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MADRAS RECORD OFFICE.

Government of Madras.

Revenue DEPARTMENT.

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GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

25th October 1880, No. 1,395.

READ THE FOLLOWING PAPER:—

No. 363. Despatch from the Most Honorable the Secretary of State for India, dated India Office, London, 16th September 1880, Revenue No. 39.

MY LORD DUKE,—Referring to paragraph 2 of my Despatch No. 21, of the 29th April last, I have now to report to your Grace the results of the experiment therein referred to, for the manufacture in this country, on account of Government, of quinine and other alkaloids from the bark sent home from the Nílgiri Cinchona plantations.

2. With a view of exhibiting in a concise form the details of this experiment, I have caused a memorandum on the subject to be drawn up in this Office, copies of which are herewith transmitted for your Grace's information. From this it will be seen that, so far as the renewed red and crown barks are concerned, it will be more advantageous to utilize them for the manufacture of quinine and other alkaloids than to sell them as heretofore.

3. With regard to the red barks the case seems to be different, as the manner in which the mixed alkaloids have been extracted has resulted in a loss compared with the result that would have been obtained by selling them.

4. Before deciding upon the general adoption of manufacture in this country for future consignments of bark from the Nílgiris, I have determined to repeat the experiments on a larger scale when the next shipment arrives from your Presidency, and the opportunity will then be taken of trying whether the extraction of sulphate of quinine and other alkaloids separately from the red bark can be effected with more economical results than have been obtained by the method adopted in the recent experiment.

5. Of the different products referred to in the accompanying memorandum, the sulphate of quinine has been sent to India in part compliance with indents, and one half of the others, as stated in the margin,* have been shipped to your Government.

	LB.
* Cinchonidine	44
Quinidine	5
Cinchona alkaloid	16
Liquor of amorphous sulphate ...	85
Quinetum alkaloids	89
Soluble tartrates	31
Quinoidine	7

6. Two of these products, viz., cinchonine alkaloid and soluble tartrates, are new preparations. It is represented that they are more economical to make than the sulphates, and that whilst the former can, if thought necessary, be converted into sulphate, or muriate, or any other salt of quinine, the latter, which is produced as a substitute for the amorphous alkaloids, has the advantage over that preparation of containing no quinoidine, and is thus free from the cause of nausea in the amorphous preparation.

7. I desire that these samples may be subjected to such test as may seem desirable to prove their efficacy, and that reports on them may be sent home for my information. I shall also be glad to receive any remarks or suggestions which you may desire to offer on the subject of the experiments above referred to.

I have, &c.,
(Signed) HARTINGTON.

His Excellency the Most Noble
The Governor in Council, Fort St. George.

ENCLOSURE.

Utilization of Government Cinchona Bark from India.

LAST autumn the question was considered, what would be the best means of utilizing the products of the Government Cinchona plantations in India (more particularly with reference to the Nilgiri plantations), so as to make them serve, to the greatest extent possible, the main object in view when the Cinchona plant was first introduced into India, viz., to secure a cheap and plentiful supply of febrifuge for use in India.

Four alternatives appeared to exist for the future disposal of these plantations and of their produce :—

1. To realize the sum already expended upon the plantations by their sale, and to trust entirely to private enterprise for their future development and cultivation.
2. To retain the plantations in the hands of Government, and to sell the bark in the open market, as at present.
3. To retain the plantations, and extract from the bark the quinine and other alkaloids at a Government Factory in India.
4. To retain the plantations, and send the bark home annually, in order that the quinine and other alkaloids might be extracted in this country by one of the established quinine manufacturers here, on Government account.

The question as to whether Government should sell their Cinchona Plantations on the Nilgiris has been several times considered, but has always been negatived, on the grounds that, by retaining them in their own hands, Government would be enabled to encourage the efforts to establish and extend the growth of private plantations in the Nilgiris; that there yet remain several economic questions with regard to Cinchona cultivation and harvesting of the bark which can better be solved by Government than by private enterprise; and that, as the object in establising the Nilgiri plantations was, primarily, with the view of securing the benefit of cheap quinine or other febrifuge for the people of India, the agency of the State was necessary in order to ascertain the lowest cost at which the remedial agent could be procured without detriment to its efficiency, and the chemical form by which that end could be best secured. These arguments still hold good, and it does not, therefore, appear that the time has yet arrived when the Government Nilgiri Cinchona plantations can be disposed of in the interests of the Indian public.

The principal argument against selling the bark in the open market is that by so doing the State enters into competition with private enterprise. Quinine manufacturers, however, do not object to this course, and, so far as I have been able to ascertain, the Indian Government bark is highly esteemed on the London market, on account of its richness in alkaloids, its uniformity of character, and the manner in which the bales are generally packed and sent home. Private growers naturally object to Government competition, but this probably puts some degree of pressure upon them to maintain their shipments at a higher standard of quality than they otherwise would take the trouble to do, and thus the buyers of bark are generally benefited by the competition. This, however, has had no weight with Government in connection with the general question, and their bark has hitherto been so largely sold in London in consequence of the necessity of disposing of it in the most profitable manner in order to secure a return for the public money spent on the establishment and maintenance of the plantations, and should no more advantageous method of employing the bark for the future be discovered there would appear to exist no reasonable grounds why it should not continue to be sold as heretofore.

In connection with this question I may quote what was said upon the subject by the Cinchona Committee in their Report of the 31st August 1878, paragraph 56.

