute particle of strophanthin there was added a small drop of distilled water, and also of dilute solution of ferric chloride, and then a drop of strong sulphuric acid, a deep yellow

colour appeared, which changed to pink. On mixing the whole with a glass rod the pink disappeared.

9. Solution of phosphomolybdic acid developed rather slowly a green tint, which on prolonged exposure became a pure blue of considerable intensity. If an alkali was added along with or after the phosphomolybdic acid, the blue colour was immediately developed.

10. Solutions of potash, soda, and ammonia, and of other alkalies and their carbonates, produced a faint yellow colour, which disappeared on the addition of acids.

11. Negative results were obtained on the addition of iodic acid and starch, nitrate of silver, sulphate of zinc, sulphate of copper, and Nessler's reagent.

Solution of Strophanthin in Water (1 or 2 per cent.).

1. Concentrated, or 10 per cent. solutions of sulphuric, nitric, hydrochloric, phosphoric, and chromic acids, and concentrated acetic acid, each produced a slight haze even in a 1 per cent. solution of strophanthin. When the solution was afterwards neutralized and tested with Fehling's reagent, the reagent was in each case reduced.

2. Sulphuric acid and bichromate of potassium also produced a slight opalescence, and the solution, on being neutralized, reduced Fehling's reagent.

3. Solutions of potash, soda, ammonia, lime and baryta, of carbonate of ammonium, and phosphate of sodium, each caused the solution of strophanthin to become of a light yellow colour; but even after prolonged contact, the yellow solutions did not reduce Fehling's reagent. The alkaline yellow fluids became deep reddish brown when heated to 212° F., and at the same time they lost much of their original bitterness, and apparently also of their pharmacological activity.

4. Solution of ferric chloride produced no change until sulphuric acid had been added, when a faint opalescence occurred. When a drop of 1 per cent. strophanthin in water was placed on a white porcelain slab, and a minute drop of solution of ferric chloride, followed by a small drop of strong sulphuric acid, was added to it, a yellow colour was first produced, and then streaks or patches of pink and blue were quickly developed. In a short time the whole assumed a pale greenish blue colour.

5. Solution of nitrate of silver very slowly produced a reddish brown colour and a slight dark deposit.

6. Phosphomolybdic acid slowly produced a bright green colour, which gradually passed into greenish blue.

7. Tannic acid solution threw down a copious yellowish-white precipitate, which redissolved until an excess of the acid had been added.

8. Molybdate of ammonium in sulphuric acid produced a slight opalescence, and Fehling's reagent afterwards revealed the presence of glucose in the neutralized solution.

9. Negative results were obtained by an addition of chloride of gold, platinic chloride, cobaltic chloride, acetate and subacetate of lead, mercuric chloride, mercurous nitrate, ferro- and ferri-cyanide of potassium, chloride of barium, acid carbonate of potassium, iodide of potassium, tri-iodide of potassium, tri-bromide of potassium, potassio-mercuric iodide, metatungstate of sodium, potassio-bismuthic iodide, and potassio-cadmic iodide.

Decomposition by Acids, etc.

Glucose having been produced by the application to strophanthin of such of the above reagents as were acid in reaction, it was indicated that this substance is a glucoside. This indication has been rendered clear and unambiguous by the results of other experiments, of which the following are given by way of illustration.

To a colourless and clear 3·3 per cent. of strophanthin in distilled water, sulphuric acid was added so as to make the solution a 0·3 per cent. one of acid, and the solution was then left to itself at the ordinary temperature. On the following day it had become slightly turbid, and two days afterwards several colourless rosettes of lancet shaped crystals had formed at the bottom of the flask. On the fourth day the rosettes had increased in size, and now also a general crystalline incrustation had occurred over the bottom and sides of the flask, while the solution had lost its turbidity, and had again become quite clear. The crystals increased in quantity during the next twenty-four hours, and on the sixth day, when they were collected as carefully as possible, they weighed 33·7 per cent. of the strophanthin used. The filtered solution, after having been neutralized, was found to contain 22 per cent. of glucose.

In an experiment with the same quantity of strophanthin and of sulphuric acid in solution, as soon as the solution had been made it was placed in the water-bath and gradually heated. While the temperature rose from 150° to 165° F., a beautiful

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of filtered saliva* was added. The now decidedly alkaline mixture was digested for an hour at a temperature ranging between 99° and 100° F. The digestion did not produce any obvious change, nor could any strophanthidin be detected in the fluid after it had cooled. When, however, it was tested with Fehling's reagent, reduction immediately occurred, and an estimation showed that rather less than one per cent. of glucose had been produced. Prolonged contact with saliva is therefore able to cause only a slight decomposition. As a large quantity of saliva of great protylytic activity had been used in this experiment, it is reasonable to infer that in the ordinary administration of strophanthus, decomposition will not be produced to any appreciable extent by admixture with the mouth secretions.

As only slight decomposition occurs when extract of strophanthus is digested for half an hour with 0·1 per cent. hydrochloric acid at a temperature ranging between 98° and 100° F., the inference also appears to be justified that when strophanthus is introduced into the stomach, it will probably be absorbed into the blood before any important part of the dose has undergone decomposition.

Still, these experiments, and indeed all the experiments in which strophanthin was shown to be decomposed by acids, render it not only of interest, but probably of practical importance, to determine, as I propose on some early occasion to do, the pharmacological action of strophanthidin itself.

Strophanthidin.—In the meantime, in addition to those physical and chemical characters of crystalline strophanthidin that have incidentally been mentioned, it may be added that it has an intensely bitter taste and a neutral reaction; that it is very slightly soluble in cold water, moderately soluble in cold rectified spirit, chloroform, and amyl alcohol, and pretty freely soluble in warm rectified spirit; that it does not give a glucose reaction with Fehling's solution, either before or after prolonged digestion with 2 per cent. sulphuric acid at 200° and 212° F.; and that it is extremely active as a pharmacological agent, 0·0025 and 0·00125 grain producing death in frogs weighing 350 grains and 340 grains respectively, with symptoms closely resembling those produced by

* The saliva was obtained, with the usual precautions to exclude impurity, from an adult to whom pilocarpine had been administered. It was alkaline in reaction, and neither before or after prolonged heating did it affect Fehling's solution. A small quantity rapidly and abundantly produced glucose in starch solution.

strophanthin. It can readily be obtained in colourless crystals by the spontaneous evaporation of a solution in rectified spirit.

As a solution of recrystallized strophanthidin, produced by the decomposition of strophanthin by sulphuric acid, remained unchanged when solution of chloride of barium was added to it, strophanthidin cannot be regarded as a combination of some substance present in strophanthin with the acid employed in decomposing it.

The amorphous brown substance obtained by boiling strophanthin with moderately strong acids has not been examined further than to determine that it is much less bitter than either strophanthin or strophanthidin, and that it is insoluble or nearly so in water and acids, and soluble in alkalies and rectified spirit.

Kombic Acid.—Basic and neutral acetate of lead have been enumerated among the reagents which produce precipitates in solutions of the extract in water. The precipitate obtained by the former reagent has not been examined. That produced by neutral acetate of lead, after having been carefully washed with distilled water, was decomposed by sulphuretted hydrogen, and the filtrate from lead sulphide was concentrated by evaporation at a low temperature, and then dried *in vacuo* over H_2SO_4. There was thus obtained a scaly brownish yellow substance, representing 1·6 per cent. of the extract, of strongly acid reaction, and freely soluble in water. For this acid, the name "kombic acid" is suggested.

Comose Appendages.—On being subjected to analysis, the comose appendages of the seeds yielded a relatively small quantity of strophanthin and a large quantity of a resin-like substance. Even when one pound weight of appendages was examined, no alkaloid could be isolated by Stas's process.

Follicles, leaves, roots, etc.—Chemical examination of the pericarp of the follicles, of the leaves, branches, stem and root of strophanthus resulted in showing that each of these parts of the plant contains strophanthin, but only in small, and in some of the parts, in minute, quantity.

Specimens of the leaves of strophanthus grown by Mr. Christy at Sydenham were placed on the table.

The PRESIDENT, having moved a vote of thanks, said all would appreciate very highly the paper by Dr. Fraser, who had done an immense amount of work on strophanthus. In reference to the

leaves exhibited, he said the various kinds of plants produced from the strophanthus seeds of the trade were remarkable; he had lately seen them growing, and one could scarcely recognise the plants from some of the seeds as being strophanthus at all; they were so wholly dissimilar. He was very sorry that Mr. Christy was not present to make some remarks on the subject.

Mr. WELLCOME said Mr. Christy had dealt so thoroughly with the subject that hardly anything he could say in the direction of his treatise would add to the information of the members. It was very well known to all who had occasion to employ strophanthus seed that very great care was necessary in purchasing those which came to the London market, to avoid false seeds. Many of them were absolutely inert, and others were either so damaged in transit or being gathered before they were ripe, that they were entirely useless. The great value of Dr. Fraser's paper was obvious to them all, and they had been looking forward for a long time to the results of his work on the active principles of strophanthus.

Mr. DOTT said he had nothing to add to the chemistry of the subject which had been so well dealt with by Professor Fraser. With regard to the seeds, certainly the appearance of some of them showed that they were not genuine, but in other cases it was not so easy to determine. Some had come into his hands about which he had a little doubt, and on submitting them to Dr. Fraser he at once said they were immature, and on comparing their weight with the genuine sample he found they weighed about half what they should, which confirmed Dr. Fraser's opinion that they were immature.

The PRESIDENT asked if Dr. Fraser had any of the varieties of seeds met with in trade under cultivation?

Mr. DOTT said there were some in the Botanical Gardens in Edinburgh.

The Conference then adjourned for luncheon.

Upon resuming, the first paper read was on—

NARCEINE AND ITS SALTS.

BY D. B. DOTT, F.R.S.E.

Narceine is one of the opium alkaloids which exist in larger quantity, it being present in sufficient amount to admit of its employment in medicine to a considerable extent. So far, how-

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by a sufficient number of recrystallizations chlorine-free narceine would be obtained, just as by a sufficient treatment with water, oxychloride of bismuth is converted into pure oxide. Wright's method of obtaining pure narceine from the basic hydrochloride is to convert into sulphate, which after recrystallization and precipitation yields the pure alkaloid. Merck is not very clear as to the method followed by him, but he mentions the fact that if caustic soda is used to precipitate, the narceine may be obtained free from chlorine. The same chemist seems inclined to regard these basic hydrochlorides as mixtures or compounds of the normal hydrochloride with the alkaloid. I do not think that is a tenable hypothesis, but is rather one which arises from a mistaken view of such salts. Whether it be true that all alkaloidal salts are simply molecular compounds, it is certainly true of some of them. The so-called acid hydrochlorides, for instance, are evidently of this nature, being analogous to the so-called potassium quadroxalate. That is to say, the second molecule of hydrochloric acid is not atomically combined to the alkaloid, but is simply related to it as the "water of crystallization" to the salt molecule. The basic hydrochlorides of narceine are doubtless of the same nature, so many molecules of alkaloid being feebly combined with so many molecules of acid. The view formerly referred to, that these salts are compounds of the normal salt with alkaloid, does not appear to be tenable; because when one molecule of the normal salt is decomposed by water, there is no obvious reason why all the molecules present should not be similarly decomposed. Merck thinks that the behaviour of narceine towards acids contradicts the current assumption that narceine is a very weak base. Yet surely the tendency to form basic salts is no proof of strength. Bismuth and antimony salts tend to form basic compounds, not because their oxides are strong bases, but rather the contrary. It is impossible to say whether the normal salts of narceine are acid in reaction or not, as they no doubt all suffer more or less decomposition when dissolved. When narceine is suspended in hot water, and sulphuric acid gradually added, complete solution does not take place until sufficient acid has been added to form the acid sulphate, which fact is another proof of the feeble character of the alkaloid. Indeed narceine follows the general rule, that the higher the position of a compound in a series, the less developed is its distinctive character; and if the morphine series of alkaloids were truly homologous, the rule would doubtless be strictly correct. Codeine is a stronger base than morphine, but although it differs

by CH_2, it is not a true homologue of morphine. It is in reality what has been called a "compound ether" of morphine, for want of a better name. The most interesting portion of Herr Merck's paper has reference to the melting-point of narceine. It is shown that the melting-point is greatly lowered by the presence of a small proportion of hydrochloric acid, from which it would appear that much of the impurity formerly spoken of was nothing but a little acid, which is pharmacologically speaking no impurity at all. It further appears that decomposition takes place at, or probably under, the observed melting-point of 170°. The question arises, can a substance be said to have a melting-point, which is above its temperature of decomposition? The discrepant statements as to the melting-point of morphine, led me to try one or two experiments, but I soon found that the morphine showed signs of extensive decomposition before there was any appearance of fusion, and therefore abandoned the experiments as useless. In short, the melting-point as a means of determining purity must be regarded as of very limited application in the case of the complex alkaloids. From all we have been able to learn, the general practical conclusion would seem to be, that no proof has been adduced to show that commercial narceine ever contains any impurity which can affect its value as an article of the materia medica.

The PRESIDENT, having proposed a vote of thanks, said this was a very difficult subject, but Mr. Dott had made it a special study for some years past, and no one connected with the Conference was better able to speak upon it. Mr. Dott's former papers had been looked upon as standard works on the various alkaloids of opium, which he had from time to time investigated.

Mr. MACLAREN also added his testimony to the value of Mr. Dott's work upon these alkaloids.

The next paper read was a—

NOTE ON LEMON JUICE.

By T. HOWELL WILLIAMS, F.C.S.

In the British Pharmacopœia of 1867 lemon juice is described as having sp. gr. 1·039, and containing 32·5 grains of citric acid in 1 fluid ounce. In the Pharmacopœia of 1885 the sp. gr. is given as from 1·035 to 1·045, and the quantity of citric acid as from 36 to

46 grains per fluid ounce. The variability of the juice is here very properly allowed for, but as far as my experience goes the standard for citric acid is much too high. From 30 to 36 grains per ounce citric acid would more correctly represent the amount present in lemon juice as commonly obtained from the finest imported fruit during the winter months, and from 20 to 30 grains per ounce when the juice is pressed in summer.

On looking up the literature of the subject, I find very conflicting statements. For example, Bentley and Redwood, in their "Materia Medica," give the citricity of lemon juice as 32 grains per fluid ounce, while Mr. W. W. Stoddart, in a paper which he read at the Norwich Pharmaceutical Conference in 1868, gives as the result of the examination of eight lemons from 39 to 46 grains of citric acid, and he concludes that should there be less than this the lemons must have been kept too long or gathered too late in the season. Flückiger and Hanbury, in the "Pharmacographia," consider 40 to 46 grains per ounce the normal quantity of citric acid, while Warington, whose experience on this subject is very extensive, states that English pressed juice contains from 11 to 13 ounces to the gallon, that is, from 30 to 35·5 grains per ounce.

Under these circumstances, being asked to contribute to the Conference, I have thought that the results of analyses performed in the laboratory of my firm upon juice obtained by us from fruit of our own importing might perhaps be acceptable. There was no idea of publishing these results until a few days ago. Lemon juice is, with us, only a bye-product, and it is only occasionally that the results of analyses have been recorded, and still less often that the yield of juice has been noted. The lemons are not pressed to the full extent of the hydraulic press, as time is considered of more value than a small additional yield of juice. In one instance I find that 15,000 lemons yielded 104 gallons of juice. A case of 400 lemons pressed a few days ago yielded 4¼ gallons of juice, a very much larger proportion, but the juice was of very inferior quality. Each carboy of juice was tested immediately after pressing, and the results are given below.

The amount of acid present is ascertained by titrating 1 fluid ounce, measured with a pipette of known accuracy, with normal caustic soda, using phenolphthalein as an indicator. The number of cubic centimetres of normal soda solution used multiplied by 1·078 gives the weight of crystallized citric acid in grains. But it must be remembered that phenolphthalein indicates an alkaline state of the solution, and in working with these quantities the

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experiments were Messina or Naples lemons. According to his experience, the latter had the larger amount of juice but the smaller amount of citric acid, and the peel contained less essential oil than the Messina lemons. Some years ago he remembered some lemon juice being ordered, and he sent out true lemon juice, but the doctor came back to know why he had sent artificial juice, which would not effervesce with the mixture. He then sent some more, with the same result, and on examining the lemons he found they were perfectly sweet, and contained no acid whatever, and twice since then he had met with perfectly sweet lemons.

Mr. NAYLOR asked how far the percentage of acid was influenced by the maturity of the lemon?

