

AMERICAN JOURNAL OF PHARMACY
Volume 55, #7, July, 1883

Botanical Medicine Monographs and Sundry

SOME FACTS CONCERNING FILTRATION.

BY CHARLES SYMES.¹

The process of percolation has engaged so much attention of late years that it is not surprising to find the less important, although kindred one, filtration, somewhat neglected. It may be thought that all has been accomplished that could reasonably be desired for rendering this operation as complete as it can be, or that it is too simple to merit much consideration. Be this as it may, practical pharmacists know quite well that they are not unfrequently troubled to conduct it to their entire satisfaction.

The more serious difficulties connected therewith do not perhaps occur to each individual very often, hence the danger that the experience gained on one occasion is overlooked or not made available when circumstances again arise for its application.

The subject seems naturally to divide itself under three heads, viz.: The liquid to be filtered, the medium through which it is to pass, and the form in which that medium is presented. As it is not intended, however, to make these notes exhaustive, it will be unnecessary to deal with it in precisely this order. Let us rather take some facts as they occur and see if we can by their consideration render available anything of practical value for every-day use.

The most simple operation of this kind is to filter through paper in small quantity a liquid containing a solid body for which it has no affinity.

Text-books tell us at the outset that it is very necessary to use a funnel, the sides of which form an angle of 60°, this being the angle formed by the folded paper. Now I take exception to this very exacting requirement. We do not get our straining bags or percolators made of such a shape, and that because our experience teaches us how much more suitable is a form in which the angle is decidedly more acute; the same volume of liquid in this latter form producing a longer column, and consequently a greater downward pressure. Then, as to the paper fitting the funnel; we know quite well that all else being equal, the less perfectly it fits, the more rapidly filtration proceeds, so that, for any useful purpose it is quite unnecessary to insist on this very orthodox shape. One has, say, a pint of fluid to filter, and for this purpose a funnel of about 8 ozs. or 10 ozs. capacity is taken. I would use one of the long French pattern, fold the filter in plaits and before opening it out, place it fairly well down in its position in the funnel; or if there were reasons for not plaiting the filter, then it should be folded first in half, and then the two outer portions, representing rather more than one-eighth each of the entire paper, should be turned back so as to overlap each other slightly at the top, and not to form a very acute point. In either case, the paper whilst

¹ Read before the Liverpool Chemists' Association.

being fairly well supported would have comparatively little surface adhesion, and but small resistance would be offered to the passage of the fluid in any part. Funnels of this shape in much larger sizes can be used with advantage, but it is then desirable to have them ribbed. The ribs of funnels (especially of large ones) to be of any real value should be much deeper than they usually are, and should not run vertically, but spirally. A piece of muslin placed between the paper and funnel not only strengthens and supports the paper, but assists filtration by preventing adhesion; a cone formed of coarse hair cloth is still better. For larger sizes, say of from 4 to 8 pints, it is advantageous to dispense with the funnel altogether, and to use an inverted cone formed of linen or stout calico; the edges being fastened to a wooden hoop, which, resting on a deep earthenware pan, forms an efficient support for the paper, the liquid passing through with equal facility over the entire surface, a suitable cover placed over it excluding the air, and the process goes on under comparatively satisfactory conditions. A self-feeding arrangement can be fitted to this, if it be so desired, in a very simple manner.

When, by exhausting the receiver, atmospheric pressure is brought to bear on the liquid in a funnel, then the latter should be of the orthodox shape, as with it air is less likely to pass; but this requirement militates against the advantages that, such a method would otherwise possess. The point of the filter should be supported by a cone of platinum or zinc, or by a packing of tow or prepared wool.