"A good deal has been said in regard to the action of Government in disposing of the barks grown on the Nilgiri experimental plantation on ordinary commercial principles. We are disposed to consider this plan of procedure not only free of objection in itself, but as having contributed more than any other circumstance to the embarkation of private enterprise and capital in the cultivation of Cinchona in India and Ceylon. The barks produced from the Government estates have been obtained after careful experiment of the advantages of the mossing and renewal process. The reputation of these barks is so well established that they are keenly competed for by the European manufacturers of alkaloids. They have steadily held the first place in the London market, and the Government experience has demonstrated to planters that cultivated bark will fetch a higher price than natural South American bark. The result of the Government sending its best barks into the open market has been to encourage private enterprise on a scale so vast that in a few years Cinchona production will be one of the chief industries of the hilly country of South India and Ceylon."

An attempt to make a cheap febrifuge from the Nilgiri bark in India has already been made. In 1866, Mr. Broughton was appointed from this country as Government Quinologist

in order to establish a factory for the Nilgiri Government bark at Ootacamund. It was understood from the first that if the bark were all sent home to England for sale a larger direct profit might possibly be secured than if it were converted into alkaloids in India, but commercial profit was not the chief object in view, and the prices that could be obtained for the bark in the London market were not, therefore, the most important element in the investigation Mr. Broughton was instructed to undertake. This simply was the necessary cost of cultivation and manufacture, and the lowest price at which the febrifuge could be produced locally where the bark was grown.

After repeated experiments, Mr. Broughton, in 1870, decided upon a preparation, subsequently named *amorphous quinine*, which was prepared by precipitating the alkaloids in an insoluble state, and subsequently separating them from the mass of impurities with which they were mixed by solution in alcohol. Several medical men bore testimony to the efficacy of this preparation, and its extended use was sanctioned by Government. Doubts having subsequently arisen as to the economy of the manufacture, the subject was referred to the Committee, who, in February 1875, showed in their Report that, on the most favorable calculation, Government were paying twice as much for the amorphous quinine as it was worth, and that the drug, as prepared and issued, was of uncertain composition; sometimes it was rich in quinine, whilst at others cinchonidine and cinchonine predominated. Under these circumstances, Government decided on abandoning the manufacture, and early in 1875 Mr. Broughton resigned his appointment.

The Cinchona Committee, considering the subject of local manufacture in their report of August 1878, remarked (paragraph 55) that in their opinion, this could not be adopted with respect to the Nilgiri barks without sacrifice of valuable produce and incommensurate results in outturn, and that the manufacturing operation for the production of crystalline salts could be conducted cheaper and more satisfactorily in England than in India. They added that the Bengal Government were able to produce a considerable harvest of bark of inferior commercial value which it would not be remunerative to send to European markets; but that the Nilgiri barks were, on the other hand, of high value and remunerative to exporters, and their realized value in the home market would permit Government to purchase largely and economically the febrifuge alkaloids of European manufacture required for use in India.

The Committee noticed a further objection to the conversion of the produce of the Nilgiri barks into a crude febrifuge for general distribution and sale below its market value, and that was, that owing to the richness of the Nilgiri barks into quinine, if such a preparation had been made on the Nilgiris from the renewed red barks or from crown barks during the late demand for quinine, it would have paid speculators to buy up the febrifuge and send it home to manufacturers for the extraction of the quinine in it; and this, they remark, would surely happen if Government attempted to sell such an article locally at a price below the value of the crystallizable quinine in the mixture of alkaloid.

Owing to these adverse reports no one was appointed to succeed Mr. Broughton, and since his resignation the local manufacture on the Nilgiris has not been renewed, and no new facts have arisen that would render it probable that such a manufacture could now be undertaken with any better chance of success than attended Mr. Broughton's experiments. Should, however, a recent report of the successful manufacture of quinine by Mr. Gammie, at Rungbi, at a cost of only Rs. 2 per ounce be confirmed, this question may be open to reconsideration.

It now remains to consider the chances of success that would attend the adoption of the fourth alternative above referred to.

In order to ascertain how far it would be practicable to adopt this alternative, communications were made to Mr. Howard and Mr. Whiffen to ascertain upon what terms they would be willing to assist in carrying it out. Mr. Howard's proposal, in reply, was that he should receive from Government all the Nilgiri bark sent home, and supply them with all the quinine and alkaloids they might require. In adopting this course Mr. Howard observed that "Government would be their own analysts, and would receive a price proportional to such analysis; they would avoid the uncertainty which now attends public sales, at which, of course, no such price is realized, unless under exceptional circumstances;" and "Government would also be gainers by the saving in brokerage and intermediate profits."

Mr. Whiffen entered very fully into the subject, and, in reply to the reference from this Office, he expressed his willingness to undertake the extraction of the alkaloids from the Government bark on some such basis as the following :—

1. The whole of the products to be returned to the Indian Government.
2. The manufacturer to be paid in money at an agreed rate per ounce or per pound of the manufactured product; or an arrangement might be made by which he should be paid in quinine or other produce.
3. The quantity of products to be returned for each parcel of bark would be determined by calculation, founded upon analysis of average samples. These analyses to be

made by a competent person on behalf of the Government and by the manufacturer for himself.

4. The bark should be sent from India as carefully assorted as it now is.
5. The bark would have to be carefully sampled on arrival, and this would best be done at the London Docks, or some public warehouse. Weighing and taring would also be done there.
6. The manufacturer should offer good and sufficient security to the Government for the property in his charge.

