[*From the* Pharmaceutical Journal *for* March, 1860].

PART II.

THE DESCRIPTION, COMPOSITION, AND PREPARATIONS OF THE SANGUINARIA CANADENSIS.

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In another place* I have been at some pains to show the value of the sanguinaria, or Canadian blood-root, in many internal diseases, of which those of the chest and throat are the most important. From the evidence which has been brought forward to prove its value in these, there is no doubt that the drug will become extensively employed in this country. The pages of the *Pharmaceutical Journal* have appeared to me the fittest place for a description of the root, its composition, and of the various preparations employed medicinally.

The plant belongs to the sexual system Polyandria Monogynia, and the natural order Papaveraceæ.

DESCRIPTION.

The only officinal part of this hardy little herbaceous perennial plant is the root.

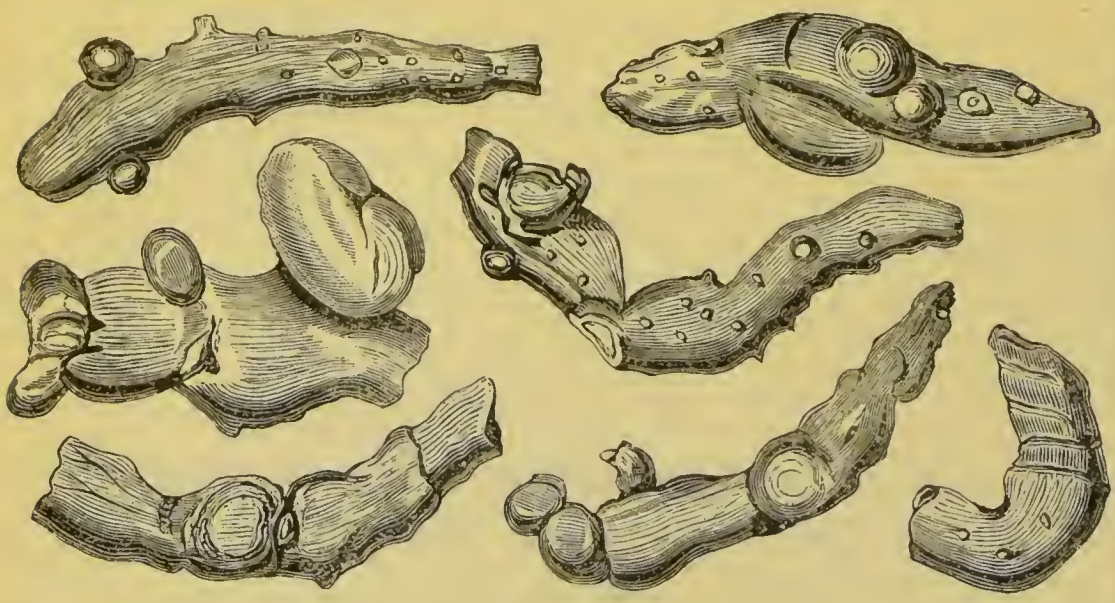
The Root.—When *fresh*, it is from two to three and a half and four inches long, abrupt at the end, often contorted and truncated, about as thick as the finger, fleshy, round, being for the most part tolerably stout in the middle, with a curvature at each end, covered with orange fibres two or more inches long, of a reddish brown colour externally, inclining to copper, of a brighter blood-red within, and abounding in an orange-coloured juice, which escapes when it is cut. The end always has the appearance of having been cut off by a dull instrument, or broken in removing it from the ground. Occasionally a number of roots are connected together, principally by no closer attachment than that produced by a fasciculation of numerous fibres originating from the main body.

When *dried*, it has considerably shrunken; and, as met with in commerce, is in pieces from one to three inches long,† from a quarter to half an inch or more in thickness, flattened, heavy, much wrinkled and twisted, often furnished with abrupt offsets or knobs and many short radical fibres, externally a darker reddish-brown colour, with a spongy, uneven fracture when broken, the surface of which is at first bright orange, deepest in the centre, but becomes of a dull brown by long exposure.

