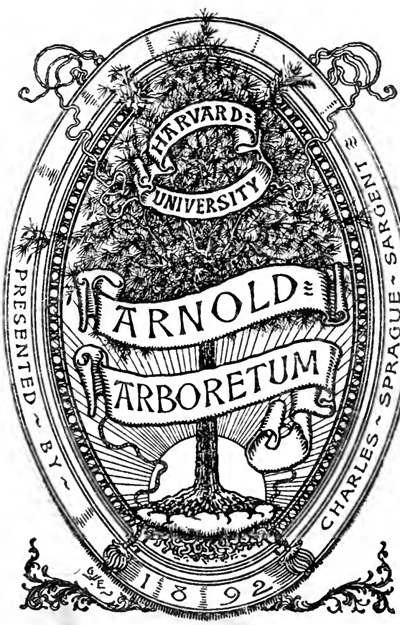
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1892

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

NEW SERIES VOL. II.

EDITED BY

H. N. RIDLEY, Esq., M.A., F.L.S.,

Director of Gardens,

Straits Settlements.

SINGAPORE:

1903.

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No. 1.] JANUARY, 1903. [VOL. II.

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H. N. RIDLEY, M. A., F. L. S.,
Director of Botanic Gardens and Forests, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

Para Rubber in the Botanic Gardens, Singapore.

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PARA RUBBER IN THE BOTANIC GARDENS SINGAPORE.

WITH PLATE.

The Plate given this month, shows a view of the large plantation of Para Rubber in the Botanic Gardens, Singapore. The large trees on the right are among the oldest trees in the Peninsula and were planted in 1878. They are about 60 feet in height and beginning from the nearest to the spectator measure, at five feet from the ground :—

No. 1. five feet two inches in circumference.

,, 2. Branches at 3 feet from the ground just below this, it is 9 feet in circumference while the three branches measure respectively at 416 from the ground, 4 feet 7 inches, 3 feet 9 inches and 4 feet 6 inches.

,, 3.	At 5 feet from the ground		4 feet 1 inch.
,, 4.	,,	,,	4 ,, 0 ,,
,, 5.	,,	,,	5 ,, 2 ,,
,, 6.	,,	,,	6 ,, 10 ,,
,, 7.	,,	,,	4 ,, 9 ,,
,, 8.	,,	,,	5 ,, 5 ,,

This tree throws a branch below this point measuring 2 feet 9 inches at the base.

No. 9. At 5 feet from the ground 5 feet 7 inches.

The other trees on the left were planted at a much later date about 1884 and vary in diameter according chiefly to the amount of light and expanse of branches. The distance apart varies a good deal, as seedlings have often grown up in and between the original rows which were about 12 feet apart in most cases.

The following measurements of trees of this age will give an idea of their dimensions.

A. Trees in a row with light on both sides about 9 feet apart. Diameter at five feet from the ground—(1) 4′ 8″, (2) 4′ 8″, (3) 3′ 4″, (4) 4′ 8″, (5) 4′ 11″, (6) 2′ 10″, (7) 4′ 6″. No. 3 which is smallest is only 28 inches distant from the next tree.

B. Another row by the roadside with light on both sides and the trees 11 feet apart gives at the same height—4′ to 3′ 6″; 2′ 11″; 3′ 2″ : 4′ 9″ and 3′ 1″.

C. Another row similarly placed but only 5 to 7 feet apart, gives—3′ 1″; 3′ 5″; 2′ 3″; 4′ 6″; 4′ 6″; 2′ 6″; 4′ 10″; 3′ 3″; 3′ 7″; 3′ 6″; 2′ 10″; 2′9″; 3′ 0″; 4′ 0″; 2′ 7″; 3′ 5″; 3′ 8″; 2′ 8″; 4′ 4″.

This planting is unusually close but it will be noticed that the trees are not very far behind those planted more distantly.

The averages are as follows—

A. 3′ 11″ B. 3′ 8″ C. 3′ 5″.

The biggest tree of about the same age in the plantation, on the edge of a large group measures 5 feet 8 inches in circumference at 5 feet from the ground.

The soil in which these trees are growing is an alluvial soil, rich in humus, and very damp. It seems to have been formerly a tidal river, of some size, as fruits of the Nipa palm, are found in the soil and the tidal river fern, *Acrostichum aureum* still grows there. The water in many parts is on ordinary weather about 6 inches under ground, and in very wet weather is flooded. The defect of this is that the tap root of the tree disappears with growth, and large masses of high roots close to the surface are developed. This gives the tree a less firm hold in the soft soil, and in rough weather trees are not rarely blown down.

Trees were also planted in the dryer parts of the Garden for experiment, but in most cases the stiff rocky clay did not permit the trees to produce enough roots and the trees made little growth. Some however planted some years ago in a wooded hill in the gardens though of stiff clay with a small amount of humus, have made grand growth.

The ideal soil for Para rubber is I think the low alluvial flats full of well decayed vegetable debris, and sufficiently good drainage to prevent the soil being sodden.

THE HISTORY OF THE INTRODUCTION OF PARA RUBBER INTO THE MALAY PENINSULA.

As there has been a good deal of confusion as to the history of the introduction of the plant into the East. The following history may be of some interest. In a letter dated April 17th, 1878, from Sir WILLIAM THISELTON DYER, then Secretary to Sir JOSEPH HOOKER at Kew Gardens, he writes "On 4th June, 1893, we received from Mr. MARKHAM some hundreds of seeds, obtained from Mr. JAS. COLLINS, of these seeds less than a dozen germinated and six of the plants so obtained were taken by Dr. KING, Superintendent of the Botanic Gardens, Calcutta, in the same year to India. The climate of Calcutta did not prove very favourable to the Heveas which require the conditions of growth met with in hot and moist tropical forests. It was therefore decided on consultation with Mr. MARKHAM that in the event of more Heveas being raised and sent out from Kew they should be received at the Botanic Gardens Ceylon which should then be regarded as the depot for supplying young plants to such parts of India as were suited for its growth.