The question as to whether all the Nilgiri barks (red, renewed red, and crown barks) should be operated upon from the separation of quinine, cinchonidine, and cinchonine as sulphates would, Mr. Whiffen remarked, depend upon whether the Rungbi factory produces from the Sikkim bark as much cinchona febrifuge or quinetum as the Government require. If not, he suggested that it might be best to work up all the crown and renewed red barks for the sulphates of quinine, cinchonidine, and cinchonine, and to work up the ordinary red bark for the alkaloids or quinetum. In order to meet some of the objections that have been raised to the quinetum or cinchona febrifuge, Mr. Whiffen proposed to produce the entire alkaloids in the form of a soluble sulphate (not crystallized) or as a soluble barate. In order to furnish materials for some reliable estimate of the probable cost of the proposed experiment, Mr. Whiffen offered to work up a small parcel of bark in the first instance, which he thought would give information on minor details, and might bring out practical difficulties which he did not foresee.

Naduvatam Red.

* 6	Bales out of Nos.		170—217
6	"	"	218—256
6	"	"	257—300
6	"	"	301—360
6	"	"	361—450
6	"	"	451—504
6	"	"	541—600
6	"	N.P.	1—41
6	"	N.R.	1—41

Dodabetta Crown.

Bales, Nos. 359 to 410 inclusive.

Mr. Whiffen's offer to make an experiment on a moderate scale was accepted, and 106 bales* out of the consignment received per steam ship "Hydaspes" (Madras Letter, No. 2, of 19th January 1880), were accordingly made over to him for this purpose.

Samples taken from the selected bales were sent to Dr. B. Paul and Mr. C. H. Wood for analysis on behalf of the Secretary of State, whose reports gave the following results:—

—	Naduvatam Red.					Dodabetta Crown.		
	Natural.	Branch.	Renewed.	Mossed.	Root.	Renewed.	Mossed.	Natural.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Crystallized quinine sulphate..	1·6	0·7	3·74	1·9	1·4	5·97	4·04	2·99
" quinidine " ..	..	..	trace	..	..	0·25	0·23	0·11
" cinchonidine " ..	3·5	1·3	2·77	3·5	2·2	1·11	1·67	1·52
Cinchonine	1·1	0·6	2·10	1·9	2·7	0·16	0·25	0·25

Mr. Whiffen proposed to work the three parcels of crown bark and the one of renewed red into quinine, cinchonidine sulphate, and cinchonine alkaloid, and the other four parcels of red bark into quinetum febrifuge. According to the analyses the products should be as follows:—

—	Quantity of Bark in lb.	Quinine Sulphate.		Cinchonidine Sulphate.		Cinchonine Alkaloid.	
		At per cent.	Total.	At per cent.	Total.	At per cent.	Total.
			lb.		lb.		lb.
Natural Crown Bark ...	1,636	2·99	48·92	1·52	24·87	0·25	4·09
Mossed " " ...	1,524	4·04	61·57	1·67	25·45	0·25	3·81
Renewed " " ...	2,144	5·97	127·99	1·11	23·80	0·16	3·43
Renewed Red " ...	1,202	3·74	44·96	2·77	33·29	2·10	25·24
Total ...	...	...	283·44	...	107·41	...	36·57

The analyses of the other red barks being given in terms of sulphates, I give here Mr. Whiffen's* estimate of the yield of alkaloids according to his analysis made before the experiment—

					lb.
N. Mossed red bark,	625 lb.	at 7·05	per cent.	...	44·06
Branch "	1,192 "	4·71	"	...	56·14
Natural "	1,803 "	6·06	"	...	109·26
Root "	607 "	7·14	"	...	43·34
			Total ...		252·8

The result of working the four parcels containing the crown barks and renewed red has been as follows:—

	lb.
Quinine sulphate	291 or with carmine, 294 lb.
Cinchonidine sulphate	88½
Quinidine "	10½
Cinchonine alkaloid	32
Liquor of amorphous sulphate (one part sulphate in four parts liquor)...	170

This is perhaps as close a result as could be expected. It is satisfactory to find that the quinine sulphate, the most valuable of all the products, has yielded 7·56 lb. more than the estimate founded upon the analysis. The cinchonidine and quinidine sulphates together amount to 99 lb. or 8·41 lb. less than the amount of cinchonidine according to the analysis; the cinchonine alkaloid also came very closely up to the analysis.

The result of working the other bales of succirubra bark has been as follows:—

	lb.
About three-fourths of the bark were worked and yielded quinetum alkaloids or cinchona febrifuge	179
The remaining portion was worked into mixed soluble tartrates of quinine, cinchonidine and cinchonine, and yielded	62
And of quinoidine as sulphate (in liq. solution, 56 lb. 1 in 4	14
Total ...	255

The experiment of converting a portion of the bark, referred to in the foregoing statement, into mixed tartrates is for the purpose of ascertaining whether the succirubra bark could be worked into a more satisfactory form than that of the mixed alkaloids (quinetum), and at the same time of an economic nature.

One of the chief objections to quinetum, is that it has a tendency in some cases to produce nausea, and another is that it is not readily soluble. Both of these objections, Mr. Whiffen holds, are avoided in the use of the mixed tartrates, which are produced in a crystalline form, and contain the entire quinine, cinchonidine, and cinchonine present in the bark, whilst the amorphous alkaloid quinoidine, which is the cause of the nausea, is excluded. Mr. Whiffen further states, that the tartrates are as readily soluble as sulphate of quinine, and the cost of their production is but little more than that of the alkaloids, as this salt forms with much facility, and is therefore more cheaply produced than the better known sulphates. For these reasons he considers the tartrates deserving of careful trial, and that the result may possibly be that they will be found the most satisfactory form of using up the Indian red bark.

It now remains to consider the financial result of this experiment.