English paper makers do not appear to have devoted much attention to the production of filters in any variety, and for this reason we derive our supplies chiefly from the continent. It is a well-known fact that holding almost any of the common filters up before a strong light they are seen to be perforated more or less with minute pinholes, so that when in use it is only after these have become filled up that the whole of the solid matter is separated, and the liquid passes through bright. Each time a fresh portion of liquid is added, the disturbance caused thereby is liable to remove some of the particles which are acting as a filling, and if this occurs filtration again becomes imperfect. These filters, although very cheap, do not pay to use if time and convenience are taken into consideration. There is, however, considerable difference in the efficiency of the various kinds of filtering papers, even when free from this defect. The presence of animal matter, as in the gray filter, increases the strength, but diminishes its working capabilities, and the existence of mineral matters therein does the latter, but not the former. The papers specially prepared by Messrs. Schleicher and Schüll are practically free from all extraneous matters, the pulp having been treated with hydrochloric and hydrofluoric acids, etc. They are an example of what can be accomplished in this respect, but at the same time they are too expensive for general pharmaceutical purposes, and, indeed, are only made in comparatively small sizes suitable for analytical work. For operations requiring filters of 7 inches diameter (before folding), the Rhenish papers, No. 595, are, in my opinion, the most suitable; for larger sizes the French stout plaited or plain papers, taken in all their qualities, give the best results. The French also make a papers especially suitable for syrups, thick to support the weight, and yet sufficiently pervious to allow of fairly rapid filtration. I find, however, in very large sizes, a double sheet of Rhenish paper in an inverted case of linen, as already described, answers even better.

Some fabrics, such as swansdown, close textured twilled calico, etc., filter as brightly

as paper does, and may be used for that purpose as distinct from ordinary straining, provided the solid particles separate from the liquid in which they are suspended with ease, but when this is not the case they are of much less value; indeed, with paper as a medium, slimy deposits present considerable difficulty. Pepsin wine, prepared from the fresh, undried pepsin, might be regarded as typical of this class of liquids; the tendency being to choke up the pores of the filter almost immediately the operation commences. In such cases some kind of coarse straining material placed within the paper cone helps materially to obviate the difficulty. Hair cloth and thin coarse flannel answer well for this purpose; they operate by collecting on their rough projecting surfaces the larger proportion of the undissolved slimy matter, without becoming sufficiently choked up to materially impede the progress of the operation.

Succus taraxaci, as expressed from the root and mixed with spirit according to the B. P. instructions, is typical of a class containing a large quantity of starchy matter and where subsidence in a closed vessel previous to filtration is of great service. The liquor from poppy capsules, in the process of preparing syrupus papaveris alb., furnishes us with an example of a liquid containing a large quantity of albuminous matter and mucilage which, when coagulated by spirit, has to be filtered off, and here again subsidence in a closed vessel helps the separation materially. The greater portion of the liquor can, after a time, be poured almost bright into the filter, and the remaining soft mass. can with care be slowly pressed almost dry; the chief difficulty in this latter operation being to press sufficiently slowly to separate the liquid from the solid, and yet not to expose it to the air long enough to lose much spirit by evaporation, as in that case some of the solid portion would be again taken up in imperfect solution.

