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FLUID EXTRACTS OF THE NEW PHARMACOPOEIA, PART II

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Read at the Pharmaceutical Meeting, February 20.

EXTRACTUM CYPRIPEDII FLUIDUM.—*Fluid Extract of Cypripedium*.—This newly introduced preparation is one of the eleven added to the list by the Committee of Revision, it was under consideration by the Committee of the Philadelphia College of Pharmacy, but was finally rejected, on the ground that little or no demand existed for the preparation. The officinal menstruum is alcohol, but it is quite probable that a menstruum composed of two parts of alcohol, and one part of water, would have been sufficiently strong.

EXTRACTUM DIGITALIS FLUIDUM.—*Fluid Extract of Digitalis*.—The menstruum directed for this preparation by the Pharmacopoeia of 1870, was alcohol twelve fluidounces, glycerin three fluidounces, and water one fluidounce, finishing the percolation with diluted alcohol, and adding one fluidounce of glycerin to the dilute percolate before evaporation. The present Pharmacopoeia directs a mixture of three parts of alcohol, and one part of water; the Philadelphia College of Pharmacy recommended alcohol, and several previous investigators have also recommended the same menstruum. A sample prepared in December, 1879, with a menstruum composed of two parts of alcohol and one part of water, deposited a considerable precipitate soon after it was finished; another sample prepared at the same time, with alcohol, kept with only slight precipitation for nearly two years, and even at the present time, there is only about one-fourth as much deposit in it, as there is in the other sample, but there is also deposited on the sides of the bottle a thin waxy coating, from which the other sample is quite free; it is quite probable that the officinal menstruum is the best for this preparation; should it still after a time precipitate, the addition of five or ten per cent. of glycerin would most likely render it permanent. These experiments were made with the English leaves, results obtained from the use of the cheap commercial leaves might have been, and probably would have been, quite different.

EXTRACTUM DULCAMARAE FLUIDUM.—*Fluid Extract of Dulcamara*.—For this preparation the Pharmacopoeia of 1870 directed alcohol eight fluidounces, glycerin three fluidounces, and water five fluidounces, finishing the percolation with diluted alcohol, and adding one fluid ounce of glycerin to the dilute percolate before evaporation. The present Pharmacopoeia directs diluted alcohol, and the Philadelphia College of Pharmacy recommended one part of alcohol, and two parts of water as the menstruum. A sample thus prepared in January, 1880, has only a moderate deposit, which formed soon after the sample was made; it is extremely doubtful if the stronger

officinal menstruum possesses any advantages in this preparation.

EXTRACTUM ERGOTAE FLUIDUM.—*Fluid Extract of Ergot.*—This is one of the most important preparations in the Pharmacopoeia. A reputation gained among physicians for having this article always of a reliable quality, will contribute largely to the professional standing and pecuniary success of the pharmacist; more especially will this be the case if the preparation is the product of his own skill; if the pharmacist sells the preparation of a manufacturer even of the highest reputation for reliability, he gains nothing but the dealer's profit, which, indeed, is all that he deserves, for all the credit of making a good article, belongs to the man who makes it, and not to the mere shopkeeper who simply sells it.

As the menstruum for this preparation the Pharmacopoeia of 1870 directed alcohol eight fluidounces, glycerin three fluidounces, and water five fluidounces, finishing the percolation with diluted alcohol, and adding one fluidounce of glycerin, and half a fluidounce of acetic acid to the dilute percolate previous to evaporation. The present Pharmacopoeia directs a mixture of three parts of alcohol, and four parts of water, adding six per cent. of diluted hydrochloric acid to the dilute percolate before evaporation. The Philadelphia College of Pharmacy recommended one part of alcohol, and one part of water, with one per cent. of acetic acid added to the dilute percolate. The officinal menstruum may be readily obtained by using equal volumes of alcohol and water, which have the specific gravity of .935, while the officinal is only .936, and as equal weights of alcohol and water, have the specific gravity of .928, the difference between the officinal menstruum, and that recommended by the Philadelphia College of Pharmacy is insignificant, therefore, the two preparations may be considered identical, except in the use of different acids in the dilute percolate; recent scientific investigations having conclusively established the fact that no acid is required for the protection or preservation of the active constituents of ergot, such addition might well be omitted, though it is probably not injurious to the preparation; if either is retained, the preference seems to be in favor of the acetic acid.