The average prices realized from the sale by public auction of similar parcels of bark forming part of the same consignment were:—renewed crown, 10*s.*; mossed crown, 7*s.* 3*d.*;

* Mr. Whiffen's analysis for sulphates contained in this bark corresponds almost exactly with the official analysis.

natural crown, 5*s.* 6*d.*; and renewed red, 6*s.* 6*d.* per lb. At these prices the value of the above-named barks was as follows:—

			£	*s.*	*d.*
Renewed crown, 2,144 lb. at 10*s.*			1,072	0	0
Mossed „ 1,524 „ 7*s.* 3*d.*			552	9	0
Natural „ 1,636 „ 5*s.* 6*d.*			449	18	0
Renewed red 1,202 „ 6*s.* 6*d.*			390	13	0
			2,465	0	0
Deduct, allowance for dust, 3 per cent. ...					
Do. tret, 4 per cent.	10½ per cent....		258	16	6
Do. discount, 2½ per cent.					
Do. brokerage, &c., 1 per cent. ...					
			2,206	3	6

The value of the products obtained therefrom at the market prices of the day has been—

	£	*s.*	*d.*
Quinine sulphate, 291 lb. at 175*s.*	2,516	5	0
Cinchonidine sulphate, 88½ lb. at 45*s.*	199	2	6
Quinidine sulphate, 10½ lb at 90*s.*	47	5	0
Cinchonine alkaloid, 30 lb. at 15*s.*	22	10	0
Liquor quinoidine, 170 lb. at 2*s.* 6*d.*	21	5	0
	2,836	7	6
Deduct working expenses	312	9	6
	2,523	18	0

With regard to the 42 bales of red bark, it appears that similar parcels of the same consignment fetched the following average price:—mossed red, 4*s.* 7*d.*; branch red, 2*s.* 8*d.*; natural red, 3*s.* 2*d.*; and root, 2*s.* 7*d.* per lb., at which prices the value of the bark used for experiment was—

	£	*s.*	*d.*
Mossed red, 625 lb. at 4*s.* 7*d.*	143	4	7
Branch red, 1,192 lb. at 2*s.* 8*d.*	158	18	8
Natural red, 1,803 lb. at 3*s.* 2*d.*	285	9	6
Root red, 607 lb. at 2*s.* 7*d.*	78	8	1
	666	0	10
Deduct 10½ per cent. allowances, as above	69	18	8
	596	2	2

The value of the products obtained from this bark at the market prices of the day is—

	£	*s.*	*d.*
Quinetum alkaloids, 179 lb. at 53*s.*	473	7	0
Tartrates of alkaloids, 62 lb. at 60*s.*	186	0	0
Liquor quinoidine, 56 lb. at 2*s.* 6*d.*	7	0	0
	666	7	0
Deduct working expenses	130	0	0
	536	7	0

Comparing the sum that would have been realized for the bark, if sold, with the net value of the products obtained therefrom in the present experiment, we arrive at the following result:—

—	Value of Bark.	Net Value of Product.	Difference.
	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
64 bales of crown and renewed bark ...	2,206 3 6	2,523 18 0	+317 14 6
42 bales of red bark	596 2 2	536 7 0	— 59 15 2
Total ...	2,802 5 8	3,060 5 0	+257 19 4

From these calculations it appears that the experiment has proved a financial success, and that it has resulted in a net gain of 257*l.* 19*s.* 4*d.*, or 9 per cent. more than would have been realized had the bark been sold in the usual manner. But it will be observed that the gain was wholly due to the crown and renewed red barks, which are rich in quinine, and that these realized 317*l.* 14*s.* 6*d.*, or over 14 per cent. more than the bark would have sold for in the open market. The loss due to the working of the red barks seems to show that these fetch a higher price in the market than what is due to the actual value of the alkaloids they contain. This, I understand, is the case, and that the price which they realize is due to competition amongst druggists for these barks, which are largely used by them in making decoctions, &c.

The general conclusion to be drawn from this experiment appears to be that it will be advantageous to convert nearly all the crown barks and renewed red barks from the Nilgiris into quinine cinchonidine and quinidine sulphates, and into cinchonine alkaloid for transmission to India in compliance with the ordinary medical indents, but that the red barks should, as a rule, continue to be sold on behalf of the Indian Government as heretofore, if sent home in any quantities.

In consequence, however, of the annually increasing quantities of bark sent home from Ceylon and elsewhere, the time may possibly soon arrive when owing to a fall in price it may be advisable to convert these red barks instead selling them. It might also perhaps be found more advantageous, from a pecuniary point of view, to extract the several alkaloids separately from the red bark instead of making cinchona febrifuge, and this might be tried in the next experiment on a larger scale, which seems desirable before finally settling the question now under consideration.

I say advisedly, that *nearly* all the richer barks should be converted in this manner, as it will probably be considered advisable that out of future consignments home some portion should occasionally be sold, both as a test of the quality of the bark sent home, and of the manner in which it is packed for consignment, and with a view of obtaining the necessary data for checking the financial results of the undertaking from time to time.

Before determining upon the general adoption of this plan, it will doubtless be considered desirable to repeat the experiment with the crown and renewed red barks upon a larger scale, and to test the financial result of extracting the several alkaloids separately from the inferior red barks, as it will clearly not be desirable to work them up again, as before, at a loss.

F. C. D.

20th August 1880.

No. 364. ORDER THEREON, 25th October 1880, No. 1,395.

Miscellaneous.

COMMUNICATED to the Surgeon-General with the Government of Madras who will arrange for the samples referred to in paragraph 7 being tested and reported on as desired by the Secretary of State, and will also submit any remarks he may wish to offer regarding the experimental extraction of the Cinchona alkaloids ordered by the Home Government.