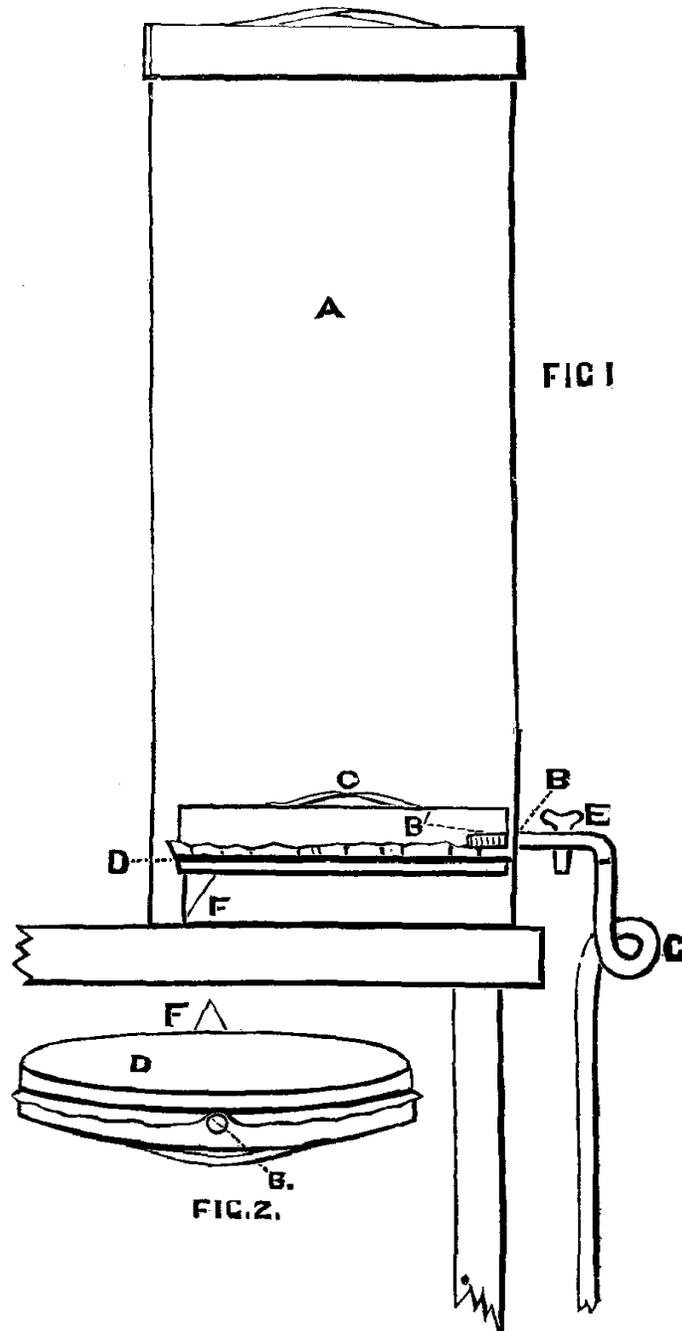
For removing suspended particles from strong acids, spun glass, known as "glass wool," answers best, but this might be regarded as straining rather than filtration. With ordinary liquids, when there is but little insoluble matter, absorbent cotton not only strains, but by fairly tight packing filters brightly. In cases where it is desired to save the deposit, and possibly to dry or incinerate it, asbestos paper can be recommended; the liquid passes through it slowly, but it is very strong, and it is indestructible by heat. Paper lint, as introduced from America some few years ago, answered well as a filtering medium, being both strong and absorbent; but I am not certain whether its manufacture has been continued.

So far we have considered filtration as conducted only in funnels or funnel-shaped arrangements, as the various forms in which atmospheric pressure is commonly employed are described in works which treat of such matters. They are chiefly those in which a long column of liquid is carried above the point of filtration, as in Mr. Proctor's arrangement; where exhaustion is obtained by means of a syringe underneath; or suction by means of a bent tube, as described by Mr. Schacht at the meeting of the Conference at Birmingham in 1865. Recently there has been advertised a "Filtre Rapide," in which the filtering material is placed on a frame or support rising up within the cylinder and forming a space in the centre into which the filtered liquid flows laterally to a receiver below. It is a compact and ingenious arrangement, but I have not any experience from which to speak of its usefulness.

To my mind upward filtration is the direction in which we should work, and from which we may expect the best results.

Some years ago Mr. William R. Warner, of Philadelphia, invented an oil filter on this principle, consisting of two vessels in superposition, measuring altogether about 40 inches in height by 10 inches in diameter, and which is said to be capable of filtering a barrel of oil per day. This, of course would depend on the nature of the oil and the temperature at which it is used.

Recently I have devised a form of upward filter in one vessel only, and have added to it a suction tube. It occupies comparatively little space, is simple in construction, efficient in action, and can be made by any tinman at little cost.



It consists of a plain tin cylindrical vessel (A) with a tap-hole (B) $1\frac{1}{2}$ inch from the bottom; it is 22 inches high and 8 inches diameter. A tin tray (c and Fig. 2), 7 inches in diameter, with a vertical rim 1 inch or $1\frac{1}{4}$ inch deep, has a hole (B') in the rim; this and the hole near the bottom of the cylinder being fitted with a short female screw of the same pitch of thread. Over the tray the filtering material (D) (flannel, calico, paper supported by muslin, or any other