In regard to the proper menstruum for ergot, it is well known, that water alone extracts the active constituents, the *extractum secalis cornuti* of the German Pharmacopoeia, and the *extractum ergotae liquidum* of the British Pharmacopoeia, are both prepared with that menstruum, fifty per cent. of rectified spirit being added to the evaporated aquous extract in the English preparation. One of the most careful and competent investigators, who is also a large manufacturer of' fluid extracts, has recommended a menstruum composed of one part of alcohol and three parts of water.

After a number of previous experiments, a series of four fluid extracts, differing only in the menstruums, was made in January, 1880.

No. 1. With a menstruum composed of one part of alcohol and one part of water, with one per cent. of acetic acid in the dilute percolate. This is the formula finally recommended by the Philadelphia College of Pharmacy.

No. 2. The same menstruum, without the acetic acid.

No. 3. With a menstruum composed of one part of alcohol and two parts of water, also

without acid.

No. 4. With one part of alcohol, and three parts of water, without acid.

None of these samples have either been decanted or filtered, and now, three years after they were made, the deposit in each is about equal, but only moderate in amount, being about the one-eighth of an inch deep in a four ounce bottle; in both number one and two, a black, tarry matter covers the upper part of the bottle above the fluid extract, which has also become darker than when first made, and is no longer quite transparent. With the exception of the deposit above referred to, numbers three and four remain as when first made, reddish brown in color and transparent in thin layers. Number three is decidedly preferable to either number one or two. I have made considerable quantities by this formula during the last three years, to my own satisfaction, and with the approval of physicians. The only reason why number four was not used, was the fear that it might not contain sufficient alcohol for its preservation under all circumstances, in hot weather. As number three may be said to keep for an unlimited period, and as it is not always possible to get good ergot, the pharmacist would do well, when he does find a good article, to makeup a considerable quantity of the fluid extract.

EXTRACTUM ERYTHROXYLI FLUIDUM.—*Fluid Extract of Erythroxylon*.—This is a newly introduced preparation, it is not probable that the officinal English title will supercede the name of fluid extract of coca, by which this preparation is commonly known. The Pharmacopoeia directs diluted alcohol as the menstruum, and the Philadelphia College of Pharmacy recommended the same. A sample of the fluid extract prepared in December, 1879, remains in good condition, with only a slight precipitate, and a very small quantity of waxy matter on the upper part of the bottle.

EXTRACTUM EUCALYPTII FLUIDUM.—*Fluid Extract of Eucatyptus*.—This is also one of the new fluid extracts. The Pharmacopcoeia directs alcohol to be used in its preparation, and the Philadelphia College of Pharmacy recommended the same menstruum. A sample thus made in December, 1879, remained without change for some time, but it now contains a moderate quantity of sediment, and above this appears a large quantity, about one-fourth of the bulk of the fluid extract, of greenish, somewhat gelatinous, separated matter thus affording sufficient evidence that alcohol is not the proper menstruum for this preparation. Another sample was made at the same time as the first one, with a menstruum composed of three parts of alcohol and one part of water, this soon deposited a moderate precipitate, but no further change has occurred, and this sample now, after three years have elapsed, possesses all the characteristics of a good fluid extract; this menstruum is therefore recommended as being decidedly better for eucalyptus, than alcohol alone.

EXTRACTUM EUPATORII FLUIDUM.—*Fluid Extract of Eupatorium*.—This is one of the new fluid extracts. The Pharmacopoeia directs diluted alcohol as the menstruum, the Philadelphia College of Pharmacy recommended one part of alcohol and two parts of water; a sample thus prepared in December, 1879, now contains only a moderate deposit, and the liquid portion is perfectly transparent, and of a deep red color in thin layers; it has acquired a very peculiar odor, and has apparently undergone some change. The officinal menstruum is no doubt the, best for this not

very important preparation.

EXTRACTUM FRANGULAE FLUIDUM.—*Fluid Extract of Frangula*.—This is also a newly introduced preparation. The Pharmacopoeia directs a menstruum composed of one part of alcohol and two parts of water, which strength was also recommended by the Philadelphia College of Pharmacy; a sample thus prepared in December, 1879, now contains rather more than a moderate, precipitate, it being about one-quarter of an inch deep in a four ounce bottle, but is otherwise in good condition, of a deep red color, and perfectly transparent in thin layers.