Mr. SCHACHT said he remembered a paper being read some years ago by Mr. Stoddart on this question, and the discussion which arose upon it, from which it appeared that it was the unfortunate habit of medical men to order so much fresh lemon juice to be taken with a definite amount of carbonate of soda or potash, inasmuch as at certain times of the year very much more of the alkaline carbonate would be required to produce the desired effect, which was probably something like neutrality. At that time Mr. Stoddart went through some elaborate experiments, the result of which was that lemons gathered at certain times were found to be much more acid than at others. In those days the importation of lemon juice had not reached the immense volume it now had, and consequently very little lemon juice was then used except that recently expressed. It was settled then that it was a little unfortunate that there was not supposed to be any standard acid strength of lemon juice. He should like to know whether fruits imported at certain times were supposed to represent the fruits gathered at that time.

Mr. CONROY said he gathered from the author of the paper that he obtained on an average about 32 grains of acid to the fluid ounce. He had had considerable experience in testing lemon juice, and he must say he had found it to contain much more than that. Thirty-two grains only worked out about 7 per cent., whereas he generally found that fresh lemon juice prepared in the months of December, January and Feburary, those being the months in which lemon juice was pressed, the lemon juice of commerce being a bye-product obtained in the manufacture of lemon peel, yielded on an average about 8·7 per cent. of free citric acid. His mode of testing was similar to that adopted by the

author, but as he had many hundreds of samples to test, representing puncheons of juice, he made a standardized soda solution, 1000 fluid grains of which represented 100 grains of citric acid. By standardizing the solution in that way, the percentage could be read straight off immediately after titration. It might be that he was under a misconception in reference to the percentage given by the author of the paper, but his experience was that 8·7 per cent. was a very fair average, and he had frequently found lemon juice which tested over 10 per cent. of citric acid, equal to 1 lb. of citric acid per gallon.

The PRESIDENT asked if Mr. Conroy referred to imported lemon juice, or that pressed in England.

Mr. CONROY said he referred to that pressed in this country by manufacturers of candied lemon peel. The imported lemon juice was much weaker.

Mr. W. H. SYMONS said the percentage mentioned by Mr. Conroy represented about 39 grains to the fluid ounce, while Mr. Williams recommended from 30 to 36 grains as the standard. It was well known that lemons varied very much, especially during the summer months, those which had been stored from the early crops being less acid than those more recently gathered, and perhaps those most suitable for Mr. Williams's purpose for manufacturing tincture would not be suitable for the manufacture of citric acid.

The PRESIDENT asked if Mr. Conroy knew whether the makers of candied peel used Messina or Palermo lemons? It was possible that in one case the peel might be superior, but there might be a difference in the amount of acid in the juice.

Mr. CONROY said that was a question he could not answer. He had heard, but he had confused the two names, and did not know which it was.

The PRESIDENT said good judges of essence of lemon could tell the difference between the essential oils obtained from different varieties, and it was possible there might be some slight difference in the juice of the two fruits.

Mr. CLARK said it was the Messina lemons that were pressed in such large quantities abroad, and the peel came over in puncheons packed in salt.

The PRESIDENT remarked that Mr. Stoddart's paper referred to freshly expressed lemon juice, and his proportions were 31·09 to 31·5 grains of citric acid to the ounce. Those figures rather agreed with the average given by Mr. Williams.

Mr. CONROY said if he remembered Mr. Stoddart's paper rightly,

he pressed the lemons himself; but the lemon juice from a presser containing many puncheons at a time, was more likely to give an average sample than Mr. Stoddart could have obtained by buying a few lemons himself. Mr. Williams had mentioned that the lemons were pressed by hydraulic power, but he knew a very large manufacturer, Mr. Hartley, of Bootle, whose lemon peel went all over the country, who used a lemon squeezer invented by himself. He simply got the lemon juice as a bye-product, as he wished to preserve the peel intact for preserving purposes. He forgot to mention before, with reference to the titration, that he found as soon as he got the lemon juice slightly alkaline it was a sufficient indicator of itself; it turned immediately a bright yellow with the least excess of alkali, so that there was scarcely any necessity to use an indicator.

Mr. MACLAREN asked if in both cases referred to peeled lemons had been dealt with.

Mr. WILLIAMS said in all cases they peeled the lemons.

Mr. SCHACHT said Mr. Stoddart found that the same lemons when kept a certain number of months lost their acidity. On May 28 he bought a lot of lemons from six different shops, and after mixing them pressed eight, which gave 7 ounces of juice having specific gravity 1·040 to 1·046, and yielded 40 to 46 grains per ounce of citric acid. The remainder was put aside again to the end of May, and again examined, when the result was an average of 41 grains of citric acid. The lemons kept on decreasing in acidity, at first slightly and then rapidly, but the specific gravity only suffered a slight diminution, and in July it was 1·027, but had lost all the citric acid.

Mr. CONROY said that rather bore out his statement.

The PRESIDENT said the Conference was much obliged to Mr. Williams for this paper. Of course they were concerned in seeing that the standard in the British Pharmacopœia was not too high, and when a statement was made that lemon juice should contain 40 to 46 grains to the fluid ounce, and when they found in the summer months freshly-pressed juice only contained 26 grains to the ounce, it was rather an important difference, and they should know what they were about, or some day something would take place which would be a great annoyance to somebody. He himself should read this paper with great interest, and should turn back to that of their lamented friend, Mr. Stoddart, and read the two together, and he had no doubt on comparing them they would get pretty nearly accurate results.

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The next paper read was entitled—

TANNIN: ITS SOLUBILITIES, Etc.

By B. S. Proctor, F.I.C.

While compiling a table of solubilities of pharmaceutical materials for the second edition of "Practical Pharmacy," I found that the statements with regard to tannin were very contradictory, old writers saying that in the manufacture of tannin by treating powdered galls with moist ether, a heavy aqueous solution of tannin was obtained, and a lighter ethereal liquor containing but little tannin, tannin being only sparingly soluble in ether. More recent and careful observers state that the heavy liquor is a dense solution of tannin in ether, tannin being very soluble in ether. I accepted this latter testimony, and obtained what I considered confirmatory evidence. This was in 1882. On the appearance of the B.P., 1885, I noted its statement that tannin is sparingly soluble in ether.

When the lecture session of the present Newcastle Pharmaceutical Association collapsed for want of students, I felt my hand liberated, and took up the criticism of the pharmacopœial tests, and I now propose to lay before you notes of my observations on tannin, observations made in a somewhat fragmentary way during the last two or three years, and made with the appliances and methods most handy to a pharmaceutical operator. I do not give them in exact chronological order, but arranged according to the nature of the experiments.

I first worked, as most pharmacists would, with commercial tannin and methylated ether. Then I went to commercial tannin and commercial absolute ether. Becoming more critical, I estimated the water in my tannin, and worked with dry tannin and commercial absolute ether, and as a last step I adopted ether which I had rectified by maceration with, and distillation from, sodium.

Note A. To 6 fluid drachms of ether (=about 235 grains) tannin was added, 20 grains at a time, up to 180 grains. The first addition soon dissolved excepting a very small light residue. The second did the same; the third dissolved, but the solution separated into two strata, one heavy and turbid, the other light, clear, and pale. Further additions continued to dissolve, the lower stratum increasing and the upper diminishing in bulk till the sixth addition (total 120 grains) caused the total disappearance of the light stratum, but did not exhaust the solvent power. Three further

additions were made without showing saturation. This was 180 grains of tannin in 235 grains of ether.

The insoluble was evidently very small and light; it was filtered out, washed with ether, then with spirit, and finally with water, and when dry weighed 0·3 grain.

B. The filtered solution *A* was found to dissolve in all proportions in methylated ether, though the same proportions of ether, and tannin had previously given immiscible strata. This observation is not confirmed, nor yet exactly contradicted, by subsequent results, as the experiments have not been precisely parallel.

C. Further additions of tannin in powder to the solution *B* at first dissolved clear, but 20 per cent. addition caused the re-establishment of immiscible strata, one volume of light solution rising and two volumes of heavy subsiding.

D. The light solution containing about 8 per cent. of tannin, the heavy about 25 per cent. of tannin.

F. The ethereal solution of tannin *B*, containing about 43 per cent. of tannin, when shaken with an equal volume of water, separated into three strata. The bottom one, *Fb*, thick and brown; the middle, *Fc*, almost colourless, and the top one, *Fd*, small, yellow and mobile. The heaviest solution was ethereal, and contained about 33 per cent. of tannin. The lightest solution was also ethereal, and contained about 2·2 per cent. of tannin. The middle stratum was aqueous, and contained about 3 per cent. of tannin. We may no doubt regard all these three solutions as consisting of ether, water, and tannin, the proportions being determined by some law not as yet ascertained.

We should naturally conclude that both of the ethereal solutions would contain as much water as they could take up, and that the aqueous solution would be saturated with ether; but it would not be safe to assume that the same law of intersolubility which holds good between ether and water in their pure state would be maintained in the presence of tannin.

The solutions *Fb* and *Fc* (heavy ethereal and aqueous) left in an uncorked vial at rest for twenty-four hours remained as separate strata, but on shaking became a clear uniform solution. The addition of a little ether caused separation into *two* strata, a syrupy heavy ethereal solution with a weak aqueous solution above, and a further addition of ether caused separation into *three* strata, the heavy and light liquors as before being ethereal, and the medium aqueous.

G. A fluid drachm of commercial absolute ether (sp. gr. 0·7194) with additions of tannin, 5 grains at a time. The first addition turned pasty and then dissolved, forming heavy and light solutions. Further additions were made, 5 grains at a time, up to 40 grains, the light stratum disappeared, a dense solution nearly clear resulting (38·8 grains of ether to 40 grains tannin); that is to say, this syrupy solution contained more than 50 per cent. of tannin.

H. I drachm of tannin pressed into a half ounce vial and fʒj. commercial absolute ether poured upon it, the tannin speedily contracted and dissolved into a syrupy liquid. That is, tannin, 60, ether, 38·8, or nearly 60 per cent. of tannin in the solution.

I. Pharmaceutical tannin, as dry as dust, was found to lose about 10 per cent. on drying at a water-bath temperature. I am not in a position to say whether or not a few hours' exposure to this temperature effects any decomposition, but for the present paper I speak of this simply as dry tannin.

J. 6·4 grains of dried tannin with 20 grains of commercial absolute ether speedily became pasty, and in twelve hours formed a syrupy liquid with a supernatant mobile stratum. Four grains of dry tannin added dissolved speedily, solution being nearly complete in five minutes. Further additions of tannin up to a total of 18·4 grains dissolved to a thick syrupy liquid.

Having named these results to Prof. Bedson, he suggested repeating the experiments with ether further rectified, considering that the sp. gr. 0·7194 was not a sufficient guarantee of purity. I consequently rectified a small quantity of ether for myself, taking commercial ether from pure alcohol, macerating it with fused potash for several days, decanting the ether from the heavy alkaline liquor, and adding it to eight or ten little strips of sodium, moderating the action by immersing the bottle in cold water. When the action had apparently ceased the ether was again decanted clear and brown. Clean sodium was added, and the maceration continued for ten days, during which there was no visible evolution of gas, though some further action on the sodium took place. At the end of this time the bottle was connected by a bent glass tube and perforated corks with another clean dry bottle.

The bottle containing the sodium and ether was then immersed in warm water and the other bottle in ice and water. Distillation was continued till nine-tenths of the ether had passed over. A sample of this ether, after keeping in a corked vial for a week,

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it—water enough has been added to dissolve all the ether. In operating at ordinary temperatures, we are apt to lose sight of there being a saturation of the ether in the heavier liquor, because this solution is miscible in all proportions with water, as, in like manner, the lighter ethereal solution of snow (or water) is miscible in all proportions with ether. We are apt to speak of the phenomenon of solution as if the solvent only were the active body. But if solution is a composition of the molecular motions of the bodies concerned, we must take into account the molecular motions of the solids as well as of the liquid solvents; and if we admit the statement that tannin is sparingly soluble in ether, we should guard the statement by adding that ether is largely soluble in tannin.

The length of time during which a small quantity of dry tannin may remain apparently dry and dusty in ether is remarkable, and suggestive of combination taking place between the tannin and ether, analogous to the combination which takes place between some anhydrous salts and water before solution can be effected. For example, dry ferric sulphate thrown into cold water only slowly dissolves, though it is really very soluble and very deliquescent. Its hydration takes considerable time, the solution of the hydrate takes very little. The heavy ethereal liquor may be an etherate of tannin in the same sense as an anhydrous salt may combine with a portion of water and become a crystalline hydrate, and then with a large bulk of water it becomes a solution.

If we accept this proposition, then the "etheration" of the tannin is obscured by the fluidity of the compound, and by our want of a clear definition of what constitutes solution.

The experiment *F* recorded above, in which ethereal solution of tannin shaken with water separated into three strata, the heavy ethereal liquor containing 33 per cent. of tannin against 3 per cent. in the aqueous, suggests that tannin is more soluble in ether than in water. Or to use a rather old-fashioned form of expression, that there is a greater affinity between ether and tannin than between water and tannin. I prefer that old-fashioned statement as being more concordant with the facts, for the solubility in water is even greater than its solubility in ether.

N. To a fluid drachm of water, tannin added 60 grains at a time up to 180 grains; the last addition made it pasty while cold, but fluid while warm. Increasing the water to fʒiss. (*i.e.*, 71 grains), it became a brown syrupy liquid while cold. Stated in 100 parts, we may say 100 of cold water dissolve 253 parts of tannin, forming a

syrupy solution. Being a colloid body, there is no hard and fast line of delimitation to its solubility.

O. Sixty grains of tannin in fʒj. rectified spirit dissolves rapidly. The same result was obtained with B.P. absolute alcohol.

P. Two grains of tannin in fʒj. chloroform, macerated for a day, showed no sign of solution. Thrown on a filter, 44·2 grains of the filtrate left on evaporation a residue too small to be weighed, but capable of giving a colour reaction with ferric chloride equal to that produced by about two or three ten-thousandths of a grain of tannin.

Q. Two grains of tannin in fʒj. benzol, macerated a day and filtered; 22·5 grains of the filtrate evaporated left a residue too small to be weighed, and giving a scarcely visible colour reaction with ferric chloride. The possibility of using separable solvents in the estimation of tannin in solutions seemed to be indicated by the experiment *F*, and the following gives the results of some tentative trials.

R. Sixty grains of tannin dissolved in fʒv. of water in a separator, fʒj. methylated ether added dissolved. The addition of ½ drachm more ether caused the separation of about 65 grains of a heavy ethereal solution, which on evaporation left 28·7 grains of tannin.

(*b*) fʒiss. more ether added to the contents of the separator (which was a clear brown solution) made it milky, and caused the deposit of a further portion of heavy ethereal solution, which ran off to the extent of 35·4 grains, containing 14·8 of tannin.

These estimates of the weight of the ethereal solutions run off are necessarily very crude, as the evaporation of ether was going on all the time of the running and weighing; but this is not of consequence, as the important point—the quantity of tannin they contained—was determined with comparative accuracy.

(*c*) A third separation of heavy solution took place on adding fʒiss. more ether, but the quantity was small, only five or six drops, and left a residue of 0·8 of tannin. The contents of the separator at this stage were clear while cold, but the warmth of the hand made them milky, the clearness being restored by running cold water over the outside of the vessel.

(*d*) A final addition of fʒiss. of ether caused the separation of a light ethereal solution containing 1·5 tannin.

(*e*)The aqueous solution was found still to contain 6·2. The tannin used in this experiment had not been dried, and according to the observation recorded in note *I* it might contain 10 per cent.

of water, and on this supposition there was about 2 grains loss in the experiment. The point, however, is that the ether did not remove all the tannin from the water, but nearly ceased to do so when there ceased to be so much present as would make a heavy solution with the ether.

The presence of common salt diminishes the power of water to dissolve ether: and the addition of brine to a syrupy aqueous solution of tannin precipitates the tannin almost entirely. The question naturally presents itself whether the addition of salt to the contents of the separator would make the extraction by ether perfect or nearly so.

Two subsequent experiments with the object of testing this were inconclusive through accidental circumstances. In the first the tannin had not been dried previous to the first weighing of the 60 grains taken for experiment, so the tannin obtained by shaking out was air-dried only, and weighed 57·1. The difference in the degree of dryness it might have detracts from the value of the result. In the other case the vessel was broken before the final weighing had been obtained.

In note (*I*) I recorded the fact that pharmaceutical tannin under ordinary keeping contained so much water as to lose about 10 per cent. on drying in a water-bath.