that may be suited to the liquid to be operated on) is tied securely ; it is then inverted and placed in the cylinder so that the holes B and B' are exactly opposite one another. A tap, (E) with a bend at a right angle is screwed in so that it holds the two together and assists a short leg (F) in supporting the tray in position. To the end of the tap is attached an india rubber tube turned on itself (G), or a long glass tube of similar construction (in fact like a large safety funnel deprived of the thistle head), which can be attached by a short piece of rubber tube. It will be obvious that any communication between the tap and the contents of the vessel must be made through the filtering medium which covers the inverted tray, and that any deposition which takes place must be on the bottom of the vessel itself or on the opposite side of the tray, but not on the filtering surface, and herein lies the special advantages of the filter I now introduce. The use of a long delivery tube is not new; it formed part of an oil filter patented by Mr. Britten, of Liverpool, some years before Mr. Schacht's application of it to his filter. Neither is upward filtration new, as already stated; but the combination of the two and in this particular form will, I believe commend itself to any one who will give it a trial.

The dimensions given furnish a filter of about 3 gallons capacity at a cost of some ten or twelve shillings.—Phar. Jour. and Trans., May 19, 1883.

MADDER COLORS.

By A. WURTZ.

This paper is a report drawn tip by Wurtz on a memoir of Rosenstiehl on the coloring matters of the madder root. From this root five separate coloring substances can be extracted: alizarin, purpurin, madder-orange, pseudopurpurin, and purpuroxanthin. The researches of Graebe and Liebermann have fixed the constitution of the two former, whilst Rosenstiehl has studied more especially the three latter substances. He has shown that purpuroxanthin is isomeric with alizarin, and can be converted into purpurin by fusion with potash; and inversely purpurin can be reconverted into purpuroxanthin by the action of reducing agents, but if the action be prolonged, hydropurpuroxanthin is formed. Rosenstiehl has also devised a new method of formation of purpurin. On heating the madder root with sulphurous acid, Kopp obtained a product known as *commercial purpurin*; as this substance is useless for dyeing purposes, it has been customary to heat it to 180° with glycerol to convert it into *solid purpurin*. This rationale, of the process Rosenstiehl has explained; the "commercial purpurin" contains pseudopurpurin, which possesses no tinctorial properties, but is easily decomposed into carbonic anhydride and purpurin; this latter dyes a brilliant madder-red. Rosenstiehl has succeeded in separating the pseudopurpurin, and shows that it is a monocarboxyl-derivative of purpurin, thus:

purpurin, $C_{14}H_5O_2(OH)_3$, pseudopurpurin, $C_{14}H_4O_2(OH)_3COOH$.

This fact has thrown an unexpected light on the practical industry of the madder; for it has long been observed that madder of Avignon gave a more solid dye-stuff than the madder of Alsace.. It is now shown that this fact is due to the greater quantity of lime in the Avignon soil, which serves to eliminate the pseudopurpurin as a lime compound, and prevents it being fixed to the tissue of the root.

It has also been customary in Alsace to add small quantities of chalk to the dye-baths; this also prevents the fixation of the pseudopurpurin which passes into the residues, where it may be decomposed by sulphuric acid and converted into useful purpurin. Rosenstiehl has also studied madder-orange, identical with the munjistin of Stenhouse, and has shown that it is a monocarboxyl-derivative of purpuroxanthin, bearing to it the same relation that pseudopurpurin does to purpurin. These researches also show that the madder-root contains besides alizarin existing as such, three glucosides, viz., one which gives pseudopurpurin or purpurinearboxylic acid, a second which gives alizarin carboxylic acid, and a third which gives munjistin or xanthopurpurincarboxylic acid. The memoir presented to the Academy contains a full account of the various substances obtained from madder, and their physical properties as absorption-spectra.—*Jour. Chem. Soc.* 1883, p. 598; *Compt rend.*, 96, 465-471.

GLEANINGS IN MATERIA MEDICA.

BY THE EDITOR.