EXTRACTUM GELSEMII FLUIDUM.—*Fluid Extract of Gelsemium*.—For this preparation the Pharmacopoeia of 1870 directed alcohol (sp. gr. 835), the present Pharmacopoeia also directs alcohol. The Philadelphia College of Pharmacy recommended diluted alcohol as the menstruum), and a sample, thus prepared in December, 1879, now contains a slight precipitate, but is otherwise in good condition; it is probable, however, that the officinal menstruum is the best for this preparation.

EXTRACTUM GENTIANAE FLUIDUM.—*Fluid Extract of Gentian*.—For this preparation the Pharmacopoeia of 1870 directed a menstruum composed of alcohol, eight fluidounces, glycerin, three fluidounces, and water, five fluidounces, finishing the percolation with diluted alcohol, and adding one fluidounce of glycerin to the dilute percolate before evaporation. The present Pharmacopoeia directs diluted alcohol, and the Philadelphia College of Pharmacy recommended. the same. A sample thus prepared in December, 1879, now contains only a very moderate precipitate, which formed soon after its preparation; in every other respect it is in good condition. As the menstruum for the solid extract of gentian is water alone, it is quite probable that a weaker spirit than diluted alcohol would have answered for the fluid extract.

EXTRACTUM GERANII FLUIDUM.—*Fluid Extract of Geranium*.—For this preparation the Pharmacopoeia of 1870 directed a menstruum composed of alcohol, eight fluidounces, glycerin, three fluidounces, and water, five fluidounces, finishing the percolation with diluted alcohol, and adding one fluidounce of glycerin to the dilute percolate before evaporation. The present Pharmacopoeia directs diluted alcohol, with ten per cent. of glycerin in the first one hundred parts of the menstruum; the Philadelphia College of Pharmacy recommended the same, and a sample thus prepared in December, 1879, kept very well for a long time, and has now only a moderate precipitate; but about one-third of the lower portion of the fluid extract has become of a slightly gelatinous character, this however readily mixes with the remainder, and then it presents a rather fair appearance. Another sample prepared at the same time, and differing only in containing twenty per cent. of glycerin, appears to be even more changed than the first, with a much larger sedimentary deposit. It is evident that this preparation, to be made permanent, requires a more alcoholic menstruum, and a mixture of three parts of alcohol and one part of water, with ten per cent. of glycerin in the first one hundred parts, is suggested as being likely to accomplish that object; should this also fail, it may even be necessary, as in the case of cotton root, to omit the water entirely.

EXTRACTUM GLYCYRRHIZAE, FLUIDUM.—*Fluid Extract of Glycyrrhiza*.—The fluid extract of liquorice root of the Pharmacopoeia of 1870, was prepared with a

menstruum composed of eight fluidounces of alcohol, three fluidounces of glycerin, and five fluidounces of water; finishing the percolation with diluted alcohol, and adding one fluid ounce of glycerin to the dilute percolate before evaporating. The present Pharmacopoeia directs diluted alcohol, with three per cent. of water of ammonia in the first one hundred parts of menstruum, and three per cent. more in the dilute percolate previous to evaporation. The Philadelphia College of Pharmacy recommended a menstruum composed of one part of alcohol, and three parts of water, with twenty per cent. of glycerin, and five per cent. of water of ammonia in the first one hundred parts. A sample thus prepared in December, 1879, now contains only the slight precipitate which formed soon after it was, made, and in all other respects it is in excellent condition. In regard to the officinal formula, the utility of adding a portion of the water of ammonia to the dilute percolate is not apparent, it would seem to be more advantageous to add all that is used to the menstruum, so that its solvent action may be exercised on the drug; neither does it appear necessary to use as strong a menstruum as diluted alcohol. A menstruum containing as little as twenty per cent. of alcohol, has been recommended by an operator of the greatest ability; as water alone will exhaust liquorice root, the chief use of alcohol in the fluid extract is as a preservative; regarding the use of glycerin in this preparation, it is possible that ten per cent. might be sufficient, although a sample made with that proportion precipitated considerably more than the sample containing twenty per cent.