(True Extract.)

(Signed) C. G. MASTER,
Secretary to Government.

To the Surgeon-General with the Government of Madras.
„ the Commissioner of the Nilgiris.
„ the Board of Revenue.
„ the Conservator of Forests.
„ the Superintendent, Central Museum.

Exd. W. H. French.

75 Copies.

India Office,
London, 16th September 1880.

Revenue,
No. 39.

To His Excellency The Most Noble The Governor in Council, Fort St. George.

My Lord Duke,

Para. 1. Referring to para. 2 of my Despatch, No. 21, of the 29th April last, I have now to report to your Grace the results of the experiment therein referred to, for the manufacture in this country, on account of Government, of quinine and other alkaloids from the bark sent home from the Nilgiri Cinchona plantations.

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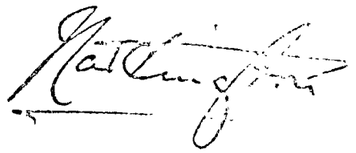
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I have the honour to be,

My Lord Duke,

Your Grace's most obedient humble Servant,



Back No 363

1003

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11

ENCLOSURE.

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Four alternatives appeared to exist for the future disposal of these plantations and of their produce:—

1. To realize the sum already expended upon the plantations by their sale, and to trust entirely to private enterprise for their future development and cultivation.
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4. To retain the plantations, and send the bark home annually, in order that the quinine and other alkaloids might be extracted in this country by one of the established quinine manufacturers here, on Government account.

The question as to whether Government should sell their cinchona plantations on the Nilgiris has been several times considered, but has always been negatived, on the grounds that, by retaining them in their own hands, Government would be enabled to encourage the efforts to establish and extend the growth of private plantations in the Nilgiris; that there yet remain several economic questions with regard to cinchona cultivation and harvesting of the bark which can better be solved by Government than by private enterprise; and that, as the object in establishing the Nilgiri plantations was, primarily, with the view of securing the benefit of cheap quinine or other febrifuge for the people of India, the agency of the State was necessary in order to ascertain the lowest cost at which the remedial agent could be procured without detriment to its efficiency, and the chemical form by which that end could be best secured. These arguments still hold good, and it does not, therefore, appear that the time has yet arrived when the Government Nilgiri cinchona plantations can be disposed of in the interests of the Indian public.

The principal argument against selling the bark in the open market is that by so doing the State enters into competition with private enterprise. Quinine manufacturers, however, do not object to this course, and, so far as I have been able to ascertain, the Indian Government bark is highly esteemed on the London market, on account of its richness in alkaloids, its uniformity of character, and the manner in which the bales are generally packed and sent home. Private growers naturally object to Government competition, but this probably puts some degree of pressure upon them to maintain their shipments at a higher standard of quality than they otherwise would take the trouble to do, and thus the buyers of bark are generally benefited by the competition. This, however, has had no weight with Government in connection with the general question, and their bark has hitherto been so largely sold in London in consequence of the necessity of disposing of it in the most profitable

manner in order to secure a return for the public money spent on the establishment and maintenance of the plantations, and should no more advantageous method of employing the bark for the future be discovered there would appear to exist no reasonable grounds why it should not continue to be sold as heretofore.

In connection with this question I may quote what was said upon the subject by the Cinchona Committee in their Report of the 31st August 1878, para. 56.

"A good deal has been said in regard to the action of Government in disposing of the barks grown on the Nilgiri experimental plantation on ordinary commercial principles. We are disposed to consider this plan of procedure not only free of objection in itself, but as having contributed more than any other circumstance to the embarkation of private enterprise and capital in the cultivation of cinchona in India and Ceylon. The barks produced from the Government estates have been obtained after careful experiment of the advantages of the mossing or renewal process. The reputation of these barks is so well established that they are keenly competed for by the European manufacturers of alkaloids. They have steadily held the first place in the London market, and the Government experience has demonstrated to planters that cultivated bark will fetch a higher price than natural South American bark. The result of the Government sending its best barks into the open market has been to encourage private enterprise on a scale so vast that in a few years cinchona production will be one of the chief industries of the hilly country of South India and Ceylon."

An attempt to make a cheap febrifuge from the Nilgiri bark in India has already been made. In 1866 Mr. Broughton was appointed from this country as Government Quinologist in order to establish a factory for the Nilgiri Government bark at Ootacamund. It was understood from the first that if the bark were all sent home to England for sale a larger direct profit might possibly be secured than if it were converted into alkaloids in India, but commercial profit was not the chief object in view, and the prices that could be obtained for the bark in the London market were not, therefore, the most important element in the investigation Mr. Broughton was instructed to undertake. This simply was the necessary cost of cultivation and manufacture, and the lowest price at which the febrifuge could be produced locally where the bark was grown.

After repeated experiments, Mr. Broughton, in 1870, decided upon a preparation, subsequently named *amorphous quinine*, which was prepared by precipitating the alkaloids in an insoluble state, and subsequently separating them from the mass of impurities with which they were mixed by solution in alcohol. Several medical men bore testimony to the efficacy of this preparation, and its extended use was sanctioned by Government. Doubts having subsequently arisen as to the economy of the manufacture, the subject was referred to the Committee, who, in February 1875, showed in their Report that, on the most favourable calculation, Government were paying twice as much for the amorphous quinine as it was worth, and that the drug, as prepared and issued, was of uncertain composition; sometimes it was rich in quinine, whilst at others cinchonidine and cinchonine predominated. Under these circumstances, Government decided on abandoning the manufacture, and early in 1875 Mr. Broughton resigned his appointment.