* See *British Medical Journal*, page 104.

† A few reach the length of four inches.

The form and dimensions of the dried root, as usually met with, are represented in the woodcuts.



There is but the one kind only of blood-root employed in commerce, and it is met with unadulterated, there being no inducement to practise fraud, from its cheapness and abundant growth. A few extraneous but unimportant matters are sometimes found with the dried roots. Two packages of the dried root sent me by my friend Dr. Fenwick, obtained from Lyman, Savage, and Co., druggists, of Montreal, contained eight pounds each, and were put up in oblong deal boxes, with a sliding lid, and were perfectly air-tight.

The odour of the root is peculiar and somewhat narcotic, and on handling it, causes sneezing; the taste is bitterish, acrid, and durable. The sneezing effect is also produced by stirring the powder. It yields its virtues to water and alcohol, and these will be found to be the greatest when the seeds are ripe, about the months of May and June, which are the best time to collect the plant for medicinal purposes. The virtues of the root are said to be rapidly deteriorated by time; some difference of opinion, however, exists on this point.

The *powdered root* possesses a brighter brownish orange-red colour than powdered cinnamon, and otherwise resembles it.

The *seeds* are about the size of grains of barley, of a dark shiny reddish brown colour, half surrounded with a peculiar white vermiform appendage, which projects at the lower end. Like most other seeds of the poppy tribe, the albumen of the seeds of this plant is between fleshy and oily. A bland and nutritious colourless fixed oil is obtained from the seeds, which, as already mentioned, ripen in the months of May and June, or even much earlier in the southern states of America.

The *juice* of the plant, generally of an orange colour, sometimes assumes the tint and redness of blood, especially in the northern parts of Canada. That obtained from the leaves is of a lighter tint. Both stain a deep orange yellow, and hence its use as a dye, as described in the economical uses of the plant further on.

The juice, when examined under the *microscope*, presents numerous transparent globules, like those represented in milk, and multitudes of coloured granules, free and in clusters; this is at 300 diameters. With a higher power than this, the likeness to the globules of milk is even more distinct, as they are varied in size, and are equally as numerous as in rich milk. With a still higher power of 740 diameters, the fluid is seen to be in a state of life, as multitudes of

transparent monads, moving to and fro, give the most active appearance to all the objects on the field, a peculiarity I have only observed in freshly drawn milk taken from the female breast, which has undergone saccharine fermentation within the gland. Many of the globules of the juice filled cells, which contained as many as fifteen or twenty, thus resembling a compound granular corpusele.

The greater part of the globules and granules were dissolved by ether, and rendered thinner and more transparent by liquor potassæ. Acetic acid dissolved a good deal of the granular matter. The action of a number of reagents, such as the acids, ammonia, &c., did not produce any of the salts of sanguinarina, although the condition of the peculiar resin was slightly altered in its molecular cohesion.

A horizontal section of the fresh root is probably one of the most beautiful objects under the microscope to be met with in the whole vegetable kingdom. It is found to consist of a multitude of cells of more or less uniform diameter throughout its central part, of a somewhat oval and hexagonal form, and filled with three different substances. The first of these is the orange-coloured resin peculiar to the plant, which occupies the larger proportion of the cells, presenting the most beautiful shades of transparent amber. The second is a substance, occupying the cells here and there, of a magnificent transparent garnet hue, resembling dots of true garnet scattered over the field, with lateral facets, like a precious stone: this is probably the most remarkable peculiarity connected with this wonderful plant, and I believe these garnet bodies to represent the sanguinarina; whilst the third substance is white and transparent, occupying even fewer cells than the last named, but consisting of a colourless fixed oil, peculiar to the plant itself.

COMPOSITION.

The root, the leaves, and the seeds have been submitted to chemical analysis by several American physicians; these, however, were not complete, and did not all agree with one another.