S. Repeating the experiment again, 10 grains of tannin from the shop stock, exposed to the air in an evaporating dish for twenty-four hours during rather damp weather, gained 0·5 grain. Heated over a water-bath at about 200°F. (the water not being kept boiling) lost 1·5, making a difference of 15 per cent. between the two conditions, both having the appearance of dryness. In its dry state tannin rapidly absorbs moisture. We may say it is pretty strongly hygroscopic but not deliquescent. Its hygroscopic quality is apt to be overlooked, from the fact that the moisture which it absorbs under ordinary circumstances makes no visible change in its condition.

T. With the view of testing the disposition of tannin to absorb ether vapour, 10 grains of dry tannin placed in a miniature percolator made of a leech tube, the narrow end of which was tied over with muslin and set in a ½-ounce vial containing f℥j. of dry ether, the top of the tube being corked to prevent very rapid evaporation of the ether, the bottom of the tube standing about half an inch above the surface of the ether in the receiver. The tannin absorbed 6 grains of ether vapour in sixteen hours, and in twenty-four hours had absorbed 9·1 grains, being converted into a pasty

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dissolved in ½ ounce of warm distilled water, and mixed. Partial precipitation of both reagents will take place, but if now 40 grains of precipitated barium carbonate be added, the complete precipitation of all these chemicals will take place, and on heating the mixture to the boiling point to expel carbonic acid and facilitate the speedy completion of the reaction, and throwing the magma upon a filter, pure water will come through. This, on evaporation, would indicate if there had been present any substance such as glucose, not precipitable by these reagents.

I have said *dry* ferric sulphate, as the pharmaceutical solution of this salt usually contains nitric acid, which would introduce nitrate of barium into the filtrate. The barium carbonate, if not well washed, is also a source of error.

X. I have obtained results equally good by substituting prepared chalk for the carbonate of barium, provided spirit and water in equal proportions were used for the solvent, dissolving the tannin in methylated spirit, the ferric sulphate in warm water, and then adding the chalk.

Looking over all these results, there are sundry questions which I feel tempted to ask, but which I have not yet seen my way to answer.

Is the tannin retained by the water in experiment *F* of the same nature as that in the heavy or light ethereal solutions?

Is the portion insoluble in dry ether, but soluble in moist, of the same nature as that which is soluble in dry ether? We might very naturally say no; there must be two or more bodies in commercial tannin. That, however, is not absolutely conclusive.

Is pharmaceutical tannin a glucoside of digallic acid? This has been debated, but it is rather a speculation of pure chemistry than a question of practical pharmacy.

Is tannin changed by drying at 212° till it ceases to lose weight? One experiment seemed to indicate that it partially lost solubility, but that I have not conclusively answered. It is, however, a pharmaceutical problem, and we may inquire whether the B.P. instruction to "dry the tannin in a hot-air chamber at a heat not exceeding 212° F." is a suitable limitation.

I have used the term "tannin" and "pharmaceutical tannin" rather than tannic acid, as the writers on this subject differ in their statements, and speak of "natural tannic acid," "crystallized tannic acid," "tannic acid freed from glucose," etc., and I wish it understood that my remarks apply to a product supposed to be obtained by the official process.

The solubilities of tannin as above noted, put into tabular form, are as follows :—

Tannin and Ether forming a Syrupy Solution.

One hundred parts of meth. ether dissolve 51 to 76 or more of tannin in its commercial state (note *A*).

One hundred parts of com. absol. ether dissolve 102 of tannin in its commercial state (note *G*).

One hundred parts of com. absol. ether dissolve 92 of dried tannin (note *J*).

One hundred parts of ether rectified by sodium dissolve 90 of dry tannin (note *K*).

Tannin and Ether forming a Mobile Solution.

One hundred parts meth. ether dissolve about 9 of tannin in its commercial state (note *D*).

One hundred parts of ether dissolve 2·3 of tannin in the presence of water (note *F*').

One hundred parts of ether rectified by sodium dissolve 2·5 of dried tannin.

Tannin and other Solvents.

One hundred parts of cold water form a syrupy solution with 253 parts of tannin.

One hundred parts hot water form a syrupy solution with 300 parts of tannin.

One hundred parts of rectified spirit or absolute alcohol dissolve 120 parts or more of tannin.

One hundred parts of chloroform dissolve about 0·007 parts of tannin.

One hundred parts of benzol dissolve less than 0·007.

Brine dissolves only traces of tannin. The quantity not estimated.

The PRESIDENT having proposed a vote of thanks to the author of the paper,

Mr. DOTT said he was not sure that he altogether agreed with Mr. Proctor in the conclusions he had arrived at. Commercial ether contained not only water, but alcohol also, even that of 0·717. specific gravity. Of course tannin being soluble in alcohol, unless it were eliminated entirely, the solvent could not be relied on as being ether, for it might be partly alcohol. Commercial tannin

was not a definite chemical compound, but a mixture of some kind, and any definite statement as to a substance like tannin being soluble one part in so many could hardly be made. It was soluble practically to any extent in a menstruum in which it was soluble. Given a sufficient time, there was no limit between solidity and a weak solution. It was only as regarded crystalline substances that definite statements could be made as to solubility, and not as to an amorphous substance like tannin. Another point was that sodium was not a good agent for dehydrating ether; it did not completely remove the water from any substance to which it was applied, at least not when alcohol was present.

Mr. MABEN asked if Mr. Proctor had any theory to account for the two ethereal layers.

Mr. PROCTOR said Mr. Dott would not have made the remarks he had if he had read the paper in its entirety, because he had pointed out clearly that the tannin of commerce was not to be regarded as a definite thing. He spoke of tannin rather than tannic acid, because authorities differed as to what tannic acid was. With regard to the dehydration of ether by sodium, he could only say that his authority was the Professor of Chemistry at Newcastle, who recommended that process to get rid of the least trace of water as being the most reliable he could suggest. Mr. Dott shook his head, but he should be glad to hear if he could suggest any better method than digesting it ten days with metallic sodium and then distilling from the same.

Mr. DOTT said it could be found in other cases that hydrate of sodium gave up a certain amount of water which was always reformed.

Mr. PROCTOR said he would not argue the question if there were experimental evidence to show that he was wrong, but he should like to have the matter proved by experiment. In the absence of any better evidence than Mr. Dott was able to give at present with regard to the separation of water and alcohol, he said metallic sodium was a very good medium for separating alcohol. The alcohol itself was decomposed by sodium, and the maceration of the rectified ether again with sodium, and redistilling it did not, he think, allow much probability of there being an imperfect rectification. If there was he should be glad to hear of the experiment which proved it. In the meantime he accepted the statement, as given to him on what he considered good authority, that that was a good means of separating the ether from the alcohol and water which were invariably present in the commercial articles. Again,

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bark exerts on the heart depends essentially upon the hydrocyanic acid it yields." This being the case, it is obvious that if the drug is to obtain full justice to its medicinal properties, its preparations should be so made as to represent as nearly as possible the whole of the hydrocyanic acid obtainable from the bark, and that this quantity should be fairly uniform.

The amount yielded by the fresh bark varies with the time of the year, the percentage being, according to Perot, about ·05 in April, ·1 in June, and ·14 in October. As, however, the bark is ordered to be used in the dry state, these figures cannot be taken as a standard for the strength of the preparations.

The bark should be collected in autumn, and as it deteriorates by keeping should be recently dried. The autumn is therefore the most favourable time for using it. Whether or not the *cort. prunivirg.* of commerce is generally that collected in autumn it would be difficult to say; but as we have to use it as we get it, it is only fair to judge it as it comes. Half a dozen samples were obtained from leading houses, and the yield of hydrocyanic acid estimated. This was done by distilling the fine powder with water, and titrating the distillate with centinormal silver nitrate solution.

The following were the results per cent.:—

1.	·079
2.	·082
3.	·137
4.	·107
5.	·160
6.	·133

The preparations in general use are the liquid extract, infusion, and syrup of the United States Pharmacopœia, and the syrup and tincture of the Unofficial Formulary.

The strength of the liquid extract should be 1 ounce in 1 fluid ounce. Commercial samples of it gave the following amounts of hydrocyanic acid in grams per 100 c.c.:—

1.	·030
2.	·000
3.	·000
4.	·019
5.	·008
6.	·016

I can only account for the negative results in Nos. 2 and 3 by supposing them to be made by some process in which the whole of

the extractive was heated. The others are much below that indicated by the average yield from the bark.

A sample of the liquid extract was then made with the bark No. 3, containing ·137 per cent. of H Cy, the directions of the United States Pharmacopœia being strictly followed. The product was found to contain ·084 per cent. From this it seems that th menstruum which remains unheated is sufficient to readily extract the whole of the acid.

Samples of the infusion, eight times concentrated, were then estimated in the same way. These should represent 32 per cent. of bark. The results were :—

1.	·0029
2.	·0000
3.	·0067
4.	·0000
5.	·0019
6.	·0029

Here again the quantities of acid are much below the theoretical amounts. Nos. 1 and 4 were very much darker than the others. Both of these contained glycerine and appeared to be made by diluting the liquid extract.

A pint of concentrated infusion was made with No. 3 bark. The bark in No. 40 powder was damped with water, left to macerate for twenty-four hours, and then percolated with water till 14 fluid ounces had been collected. This was reserved, and the percolation continued till exhaustion was effected. These last runnings were evaporated to one fluid ounce, and added to the first portion, together with 5 fluid ounces of rectified spirit. On estimating the product the percentage of H Cy was found to be ·0428, the theoretical yield being ·0457. Another sample of exact U.S.P. strength made by percolation was found to contain the full amount.

The syrup represents 12 per cent. by weight of the bark. The following were the percentages by weight of H Cy found in some commercial samples :—

1.	·0007
2.	·0000
3.	·0011
4.	·0014
5.	·0029
6.	·0005

These results are also below the proper yield. A sample made from bark No. 3 in No. 20 powder according to the U.S.P. process gave ·0152 per cent., the theoretical yield being ·0164.

In the same way six samples of tincture, B.P.C., were examined. The strength should be 1 ounce in 5 fluid ounces, but the quantities of prussic acid found were in this case also too low, the results in grams per 100 c.c.'s being—

1.	·009
2.	·000
3.	·008
4.	·012
5.	·007
6.	·016

A sample made from No. 3 bark yielded ·0228, the theoretical amount being ·0274.

It is evident from these results that the preparations of wild cherry bark do not as a rule represent the full value of the drug, so far as the hydrocyanic acid is concerned. If the hydrocyanic acid found in the six samples of bark may be taken as the usual percentage, not one of the preparations examined can be said to be near its proper strength. This may be caused by the loss of some of the acid in keeping, or else sufficient care is not exercised to insure its presence. Experiment shows that the infusion, syrup and tincture, may be made of proper strength provided the proper methods be employed, and the products kept free from exposure. The liquid extract does not seem so satisfactory, and the practice of making the other preparations from it by dilution should not be countenanced, unless some means be employed to make it of definite strength, as by the addition of hydrocyanic acid. Although the hydrocyanic acid exists in a very small proportion, there is no reason why this proportion should not be secured. If the preparations in use only contain a small fraction of what they should do, and these fractions vary considerably among themselves, it cannot be expected that *Prunus Virginiana* will obtain the reputation here which it is claimed to deserve in America.

The PRESIDENT, having proposed a vote of thanks to Mr. Hawkins, said this was one of those contributions similar to those they had had on former occasions upon cherry laurel water, and similar bodies containing minute quantities of hydrocyanic acid. There

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℞	Bitter orange peel, bruised . .	of each, 3 ounces.
	Gentian root, bruised . . .	
	Fresh lemon peel	6 ,,
	Rectified spirit	7½ fluid ,,
	Cold distilled water	15 ,,
	Boiling distilled water . . .	a sufficiency.

Mix the orange peel and gentian root with the spirit and cold water, and, into the mixture contained in a suitable vessel, such as a wide-mouth jar to which a bung can be fitted, grate the lemon peel. This is best accomplished as follows: weigh the lemons—about six, if of medium size; rub off the yellow portion of the rind against a coarse grater; pare off, as thinly as possible, as much of the spongy part as may be found saturated with the essential oil, and add the parings to the mixture; again weigh the lemons, noting the loss, which will correspond with the weight of peel obtained. If necessary, increase that weight to six ounces with more grated peel. Macerate for seven days, stirring occasionally; strain through a press bag or piece of calico, and press out the rest of the infusion. Re-macerate the marc with about twelve ounces of boiling distilled water for twelve hours, and again press. Mix the liquid obtained with the previous portions, and set aside for a few days, afterwards filtering and making up with distilled water to a pint and a half.

Though the repercolation process described by Mr. J. Wilson in the *Pharmaceutical Journal* for January 21, 1888, is no doubt a good one, I consider that now given, simpler and more likely to meet with the approval of small makers. The price (which comes out about a shilling a pound, exclusive of labour) is satisfactory, and the quality of product excellent. When one part of it is mixed with seven parts of distilled water, the resulting fluid is exactly the same in colour, aroma, and bitterness as the freshly made B.P. infusion; whereas, I have noticed that the concentrated preparation obtained from many wholesale houses is darker in colour when diluted and less fragrant than the pharmacopœial article. The present official formula might still remain as an alternative one, leaving dispensers to choose whichever they preferred. In large dispensing businesses, the old way would probably be retained, because of the saving in spirit; but in smaller ones, a reliable, ready-made "concentration" would often, in busy moments, be hailed as a boon. Some are deterred from using such dispensing conveniences because they are not recognised "by authority." It may be objected that the formula now given is for

a weak tincture instead of an infusion; but surely that is rather hypercritical. The difference in therapeutical effect must be practically nil; and if a physician did wish for some reason, to prescribe an article quite free from alcohol, it would be a very simple matter for him to write "Inf. Gent. Co. Recent.," in his prescription."

It is not meant to be inferred that *all* the infusions are so amenable to concentration as the one now treated of. Thus, it would be somewhat difficult to make a 1 to 7 infusion of cascarilla as aromatic as a fresh one; and, I understand, no concentrated infusion of digitalis is at all equal in value to the "impromptu" preparation. Still, the principle might be adopted wherever it conveniently could, which is certainly the case with the infusion of gentian and a number of others.

TINCTURE OF LEMON PEEL.

By William Johnson.

As a sequence to the suggestion just thrown out for the manipulation of the lemon peel in the making of infusion of gentian, I would recommend that the B.P. formula for tincture of lemon peel be altered to the following:—

℔	Fresh lemon peel, grated	5 ounces.
	Proof spirit	2 pints.

"Macerate for seven days, in a closed vessel, with occasional agitation; strain, press, and filter; and then add sufficient proof spirit to make one pint.

"The peel should be obtained direct from the lemons (about five will be required, if of medium size) by rasping off the yellow portion against a rough grater held over the spirit, afterwards thinly paring off the spongy portion of rind saturated with oil and adding the parings to the spirit. The weight of peel obtained may be found by weighing the fruit before and after peeling."

The advantages of this method are these: practically no loss of essential oil by evaporation; increased facility in reducing the peel to maceration state; and, probably, improved exhaustion.

The tincture of fresh orange peel might be made in the same way; only it is so seldom prescribed that its formula is scarcely worth tinkering.

The PRESIDENT, having moved a vote of thanks to the author of these papers, said he never could quite understand why the Pharmacopœia directed the tincture of fresh orange peel to be made with rectified spirit, and the tincture of lemon peel to be made with proof spirit. Recurring to the discussion on the previous day, there seemed to be a certain amount of rule of thumb with regard to the strength of spirit to be used in these matters. The tincture of fresh orange peel, as now prepared, appeared to be by far the better preparation of the two, and he saw no reason why tincture of fresh lemon peel should not be made by the same process. The peel always contained a considerable quantity of water. Although not sufficiently large to bring the spirituous strength down to that of proof spirit, it would certainly reduce it, and if any alteration were made it should be in that direction.

Mr. LINFORD pointed out that tincture of fresh orange peel deposited its oil on mixture with water, whilst tincture of lemon peel did not, and the intention was probably that one should be mixed with water, and the other used in elixirs and similar preparations.

Mr. WILLIAMS said much more elegant preparations were made with the tincture made with a weaker spirit, and a better flavour was also obtained. The finest flavour was obtained by using a spirit about sixteen over proof to start with. When the process was completed it was generally about sixteen under proof.

In the absence of the author, the two following papers were read by Mr. Naylor:—

EXACT FORMULÆ FOR THE OFFICIAL ONE PER CENT. LIQUORS.

BY C. A. MACPHERSON.