The Cinchona Committee, considering the subject of local manufacture in their Report of August 1878, remarked (p. 55) that, in their opinion, this could not be adopted with respect to the Nilgiri barks without sacrifice of valuable produce and incommensurate results in outturn, and that the manufacturing operations for the production of crystalline salts could be conducted cheaper and more satisfactorily in England than in India. They added that the Bengal Government were able to produce a considerable harvest of bark of inferior com-

mercial value which it would not be remunerative to send to European markets; but that the Nilgiri barks were, on the other hand, of high value and remunerative to exporters, and their realized value in the home market would permit Government to purchase largely and economically the febrifuge alkaloids of European manufacture required for use in India.

The Committee noticed a further objection to the conversion of the produce of the Nilgiri barks into a crude febrifuge for general distribution and sale below its market value, and that was, that owing to the richness of the Nilgiri barks into quinine, if such a preparation had been made on the Nilgiris from the renewed red barks or from crown barks during the late demand for quinine, it would have paid speculators to buy up the febrifuge and send it home to manufacturers for the extraction of the quinine in it; and this, they remark, would surely happen if Government attempted to sell such an article locally at a price below the value of the crystallizable quinine in the mixture of alkaloid.

Owing to these adverse reports no one was appointed to succeed Mr. Broughton, and since his resignation the local manufacture on the Nilgiris has not been renewed, and no new facts have arisen that would render it probable that such a manufacture could now be undertaken with any better chance of success than attended Mr. Broughton's experiments. Should, however, a recent report of the successful manufacture of quinine by Mr. Gammie, at Rungbi, at a cost of only Rs. 2 per ounce be confirmed, this question may be open to reconsideration.

It now remains to consider the chances of success that would attend the adoption of the fourth alternative above referred to.

In order to ascertain how far it would be practicable to adopt this alternative, communications were made to Mr. Howard and Mr. Whiffen to ascertain upon what terms they would be willing to assist in carrying it out. Mr. Howard's proposal, in reply, was that he should receive from Government all the Nilgiri bark sent home, and supply them with all the quinine and alkaloids they might require. In adopting this course Mr. Howard observed that "Government would be their own "analysts, and would receive a price proportional to such analysis; "they would avoid the uncertainty which now attends public sales, at "which, of course, no such price is realized, unless under exceptional "circumstances;" and "Government would also be gainers by the saving "in brokerage and intermediate profits."

Mr. Whiffen entered very fully into the subject, and, in reply to the reference from this Office, he expressed his willingness to undertake the extraction of the alkaloids from the Government bark on some such basis as the following:—

1. The whole of the products to be returned to the Indian Government.
2. The manufacturer to be paid in money at an agreed rate per ounce or per pound of the manufactured product; or an arrangement might be made by which he should be paid in quinine or other produce.
3. The quantity of products to be returned for each parcel of bark would be determined by calculation, founded upon analysis of average samples. These analyses to be made by a competent person on behalf of the Government and by the manufacturer for himself.
4. The bark should be sent from India as carefully assorted as it now is.
5. The bark would have to be carefully sampled on arrival, and this would best be done at the London Docks, or some public warehouse. Weighing and taring would also be done there.
6. The manufacturer should offer good and sufficient security to the Government for the property in his charge.

The question as to whether all the Nilgiri barks (red, renewed red, and crown barks) should be operated upon for the separation of quinine, cinchonidine, and cinchonine as sulphates would, Mr. Whiffen remarked, depend upon whether the Rungbi factory produces from the Sikkim bark as much cinchona febrifuge or quinetum as the Government require. If not, he suggested that it might be best to work up all the crown and renewed red barks for the sulphates of quinine, cinchonidine, and cinchonine, and to work up the ordinary red bark for the alkaloids or quinetum. In order to meet some of the objections that have been raised to the quinetum or cinchona febrifuge, Mr. Whiffen proposed to produce the entire alkaloids in the form of a soluble sulphate (not crystallized) or as a soluble barate. In order to furnish materials for some reliable estimate of the probable cost of the proposed experiment, Mr. Whiffen offered to work up a small parcel of bark in the first instance, which he thought would give information on minor details, and might bring out practical difficulties which he did not foresee.

Mr. Whiffen's offer to make an experiment on a moderate scale was accepted, and 106 bales* out of the consignment received per steam ship "Hydaspes" (Madras Letter, No. 2, of 19th January 1880), were accordingly made over to him for this purpose.

Samples taken from the selected bales were sent to Dr. B. Paul and Mr. C. H. Wood for anaysis on behalf of the Secretary of State, whose reports gave the following results:—

Nedivattam Red.

*6 Bales out of	Nos. 170–217
6 " "	" 218–256
6 " "	" 257–300
6 " "	" 301–360
6 " "	" 361–450
6 " "	" 451–504
6 " "	" 541–600
6 " "	N. P. 1–41
6 " "	N. R. 1–41

Dodabetta Crown.

Bales, Nos. 359 to 410 inclusive.