Dr. Downey, of Maryland, who wrote an inaugural dissertation upon it in 1803, considered the proximate principles of the plant to be *resin*, *gum*, and an *extractive* or *saponaceous matter*, the gum being the greatest in quantity, and containing the active principle of the plant. Dr. Bigelow, on the other hand, who examined the root chemically in 1816, found neither gum nor extract present, but a *peculiar resin* of a deep orange colour, a *bitter principle*, an *acrid principle* (residing partly in the resin), *fecula*, and a *fibrous* or *woody portion*. Dr. Fitzgerald Bird, in 1822, published an inaugural dissertation on the root, and gave a more accurate and minute analysis, the steps of which are carefully detailed by him. He found the root to contain: 1. *Cinchonin*; 2. *Extractive matter;* 3. *Gummy material;* 4. *Resin;* and 5. *Gallic acid* in a state of combination. The colouring principle of the root resides chiefly in its resinous parts, as the alcoholic solution is always more than twice as highly coloured as the aqueous. Papers dipped in these solutions receive a bright salmon colour from the tincture, but a very faint one from the aqueous solution.

In 1824, a series of experiments were performed by the late Dr. Dana, of New York, and he discovered a peculiar organic alkali in the root, which he called *sanguinarina*. This alkaloid, no doubt, contains the *active principle* and medical virtues of the plant, and is an acrid white substance, which forms coloured salts with the acids. I have discovered this principle in the leaves, and have no doubt it exists in the seeds also.

The following are the different methods which may be employed to procure this alkaloid, which are here called after the respective chemists, for convenience of description:

Sanguinarina by Dana's Process.—The finely powdered root is to be infused in water acidulated with muriatic or acetic acid, precipitating with ammonia, collecting the precipitated matter, boiling it in water with pure animal charcoal, filtering off

the water, treating the residue left upon the filter with alcohol, and finally evaporating the alcoholic solution.*

Other methods are described as Dana's, which are of sufficient importance to mention, such as: Digesting the finely powdered root in absolute alcohol, adding to the tincture a solution of ammonia, so long as it occasions any precipitate. A grey powder falls down, which is to be treated as described in the process given above.

The advantage of employing absolute alcohol is that everything soluble is taken up by it. A white pearly or pearl grey substance remains, which is the sanguinarina.

Dr. James Schiel, of St. Louis, Missouri, determined the identity of sanguinarina with chelerythrine, and he gives the following as the simplest process of preparing either alkaloid:

Sanguinarina by Schiel's Process.—Digest the root with water strongly acidulated with sulphuric acid, precipitate with ammonia, wash and dry the precipitate, dissolve it in ether, treat with animal charcoal, filter, and precipitate with sulphuric acid dissolved in ether. A pure sulphate of sanguinarina is thus obtained, which may be decomposed in the ordinary method to obtain the alkaloid.†

Schiel's process has the advantage of both cheapness and simplicity. I have prepared the alkaloid by Dana's and Schiel's methods, and obtained, perhaps, an equal quantity of the alkaloid by each. As the identity of sanguinarina with chelerythrine has been established by Schiel, found in celandine long subsequently to Dana's discovery, I quite agree with Dr. Wood,‡ of Philadelphia, that the name of chelerythrine should be abandoned.

Riegel, however, suspects that the *porphyroxine* found by Merck in opium, is identical with *sanguinarina*, as well as with *chelerythrine*, and the alkaloid discovered by Walz in the Eschscholtzia Californica.§

Sanguinarina may also be conveniently procured by a method similar to that employed by Probst for obtaining chelerythrine from celandine. This consists of the following process:

Sanguinarina by Probst's Process.—A strong ethereal tincture of the dried and powdered root is first to be prepared; a current of muriatic acid gas is to be passed through this, which will throw down the muriate which is insoluble in ether; it is to be dissolved in hot water after filtering, and precipitated by ammonia. This is to be collected and dried, dissolved in ether, decolorized by animal charcoal, precipitated by means of muriatic acid gas, and decomposing the muriate as before.‖

Sanguinarina is a white pearly substance, having a bitter and an acrid taste, very sparingly soluble in water, soluble in ether, and very soluble in alcohol. It possesses well-marked alkaline characters: thus it changes turmeric to a brown, and purple cabbage infusion to a green. When heated, it melts into an oil, and burns without any residue. Concentrated nitric acid decomposes it. Its formula, according to Schiel, is C_{37} H_{32} N_2 O_8.