Liquor Arsenicalis.

℞	Arsenious acid in powder Carbonate of potassium	of each 35 grains or 1 part.
	Compound tincture of lavender . . .	2 fluid drachms or 3·125 fluid parts.
	Distilled water a sufficiency to make . .	8 fluid ounces or 100 fluid parts.

Place the arsenious acid and the carbonate of potassium in a flask with 4 ounces, or 50 parts, of the water, and apply heat until a clear solution is obtained. Allow this to cool. Then add the

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and dissolve the acetate of morphine in the mixture; then add sufficient distilled water to make the solution measure 8 fluid ounces, or 100 fluid parts, at 60° F. (15·5° C.).

Liquor Morphinæ Hydrochloratis.

℞ Hydrochlorate of morphine	35 grains or 1 part.
Diluted hydrochloric acid.	70 minims or 1·8 fluid part.
Rectified spirit . .	2 fluid ounces or 25 fluid parts.
Distilled water, a sufficiency to make . .	8 fluid ounces or 100 fluid parts.

Mix the acid, the spirit, and 4 ounces, or 50 parts, of the water, and dissolve the hydrochlorate of morphine in the mixture; then add sufficient distilled water to make the solution measure 8 fluid ounces, or 100 parts, at 60° F. (15·5° C.).

Liquor Potassii Permanganatis.

℞ Permanganate of Potassium	35 grains or 1 part.
Distilled water, a sufficiency to make . .	8 fluid ounces or 100 fluid parts.

Dissolve.

The solution should measure 8 fluid ounces, or 100 fluid parts, at 60° F. (15·5° C.).

Liquor Sodii Arseniatis.

℞ Arseniate of sodium rendered anhydrous by a temperature not exceeding 300° F. (148·9° C.).	35 grains or 1 part.
Distilled water, a sufficiency to make . .	8 fluid ounces or 100 fluid parts.

Dissolve.

The solution should measure 8 fluid ounces, or 100 fluid parts, at 60° F. (15·5° C.).

Liquor Strychninæ Hydrochloratis.

℞ Strychnine in crystals . .	35 grains or 1 part.
Diluted hydrochloric acid	54 minims or 1·4 fluid part.
Rectified spirit . .	2 fluid ounces or 25 fluid parts.
Distilled, water a sufficiency to make . .	8 fluid ounces or 100 fluid parts.

Mix the hydrochloric acid with 2 ounces, or 25 parts, of the water, and dissolve the strychnine in the mixture by the aid of heat. Then add the spirit and sufficient distilled water to make the solution measure 8 fluid ounces, or 100 fluid parts, at 60° F. (15·5° C.).

In a paper read before the Pharmaceutical Society at an evening meeting in Edinburgh, in November, last year,* it was shown that the formulæ given in the Pharmacopœia for what are known as the 1 per cent. solutions do not yield products in accordance with their reputed strength, and that there is an indefiniteness about these preparations which is not desirable. With special reference to the strychnine solution, it was pointed out also that the proportional parts formula differs materially from the imperial weights and measures one, and an amended formula was given for this preparation, whereby a true 1 per cent. solution can be obtained, identical in composition, whether the imperial or the proportional quantities be used. Dr. Attfield having suggested the supplementing of the paper referred to by another containing formulæ for all the solutions of this class, corrected and arranged in the same manner as the one already given, the subject was again taken up, and the formulæ contained in the first part of this paper were constructed. For the sake of uniformity, imperial quantities for 8 ounces of solution have been given in each case, otherwise official data have been adhered to, except in so far as it was necessary to amend them to bring the finished products into consonance with their pharmacopœial reputed strength.† In Donovan's solution the change has been made from 1 part in 100 by weight nominally, to 1 by weight in 100 by measure, the advantage of which is obvious. The slight addition of arsenions acid which it has been necessary to make to the arsenical solutions will not affect the characters and tests given in the Pharmacopœia further than to entail the increase of the quantity of the volumetric solution of iodine used in testing the specified quantity of solution from 875 to 883 grain-measures: the specific gravity will practically remain as at present.

Some of the formulæ contain fractions in the centesimal column which may seem to cause a difficulty in working from them, but on closer inspection it will be seen that they do not form any obstacle. However, should it be thought that other fractions, such

* *Pharm. Journ.* [3], xix. 433.

† Each solution contains four and three-eighths grains of its particular active ingredient in every fluid ounce, or 1 part by weight in every 100 similar parts by measure.

as ·25, ·5, or ·75, would conduce to render the proportional formulæ better adapted for use, they could easily be substituted without materially affecting the character of their respective solutions. Thus, in *liquor arsenicalis*, by substituting four drachms forty-eight minims of compound tincture of lavender for five drachms in a pint of solution—which is equal in round numbers to one hundred and fifteen minims in 8 fluid ounces—the proportion would be altered from 3·125 to 3 per cent., and the colour of the solution would not be sensibly affected. In the morphine solutions, by using the acids in the proportion of 168 minims in the pint—say, 67 minims in the 8 fluid ounces—the percentage would be 1·75 instead of 1·82 as at present; and in the strychnine solution the use of 48 minims of acid instead of 54 minims in the 8 fluid ounces would be equal to 1·25 in place of 1·4. In the latter instance the quantity of acid would still be a little over one-fourth more than is necessary to convert the strychnine into hydrochlorate, while in the former the comparatively large amount of acid present could easily allow of the reduction being made.

The proportional parts formulæ present no difficulty when the unit consists of the ounce or its multiples, but when grains and grain-measures are in question, it is necessary to emphasize the caution not to confound grain-measures with minims—an error liable to happen in the present state of our weights and measures. To facilitate the conversion of grain-measures into minims, it may be stated as a general rule, sufficiently accurate when small quantities are concerned, that one-tenth of the sum added to any given number of grain measures will show the equivalent number of minims which require to be used.

The PRESIDENT, having moved a vote of thanks to Mr. Macpherson,

Mr. MARTINDALE said this matter was of some importance, because the Pharmacopœia was in a very inconsistent position, these solutions being neither percentage by weight or by measure. Take the morphine solutions, they were one part of morphine salts in each case to 99 grain measures, which did not produce 100 grain measures, nor did they produce a definite weight. The writer suggested that they should have actual centesimal parts by measure or centesimal parts by weight. In the case of morphine solutions, the spirit present in the solution interfered with that number of centesimal parts by weight. The inconsistency of the

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prescriptions by measure it was impossible to introduce parts by weight, and the Pharmacopœia must continue to have parts by measure. Owing to the difference in specific gravities, they would come into endless difficulties if weighing were attempted to be introduced. With reference to Mr. Maclaren's objection, he thought he had found a mare's nest. They had nothing whatever to do with whether a minim and a fluid grain were the same thing.

Mr. MACLAREN said what he wished to point out was that Mr. Macpherson had given statistics which showed that he was in error. He had stated a weighed measure instead of a measured quantity.

Mr. PLOWMAN said there was one other aspect of the question to be considered, and that was the prescriber's. It was no use discussing this question until prescribers were educated to prescribe in a different fashion. So long as they prescribed by measure the chemist must follow them, and until medical men were educated possibly in better ways, they must, in order to get what was commonly called, but what they knew not to be, one part in 100, put up with the prescribers' conventional one part in 100. The only possible method was to ignore all ideas of specific gravity, and simply to have one grain in 100 minims.

Mr. MACEWAN said that was just the point at the bottom of this whole difficulty. He believed the reason why the centesimal liquors were introduced into the Pharmacopœia was the desire expressed by the International Congress at Brussels to have all potent solutions made of the strength of one in 100. Instead of being of the strength of one grain in 100 minims, the Pharmacopœia recognised one grain in 100 fluid grains.

Mr. MARTINDALE said No, it was one part added to ninety-nine fluid parts.

Mr. MACEWAN said he quite recognised the fact that the person who drew up the formulæ had not succeeded in making them exact, but the point he was aiming at was one grain in 100 fluid grains, although he did not quite succeed. If a doctor, for instance Mr. Plowman, wanted to prescribe a liquor, and imagined he was getting in 10 minims $\frac{1}{10}$th of a grain of the drug, he was entirely wrong. There was only $\frac{1}{10}$th of a grain in 10 fluid grains, and he maintained that the chemist and druggist could not dispense by fluid grains. The fluid grain was not recognised by the Weights and Measures Act.

The PRESIDENT said this was a matter evidently for thought,

and when the paper appeared in type they might think the matter over, and some one would no doubt send some contributions to the *Journal* or some other publication on the subject.

LIQUOR MORPHINÆ MECONATIS.

By C. A. Macpherson.

The pharmacopœial solution of morphine bimeconate is a preparation which is nearly allied to the official 1 per cent. solutions, and like them has an indefiniteness about it which is not desirable. On comparing its formula with that given for the morphine hydrochlorate solution, it seems as if it were intended to have both solutions of the same alkaloidal strength, the same quantity of morphine hydrochlorate being ordered for what presumably is intended to be in each instance 2 fluid ounces of solution. Such a result cannot be obtained in practice, since in following the official process a loss of alkaloid is sustained, which will be greater or less according to the care and skill exercised by the operator; and the finished product, instead of containing $5\frac{4}{5}$ grains of "bimeconate" in each ounce, as it would if there were no loss, is more likely to approximate to the strength stated in the Pharmacopœia—about $5\frac{1}{2}$ grains in 1 fluid ounce.* Strangely enough, while an attempt has been made to have both solutions of the same alkaloidal strength, the official dose of each has been based not on the proportion of alkaloid contained in it, but upon that of its particular salt.

In the Pharmacopœia it is stated that the bimeconate solution is about the same strength as tincture of opium, as regards meconate of morphine, but the only reason for adhering to this somewhat indefinite standard seems to be that it was the one adopted for the unofficial preparation of which it is an imitation. It thus becomes a question whether it would not be advisable to include this preparation in the 1 per cent. solutions, and supersede the present tedious and inexact process by one which will yield a definite product. This could be accomplished by adopting either of the following formulæ:—

* The statement in the "Extra Pharmacopœia," that it contains about $6\frac{1}{2}$ grains in the ounce is incorrect.

1. *Liquor Morphinæ Meconatis.*

℞	Morphine meconate* . .	35 grains or 3·5 parts.
	Meconic acid . . .	10 grains or 1 part.
	Rectified spirit . . .	2 fluid ounces or 87·5 fluid parts.
	Distilled water, a sufficiency to make	8 fluid ounces or 350 fluid parts.

Mix the morphine meconate, meconic acid, and rectified spirit, and add as much distilled water as will make the solution measure 8 fluid ounces, or 350 fluid parts, at 60° F. (15·5° C.).

2. *Liquor Morphinæ Meconatis.*

℞	Morphine hydrate† . .	25 grains or 1·25 part.
	Meconic acid . . .	20 „ „ 1 part.
	Rectified spirit . . .	2 fluid ounces or 43·75 fluid parts.
	Distilled water, a sufficiency to make. . .	8 fluid ounces or 175 fluid parts.

Mix the morphine hydrate, meconic acid, and rectified spirit, and add as much distilled water as will make the solution measure 8 fluid ounces, or 175 fluid parts, at 60° F. (15·5° C.).

The first formula yields a solution containing $4\frac{3}{8}$ grains of morphine meconate in each fluid ounce, or 1 part by weight in 100 similar parts by measure. The second one differs slightly, the proportion of meconate in this case being 1·006 per cent.

It may be objected that by adopting the proposed formula a weaker preparation would be substituted for the one previously in use. Such certainly would be the case, but the difference is not so very great, and the objection is not insurmountable. By calculation it is found that a tincture made from opium yielding 10 per cent. of morphine should contain the equivalent of 5·58 grains of "bimeconate" in each ounce, or 1·27 per cent.; this is equal to 4·95 grains, or 1·13 per cent. of meconate. The proposed solution contains 1 per cent. of meconate, which is equal to 1·127 per cent. of "bimeconate." The decrease in strength could easily be compensated for by increasing the dose, and by making this the same as for the other morphine solutions it would be more in unison with the actual potency of the preparation than the official dose is with that of the present one. By changing the name to that indicated,

* $(C_{17}H_{19}NO_3)_2C_7H_4O_7, 5H_2O$. Dott: *Pharm. Journ.* [3], ix. 883.
† $8C_{17}H_{19}NO_3 9H_2O$. Dott: *Pharm. Journ.* [3], xviii. 702.

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No. of sample.	Percentage amount of H Cy.
1.	3·6
2.	3·7
3.	4·0
4.	4·2
5.	4·4
6.	4·8
7.	4·9
8.	5·0
9.	5·0
10.	5·1
11.	5·1
12.	5·7

From the above table it will be seen that the strength of the specimens examined varies between the limits of 3·6 and 5·7 per cent. H Cy, a difference of 2·1 per cent.

In view of the variation in the strength of this acid, and the consequent danger attending its administration in large doses, it is very desirable that a definite standard of strength should be fixed.

The Unofficial Formulary Committee might usefully take the matter in hand, with a view to securing uniformity in the strength of so potent a medicinal agent.

THE RELATIVE VALUE OF CHLOROFORM AND ALCOHOL, AND MIXTURES OF THE TWO, FOR THE EXTRACTION OF ACONITE AND BELLADONNA ROOTS.

By R. Wright,

Pharmaceutical Chemist.

In Squire's "Companion to the British Pharmacopœia" directions are given for making two preparations termed chloroformum aconiti and chloroformum belladonnæ.

The process consists in percolating the powdered root with chloroform, and the finished product is of such strength that a fluid ounce is equivalent to 1 ounce of the root.

The preparations named are used to some extent in pharmacy, and are to be found quoted in most of the wholesale drug lists.

With a view of ascertaining whether chloroform had any advantage over alcohol for the extraction of aconite and belladonna roots, and also what was the specific action of mixtures of the two in

definite proportions upon these roots, two series of experiments were instituted.

In the first series, 10 grams of the root in No. 40 powder was macerated with 200 c.c. menstruum for fourteen days, the mixture being shaken daily. It was afterwards filtered. In the second series 50 grams of the powdered root was moistened with menstruum, and the mixture packed in a percolator. A further supply of menstruum was added, and when the liquid commenced to drop the lower orifice of the percolator was closed, and the whole allowed to macerate for three days. Percolation was then commenced, and allowed to continue until 100 c.c. of percolate had been obtained.

The following processes were employed for estimating the alkaloidal strength of the tinctures:

Belladonna.—The simplest and most reliable process for the estimation of the belladonna alkaloids was found to be that proposed by Dunstan and Short, *Pharm. Journ.*, vol. xiv., p. 625. Twenty c.c. of the tincture to be estimated was shaken up with two successive 10 c.c. distilled water, by which means the alkaloids are withdrawn from solution in the chloroform-alcohol mixture with the alcohol, the chloroform retaining the colouring matter. The latter is drawn off, the alkaloidal solution rendered alkaline with ammonia, and the alkaloids removed by agitation with two successive 10 c.c. chloroform. The mixed chloroformic solutions are afterwards evaporated in a clean tared platinum dish over a water-bath, until the weight is constant.

In experiment 1 in each series the colouring matter was removed by shaking with chloroform, and in No. 6 the alkaloids were removed by agitation with dilute alcohol.

Aconite.—It was first attempted to apply the process employed for the belladonna tinctures to the estimation of those of aconite. It was found, however, that the chloroform not only retained the colouring matter, but also some of the alkaloid, and therefore the following process was adopted:

Twenty c.c. of the tincture was introduced into a porcelain dish, with 1 c.c. dilute sulphuric acid (B.P. strength) and 9 c.c. distilled water, and the mixture evaporated over a water-bath until the chloroform and alcohol had been driven off. The residual solution was filtered when cold, the filter being washed with another 10 c.c. distilled water. The mixed filtrates were rendered alkaline with ammonia, and the alkaloids extracted by agitation with two successive 10 c.c. chloroform. The mixed chloroformic solutions were

then evaporated over a water-bath in a tared platinum dish until the weight of the residue was constant.

The following tables represent the results obtained. In each case two estimations were made, the mean of the two being taken as correct.

The important conclusions to be drawn from the results recorded in the tables are—

(1) That chloroform, *per se*, does not nearly exhaust aconite and belladonna roots of their alkaloids.

(2) That a mixture of chloroform and alcohol is superior to alcohol alone as a menstruum for their extraction.