	Nedivattam Red.					Dodabetta Crown.		
	Natural.	Branch.	Renewed.	Mossed.	Root.	Renewed.	Mossed.	Natural.
	Per cent.	Per cent.	Per cent.	Per cent	Per cent.	Per cent.	Per cent.	Per cent.
Crystallized quininine sulphate	1·6	0·7	3·74	1·9	1·4	5·97	4·04	2·99
" quinidine "	—	—	trace	—	—	0·25	0·23	0·11
" cinchonidine "	3·5	1·3	2·77	3·5	2·2	1·11	1·67	1·52
Cinchonine - - -	1·1	0·6	2·10	1·9	2·7	0·16	0·25	0·25

Mr. Whiffen proposed to work the three parcels of crown bark and the one of renewed red into quinine, cinchonidine sulphate, and cinchonine alkaloid, and the other four parcels of red bark into quinetum febrifuge. According to the analyses the products should be as follows:—

	Quantity of Bark in lbs.	Quinine Sulphate.		Cinchonidine Sulphate.		Cinchonine Alkaloid.	
		At per cent.	Total	At per cent.	Total.	At per cent.	Total
			Lbs.		Lbs.		Lbs.
Natural crown bark - - -	1,636	2·99	48·92	1·52	24·87	0·25	4·09
Mossed " " - - -	1,524	4·04	61·57	1·67	25·45	0·25	3·81
Renewed " " - - -	2,144	5·97	127·99	1·11	23·80	0·16	3·43
Renewed red " - - -	1,202	3·74	44·96	2·77	33·29	2·10	25·24
Total -	—	—	283·44	—	107·41	—	36·57

The analyses of the other red barks being given in terms of sulphates, I give here Mr. Whiffen's* estimate of the yield of alkaloids according to his analysis made before the experiment:—

					Lbs.
N. Mossed red bark,	625 lbs.	at	7·05	per cent. -	44·06
Branch	" 1,192	"	4·71	" -	56·14
Natural	" 1,803	"	6·06	" -	109·26
Root	" 607	"	7·14	" -	43·34
Total - - -					252·8

The result of working the four parcels containing the crown barks and renewed red has been as follows:—

Quinine sulphate -	291 lbs., or with carmine, 294 lbs.
Cinchonidine sulphate -	88½ "
Quinidine " -	10½ "
Cinchonine alkaloid	32 "
Liquor of amorphous sulphate (one part sulphate in four parts liquor)	170 "

This is perhaps as close a result as could be expected. It is satisfactory to find that the quinine sulphate, the most valuable of all the products, has yielded 7·56 lbs. more than the estimate founded upon the analysis. The cinchonidine and quinidine sulphates together amount to 99 lbs., or 8·41 lbs. less than the amount of cinchonidine according to the analysis; the cinchonine alkaloid also came very closely up to the analysis.

The result of working the other bales of succirubra bark has been as follows:—

	Lbs.
About three fourths of the bark were worked and yielded quinetum alkaloids or cinchona febrifuge - -	179
The remaining portion was worked into mixed soluble tartrates of quinine, cinchonidine and cinchonine, and yielded - - - - - -	62
And of quinoidine as sulphate (in liq. solution, 56 lbs. 1 in 4) - - - - - -	14
Total - - - -	255

The experiment of converting a portion of the bark, referred to in the foregoing statement, into mixed tartrates is for the purpose of ascertaining whether the succirubra bark could be worked into a more satisfactory form than that of the mixed alkaloids (quinetum), and at the same time of an economic nature.

One of the chief objections to quinetum, is that it has a tendency in some cases to produce nausea, and another is that it is not readily soluble. Both of these objections, Mr. Whiffen holds, are avoided in the use of the mixed tartrates, which are produced in a crystalline form, and contain the entire quinine, cinchonidine, and cinchonine present in the bark, whilst the amorphous alkaloid quinoidine, which is the cause of the nausea, is excluded. Mr. Whiffen further states, that the tartrates are as readily soluble as sulphate of quinine, and the cost of their production is but little more than that of the alkaloids, as this salt forms with much facility, and is therefore more cheaply produced than the better known sulphates. For these reasons he considers the tartrates deserving of careful trial, and that the result may possibly be that they will be found the most satisfactory form of using up the Indian red bark.

It now remains to consider the financial result of this experiment.

* M. Whiffen's analysis for sulphates contained in this bark corresponds almost exactly with the official analysis.

The average prices realized from the sale by public auction of similar parcels of bark forming part of the same consignment were :—renewed crown, 10*s.*; mossed crown, 7*s.* 3*d.*; natural crown, 5*s.* 6*d.*; and renewed red, 6*s.* 6*d.* per lb. At these prices the value of the above-named barks was as follows :—

			£	*s.*	*d.*
Renewed crown,	2,144 lbs. at 10*s.*	- - -	1,072	0	0
Mossed ,,	1,524 ,, 7*s.* 3*d.*	- -	552	9	0
Natural ,,	1,636 ,, 5*s.* 6*d.*	- -	449	18	0
Renewed red	1,202 ,, 6*s.* 6*d.*	- -	390	13	0
			2,465	0	0
Deduct, allowance for dust, 3 per cent. - -					
Ditto, tret, 4 per cent. - -		10½ per cent. -	258	16	6
Ditto, discount 2½ per cent. -					
Ditto, brokerage, &c., 1 per cent.					
			£2,206	3	6

The value of the products obtained therefrom at the market prices of the day has been :—

	£	*s.*	*d.*
Quinine sulphate, 291 lbs. at 175*s.* - -	2,516	5	0
Cinchonidine sulphate, 88½ lbs. at 45*s.* -	199	2	6
Quinidine sulphate, 10½ lbs. at 90*s.* - -	47	5	0
Cinchonine alkaloid, 30 lbs. at 15*s.* - -	22	10	0
Liquor quinoidine, 170 lbs. at 2*s.* 6*d.* - -	21	5	0
	2,836	7	6
Deduct working expenses - - -	312	9	6
	£2,523	18	0