EXTRACTUM GOSSYPIII RADICIS FLUIDUM.—*Fluid Extract of Cotton Root*.—For this preparation the Pharmacopoeia of 1870 directed a menstruum composed of eight fluidounces of alcohol, three fluid ounces of glycerin., and five fluidounces of water, finishing the percolation with diluted alcohol, and adding one fluidounce of glycerin to the dilute percolate before evaporation. The present Pharmacopoeia directs alcohol, with thirty-five per cent. Of glycerin in the first one hundred parts of menstruum; the Philadelphia College of Pharmacy recommended alcohol also, but with only twenty per cent. of glycerin. A sample thus prepared in November, 1879, now shows only a moderate precipitate, about the one-eighth of an inch deep in a four ounce bottle, the sides of the bottle are coated with a uniform, exceedingly thin, brown transparent deposit, the fluid extract retains its deep red color, and is without any signs of gelatinization. Another sample prepared at the same time as the first, and differing only in containing forty per cent. of glycerin, now shows considerable deposit, about the one-fourth of an inch deep in a four ounce bottle, the coating on the sides of the bottle is less uniform, and of a bright red color, numerous masses of gelatinous substance, very small at the top, and increasing in size towards the bottom, are also attached to the sides of the bottle; about one-fourth of the lower portion of the fluid extract has gelatinized, it however mixes readily with the remaining portion, and the whole of it still retains its deep red color. From this it would appear that twenty per cent is a decidedly better proportion of glycerin than forty, or so near an approach to that amount as thirty-five; if the alcohol used was absolute, and the glycerin of the highest attainable specific gravity, then it is possible that forty, or even fifty, per cent, could be employed without injuriously affecting the preparation, but the nine per cent. of water in officinal alcohol, and the varying amount in the best commercial glycerin, are sufficient to cause the preparation to prove unstable, it having been conclusively shown that the failure of the former officinal process was due to the presence of water in the menstruum.

EXTRACTUM GRINDELIAE FLUIDUM.—*Fluid Extract of Grindelia*.—This is a newly introduced fluid extract, the Pharmacopoeia directs a menstruum composed of three parts of alcohol, and one part of water; the Philadelphia College of Pharmacy recommended alcohol, and a sample so prepared in December 1879, now contains only a very slight precipitate, is of a pure green color, and apparently has undergone no change whatever. Another sample prepared with the officinal menstruum, in November, 1882, is of a brownish-green color, has a slight deposit of a white substance like fine sand, the sides of the bottle are thinly coated with the same, and floating particles of it are distributed throughout the entire body of the fluid extract; a menstruum similar to the officinal, was recommended for grindelia by a California writer several years ago, and no doubt this weaker spirit was adopted by the Committee of Revision for some other reason than cheapness, but its superiority over alcohol is not apparent.

EXTRACTUM GUARANAE FLUIDUM.—*Fluid Extract of Guarana*.—This is also a new preparation, the Pharmacopoeia directs a menstruum composed of three parts of alcohol and one part of water; the Philadelphia College of Pharmacy recommended two parts of alcohol and one part of water. A sample thus prepared in December, 1879, has only a very slight precipitate, and is in every other respect perfect; a spirit of the officinal strength appears to be quite unnecessary, although it may furnish an equally permanent preparation.

EXTRACTUM HAMAMELIDIS FLUIDUM.—*Fluid Extract of Hamamelis*.—This is one of the eleven added to the list by the Committee of Revision; the menstruum directed is one part of alcohol, and two parts of water, which no doubt thoroughly extracts the witchhazel leaves.

EXTRACTUM HYDRASTIS FLUIDUM.—*Fluid Extract of Hydrastis*.—For this preparation the Pharmacopoeia of 1870 directed fourteen fluid-ounces of alcohol, and two fluidounces of glycerin, finishing the percolation with a mixture of two parts of alcohol, and one part of water The present Pharmacopoeia directs a menstruum composed of three parts of alcohol and one part of water. The Philadelphia College of Pharmacy recommended the same; a sample thus prepared in November, 1879, now contains a moderate precipitate, and a very thin coating of brownish color deposited on the sides of the bottle, in all other respects the sample is in good condition. Another sample prepared at the same time, with a menstruum of one part of alcohol, and one part of water, with ten per cent. of glycerin in the first one hundred parts, now contains only a very slight sediment, and no deposit on the sides of the bottle; this fluid extract, however, is not quite as transparent as the other sample. The addition often per cent. of glycerin to the first one hundred parts of the officinal menstruum, would probably prevent all precipitation.