Coloring of Cinchona bark with ammonia.—Thomas and Guignard noticed a cinchona bark, the liber fibres of which were of a pale yellow color, while the porous tissue was of a deep red, and which yielded infusions considerably more tinged than the infusion of good cinchona bark. The decoctions of both barks filtered when cold, yielded with Nessler's reagent precipitates, which were white from normal cinchona bark, and brown red from the suspected bark. On treating the two barks with diluted hydrochloric acid, decolorizing with animal charcoal, precipitating with platinic chloride and igniting the precipitates, that obtained from normal bark yielded .174 gm. platinum from 1 gm. of the precipitate, while the one obtained from the suspected bark yielded .220 gm. Pt. The chloroplatinate of cinchonine and isomers gives .178 gm., that of quinine and isomers .168 gm., but the chloroplatinate of ammonium .441 gm. of platinum; the above results, therefore, prove the presence of ammonia. A yellow or pale cinchona bark may be colored red by treatment with ammonia, the tannin being converted into cinchonic red.—*Rép. de Phar.*, 1882, p. 337.

Cinchona succirubra trees in Ceylon that have been "shaved," are infested by a beetle which has been identified as the male of a species of *Lucanus*, greatly resembling the common European stag beetle. The insect appears to pierce the new bark and feed upon the resinous juice which exudes through the wound.—*Phar. Jour. and Trans.*, March 31, 1883. *Trop. Agriculturist*.

The digitalin-group.—The compounds having an action similar to that of digitalin are arranged by Schmiedeberg thus:

I. Crystalline glucosides: 1. *Digitalin*, very sparingly soluble in water; from the leaves and fruit of *Digitalis purpurea*. 2. *Antiarin*, very sparingly soluble in water; from upas antiar, the milkjuice of *Antiaris toxicaria*. 3. *Helleborein*, freely soluble in water; from the root of *Helleborus niger*, *viridis*, and *foetidus*. 4. *Euonymin*, sparingly soluble in water; from *Euonymus atropurpureus*. 5. *Thevetin*, soluble in 124 parts of water; from the seeds of *Thevetia nereifolia* and *Cerbera Odallam*.

II. Not glucosides, in part crystalline: 6. *Digitoxin*, quite insoluble in water; from the leaves of *Digitalis purpurea*. 7. *Strophantin*, soluble in water; in the Kombé arrow poison of West Africa, from *Strophantus hispidus*. 8. *Apocynin*, almost insoluble in water; from the root of *Apocynum cannabinum*.

III. Glucosides not crystallizable, very sparingly soluble in water: 9. *Scillain*, from the bulb of *Urginea Scilla*. 10. *Adonidin*, from *Adonis vernalis*. 11. *Oleandrin*, from the leaves of *Nerium Oleander*.

IV. Amorphous glucosides, very soluble in water, resembling saponin: 12. *Digitalein*, from the fruit and probably other parts of *Digitalis purpurea*. 13. *Neriin*, probably identical with digitalein, from the leaves of *Nerium Oleander*. 14. *Apocynein*, from the root of *Apocynum cannabinum*. 15. *Convallamarin*, very like digitalein from *Convallaria majalis*.

V. Parts of plants not previously investigated. 16. *Tanghiniavenenifera*, the fruit. 17. *Neriodorin* and *neriodorein*, from the bark of *Nerium odorum*. 18. *Upas of Singapore*, contains, besides a strychnaceous principle, a principle which acts like antiarin.

VI. Substances which besides other actions, possess the action of digitalin: 19. *Erythrophloein*, freely soluble in water; from sassy bark *Erythrophloeum guineense*. 20. *Phrynin*, from the glandular secretion and dried skin of the toad, *Bufo viridis* and *B. cinereus*.—*London Med. Record*.

Minjak-Lagam or *Lagam-Balsam*, according to Dr. De Vrij, was first introduced into Rotterdam in 1854, from Padang in Sumatra. It closely resembles copaiba in appearance, and yields a considerable amount of levogyre volatile oil boiling between 245° and 252°C, the boiling point rising finally to 290°. The resin is dextrogyre and on treatment with nitric acid yields an uncrystallizable very bitter substance. The plant from which it is derived is unknown; it appears that the oleoresin varies somewhat in its properties.