With the acids, it forms salts of some shade of red, crimson, or scarlet, of great intensity and beauty; these are soluble in water and alcohol, and form beautiful red solutions, in which, perhaps, the crimson predominates, but of a decided bitterness. Chloride of platinum precipitates them of an orange red, and infusion of galls of a yellowish red colour.

The following are the more important salts of sanguinarina:

Sulphate.—A pure sulphate is obtained in the preparation of the alkaloid by Schiel's process.

Hydrochlorate.—As obtained in the preparation of the alkaloid by Probst's process

* *Annals Lyceum of Nat. Hist.*, New York, ii., 250. In *United States Dispensatory*, 11th edit., 1858.

† *Silliman's Journal*, N. S., vol. xx., p. 220.

‡ In a letter to the author.

§ *Jahrb. fur Prakt. Pharm.*, xi., 100, in *Chem. Gaz.*, vol. iv., 197.

‖ *Chemical Gazette*, vol. i., p. 145.

it is of a magnificent scarlet colour, which, when dissolved in water, yields, on the addition of ammonia, pure sanguinarina in white or slightly coloured flocks, which become a yellow powder by washing and drying.

Hydrochlorate of sanguinarina is a red agglutinated friable mass. The powder, under the microscope, presents an agglomeration of well-defined small crystals. It is readily soluble both in water and alcohol, especially when heated, and is insoluble in ether.*

Acetate.—This, equally with the hydrochlorate, is peculiarly pungent and acid.

Oxalate.—Oxalic acid unites with sanguinarina, and forms minute needle-shaped crystals, visible under the microscope.

Porphyroxin.—Riegel extracted a principle from the blood-root, which he found to be analogous to the porphyroxin discovered by Merck in opium, and this has induced me to adopt the same name for it in the sanguinaria. At the same time, I wholly dissent from the suspicion entertained by Riegel that this substance is identical either with sanguinarina or chelerythrin. It may be observed that porphyroxin obtained from opium crystallizes in colourless, minute, shining needles, is neutral, becoming coloured of an olive green by concentrated nitric or sulphuric acids, and is dissolved by dilute acid, becoming red on boiling; whereas the crystals of the same substance obtained from sanguinaria, are of a tabular form.

Porphyroxin, which is a *second* alkaloid in the root of sanguinaria, is obtained by extraction with water containing acetic acid, precipitation of the sanguinarina by ammonia, neutralization of the wash water with acetic acid, and precipitation with infusion of galls; the deposit is collected, well washed, dried, and digested with an alcoholic solution of potash as long as anything is dissolved, carbonic acid passed into the solution, and the spirit removed by distillation. The residue is exhausted with water, this evaporated, and what remains extracted with ether, from which it separates on evaporation as a dirty-white crystalline mass.

By solution in alcohol and treatment with animal charcoal, it is obtained in small colourless tabular crystals, which are void of taste and smell, and are very sparingly soluble in water, more readily so in alcohol. It yields with acids colourless crystalline salts, which have a bitter taste, dissolve in water, and from whose solutions it is precipitated of a white colour.†

Puccine.—This is a third distinct principle discovered by Mr. Edward S. Wayne, of Cincinnati, in the ether, after the precipitation of the sulphate of sanguinarina in the process of Schiel. As it has not been named, I have ventured to call it *puccine,* deriving that appellation from the Indian name of the plant.