EXTRACTUM HYOSCYAMI FLUIDUM.—*Fluid Extract of Hyoscyamus*.—For this preparation the Pharmacopoeia of 1870 directed a menstruum composed of twelve fluidounces of alcohol, three fluid ounces of glycerin, and one fluidounce of water, finishing the percolation with diluted alcohol, and adding one fluidounce of glycerin to the dilute percolate before evaporation. The present Pharmacopoeia directs three parts of alcohol, and one part of water, and the Philadelphia College of Pharmacy

recommended the same menstruum. A sample thus prepared in December, 1879, now contains only a very slight deposit, less than the one-eighth of an inch deep in a four-ounce bottle; this, with a few small specks of matter attached to the sides of the bottle, is the only change that the sample appears to have undergone. Another sample made at the same time as the first, with alcohol alone as the menstruum, now contains a very large deposit, being fully an inch deep in a four-ounce bottle, also considerable matter on the sides and a coating of waxy nature on the upper part of the bottle above the fluid extract.

The appearance of these samples indicates that the officinal menstruum is best for this preparation. These experiments were made with Allen's English leaves; if the ordinary commercial leaves had been used, the result might have been different.

EXTRACTUM IPECACUANHAE FLUIDUM.—*Fluid Extract of Ipecac*.—For this preparation the Pharmacopoeia of 1870, directed twenty-four fluidounces of stronger alcohol and twelve fluidounces of water finishing the percolation with diluted alcohol, and adding eight fluidounces of glycerin to the entire percolate before evaporation. The present Pharmacopoeia directs the use of alcohol as the menstruum, and by means of a water bath distils off the alcohol from the entire percolate, which is then to be evaporated to seventy-five cubic centimeters, and when cool filtered, the precipitate on the filter is to be washed with water, until the water passes through tasteless, the filtrate and washings are to be reduced by evaporation to fifty cubic centimeters, and when cool, enough alcohol is to be added to make the fluid extract measure one hundred cubic centimeters. The Philadelphia College of Pharmacy recommended a menstruum composed of three parts of alcohol and one part of water; a sample thus prepared in January, 1880, deposited soon after it was made, a moderate precipitate, which has not been increased since, and the sample now appears to be in very good condition.

The Committee of Revision must have been convinced before they adopted the present officinal formula, that the repeated and prolonged applications of heat therein directed, do not injuriously affect the active constituents of ipecac. While it cannot be positively asserted that such treatment does lessen the activity of the preparation, it certainly cannot be claimed to increase it; the obvious object of the special procedure directed in the preparation of this fluid extract, being to furnish a product that will form a permanently transparent preparation when mixed with syrup, and as it may be doubted that even this process will always accomplish that object, it would seem preferable to prepare the fluid extract in the ordinary way, and then make the syrup by a process which can always be depended upon, although it may involve a little more pharmaceutical labor in carrying it out.

When the fluid extract is made by the formula recommended by the Philadelphia College of Pharmacy, the eighty-five parts of reserved percolate will contain at least ninety-five per cent. of the soluble portion of the ipecac, and only the small amount contained in the dilute percolate is subjected to heat. This fluid extract when mixed with the proper quantity of water, and after standing a few hours filtered, and the sugar dissolved in the filtrate, either by moderate beat, by agitation in a bottle, or by cold percolation, will yield a syrup entirely free from suspicion of injury during the process of its preparation.

Such a method for this syrup, with the addition of twenty per cent. of glycerin, has been used for years by the writer and other pharmacists, with entire satisfaction; no fermentation, precipitation, or separation of flocculent matter occurring in the syrup so made, even when kept for years, and exposed in partly filled bottles, to the varying temperature of the store in all seasons.

Recently published experiments appear to indicate that the addition of a small quantity of water of ammonia, to a very dilute alcoholic menstruum, will also furnish a transparent and permanent syrup, but such addition will undoubtedly cause a chemical change in the constituents of the ipecac, and while this charge is probably not injurious to its medicinal value, it would seem preferable to employ an equally effective preservative, which would be entirely without chemical action.