Table I.—*Representing Alkaloids obtained from the Belladonna Tinctures.*

Menstruum employed.	Quantity taken.	Alkaloidal residue in grams. Series I.	Series II.
Alcohol 84 p.c.	20 c.c.	·006	·030
Alcohol 4 vols. / Chloroform 1 vol.	20 c.c.	·008	·040
Alcohol 3 vols. / Chloroform 1 vol.	20 c.c.	·006	·035
Alcohol (equal vols.) / Chloroform (equal vols.) . . .	20 c.c.	·007	·035
Alcohol 1 vol. / Chloroform 3 vols. . . .	20 c.c.	·007	·033
Chloroform	20 c.c.	·006	·011

Table II.—*Showing Alkaloidal Residues yielded by Aconite Tinctures.*

Menstruum employed.	Quantity taken.	Alkaloidal residue in grams. Series I.	Series II.
Alcohol 84 p.c.	20 c.c.	·009	·066
Alcohol 4 vols. / Chloroform 1 vol.	20 c.c.	·009	·071
Alcohol 3 vols. / Chloroform 1 vol. . . .	20 c.c.	·(0)	·076
Alcohol (equal vols.) / Chloroform (equal vols.) . . .	20 c.c.	·009	·068
Alcohol 1 vol. / Chloroform 3 vols. . . .	20 c.c.	·009	·056
Chloroform	20 c.c.	·006	·034

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the best solvents, and he noticed in one case there were four volumes of alcohol to one of chloroform, and in the other three to one. Was there any special reason for altering the volumes in the two menstrua?

Mr. NAYLOR said he had had an opportunity of testing the impurity in the sample of salicylate of soda referred to by Mr. Wright, and he found the melting point corresponded precisely with the melting point of commercial salicylic acid.

Mr. GROVES said he should like to remark on the weakness of chloroform for extracting aconite and belladonna roots. On one occasion he found a chloroform belladonna liniment contained but a very small portion of the alkaloid, practically none, and in considering the matter he thought possibly it might be due to the fact that the alkaloids existing in the roots were in a saline condition. They were not alkaloids, but salts of alkaloids. They knew very well that when an alkaloid was dissolved in either chloroform or ether it was easily shaken out by acids, even acetic acid would remove the whole of it. He made some experiments by moistening aconite and belladonna roots with ammonia, allowing it to remain about two hours, then drying carefully, and then percolating with chloroform; he found they yielded much more alkaloid. But there was some difficulty in percolating with chloroform a body so mobile and so heavy that it ran through the marc too quickly, so that it had to be restrained by a tap. It was also desirable that spirit should not be mixed with the chloroform. Belladonna and aconite were often mixed with oil, and if spirit were used together with chloroform, the miscibility would be destroyed to a great extent.

The PRESIDENT said these matters were very interesting. He himself for years had made chloroform belladonna liniment and aconite liniment also freely by percolation of the roots by chloroform, and therefore he was rather surprised to see what little solvent power the chloroform had on the roots. He was glad to hear the remarks of Mr. Groves, for they had all been making this liniment, which was proposed by the late Mr. Peter Squire, who recommended that it should be made from belladonna root by percolating with chloroform. It showed the advantage of coming together and discussing these points. With regard to hydrocyanic acid, it was very much to be regretted that, notwithstanding the attention which had been called to this matter, these varying strengths should still be found. Scheele's acid was little used in dispensing compared with the official acid, but there was

no reason why it should not be somewhere near 4½ per cent. when met with in the trade.

Dr. THRESH said, in answer to Mr. Plowman, that Mr. Wright in the table gave the amount of alkaloid obtained by using various proportions of alcohol and chloroform. He (Dr. Thresh) had simply selected from the table the figures showing the results with pure alcohol and chloroform, and the mixtures that gave the greatest yield. In the one case, that of aconite, 3 to 1 of chloroform gave the largest percentage, whilst in the case of belladonna it was in the proportion of 4 to 1.

In the absence of the author, the last paper was then read by Mr. Naylor, on—

CASEARIA ESCULENTA.

BY DR. P. S. MOOTOOSWAMY, F.L.S., TANJORE.

Nine species of casearia are described by Roxburgh, of which five are indigenous to Southern India. *C. esculenta* is a large shrub or small tree with leaves alternate oblong, entire and smooth; flowers axillary and greenish-yellow; stamens and nectaries united at the base. The tree is found in the Circar mountains, the Travancore ghauts, and Varoosa-puthee, and other parts of the Tanjore district. It belongs to the natural order *Samydaceæ*.

The root is the part employed in Hindu medicine and sold in medical bazaars. The Tamil names are *Kadalashingi* and *Kadaloorangi*, and its Telugu name is *Gundu gungura*. The tree takes its name, it is said, from the root having the supposed property of drying up the sea.

The root is of various sizes, usually about an inch in diameter, sometimes more, sometimes less. The surface is bright yellow, and scales off in very thin layers like tissue paper. The bark is reddish brown. The wood of the root is light brown, and made up of one or more concentric layers, according to the age of the tree. When the drug is powdered in a mortar the broken pieces of bark adhere together on account of the fine, long, silky liber cells. The cobweb-like appearance of the partially powdered drug, and the bright yellow coating of the bark are two characters, I think, which distinguish it from all other articles of Indian materia medica. Sometimes another bark is called *Kadaloorangi*, which is

in long fibrous pieces, and has a bitter and astringent taste. This other bark I have found to be from *Kydia calycina*, belonging to the *Malvaceæ*, and containing, like most plants of that order, very gummy properties.

Casearia root is now coming into use as a valuable medicine for chronic enlargement of the liver, for hepatic obstructions, and for piles. It is a gentle aperient, notwithstanding the tannin present, and the dose should be equal to 2 to 3 drachms of the root. I have long known it to act as a specific in diabetes when administered in powder or decoction. One part of powder with one-fourth its weight of sugar is given twice a day. The formula for decoction is

Root bark of casearia	ʒij.
Cinnamon bark	ʒij.
Aniseed	ʒij.
Water	℥x.

To be boiled down to three ounces. Dose, one ounce and a half twice a day. It is considered to be an alterative in skin diseases by some Vythians, especially in that disease called *Padurthamaray* in Tamil, where a spreading hepatic complaint affects the lower part of the abdomen and extends around the back. The fresh bark is ground with water and applied to the parts affected. The extract and syrup of casearia are the preparations now consumed in Bombay to a great extent. The extract is made by exhausting the powdered root with water, and evaporating to the consistence of a soft extract; the dose of this is 20 grains. The syrup is a solution of the extract in sugar and water, and contains 20 grains in two teaspoonfuls.

Mr. D. Hooper has analysed the roots of *Casearia esculenta*, and furnishes me with the results of his investigation as now communicated. The drug contains 3 per cent. of neutral yellowish resins soluble in ether and partly soluble in spirit of wine. About 10 per cent. of tannin, giving a greenish colour with ferric chloride, was contained in the alcoholic extract. This tannin, from the composition of its lead-salt and the formation of a soluble crystalline product when boiled with diluted acid, resembled rhatania-tannic acid of Wittstein. Water dissolved out an organic acid having the peculiar characters of cathartic acid, both in its chemical tests and physiological action. The root also had a small quantity of starch, and left 4·8 per cent. of mineral matter when burnt.

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stimulated by the visit of the Conference and the excellent papers which had been read to become more enthusiastic for education and original research, that in another year's time such a complaint would not have to be made. These volumes were so magnificently bound that it almost seemed a pity to use them; but he took it the highest compliment they could pay to the donors would be to use them so continually that when the Conference came again to Newcastle in twenty-five years' time the binding would be well worn and the pages well thumbed, whilst the contents had been absorbed by the students, who would show by the papers then read that valuable use had been made of the gift.

The Unofficial Formulary Committee.

The PRESIDENT moved the re-appointment of the Unofficial Formulary Committee, which had a considerable amount of work in hand, though not quite ready for publication.

Mr. SIDNEY PLOWMAN seconded the motion, which he suggested would sound better if it took the form of requesting the members of the Committee to continue their labours for another year. He had had occasion before to refer to the great services which this Committee had rendered, and he was quite sure the motion would be carried.

The motion was then put, and carried unanimously.

Place of Meeting for 1890.

Mr. R. REYNOLDS said he was requested by his colleagues on the deputation from the chemists of Leeds which attended the Conference to lay before it an invitation, requesting that Leeds might be honoured by being chosen as the next place of meeting. It might seem strange that a town of such magnitude had not yet had the privilege of entertaining the Conference, but the last meeting of the British Association at Leeds was in 1858, and that Conference was born five years later. The British Association had visited the county of York three times since then, at York, Sheffield, and Bradford, and, of course, those circumstances had not been favourable to the early selection of Leeds. It was probably felt that there might be too much even of Yorkshire; and although an invitation had been sent in the meantime, it was only accepted last year, when Leeds was fixed upon for next year's meeting, and all arrangements were in train. It was therefore hoped that as usual the Pharmaceutical Conference would accom-

pany or precede the British Association in its visit. He would not use any exaggerated language in order to attract members. and would admit Leeds was a town in which the work exceeded the play, but that would be no novelty to pharmacists. There were many matters of interest to be seen; they had in connection with the modern university system one of the three colleges constituting the Victoria University, having a building corresponding in scope and object to that in which they were assembled. Their industries were of a varied character, in fact, they rather claimed to have a greater variety of manufactures than almost any other town. He could not boast, as the gentlemen in Newcastle who were putting off their armour might; but he could modestly promise that they in Leeds would do their best to make the meeting a success. He had been very much pleased with the admirable reports of that meeting given in the local press; he knew the difficulties of reporting such meetings, and remembered some years ago when Mr. Groves read a paper entitled "The Rancidity of Fats in Connection with Ointments," it was reported as being "The Rancidity of Facts"; but he could cap that example by what appeared in a Leeds paper that morning, which, in referring to the President's address, said "he expressed the hope that the Conference, in conjunction with the Medical Council, would succeed in getting the British Pharmacopœia declared obsolete and illegal." If, however, through this report, the Conference had at all lost public confidence in Leeds, which was a very law-abiding town, he trusted matters would be put right next year, if the invitation were favourably received.

Mr. G. WARD desired to add a word in support of the invitation. He was quite sure that the magnitude and importance of Leeds were such that it was quite time it received a visit from the Conference.

Dr. THRESH moved that the invitation so cordially given to the Conference by Mr. Reynolds and Mr. Ward on behalf of the Leeds chemists be cordially accepted. He was himself a Yorkshireman, who came from near Leeds, and was proud of it; he could assure the members they would meet with a hearty reception if they went there.

Mr. CONROY seconded the motion, which was at once agreed to.

Votes of Thanks.

Mr. SCHACHT moved—

"That the cordial thanks of the non-resident members of the British Pharmaceutical Conference be given to the Local Committee, and especially to Messrs. Martin, Clague, Proctor, and Harrison, for the very successful manner in which all the arrangements connected with their visit to Newcastle had been carried out."

He was very glad the word *all* had been introduced into the resolution, as it recalled to their minds the very varied duties which the gentlemen referred to had undertaken and carried out. It was not the first time he had had the pleasure of proposing such a resolution, for the members of the Conference were generally extremely well received by their brother pharmacists, who always appeared anxious to do the best they could; but it was not always that the locality was so fortunately placed as Newcastle happened to be, and the gentlemen or ladies concerned had thrown a spark of originality into the proceedings which was unique, having very kindly made special arrangements by which the ladies whom some members were fortunate enough to bring with them had occupation and amusement provided for them while their companions were otherwise engaged. It was only right to say that this part of the Committee's work had been very highly appreciated.

Mr. BENGER had the greatest pleasure in seconding the motion. There was nothing but congratulation to be given to the local committee for the very successful efforts which had been made to provide for the comfort, convenience, and recreation of the members and the lady visitors.

The motion having been put by the President was carried unanimously,

Mr. MARTIN said it was a very great gratification to him, and must be so to his colleagues, who had so ably and energetically assisted him, to hear gentlemen of so much experience say that all the arrangements had been carried out to their satisfaction, and such testimony was an ample reward for any little trouble they had taken. If there had been any little hitch or shortcoming, he hoped it would be considered their misfortune rather than their fault. There still remained the excursion, as to which he might say that every effort had been made to secure fine weather for the trip.

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to be present; but as a humble member connected with the College he would accept the vote which had been passed, and which he was sure would be a gratification to the principal.

Election of Officers.

The following gentlemen were elected as the officers of the Conference for the ensuing year:—

President.—C. Umney, F.I.C., F.C.S., London.

Vice-Presidents.—M. Carteighe, F.I.C., F.C.S., London; S. Plowman, F.R.C.S., London; A. Kinninmont, Glasgow; and W. Smeeton, Leeds.

Treasurer.—W. Martindale, F.C.S., London.

Honorary General Secretaries.—J. C. Thresh, M.B., D.Sc., Manchester; and W. A. H. Naylor, F.I.C., F.C.S., London.

Other Members of the Executive Committee.—R. H. Davies, F.I.C., F.C.S., London; D. B. Dott, F.R.S.E., Edinburgh; A. W. Gerrard, F.C.S., London; Prof. Green, M.A., B.Sc., London; E. M. Holmes, F.L.S., London; W. Kirkby, F.R.M.S., Manchester; N. H. Martin, F.L.S., Newcastle-on-Tyne; F. Ransom, F.C.S., Hitchin; and S. Taylor, Leeds.

Local Secretary.—F. W. Branson, F.C.S., Leeds.

Auditors.—T. Rheeder, Newcastle-on-Tyne, and G. Ward, F.I.C., F.C.S., Leeds.

Mr. GROVES then moved—

> "That the hearty thanks of the Conference be accorded to the President for the very able and courteous manner in which he has conducted the business of the meeting."

He said all present were as well able as he was to judge of the ability displayed by Mr. Umney, and must have noticed how thoroughly he had brought out the points arising on the various papers. The Conference was much indebted to him, not only for his address, but for much of the success of the meeting.

Mr. PROCTOR seconded the motion. It had occurred to him over and over again during the discussions how much the President had added to the value of the discussions by his opening and concluding remarks.

The motion was carried with acclamation.

The PRESIDENT said he had said so much during the last forty-eight hours, that he hesitated almost to say anything more; but

he could not help thanking the members for the very great kindness he had received from them, and for the renewal of their confidence as shown in again placing him in the post of President. It had been a great pleasure to him to come there and see some of his old friends who were almost grey-headed when he began his career twenty-five years ago. He had always looked forward to getting to the front, and if all young men would strive to do their best, they might be sure their chances of success would become better as their calling advanced. He had only to allude to the training and the help he had received from the Pharmaceutical Society and the Conference as an incentive to young men to do all they possibly could to make themselves perfect in the art and practice of pharmacy.

EXCURSION.

About two hundred ladies and gentlemen, including a larger proportion of the fair sex than usual, joined the special train which had been provided to take them from Newcastle to Hexham. The morning was dull and rainy, but it improved as the day wore on. Messrs. Gibson and Riddle acted most efficiently as guides when Hexham was reached, and the old Grammar School endowed by Queen Elizabeth, the old Manor House, once used as a prison, and the Moot Hall, where courts were held, all received their share of attention. At the Abbey Church, the principal attraction of the place, an organ performance was given. Mr. Gibson gave a very interesting historical description of the famous old church, which, it appears, was commenced in 1180 and was finished about the year 1250. On the same site, however, existed an older church, dating from the seventh century. This, however, disappeared in the ninth century, though the crypt and sanctuary-chair belong to the older building. Some members of the party afterwards visited the duke's house, while others inspected the aërated-water works lately erected by Messrs. Bell & Riddle. Before luncheon, another photograph of the Conference party was taken, the Abbey being utilized on this occasion as a background. An excellent lunch in the Town Hall followed, the chair being occupied by Mr. N. H. Martin. After lunch, the chairman gave the loyal toasts. He then gave "The Health of the Conference," to which Mr. Umney neatly replied. Mr. Atkins proposed a vote of thanks to the local committee, and especially mentioned the

names of Messrs. Gibson, Riddle, and Clague, who had so successfully exerted themselves for the pleasure of the visitors. The party then proceeded by special train to Rothbury, admiring on the way the charming scenery of the North Tyne valley. From Rothbury they were conducted to the beautiful grounds of Lord Armstrong, at Craigside, romantically situated on the side of the mountain, and reached by paths which pass by wood, stream, and rocky passes. The first thing which interested pharmacists was the electric generating machine, driven by a water-wheel equal to 40-horse power, and giving force for the electric light used throughout Craigside. The view from the terrace is charming, and the visitors were loth to leave, for the weather was now fine. Returning to Rothbury, the company assembled in the Jubilee Institute, where tea was served—a meal which was heartily appreciated. The journey was resumed at 6.10, and Newcastle reached between eight and nine, all agreeing that this excursion was one of the most enjoyable which the Conference has ever had.