With regard to the 42 bales of red bark, it appears that similar parcels of the same consignment fetched the following average prices :—mossed red, 4*s.* 7*d.*; branch red, 2*s.* 8*d.*; natural red, 3*s.* 2*d.*; and root, 2*s.* 7*d.* per lb., at which prices the value of the bark used for experiment was :—

	£	*s.*	*d.*
Mossed red, 625 lbs. at 4*s.* 7*d.* - - -	143	4	7
Branch red, 1,192 lbs. at 2*s.* 8*d.* - -	158	18	8
Natural red, 1,803 lbs. at 3*s.* 2*d.* - - -	285	9	6
Root red, 607 lbs. at 2*s.* 7*d.* - - - -	78	8	1
	666	0	10
Deduct 10½ per cent. allowances, as above -	69	18	8
	£596	2	2

The value of the products obtained from this bark at the market prices of the day is :—

	£	*s.*	*d.*
Quinetum alkaloids, 179 lbs. at 53*s.* - -	473	7	0
Tartrates of alkaloids, 62 lbs. at 60*s.* - -	186	0	0
Liquor quinoidine, 56 lbs. at 2*s.* 6*d.* - -	7	0	0
	666	7	0
Deduct working expenses - - - -	130	0	0
	£536	7	0

Comparing the sum that would have been realized for the bark, if sold, with the net value of the products obtained therefrom in the present experiment, we arrive at the following result :—

	Value of Bark.			Net Value of Product.			Difference.		
	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
64 bales of crown and renewed bark -	2,206	3	6	2,523	18	0	+317	14	6
42 bales of red bark - - -	596	2	2	536	7	0	— 59	15	2
Total - - -	2,802	5	8	3,060	5	0	+257	19	4

From these calculations it appears that the experiment has proved a financial success, and that it has resulted in a net gain of 257*l.* 19*s.* 4*d.*, or 9 per cent. more than would have been realized had the bark been sold in the usual manner. But it will be observed that the gain was wholly due to the crown and renewed red barks, which are rich in quinine, and that these realized 317*l.* 14*s.* 6*d.*, or over 14 per cent more than the bark would have sold for in the open market. The loss due to the working of the red barks seems to show that these fetch a higher price in the market than what is due to the actual value of the alkaloids they contain. This, I understand, is the case, and that the price which they realize is due to competition amongst druggists for these barks, which are largely used by them in making decoctions, &c.

The general conclusion to be drawn from this experiment appears to be that it will be advantageous to convert nearly all the crown barks and renewed red barks from the Nilgiris into quinine cinchonidine and quinidine sulphates, and into cinchonine alkaloid for transmission to India in compliance with the ordinary medical indents, but that the red barks should, as a rule, continue to be sold on behalf of the Indian Government as heretofore, if sent home in any quantities.

In consequence, however, of the annually increasing quantities of bark sent home from Ceylon and elsewhere, the time may possibly soon arrive when owing to a fall in price it may be advisable to convert these red barks instead selling them. It might also perhaps be found more advantageous, from a pecuniary point of view, to extract the several alkaloids separately from the red bark instead of making cinchona febrifuge, and this might be tried in the next experiment on a larger scale, which seems desirable before finally settling the question now under consideration.

I say advisedly, that *nearly* all the richer barks should be converted in this manner, as it will probably be considered advisable that out of future consignments home some portion should occasionally be sold, both as a test of the quality of the bark sent home, and of the manner in which it is packed for consignment, and with a view of obtaining the necessary data for checking the financial results of the undertaking from time to time.

Before determining upon the general adoption of this plan, it will doubtless be considered desirable to repeat the experiment with the crown and renewed red barks upon a larger scale, and to test the financial result of extracting the several alkaloids separately from the inferior red barks, as it will clearly not be desirable to work them up again, as before, at a loss.

F. C. D.

20th August 1880.

No 1 P.

Revenue
16th Sep. 1850

Orn

No 1090 d/25 October 1850

Communicated to the Surveyor Genl with the Govt Quadrant which accompanied the Samples referred to in Lieut Raper's letter of 16th Sept. last, also to direct Assistant Assay Masters he may wish to offer respecting the respective methods of extraction of the Cinchona Alkaloids ordered by the Home Govt.

2 Supervisor Calcutta
1 Comptr Straits
12 Bishop Rev.
21 Commissioners of Trade
2 Supt Central Provinces

The
Letter & Enclosure
No 39. & Enclosure

PRINT
27. 10. 50

Rec'd 11 Oct 50.

No 1395 Dated 10 Oct 50

Referring the receipt of the correspondence noted in the margin on the subject of the Cinchona plantations in England & Guernsey and other Colonies from the Court of Directors, requesting information whether any, & what, measures have been taken in India for ascertaining the value of the Cinchona Barks as a source of Quinine, & for introducing the cultivation of the Cinchona Plant into India, & stating that the Court have determined to have a report upon the whole subject drawn up, & have appointed Mr Weddell to proceed to the Continent for the purpose of collecting information relative to the Cinchona Plantations in Java, & to visit the Neilgherry Hills, & the Forests of Sandoway in Arracan, for the purpose of ascertaining whether the Cinchona Plant exists in a wild state in those Countries, & requesting that the Court may be furnished with any Reports which may have been received from the Governments of Bengal, Madras, & Bombay, on the subject of the Cinchona Plantations, & with any Reports which may be received from the Governments of the Straits of Malacca, Ceylon, & the Cape of Good Hope, on the same subject, & that the Court may be informed of the Measures which have been taken in India for the introduction of the Cinchona Plant, & of the Results which have been obtained.

25/10

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