EXTRACTUM IRIDIS FLUIDUM.—*Fluid Extract of Iris.*—This fluid extract is one of the eleven added to the list by the Committee of Revision; the menstruum directed for its preparation is composed of three parts of alcohol, and one part of water, which will no doubt thoroughly exhaust the blue flag root, and supply a permanent and reliable preparation of an active indigenous drug.

NOTE ON THE ORIGIN OF CASSIA LIGNEA.[1]

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The spice now known in pharmaceutical literature under the name of *Cassia lignea* has, from time immemorial, been an article of trade from South China. Flückiger and Hanbury are indeed of opinion that it was the. cinnamon of the ancients, what now bears the name being peculiar to Ceylon and unnoticed as a product of the island till the thirteenth century.[2] Cinnamon and cassia are, however, enumerated amongst the products of the East from the earliest periods; and the former was known to the Arabians and Persians as *Darchini* (*dar*, wood or bark, and *chini*, Chinese). It seems in ancient times to have been carried by Chinese traders to the Malabar coast, where it passed into the commerce of the Red Sea. In this way the statements of Dioscorides, Ptolemy, and others, are accounted for, who speak of cinnamon as a product of Arabia and Eastern Africa, countries in which there is no reason to suppose it ever grew. At the present day it is still an important item in Chinese commerce. I find, from the Statistical Returns of the Chinese Imperial Customs (for copies of which Kew is indebted to Sir Robert Hart), that the export from China for the last two years stands as follows:[3]

	Quantity.	Value.
1880.....	38,784 piculs,	225,692 Haikwan taels.
1881.....	57,456 "	300,303 "

1 picul = 133⅓ lbs.; 1 Haikwan tael = 5*s*. 6½*d*.

1 From the *Journal of the Linnean Society*, December 18, 1882.
2 "Pharmacographia," pp. 520, 521.
3 "Returns of Trade at the Treaty Ports for the year 1881," p. 10.

With regard to the botanical source of *Cassia lignea*, it is remarkable, considering its ancient history and its present importance in trade, that up to the present time nothing certain has been ascertained. Flückiger and Hanbury remark :— "Although it is customary to refer it without hesitation to a tree named *Cinnamomum Cassia*, we find no warrant for such reference; no competent observer has visited and described the cassia-yielding districts of China proper, and brought therefrom the specimens requisite for ascertaining the botanical origin of the bark."[4]

Bentley and Trimen also remark, in their "Medicinal Plants,"[5] "Though it is probable that this species (*Cinnamomum Cassia*) affords Chinese cassia, the fact has never been proved."

In the face of the uncertainty felt by these authorities, it appeared to be desirable to have the point, if possible, cleared up. The attention of the Colonial Office was accordingly drawn to the matter, November 18, 1881; and it was suggested that Mr. Charles Ford, Superintendent of the Botanical and Afforestation Department, Hong Kong, might be allowed, with the consent of his Government, to proceed to the cassia plantations on the West River for the purpose of reporting on the cultivation and collection of *Cassia lignea*, as well as of bringing back for distribution from the Hong Kong Botanic Garden living and dried botanical specimens of the authentic plant. Lord Kimberley was so good as to approve of the proposal; and in the month of May last Mr. Ford accordingly started for the cassia districts of the West River, the Sai Kong. He completely succeeded in the object of the expedition, and described his journey and its results in a Report to the Hong Kong Government, August 9. This report has been printed as a Government Notification (No. 339); but as in that form its circulation will necessarily be very limited, I think the facts deserve the wider circulation which will be afforded by the Society's Journal.

Mr. Ford's journey was timed so that he might be in the districts at the season when the trees were flowering. This enabled him to obtain authentic specimens for their botanical identification, and also to witness the operation of obtaining and preparing the bark.

Mr. Ford gives the following account of the geographical position and extent of the cassia districts:

"There are three chief districts where the Cassia is cultivated, viz.:—Taiwu, in lat. 23º 34' N., and long. 110º 18' E. in the Kwangi province; Lukpo, in lat. 23º 6' N., and long. 112º 24' E.; and Loting, in lat. 22º 52' N., and long. 111º 8' E., both in the Kwangtung province. These are the market towns of the district; but the cassia is cultivated over a large area of country stretching to considerable distances from the towns, the extent of which could not be ascertained, Owing to the unreliable accounts given by the different people questioned, who either had very vague notions of area, or were disinclined, as they usually are, to give information to foreigners.