THE CONVERSAZIONE AND RECEPTION.

A conversazione and reception was held on the Monday evening preceding the annual meeting, in the Durham College of Science, Newcastle-on-Tyne, to which all the members of the Conference and Newcastle chemists were invited. The visitors, on arriving about 8.30 p.m., were introduced to the President and other officers of the Conference.

A concert was given in the Physical Lecture Theatre, which was tastefully decorated with tropical plants and flowers. The music, both instrumental and vocal, was admirably rendered and much enjoyed. The guests, who numbered about two hundred, included a larger proportion of ladies than usual. Programmes of the music were distributed about the theatre. In another room an abundant supply of refreshments was provided, and fully appreciated.

After the withdrawal of the President and officers to attend the Executive Committee meeting, convened for 10 p.m., the guests rapidly dispersed, having spent a most enjoyable evening.

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Acidum Hydrocyanicum (Scheele) (*Hydrocyanic Acid*, Scheele.)

Take of

Ferrocyanide of Potassium	2½ oz.
Sulphuric Acid	1 fluid oz.
Distilled Water, 24 fluid oz., or a sufficient quantity.	

Dissolve the ferrocyanide of potassium in ten ounces of the water, then add the sulphuric acid, previously diluted with four ounces of the water, and cooled. Put the solution into a flask, to which are attached a condenser and a receiver arranged for distillation, and having previously put one ounce of distilled water into the receiver, and provided efficient means for keeping the condenser and receiver cold, cautiously apply heat to the flask, until by slow distillation the liquid in the receiver is increased to ten fluid ounces. Add to the product as much water as may be sufficient to bring the acid to the required strength.

Characters and Tests.—A colourless liquid. Specific gravity, 0·994. A fluid drachm of it leaves on evaporation no fixed residue. It gives no precipitate with chloride of barium, but with nitrate of silver it yields a white precipitate, entirely soluble in boiling concentrated nitric acid. Its strength, as determined by the process of the British Pharmacopœia by means of volumetric solution of nitrate of silver, corresponds to four per cent. of hydrocyanic acid.

Dose.—1 to 4 minims.

Acidum Hypophosphorosum (*Hypophosphorous Acid*).

Take of

Hypophosphite of Barium	8 oz.
(Containing not less than 95 per cent. Ba 2 ($P H_2 O_2$) $F_2 O$.)	
Diluted Sulpuric Acid, Distilled Water	of each a sufficient quantity.

Dissolve the hypophosphite of barium in thirty-six fluid ounces of hot distilled water. Add slowly to the solution seventeen fluid

ounces of diluted sulphuric acid, after which continue the addition, drop by drop, until no further turbidity is produced. Set aside in a warm place, and pass the clear liquid through a filter. Wash the precipitate by decantation with successive portions of hot distilled water, until the washings have no longer an acid reaction. Filter, unite the filtrates, and evaporate the liquid on a water bath to the prescribed density. The product will weigh about eleven and a half ounces.

Characters and Tests.—Colourless. Specific gravity, 1·1367. Its strength, as determined by volumetric solution of soda, corresponds to thirty per cent. of hypophosphorous acid. Its aqueous solution is not precipitated by diluted sulphuric acid, nor by an excess of ammonia, nor by oxalate of ammonia after neutralization, and gives not more than a faint opalescence with chloride of barium. If solution of ammonio-sulphate of magnesium be added after an excess of ammonia, no precipitate is produced. Chloride of calcium added to a neutralized solution yields no precipitate.

Dose.—2 to 5 minims.

Chloroformum Aconiti (*Chloroform of Aconite*).

Take of

Aconite Root	20 oz.
Strong Solution of Ammonia	1½ fluid oz.
Distilled Water	1 pint.
Chloroform, a sufficient quantity.	

Bruise the aconite root, and moisten thoroughly with the strong solution of ammonia and distilled water previously mixed. Macerate for four hours, dry carefully, and reduce to No. 40 powder. Pack tightly in a percolator provided with a tap and closely-fitting cover. Macerate for twenty-four hours with twenty fluid ounces of chloroform, then pour on successive quantities of chloroform, percolating slowly until thirty fluid ounces are obtained.

Chloroformum Belladonnæ (*Chloroform of Belladonna*).

Prepared as chloroform of aconite (*q.v.*), substituting belladonna root for aconite.

Chloroformum Camphoratum (*Camphorated Chloroform*).

Take of

Camphor	2 oz.
Chloroform	1 fluid oz.

Dissolve.

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Dissolve and filter. To the filtered solution add

Refined Sugar . . . . . 1 pound.

Dissolve with the aid of a little heat, strain, and add after cooling,

Hypophosphorous Acid . . . 20 minims.
Distilled Water, sufficient to produce 1 pint.

Mix. Each fluid drachm contains one grain of hypophosphite of calcium.

Dose.—1 to 4 fluid drachms.

Syrupus Sodii Hypophosphitis (*Syrup of Hypophosphite of Sodium*).

Take of

Hypophosphite of Sodium . . . 160 grains.
Distilled Water . . . . . 3 fluid drms.

Dissolve, filter, and wash the filter with distilled water, 1 fluid drachm. To the filtered solution add

Syrup, sufficient to produce . . . 1 pint.

Mix. Each fluid drachm contains 1 grain of hypophosphite of sodium.

Dose.—1 to 4 fluid drachms.

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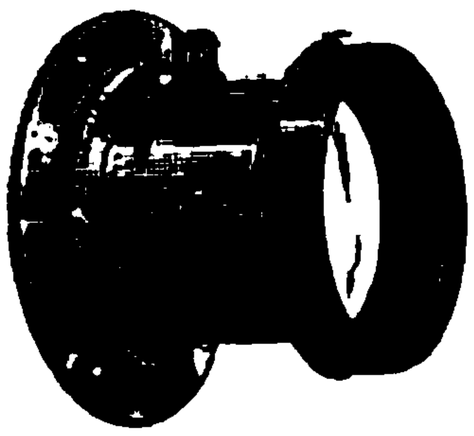

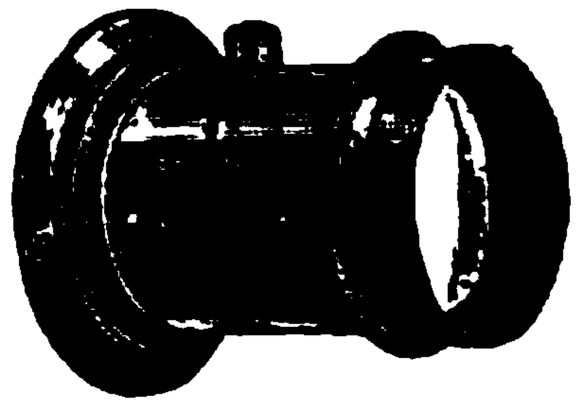

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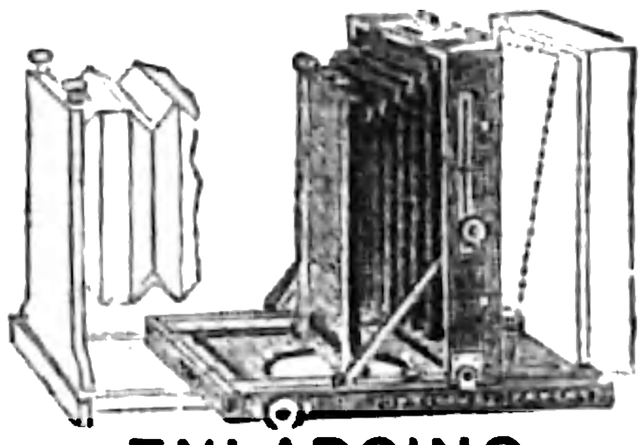

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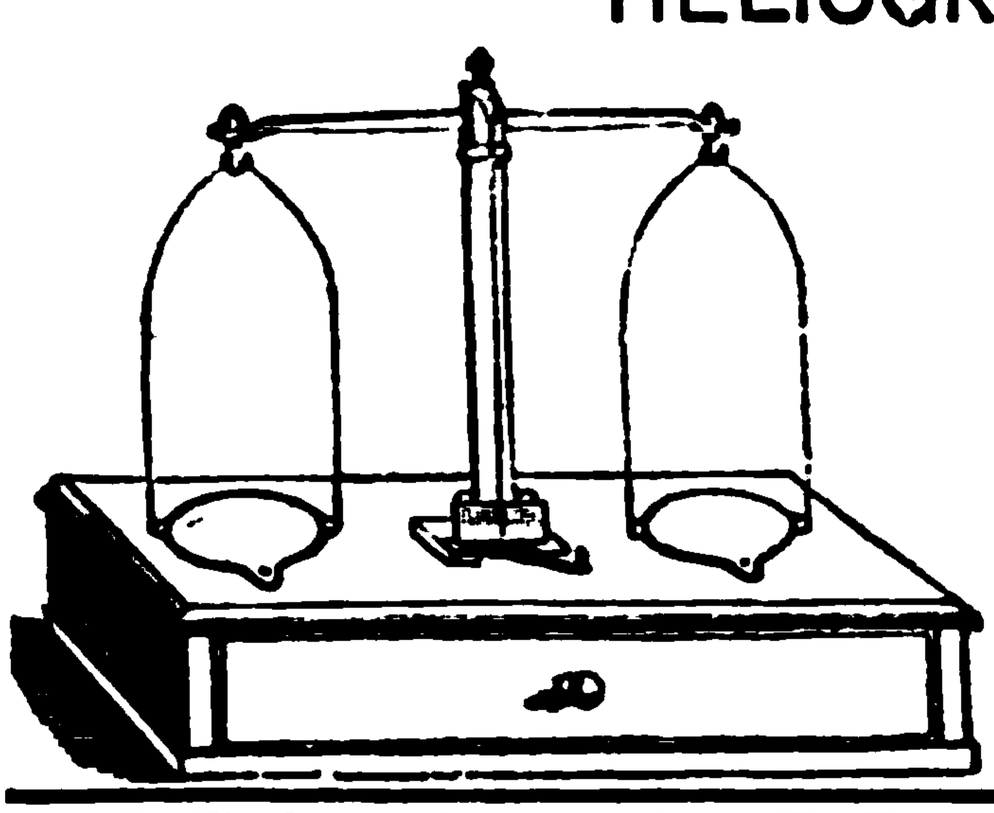

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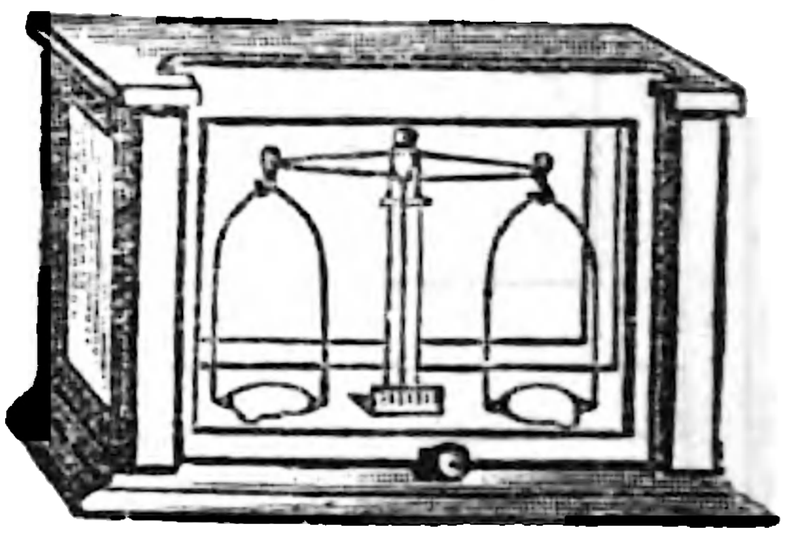

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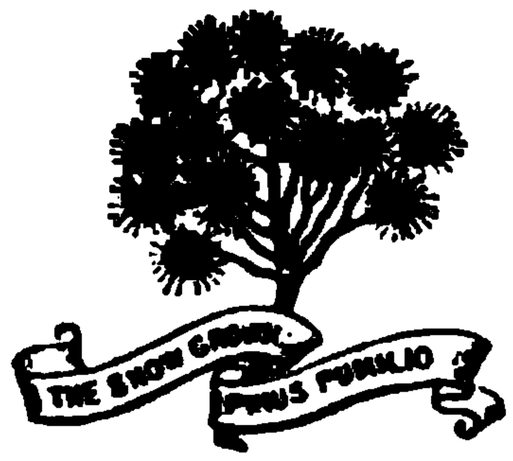

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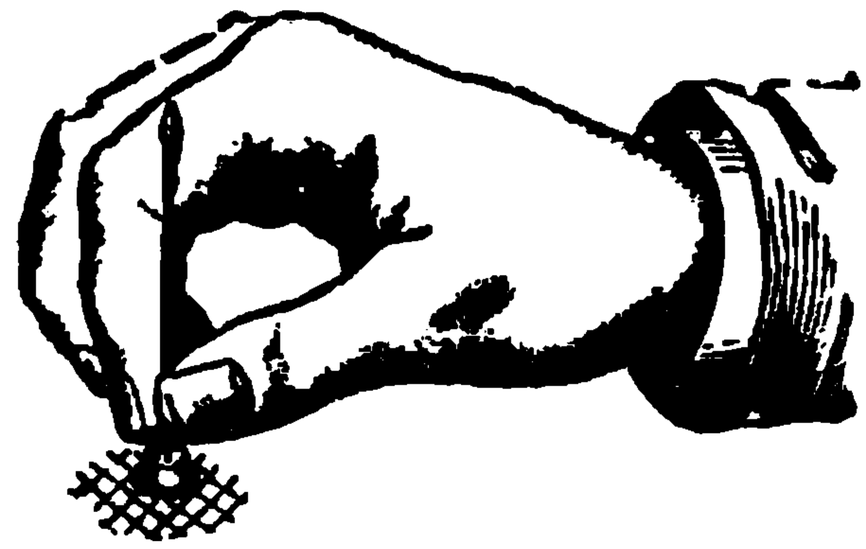

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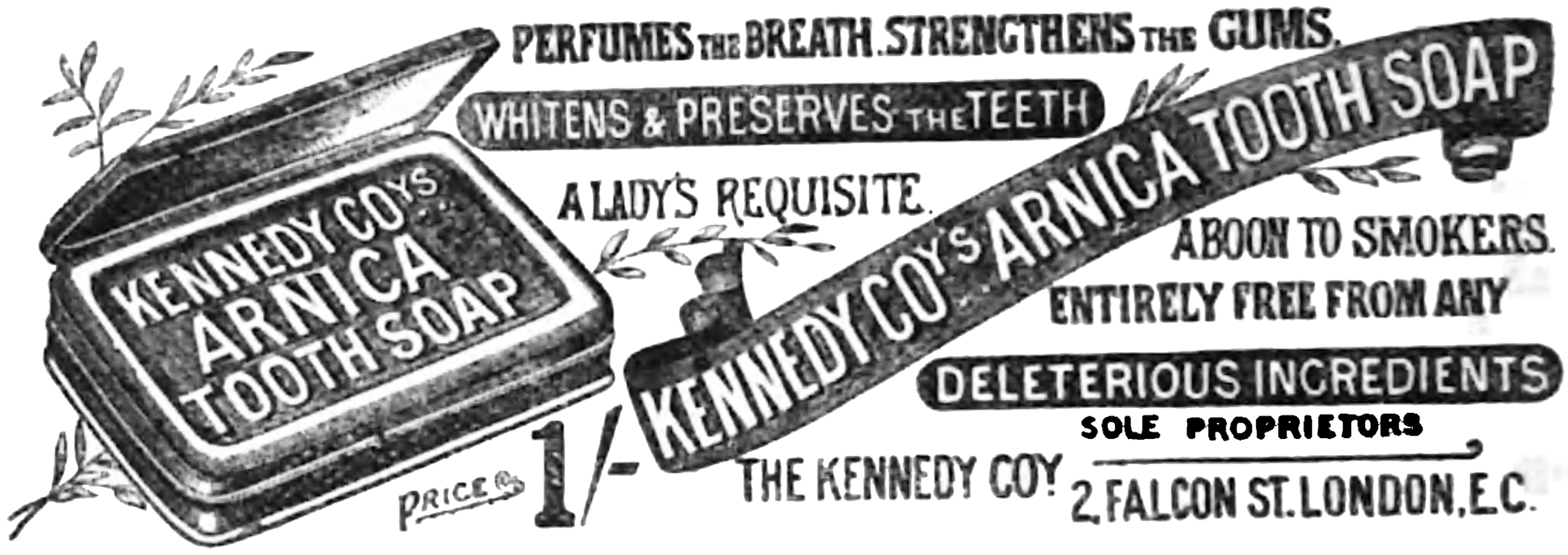