G. Haussner examined a lagam-balsam, which was a thick liquid, of a peculiar aromatic odor and a bitterish, lastingly acrid taste. In reflected light it was of a dingy green, in transmitted light yellowish and transparent; its solutions were likewise fluorescent. It was readily and completely soluble in alcohol, ether, benzol, chloroform, and carbon disulphide. Mixed with strong sulphuric acid, sulphurous acid was given off and the color changed to purplish red, brown, and black. On distillation with water

about 33 per ct. of volatile oil was obtained, which on rectification in carbonic acid gas, boiled between 249° and 251°, was colorless, levogyre 9.9°, and possessed a not disagreeable aromatic odor and burning taste; on oxidation it became yellow. From the ultimate analysis and the density of its vapor, its composition was determined to be $C_{20}H_{32}$. A crystalline compound of the formula $C_{20}H_{32}4HCl$ was obtained on treating the oil with dry hydrochloric acid gas.

The resin was inodorous, hard, yellow, soluble in alcohol and ether. A portion of it is soluble in potassa solution and yields a copper salt having the formula $C_7H_{12}O_3Cu$. The portion insoluble in alkali was treated with melted potassium hydrate, when butyric, acetic, and formic acids were obtained; also phenols or aromatic acids which could not be determined for want of material.

Minjak-lagam balsam evidently shows considerable analogy to both copaiba and gurjun balsam, and differs from the latter mainly by the resin-acid, which could not be crystallized.—*Archiv d. Phar.*, April, 1883, 241-255.

The active principle of Piscidia Erythrina or Jamaica dogwood, has been isolated by Edward Hart. A pound of the fluid extract was well mixed with 30 grams of quicklime previously made into a thick paste with water; after digesting for half an hour the liquid was filtered, and water was added to the filtrate until it became slightly turbid; after 2 or 3 days crystals of the principle, for which the name piscidin is proposed, separated accompanied with resinous substance. By adding more water a second crop of crystals still more impure can be separated. The crystals are purified by recrystallization from alcohol. The resinous matter precipitated by water retains a small portion of piscidin, of which, the author thinks a pound of the fluid extract contains about one gram.

Elementary analysis led to the formula $C_{29}H_{24}O_8$. Piscidin crystallizes in nearly colorless prisms, melts at 192°C., is insoluble in water, slightly soluble in cold, much more in boiling alcohol, slightly soluble in ether, easily soluble in benzene and chloroform. It dissolves in cold concentrated hydrochloric acid, and is reprecipitated apparently unchanged, by dilution with water. It dissolves in cold sulphuric acid, and separates again by addition of water, but it dissolves no longer easily in alcohol. Boiling with acids causes no separation of sugar. The alcoholic solution is neutral to testpaper, and not precipitated by acetate of lead.—*Amer. Chem. Jour.*, April, 1883, 39.

The coloring matter of black grapes and red wine, according to E. J. Maumené, is produced by the oxidation and probably hydration of a colorless compound. When the berries just beginning to turn red are placed in a vacuum over sulphuric acid, the color changes to yellow, but on admitting moisture and oxygen, both are rapidly absorbed and the color changes to blue-black.—*Compt. Rend.*, xcv., 925.

Cannabine Tannate is highly recommended by Fronmüller as a mild and efficient hypnotic, which leaves no symptoms of intoxication and does not produce constipation, but like opium. it must be given in increased doses when used for some time. It is described as a yellowish brown powder, insoluble in water and ether, scarcely soluble in alcohol, of a not unpleasant odor and of a bitterish astringent

taste; under the microscope it is seen to form amorphous pointed plates. The process for its preparation is not given, but is said to be tedious and difficult owing to its ready decomposition; but it is stated to be permanent and not to lose its activity after being mixed with sugar.

On distilling hemp with water a volatile oil is obtained, consisting of cannabene and cannabene hydride, the latter being poisonous and of an unpleasant odor and taste; it is not a constituent of the cannabine tannate.—*Archiv d. Phar.*, Jan., 1883, p. 51, *Memorabilien*.

Mesembrianthemum crystallinum.—H. Mangon found in the dried leaves of the ice plant 43 per cent. of salts of potassium and sodium, and calculates that a hectare would be capable of yielding 863 kilos of potassium carbonate.—*Ibid.*, xcvi, 80.