"Taiwu is about four or five miles from the West River, and is reached by a pleasant walk leading over a plain; but the nearest cassia plantations are situated twenty-five or thirty miles further in a southern or southwesterly direction, to which there is no

4 "Pharmacographia" p. 528.

5 Vol. iii., *sub tab*. 223.

communication by river. Taiwu is about one hundred and eighty miles west of Canton. The Taiwu people said that the area of cultivation was not increasing.[6]

"The next most important, if not the *most* important (or at least tending in that direction) district is the Loting one, commencing at about eight or ten miles distant from the city of Loting. After leaving the West River, about eighty miles of the Loting River—the Nam Kong—has to be traversed before reaching the city, and from there the distance to the plantations has to be accomplished overland. One of the largest cultivators said that in this district there were about 1,000,000 *maus* (about 52,600 English acres) under cultivation, and that the area was greatly extending every year. The cultivation of cassia has been carried on here for only about twenty-five years, i.e., since the Tai-Ping rebellion, at which time, for the preservation of the plants and protection of them from destruction by the rebels, they were transferred from a district further south, at which it is reported the cultivation of cassia was abandoned when it was commenced at Loting

"The next district is that of Lukpo, which is much less important than the other two. The city of Lukpo is situated on the northern bank of the West River; and the plantations are situated at about fifteen miles between the nearest one and the city.

"In addition to these places there are several small localities near the West River at intermediate places, where small patches of cassia are grown; and as the quantities of bark obtained are too small to send to market towns, it is brought off by small boats and sold to larger boats which carry produce down the river.

"About six miles southwest of the small town of To Shing, which is situated on the southern bank of the river, about twenty-five miles above the confluence of the Loting and West rivers, there are some plantations, from which, however, no bark has been obtained for two years and no new plantations made for ten, because the low prices which can now be obtained for the bark do not leave any profit to the producer. This was the only instance which came to my knowledge of the decrease of the trade in the cassia production, although it is said that the Java cassia trade, in consequence of the lower prices at which the cassia can there be produced, is cutting out and crippling the China trade."

From each of the districts of Taiwu, Lukpo and Loting, Mr. Ford obtained and sent to Kew copious and excellent specimens. These have been examined by my colleague, Professor Oliver, who informs me that they certainly all belong to the same species, and that this is undoubtedly *Cinnamomum Cassia*, Blume. Mr. Ford took great pains to ascertain if this was the exclusive source of *Cassia lignea*. He reports:

"This is the *only* tree from which cassia bark, 'buds,' or leaves of commerce in China, so far as could be ascertained from personal inspection and reports, are obtained. All the trees seen in the districts of Taiwu, Loting and Lukpo, and intermediate localities where cassia was grown in smaller quantities, were of this species, nor were there, apparently, distinct varieties of the species in cultivation. The cultivators and other natives were much interrogated as to whether they knew or had heard of any other

6 "Near the town of Taiwu, according to Mr. Moss ('Narrative of an Exploration of the West River,' 1870), the best cassia bark is produced" (Bretschneider, "Early European Researches into the Flora of China," p. 13).

tree which yielded the products under notice, and the invariable reply was that there was no other kind. There is, therefore, I think, no doubt but writers who have named other kinds as cassia-yielding trees of China have been mistaken or misinformed on the subject. One writer alludes to a tree in terms which partly corresponds to the description of *Machilus velutina*, Champ., another tree belonging to *Lauraceae*, and indigenous to South China. It is quite possible that this tree may have been supposed by a casual observer to yield cassia bark, because it is sometimes grown in plantations intermixed with those of *Cinnamomum Cassia*. The trees are reared planted, and treated in precisely the same manner as the cassia trees; but the bark is required for a very different use, viz., to supply a glutinous extract which is used to stick together powdered cassia bark and sandal wood (*Santalum album*) to form the joss-sticks used for incense. *Cinnamomum Burmanni*, Bl., which it has been supposed may probably yield 'in part the cassia bark of the Canton market,' does not, I feel sure, supply cassia bark to any extent. I did not see it anywhere cultivated; nor was it seen growing wild in any but small quantities, and these wild trees bore no signs of having been cut as had the cassia trees; many natives were asked if it was ever used; but, with one exception, all denied that it afforded any cassia bark. The one exception was an old woman, who was cultivating a field of Indian corn close to a few small trees of Cinnamomum Burmanni, and who said that its bark was sometimes, but rarely, used to adulterate the true cassia bark."