Preparation.—After precipitating all the sanguinarina by Schiel's process, there remains a substance held in solution by the ether. This is of a much deeper red colour, and leaves a yellowish solid deposit upon the sides of the vessel. If the ether is left to evaporate, a substance is left of a dark red colour, and without crystalline form. This must be redissolved in ether, and agitated with dilute sulphuric acid, until all the sanguinarina is removed. By separating the ethereal portion from the acid, and allowing spontaneous evaporation, a dark red translucent mass remains behind. If this is treated by alcohol in a displacer, a deep red tincture is obtained, upon adding water to which, a precipitate is thrown down, to be collected upon a filter and dried. This is the Puccine.‡

If diluted hydrochloric acid be added to a solution of the mass in boiling alcohol, a deep red colour is produced, and when set aside to cool, deposits beautiful needle-shaped crystals of a bright red colour.

With sulphuric acid, it forms a confused warty mass of crystals, which rub to a bright red powder.

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* *Philosophical Mag.*, January, 1843.

† *Chemical Gazette*, vol. iv., p. 198.

‡ *Amer. Jour. of Phar.*, vol. xxviii., p. 521, Nov., 1856.

From its acid combinations, it is precipitated of a pale yellow colour, which, when dried, has a pale red tint.

The quantity of puccine is so small, that fifteen pounds of the root yielded but 130 grains of it. This substance, therefore, is pale red, tasteless, insoluble in water, but soluble in alcohol and ether, and unites with hydrochloric and sulphuric acids to form crystallizable compounds, of a deep red colour.

Chelidonic Acid.—This acid has been obtained from the root by Mr. Wayne, who considers the acrid and pungent taste it possesses as due entirely to a salt of sanguinarina, probably the chelidonate. The sanguinarina and puccine he mentions as having but little taste. He moreover asserts that the red colour of the root, the tincture and other fluid preparations, is not due solely to the sanguinarina.*

Fecula.—The method I used to detect the presence of starch was as follows: A hot aqueous infusion was prepared from the powdered root, and allowed to cool; from this was precipitated a flocculent material by alcohol. This was allowed to settle 24 hours, and then examined with the microscope, when numbers of clear, thin, and transparent starch granules were seen, mostly of a circular form, the hilum not being visible unless occasionally. Smaller irregular bodies were also present, but these were not cellulose.

A very few long needle-shaped crystals were also seen, greatly multiplied on adding a drop of sulphuric acid, when they assumed the form of stars around any central body for a nucleus, many of the needles crossing one another. Some resembled a bundle of thin reeds tied round the centre. A drop or two of the tincture of iodine added to the fluid in a test tube, converted it into its characteristic dark blue colour. The demonstration of the presence of fecula was therefore positive, chemically and microscopically.

Dr. Bigelow only inferred the presence of fecula from finding the hot infusion to be viscid, glutinous, and to stiffen linen. This he precipitated by alcohol, soluble in nitric acid, and again thrown down by alcohol.

Saccharine matter.—This I discovered by applying the usual tests for sugar to an infusion of the powdered root on being cooled. Barreswil's solution of the tartrate of copper and potass indicated a tolerable quantity of sugar, a very heavy yellow precipitate of the sub-oxide of copper falling.

Vegetable Albumen.—I have found a small quantity in the infusion of the root, but by no means so much as exists in the seeds, which yield a large amount of it.

Fixed Oil.—A slow and continued heat, applied to an infusion of the bruised root, produces a thick iridescent continuous film upon the surface of the liquid, not unlike that on mutton broth, which, on being collected and examined, proves to be a yellowish coloured fixed oil, soluble in ether. It can also be readily obtained without the application of heat, simply by being allowed to stand three or four days in the heat of summer. This oil possesses an oily, bitterish, and somewhat acrid taste, immediately felt in the fauces. It may be procured in other ways besides those I have mentioned.

The *analysis* of the blood-root, as derived from the experiments of various observers, including those of my own, may be represented as follows:—

1. Sanguinarina
2. Porphyroxin
3. Puccine
4. Chelidonic acid
5. Fecula
6. Saccharine matter
7. Vegetable albumen
8. Orange-coloured resin
9. Fixed oil

* The same Journal just quoted.