Ledum palustre.—The crystalline stearopten from the volatile oil of this plant was obtained by Grassmann (1831) and farther examined by Trapp (1869) and Ivanov (1876), who obtained different results as to its composition. Hjelt and Collan have recently prepared this ledum camphor and obtained from plants grown in comparatively dry soil only a minute quantity of it and no volatile oil, while the fresh plant from wet localities yielded .7 per cent. of oil, including camphor. The latter recrystallized from alcohol is nearly inodorous and its ultimate analysis lead to the formula $C_{24}H_{44}O_2$, which comes near that ascertained by Trapp. The camphor melts at $101^{\circ}C.$, and crystallizes well from benzol, also by sublimation, when it is obtained in long white needles. —*Berichte*, 1882, p. 2500.

Mustard oil in the seeds of Cruciferae.—V. Dirks determined the following percentage quantities of mustard oil: black mustard seed-cake, 1.39 ; rapeseed from .018 to .037; rape-seed cake, .020 to .109 ; yellow mustard seed-cake, .018; turnip seed, .038; seeds of *Sinapis arvensis* .006. The quantity of oil decreases apparently with the age of the rape seed-cake, but whether this is due to a decomposition of the ferment or of the myrosin, the author is still engaged in determining.—*Jour. Chem. Soc.*, 1883, p. 245, 246. *Landw. Vers. Stat.*, xxviii, 179-200.

Ivy berries.—The fleshy part of the fruit contains, according to A. Jandous, 70 per cent. of water; a dark red coloring matter soluble in alcohol and water, turned greenish by ammonia and light red by hydrochloric acid; a greenish yellow resinous matter, sweet at first, but afterwards sharp and bitter; also grape sugar, gum, albumin and mineral matters. The seeds contain albumin, inorganic matter and a fat oil with a characteristic herbaceous and-irritating taste, precipitated by lead acetate, and slightly by lime water, and colored green by ferric chloride. The poisonous properties of the fruit are neither due to the resinous matter in the pulp, nor to the oil in the seeds.—*Ibid.*, 499. *Chem. Centr.*, 1882, p. 806.

The leaves of Fraxinus excelsior, Lin.—W. Gintl and F. Reinitzer found in the aqueous decoction of these leaves calcium malate and tannin, with smaller quantities of mannite and inosite, and still smaller quantities of quercitrin, dextrose, gum, and free malic acid. Fraxitanic acid is amorphous, yellow-brown, brittle, in powder golden yellow, deliquescent to a yellow-brown shining mass. It is insoluble in benzene, chloroform, and anhydrous ether, readily soluble in alcohol, acetic acid, ethyl acetate,

and water, and precipitated from the latter solution, like other tannins, on saturation with common salt, but not by tartar emetic. Lead acetate gives a fine golden yellow precipitate easily soluble in acetic acid, becoming brown-green on exposure to the air and at the same time less soluble in acetic acid. Ferric chloride causes a brown-green color and precipitate, changing to blood-red by alkaline hydroxide, carbonate, or acid carbonate, the colors becoming dingy on exposure. Mercuric chloride causes a slight precipitate of calomel; warming it with alkaline cupric solution throws down cuprous oxide; heated with dilute acids or baryta water, no glucose is yielded. Dried in a vacuum at ordinary temperature its composition is $C_{13}H_{16}O_7$, and after heating to $100^{\circ}C.$ in a stream of carbonic anhydride $C_{26}H_{30}O_{12}$, this anhydride being only slightly soluble in hot water.

A minute quantity of volatile oil was obtained, which had a strong and very pleasant odor like that of syringa flowers; it boiled at $175^{\circ}C.$ and had the Composition $C_{10}H_{20}O_2$.—*Jour. Chem. Soc.*, 1883, p. 216-219. *Monatsh. Chem.* iii, 745-762.