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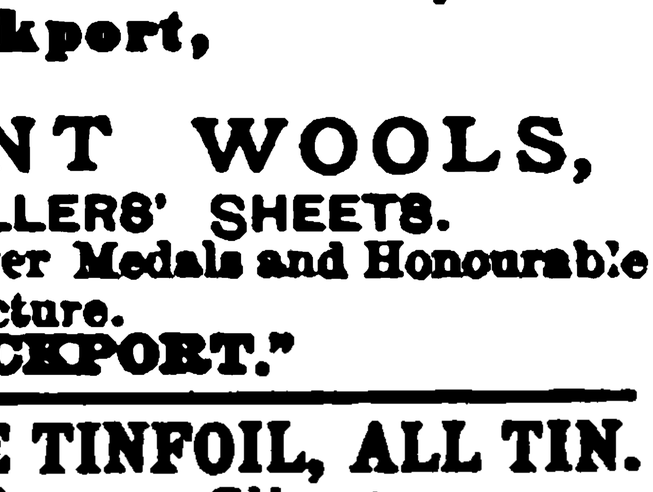

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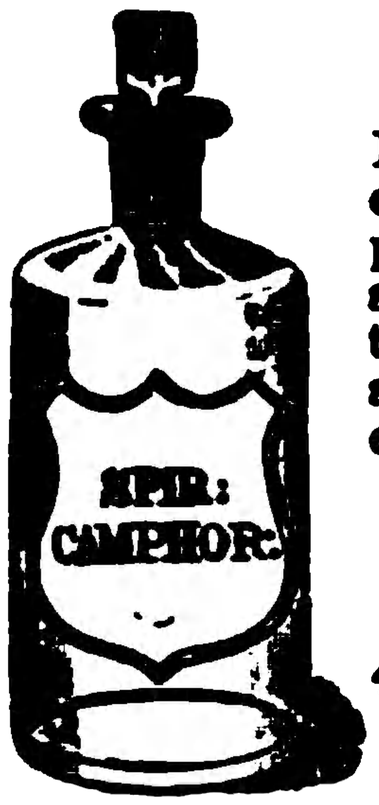

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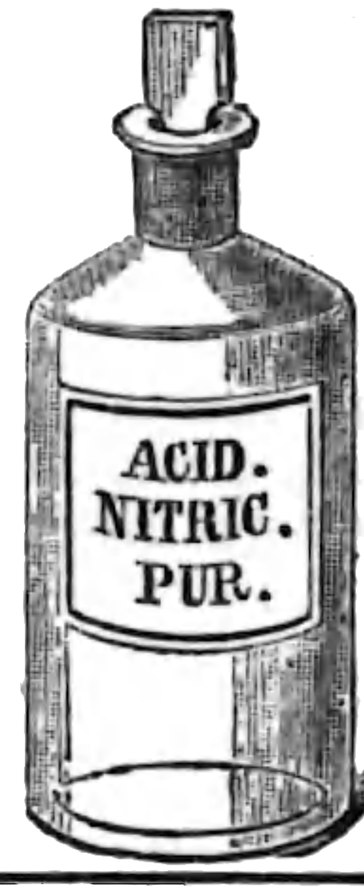

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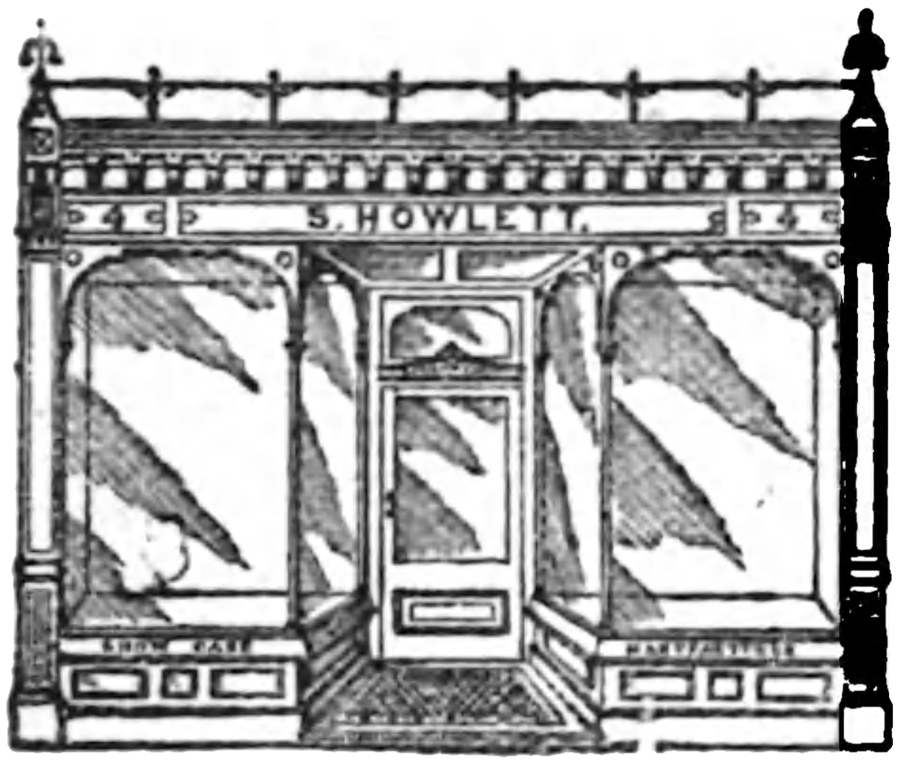

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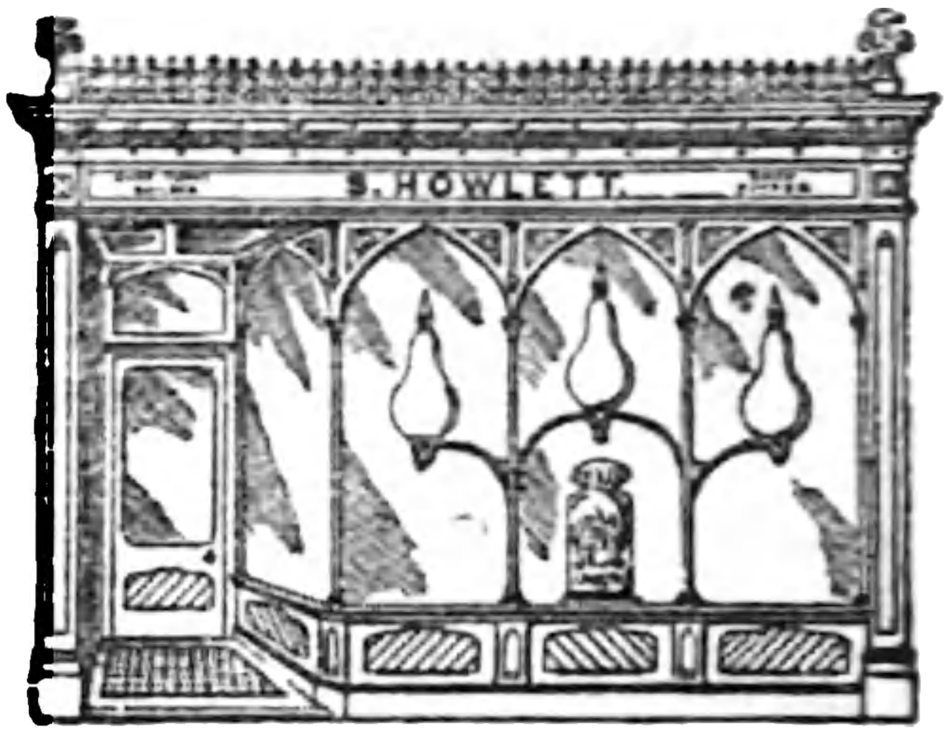

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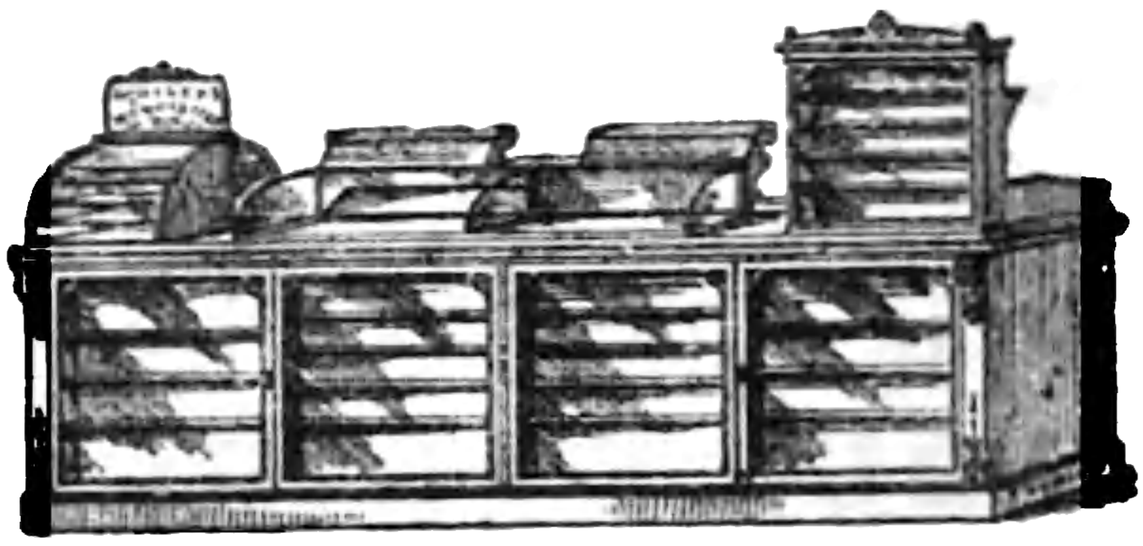

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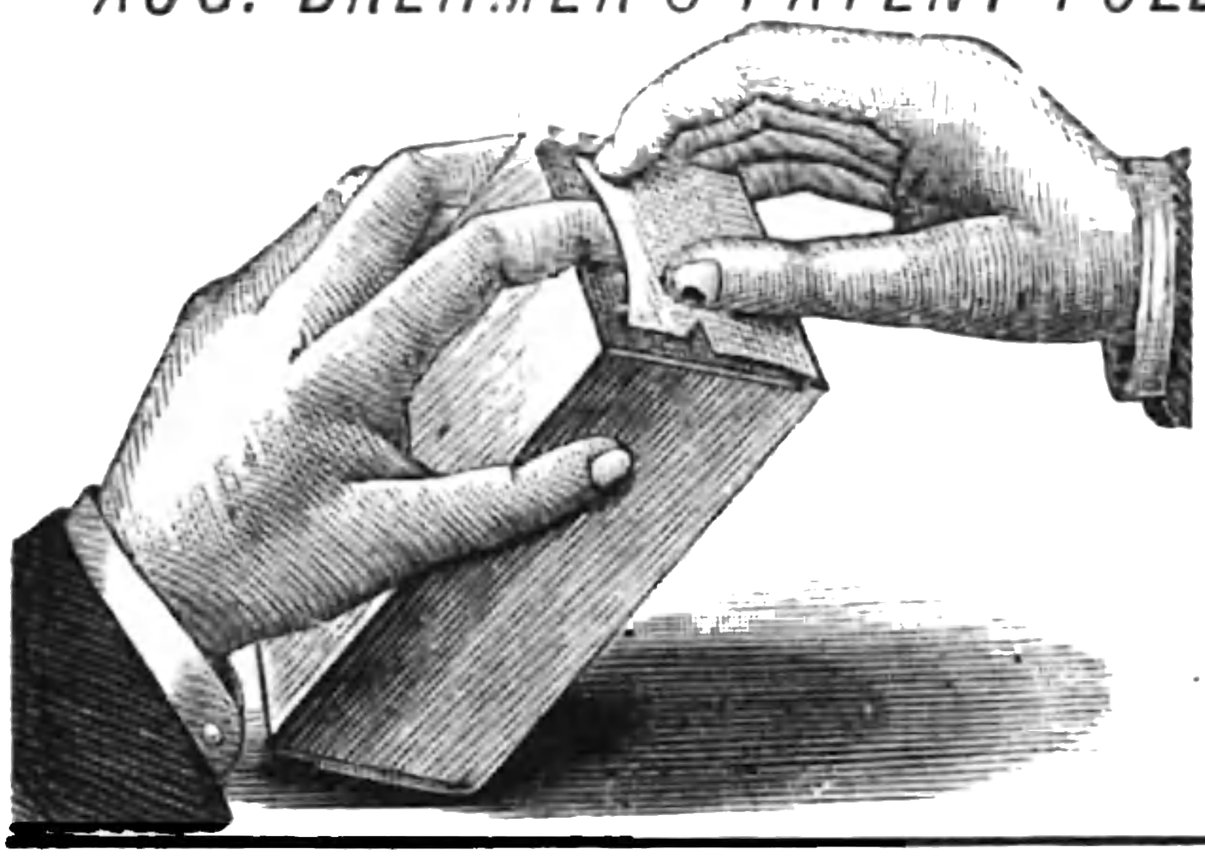

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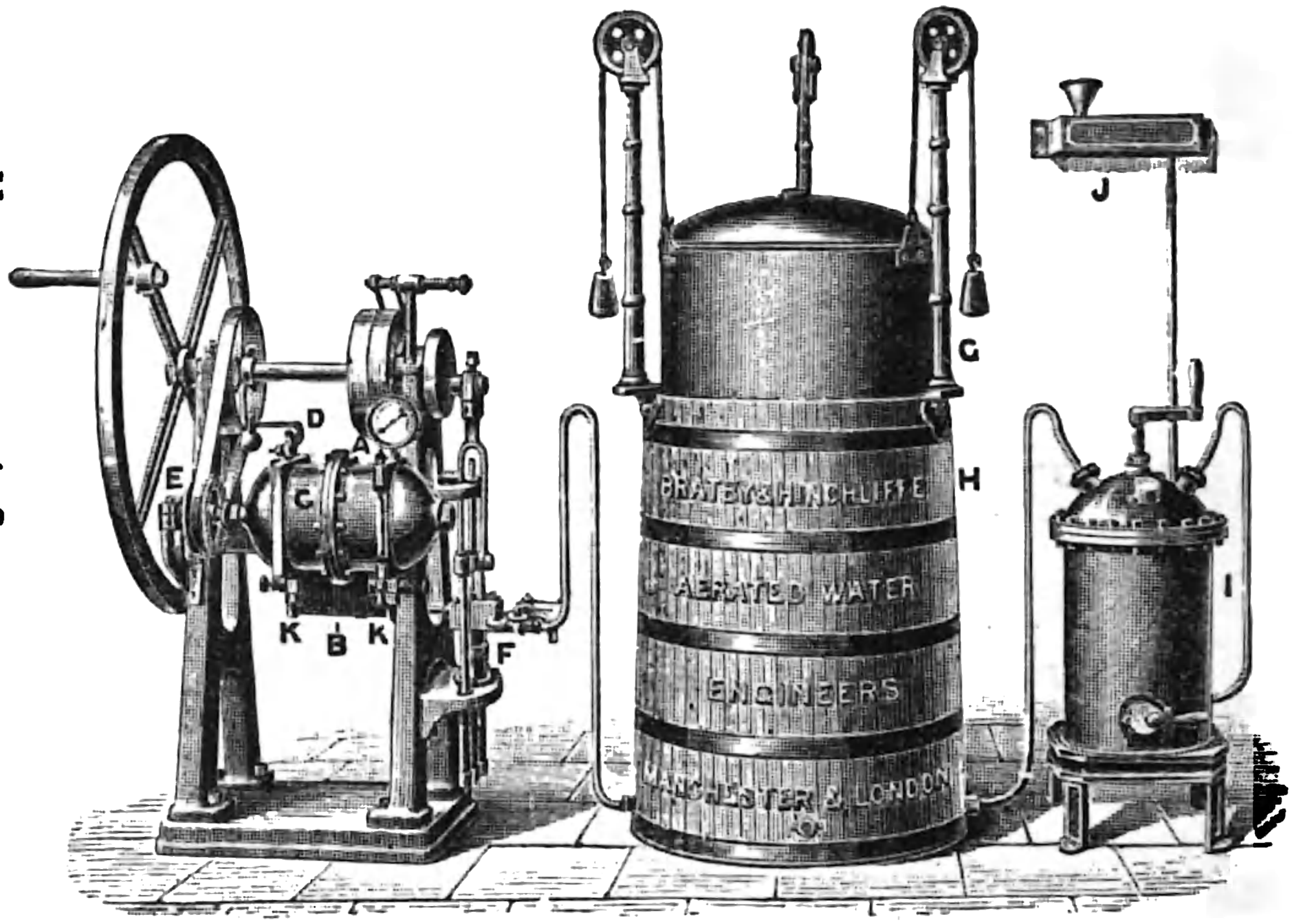