10. Extractive matter
11. Lignin
12. Gum (a little)

The seeds contain probably the greater number of the foregoing, but a fixed oil, obtained by expression, together with much albumen, are the principal ingredients which enter into their composition.

ECONOMICAL USES.

The economical purposes to which this plant is applied are few, but they are not the less important.

The earliest use made of the juice of the root of the sanguinaria, independent of its therapeutical agencies, was as a pigment to smear and colour the bodies of Indian warriors. At the same time, it was generally employed by native Indian artists to draw rude figures, and, as a dye, to colour their baskets, bark work, ornaments, and even some domestic utensils; hence one of its vulgar names, *Indian paint.*

Wherever the plant is grown, the Indians use it for these various purposes up to the present day. The Canadian settlers in the time of Charlevoix made extensive use of the juice to stain furniture; so that it would seem to be a plant not only well known, but extensively employed for miscellaneous purposes both in medicine and the arts.

The juice of the root is now also well known to produce a fine dye of an orange colour, and is extensively employed by many of the country people and others in the United States for dyeing flannel and woollen cloths. The knowledge of its application in this way I think not improbable to have been first derived from the Indians, who seemed to be well acquainted with the permanent nature of its colouring matter.

The value of the blood-root as a dyeing agent was fully proved by the experiments of Dr. Downey, of Maryland, in 1803. These were made with a view to find a suitable mordant to fix this dye. It appears that the colour of flannel and silk stained with this juice could never be entirely washed out; that the sulphate of alumina, or alumina alone, and the permuriate of tin, are tolerably good mordants for flannel, cotton, silk, and linen. Permuriate of tin was the only mordant that fixed the colour on cotton and linen.

This plant was then employed as a dye in the woollen cloth manufactory near Wilmington, Delaware. "If success has been obtained," Dr. Downey observes, "in fixing the colour permanently, there can be no doubt that the dye obtained from puccoon will become a highly important article in domestic manufactures."

I have reason to believe that it is now extensively employed in many parts of the United States, not only as a dye, but for other purposes in the arts. The sources of my information on these points, I regret to say, were not so accessible as could have been desired. I have recently ascertained that the plant is now in active use in France, to dye silks and muslins of a permanent orange colour.*

In that popular and deservedly well-known work, the *Commercial Products of the Vegetable Kingdom*, by P. S. Simmonds, 1854, under the head of Oleaginous Plants, and those yielding fixed or essential oils, the following extract has come across my notice:—

"The seeds of the *Argemone mexicana* and of the *Sanguinaria canadensis* also contain a bland, nutritious, colourless, fixed oil. The mass from which the seed is expressed is found to be extremely nutritious to cattle."—Page 511.

The cake, after the oil is expressed, is thus used for feeding purposes, and Mr. Simmonds has since informed me that the oil is medicinally employed in North America for cattle. Further knowledge about this would prove highly valuable, and should circumstances hereafter furnish me with it, it shall be rendered available elsewhere.

Partly in connexion with this subject, it may be here stated that the leaves

* *Dict. Universel des Sciences, &c.* Par Bouillet. Paris, 1854.

and the root are given (on the authority of Dr. Downey) by the farriers in Maryland to horses, to induce sweating, and thus promote the shedding of their old coats of hair.

An economical purpose to which the plant may still further be applied, is to prepare a resinous soap from the root. The residue, after the preparation of sanguinarina by Schiel's process, mixed with potass and boiled, formed a thick pultacious mass, which, after some days, evaporated to the consistence of soap of a dark grey colour. I have no doubt whatever that an investigation into its saponiform properties might lead to very interesting and, at the same time, profitable results.

ADMINISTRATION.