Mr. Ford on his return journey paid a visit to the well-known Chinese botanist, Dr. Hance, H.M. Vice-Consul at Whampoa, who identified the specimens of the cassia lignea tree collected by Mr. Ford as belonging to *Cinnamomum Cassia*. There is, in fact, in the Kew Herbarium a specimen of the same species collected by Dr. Hance in 1876; but I have searched in vain to see if Dr. Hance has published anything about it, and the specimen bears no note that it is the source of *Cassia Lignea*. This specimen is the material upon which the plate given by Bentley and Trimen is based, and represents no doubt the true plant.

Cinnamomum Cassia was first described by Blume, in 1825.[7] The species was apparently founded on cultivated specimens from Java, where Blume states it was "ex China introductum."

The Kew Herbarium possesses a cultivated Java specimen contributed by the Leyden Herbarium. This is no doubt an authentic type of the plant described by Blume; and Professor Oliver finds that it agrees precisely with the plant collected by Mr. Ford on the West River. It may be, therefore, considered finally settled on the one hand, that the Chinese *cassia lignea* plant is really the *Cinnamomum Cassia*, Blume, and on the other hand, that the plant cultivated in Java is identical with that now known to be the source of the spice in China.

It is remarkable that though the cultivation of the *cassia lignea* tree has apparently been carried on in Southern China from time immemorial, it does not appear to be indigenous there.[8] In Cochin-China, however, there appears to be some probability of its being really wild. *Cinnamomum Cassia* is, botanically, very closely allied to *C.*

7 "Blidragen Fl. Nederl. Indië," ii., p. 570.

8 The earliest printed notice in works professing to give botanical information about China appears to be in Martini's "Atlas Sinensis" (1655). See Bretschneider's "Early European Researches into the Flora of China," p. 13.

obtusifolium, Nees, one of the species from which a similar product is obtained on the Khasia hills.

It only remains to give Mr. Ford's account of the mode of collecting and preparing the bark. He obtained and sent to this country a set of the implements, which are deposited in the Kew Museum.

"*Bark*.—When the trees are about six years old, the first cut of bark is obtained. The season for barking commences in March and continues until the end of May, after which the natives say the bark loses its aroma, and is therefore not removed from the trees. The branches, which are about an inch thick, being cut to within a few inches of the ground, are carried to houses or sheds in the vicinity of the plantations. All the small twigs and leaves being cleared off, a large-bladed knife, with the cutting-edge something like the end of a budding knife, is used to make two longitudinal slits and three or four incisions, at sixteen inches apart, round the circumference through the bark; the bark is then loosened by passing underneath it a kind of slightly curved-horn knife with the two edges slightly sharpened. Pieces of bark sixteen inches long and half the circumference are thus obtained.

"The bark, after its removal and while it is still moist with sap, is then laid with the concave side downwards, and a small plane passed over it, and the epidermis removed. After this operation the bark is left to dry for about twenty-four hours, and then tied up in bundles about eighteen inches in diameter, and sent into the merchants' houses in the market towns.

"*Leaves*.—The leaves which are cleared from the branches that are barked are carefully preserved and dried, and afford by distillation Cassia oil. A large number of leaves are sent to Canton, where I was told the operation of distilling is performed.

"*Twigs*.—These are removed from the cut branches at the same time as when the leaves are obtained. They are a marketable commodity for native uses.

"*Buds*.—Cassia-buds are the immature fruits. They are gathered when about one-eighth grown. Buds, and the seeds which are annually required for sowing, are obtained from the trees ten years and upwards of age that are left standing at about fifty and a hundred feet apart amongst the trees which are cut down every six years for their bark. These seed-bearing trees are not cut unless there is a demand for the very thick bark on their trunks, when some of the trees which can be conveniently spared are sacrificed.—*Phar. Jour. and Trans.*, January 20, 1883.