Constituents of Turmeric.—Jackson and Menke have continued their investigations on curcumin (see *Amer. Jour. Phar.*, 1882, p. 388) and studied the products obtained by the action of nascent hydrogen and bromine. Oil of turmeric was obtained by light petroleum and purified by fractional distillation under diminished pressure; the fraction boiling below $193^{\circ}C.$, consisted of turmerol and petroleum hydrocarbons and the second fraction of turmerol, $C_{19}H_{28}O$; a viscous semi-solid residue was left. Turmerol is pale yellow, of a pleasant aromatic odor, spec. grav. .9016 at $17^{\circ}C.$, dextrogyrate, readily soluble in the ordinary solvents except water, and boils under ordinary pressure at $285-290^{\circ}C.$, but decomposes at the same time. It is an alcohol, and by action of a hot solution of potassium permanganate in excess is oxidized to terephthalic acid.—*Amer. Chem. Jour.*, iv, 360-374.

Oil of Erechthites consists, according to F. Beilstein and E. Wiegand, almost exclusively of terpenes, boiling between 175° and $310^{\circ}F.$

Oil of Erigeron canadense contains mainly a terpene $C_{10}H_{16}$ which after distillation over sodium, boils at $176^{\circ}C.$, has the spec. grav. .8464 at $18^{\circ}C.$, and forms a crystalline dihydrochloride $C_{10}H_{16}\cdot 2HCl$, which melts at 47 to $48^{\circ}C.$

Oil of Marjoram.—The first fractions are a terpene $C_{10}H_{16}$, boiling at 178° , of spec. grav. .8463 at $18.5^{\circ}C.$, and forming a liquid monohydrochloride. The fraction boiling between 200° and $220^{\circ}C.$, has the composition $C_{15}H_{16}O$, and is not affected by long continued boiling with metallic sodium.—*Berichle*, 1882, p. 2854.

The protein compounds of milk.—The statement made by Kemmerich, concerning the formation of casein from albumin, led Schmidt-Muehlheim to undertake a series of experiments, the result of which was that on digesting fresh milk at $40^{\circ}C.$ ($104^{\circ}F.$) for from 6 to 24 hours, albumin was not changed in the least, but casein decreased in quantity, on an average 4.17 per cent. in 6 hours, 9.45 per cent. in 8 hours, and 16.5 per cent. in 24 hours. This casein was converted into peptone, the increase of which over that contained normally in milk was proven colorimetrically by cupric sulphate and comparison with peptone solution of known strength. In order to obtain the

peptone in a suitable condition for this examination, it was found necessary to remove the albuminoids not by boiling, but by precipitation in the cold by means of table salt and acetic acid; and the milk sugar by precipitating the peptone with phosphotungstic acid and dissolving the precipitate in caustic soda. Fresh milk contains between .08 and .19 per cent. of peptone, which by digestion was increased to .33 per cent.

The conversion into peptone ceases after boiling the milk, but is not interfered with by the addition of salicylic or carbolic acid.—*Chem. Cent. Bl.*, 1883, p. 246. *Pflüg. Archiv.*

The Effect of Chemicals on the reaction of Diastase upon Starch has been studied by Professor W. Detmer, who observed that the conversion of starch is greatly accelerated by the presence of carbonic acid. Minute quantities of citric acid (.0001 to .005 gm. added to 25 cc. of 1 per cent. starch paste and 5 cc. malt infusion) have likewise an accelerating effect, increasing with the amount of acid, until a certain percentage is reached beyond which the process becomes more sluggish, and by still larger amounts of acid is entirely suspended. Analogous effects were likewise observed with phosphoric and hydrochloric acid; but a relatively large proportion of carbolic acid may be added, without materially affecting the formation of sugar, which is prevented, however, by an excess of the compound mentioned. An extremely faint alkaline reaction diminishes the conversion of starch, and a few drops of concentrated solution of potassa prevents it entirely; but in the presence of a large proportion of starch paste and at an elevated summer temperature, the mixture often acquires an acid reaction through the influence of numerous schizomycetes. The chemicals mentioned above, without the presence of diastase, do not produce the conversion of starch in the same time in which the ferment effects it completely.

A very convenient test for ascertaining the progress of this process is found in the behavior of iodine solution, which colors unaltered starch paste, blue; but as the conversion into sugar proceeds, the addition of iodine will successively cause a violet, dark red, yellowish red, and finally, scarcely any coloration.—*Zeitschr. Physiol. Chem.* vii. 1-6. (See, also, *Am. Jour. Phar.*, 1883, 292-296.)