1. Pulvis Sanguinariæ.—*Powder of Blood-root.*—The usual dose of the powder as an *emetic* is from 10 to 20 grains suspended in water. It is preferable sometimes to administer it in the form of pill to avoid the irritation of the fauces. Dr. Wood thinks it questionable to bring it in direct contact with the mucous membrane of the stomach in its concentrated form. Dr. Leonard frequently combines it with ipecacuanha, and the combination is a prompt and exceedingly easy emetic for old or young persons. As a nauseating and stimulating expectorant, the dose is from 1 to 5 grains, repeated more or less frequently according to the effect desired. Grain doses will produce a diaphoretic and expectorant effect; if given frequently, say every one or two hours, then it will exert a sedative action, and reduce the frequency of the pulse.

2. Pulvis Sanguinariæ Compositus.—*Compound Powder of Sanguinaria.*—(The Author.) (Sanguinaria, powdered, ℈ij.; hard opium, powdered, ℈j.; sulphate of potash, powdered, ʒij. ℈j.; mix them.) Every 10 grains contain 1 grain of opium, 2 of sanguinaria, and 7 of sulphate of potass. The dose of this powder is from 3 to 15 grains, and I have found it the most convenient preparation of blood-root, and one that can be depended upon. It may not inaptly be compared to the Dover's powder, the ipecacuanha of which is replaced by the sanguinaria, but in double the quantity. The majority of cases in which I have employed this remedy were treated with this powder, and I can recommend it as probably the least irritating of all the preparations of sanguinaria.

3. Pulvis Sanguinariæ cum Camphora.—*Powder of Sanguinaria with Camphor.*—(Sanguinaria, powdered, ℈j.; camphor, powdered, gr. viij.; cloves, powdered, gr. xxxij.; mix them.) This is used as an errhine in coryza, and proves very efficacious.

4. Infusum Sanguinariæ.—*Infusion of Sanguinaria.*—(Sanguinaria, bruised, ʒv.; boiling water, Oj. Macerate for four hours in a lightly covered vessel, and strain.) The emetic dose is from ʒiv. to ʒviij. at short intervals, till its effects are produced.

5. Decoctum Sanguinariæ.—*Decoction of Sanguinaria.*—(Sanguinaria, bruised, ʒvi.; distilled water, Oiss. Boil down to a pint and strain.) The dose is the same as the infusion, but is a little more energetic, particularly if given warm.

6. Succus Sanguinariæ.—*Preserved Juice of Sanguinaria.*—This is prepared by expression from the fresh root, and adding alcohol; but I think it preferable to employ the expressed juice when required, as obtained fresh from the root. When the fresh root is broken, or the stems of the leaves, the juice will pour out in sufficient quantity for immediate use.

7. Oleum Sanguinariæ.—*Oil of Sanguinaria.*—This may be obtained by submitting the root with water to repeated distillation. The dose would be from one to four drops.

8. Extractum Sanguinariæ.—*Extract of Sanguinaria.*—(Sanguinaria, bruised, ℥v.; water, Oij. The bruised root is to be macerated for some hours in a portion of the water, then briskly rubbed, adding the remainder, and then set by for the dregs to subside. The liquor is to be then strained and evaporated to a proper consistence.) If warm water is used instead of the cold, the extract

soon becomes mouldy. The dose is from an eighth to half a grain three times a day. It may be necessary to commence with a sixteenth, according to the strength of the patient. Should griping or tenesmus ensue, the tincture should be substituted. My friend, Dr. C. B. Hall, of St. Thomas, Canada West, recently told me that the extract prepared by Tilden and Co., of New York, is much used in Canada as an elegant preparation in chest affections principally.

9. Tinctura Sanguinariæ, U. S.—*Tincture of Blood-root.*—This is the only officinal preparation, and is prepared as follows, according to the *United States Dispensatory*;—

"Take of blood-root, bruised, *four ounces*; diluted alcohol, *two pints*. Macerate for fourteen days, express, and filter through paper.

"This tincture may also be prepared by thoroughly moistening the blood-root, in powder, with diluted alcohol, allowing it to stand for 48 hours, then transferring it to a percolator, and gradually pouring upon it diluted alcohol until two pints of filtered liquor are obtained."—U. S.