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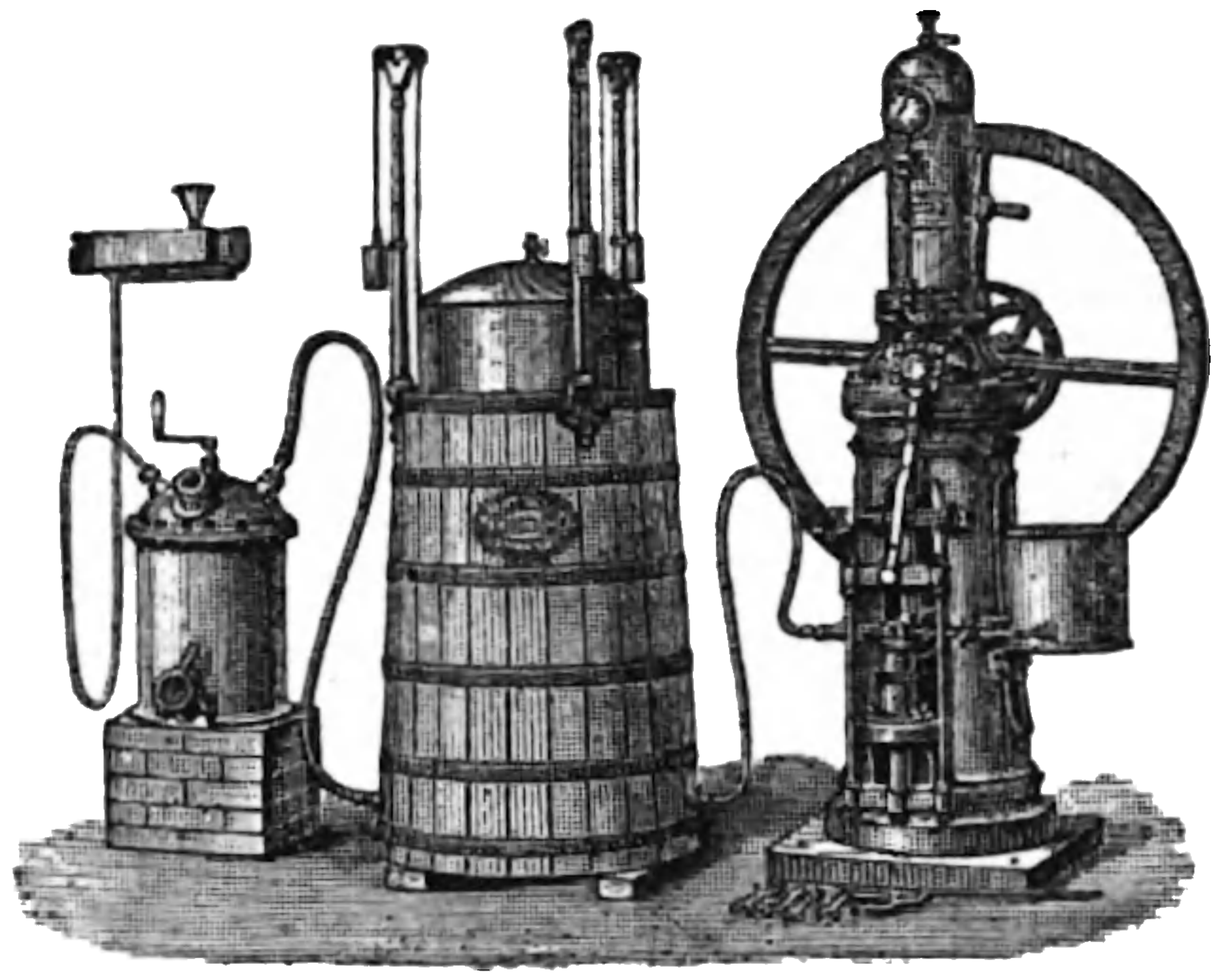

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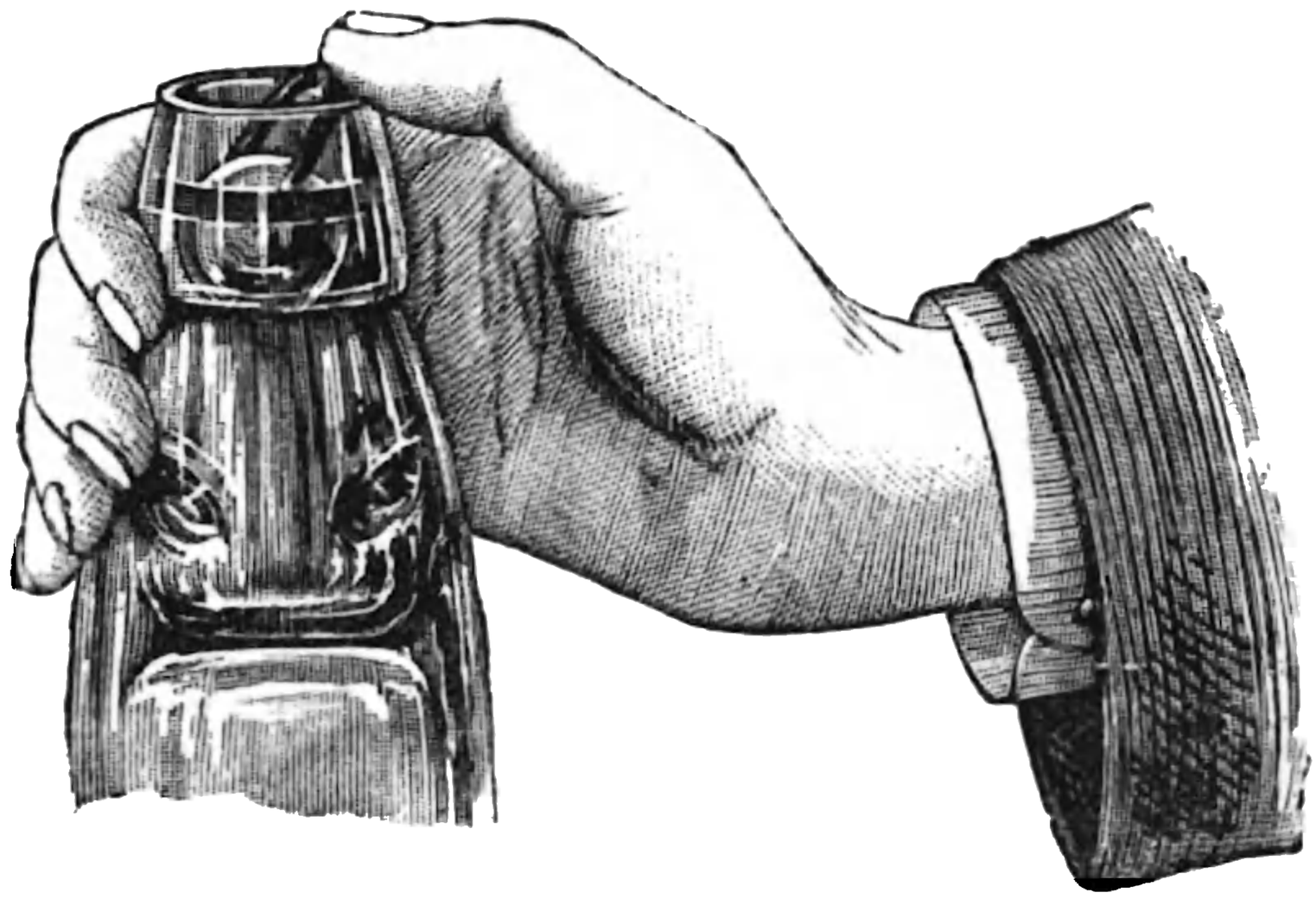
THE MOST PERFECT BOTTLE EVER INTRODUCED.
Those who use patent bottles should see they are fitted with their own opener.



OPENING WITH THE THUMB.

To open, push the wire opener from one side of the bottle neck to the other.

By means of this simple but unique invention a child can open a bottle of highly charged soda water without fear of bottle bursting or the contents splashing over Can be fixed into bottles very rapidly, and makes a permanent fixture of itself and ring also. The "Attached Opener" ready for fixing to bottles already in use, 3/- per Gross.

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EUGENE GERAUT & CO.,

PATENTEES AND MANUFACTURERS OF

SODA-WATER MACHINES,

Filling Machines, Syphons, Seltzogenes, etc.

SYPHONS

In White, Amber, Blue, or Green Bottles. Made of Pure English Block Tin. Tops warranted free from Lead. Will retain their brilliant polish.

WHOLESALE PRICES ON APPLICATION.

Customer's Name Stamped on the Metal Tops free for One Gross.

Names and Trade Marks Ornamentally Engraved on the Bottles by the Acid Process, from ½d. to 1½d. each extra. Each Syphon thoroughly tested before being sent out.

SAMPLES SENT ON APPLICATION.

SODA-WATER MACHINERY, GENERATORS, WASHING VESSELS, AND GASOMETERS.

From £40 to £120 (See our Catalogue).

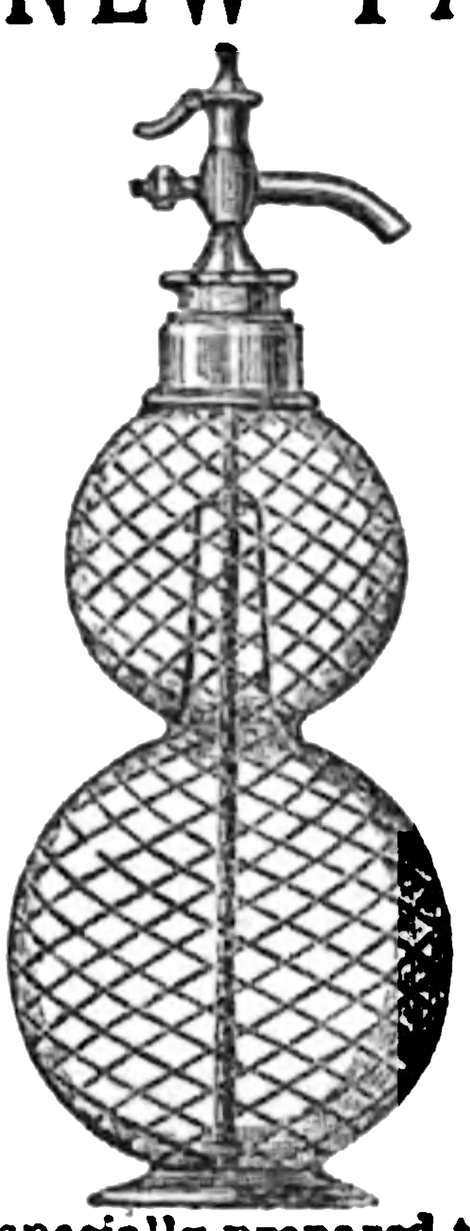
Reduced Prices.

	£	s.	d.
Syphon Filler			
Ditto, with Syruping Machine combined			
Bottling and Corking Machine			
Ditto, with Syrup Dosing Machine combined			

GUN METAL SYRINGE.

Strongly Silver-plated, for introducing Syrup into Syphons.

EUGENE GERAUT & CO.'S
NEW PATENT LEVER SELTZOGENES.



For the immediate production of Eau de Vichy, Soda Water, Sparkling Lemonade and Aërated Waters.

REDUCED WHOLESALE PRICES

Will be sent on Application.

	s.	d.		s.	d.
Three pint, wire			Three pint, cane		
Five pint, do.			Five pint, do.		
Eight pint, do.			Eight pint, do.		

Silver-Plated Tops.

Powders for the above: 12 charges. Per dozen boxes.

Three-pint size, in handsome labelled boxes	Reduced Prices on Application.
Five-pint ditto ditto	
Eight-pint ditto ditto	

LIBERAL DISCOUNT.

Our well-known Seltzogenes are improved yearly, and have already stood a public test of upwards of Twenty Years, and are acknowledged as the VERY BEST.

Best SYRUPS, warranted to be made of the choicest and finest fruits, specially prepared to be used with our celebrated Seltzogenes, are supplied by us.

Illustrated Catalogue on Application.

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"THE QUEEN OF TABLE WATERS."

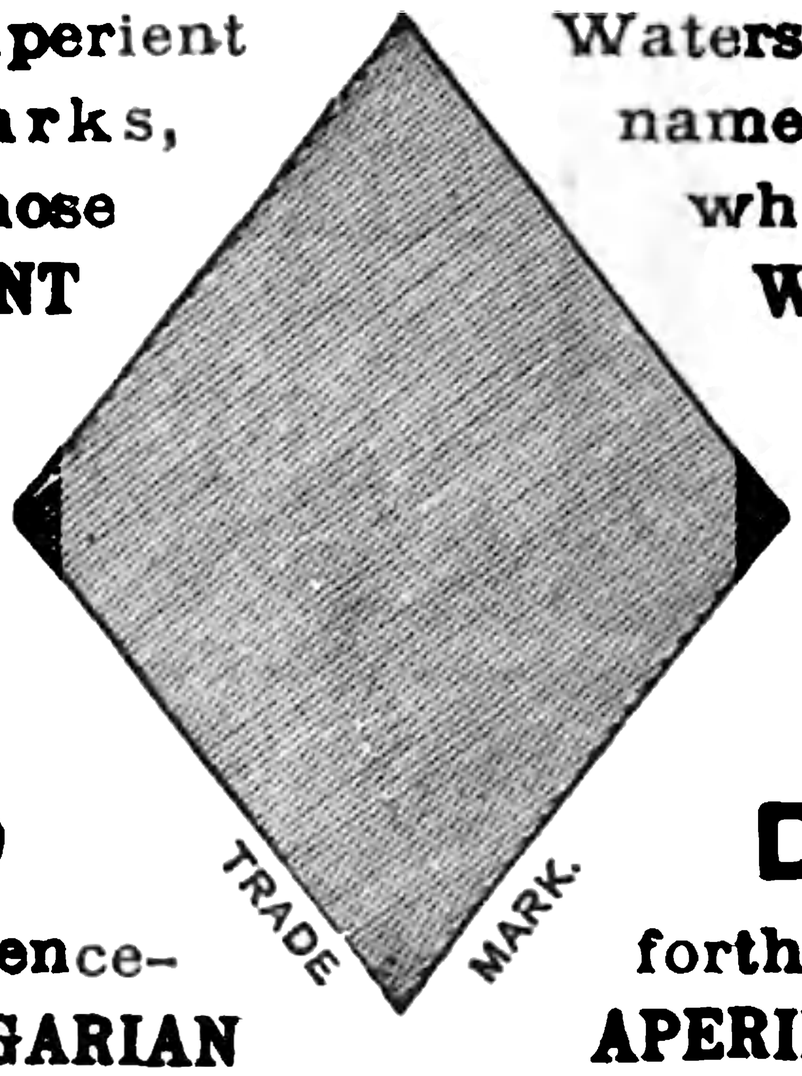
The filling at the Apollinaris Spring during the year 1889 amounted to **15,822,000** *bottles.*

"The annual consumption of this favourite beverage affords a striking proof of the widespread demand which exists for table water of absolute purity, and it is satisfactory to find that wherever one travels, in either hemisphere, it is to be met with; it is ubiquitous, and should now be known as the cosmopolitan table water. 'Quod ab omnibus quod ubique.'"

—*British Medical Journal.*

THE BEST NATURAL APERIENT.

THE APOLLINARIS CO., LIMITED, London, beg to announce that as numerous Aperient Waters are offered to the Public, with marks, names, and designations very similar to those which are used for the **HUNGARIAN APERIENT WATER** so long imported by them, they have now adopted an additional label of their own, comprising their Registered Trade Mark of Selection, which consists of



A RED DIAMOND.

This label will henceforth also serve to distinguish the **HUNGARIAN APERIENT WATER** sold by the Company from all other Aperient Waters.

DEMAND THE DIAMOND MARK,

And insist upon receiving the Hungarian Aperient Water of the Apollinaris Company, Limited, London.

Of all Chemists and Mineral Water Dealers.

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