This will prove emetic in the dose of two to four fluid drachms; but it is rather intended to act as a stimulant to the stomach, expectorant, or alterative, for which purpose from twenty to sixty drops may be given every two or three hours in acute cases, and three or four times a day in the chronic.*

10. Tinctura Sanguinariæ Greenii.—*Green's Tincture of Sanguinaria.*—Although I do not go so far as to believe with Dr. Horace Green that the officinal tincture is inefficient, it seems to me nevertheless that its strength might be increased with decided advantage, because the active principle of the root is readily taken up by the spirit. He recommends the absolute alcohol in preference to the diluted, in which I fully concur. His formula is as follows:—*Eight ounces* of the blood-root finely bruised are to be macerated in *two pints* of absolute alcohol, and then prepared in the usual way.

The dose is from fifteen to sixty drops every three or four hours, or three or four times a day, according to the necessity of the case.

11. Vinum Sanguinariæ.—*Wine of Sanguinaria.*—This may be prepared in the same manner as the tincture, substituting sherry wine for the diluted alcohol. The dose is the same as the tincture. It is recommended as being more pleasant and more powerful.

12. Acetum Sanguinariæ.—*Vinegar of Sanguinaria.*—(Sanguinaria, fresh and sliced, ℥ss.; vinegar, Oj. Shake it frequently, and it is ready for use in a few hours.) This is the process of Dr. Jennings. I think it preferable to recommend the root to be bruised and rubbed up with the vinegar, and filtered after a few hours. He found it most serviceable in the sore-throat of scarlatina, and it has been employed with advantage topically in some obstinate cutaneous affections.

13. Syrupus Sanguinariæ.—*Syrup of Sanguinaria.*—(Sanguinaria, in coarse powder, ℥viij.; acetic acid, f℥iv.; water, Ov.; sugar, ℔ij. Add to the powder two fluid ounces of the acetic acid mixed with a pint of the water, macerate for three days, transfer to a percolator, and displace with the remainder of the water mixed with the remainder of the acetic acid; evaporate the infusion obtained, by means of a water-bath, to eighteen fluid ounces, then add the sugar, and form a syrup, straining if necessary.) The foregoing is the formula proposed by Mr. T. S. Wiegand,† and it is one likely to prove serviceable to young children. The dose as an emetic is from one to two fluid drachms.

14. Unguentum Sanguinariæ.—*Ointment of Sanguinaria.*—(Sanguinaria, finely powdered, ℥j.; lard, ℥j. Mix.) Besides the uses mentioned in previous observations, it may be applied now and then to foul ulcers.

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* *United States Disp.*, eleventh edition, 1858; and Wood's *Therapeutics and Pharmacology*, vol. ii.

† *American Journal of Pharmacy*, vol. xxvi.; and *United States Dispensatory*, eleventh edition, 1858.

15. SANGUINARINÆ.—*Sanguinarina.*—The various modes of preparing this alkaloid were given when speaking of the composition of the plant, and therefore unnecessary to repeat here. It has not been used in medicine so far as I am aware, nor has Dr. Wood (the talented author of the *United States Dispensatory*, and other works) employed it, as mentioned to me in his letter of the 22nd of February, 1858. I would estimate the dose at from one-sixteenth to half a grain dissolved in some acid. The sulphate or hydrochlorate would be a more convenient preparation in doses of an eighth and quarter of a grain. To an asthmatic female patient I prescribed a twelfth of a grain of the sulphate with extract of conium twice a day, with the most extraordinary relief to the breathing and expectoration.

16. SANGUINARIN is a preparation from the laboratory of B. Keith and Co., of New York. It is a compound of the alkaloid, the resin, a resinoid, and a neutral principle, as I am informed by my friend Dr. Badgley, who kindly presented me with a sample of it. The dose is a quarter to half a grain to begin with. It is said to combine the leading active principles of the sanguinaria.