On June 14th, 1876, we received from Mr. WICKHAM about 70,000 seeds of which about 4 per cent. germinated. On August 9th we despatched 1,919 plants raised from these seeds in Wardian Cases in charge of a gardener. Of the whole consignment 90 per cent. reached Dr. Thwaites in excellent condition. On August 11th 50 plants were sent to the Botanic Gardens, Singapore. Owing to the delay in payment of freight these plants all perished.

On June 11th 1897, 22 plants were sent to the Botanic Gardens, Singapore.

In October of this year Mr. MURTON, Superintendent of the Gardens, Singapore, planted himself 9 Heveas and 1 Castilloa at the back of the residency in Kwala Kangsa. " Mr. LOW reports, " They were brought here in October last by Mr. MURTON and planted at the back of the residency and are growing very well. They were quite small when they arrived here but. the Castilloa is now (July 26th, 1878) 5 feet high with branches of equal length and the Heveas vary from 4 to 8 feet and are growing vigorously." In a subsequent report dated February 3rd, 1879, Mr. LOW writes " the Heveas are now 12 to 14 feet high. They take to the country immensely. The Castilloa is a large tree 10 feet high with branches 5 feet long."

At the same time that these were planted some Para, Castilloa and Ceara rubbers were also planted at Durian Sabatang (Teluk Anson) but it appears they were washed away by a flood shortly after.

In a later letter from Sir HUGH LOW to the Royal Gardens, Kew, dated December 11th, 1896, he writes " As I am writing I should like to mention that the Hevea Braziliensis which having received from Kew through Singapore I planted at Kwala Kangsar in Perak grew magnificently and fruited I believe two or three years before those of Ceylon. I distributed the seeds to various places in the neighbourhood and they are now to be found in Mr. HILLS' Coffee Gardens in various parts of the Peninsula and in several places in Perak. When Mr. SWETTENHAM was at home in the summer I enquired of him as to their condition and found they were not thought to be of any value as some Dyaks had tapped some of the largest trees and found that scarcely any juice exuded from them " This unfortunate statement seems to have deterred Perak planters from paying any attention to Para rubber for some time. Sir HUGH LOW obtained some seed from somewhere in 1882, and gave it to Mr. WRAY who planted it at Kwala Kangsar. This may have come from the old trees there, for Sir HUGH LOW sent seed (50) from Perak to the Singapore Gardens, the same year seeds were distributed from the Singapore Gardens, the first recorded being sent to the Bishop of Sarawak.

This entirely disposes of the statements by WRAY * and others that the first seeds or plants introduced into Perak were introduced

* Notes on Rubber growing in Perak (Thaiping 1897.)

by Sir HUGH LOW in 1882. In fact almost every plant of Para rubber in the Malay Peninsula was derived from the Botanic Gardens, Singapore, and these directly or indirectly through Ceylon from the Royal Gardens, Kew.

In 1877, MURTON who had planted the young trees received from Kew as above mentioned in the Upper Garden to a more suitable locality in the new Economic Gardens and the trees on the right side of the plate are believed to be these plants. In his report for 1881, Mr. CANTLEY writes "the tallest Hevea (in the gardens) is now 25 feet tall and 14 inches round the base. These trees commenced to fruit in 1882.

Seeds were later received in large quantities from Ceylon, and when the Kwala Kangsa trees began to fruit Sir HUGH LOW sent seeds from them back to the Singapore Gardens for distribution.

Although the plant grew so well, planters could not be induced to take it up, and owing apparently to a report that it produced no rubber, the few people interested in rubber turned their attention to Castilloa and Ceara rubber. But practically with the exception of Mr. T. H. HILLS estate there were no plantations of Para rubber till TAN CHAY GUAN commenced to plant in Malacca.

In 1897, however the high price of rubber and the low price of Coffee stimulated the interest of planters, and a rush was made for the seeds. At the same time planters in all parts of the tropics sent for seeds and plants and attempted to grow the plant everywhere with varying success. In many countries it seems to have proved a failure, the climate being unsuitable.

In the Malay Peninsula it appears to have been more successful than in almost any other country both in rapidity of growth and production of rubber, and the only thing to be regretted is that planters did not take up the cultivation ten years ago.

INSECT NOTES.

Glyphodes Actorionalis.

I received on December 4th, 1902, from Selangor a box containing a number of leaves of Ficus elastica, spun together with a network of silk and containing a large number of chrysalises of a small moth. The chrysalises were about 1 inch long and bright brown, quite loose among the webs and leaves. The moths hatched out about a fortnight later, and proved to be apparently *Glyphodes actorionalis* one of the *Pyralidæ*. The moth is about an inch across, the antennæ very long and slender half an inch across, legs long ochreous, upper wings narrow light brown with a brown fringe, a small triangle near the base and a rhomboid patch in the centre pearly white and iridescent. Lower wings pearly white iridescent with a light brown band along the edge and a white fringe, the body silvery white.

This moth is very common, and the caterpillars probably feed on other species of Ficus, as allied species do. It is common in Singapore constantly coming to light, should it prove very troublesome, it could doubtless be thinned down by the aid of acetylene lamps in a pan of water, which would attract it and the trees could also be sprayed with tuba water to kill the caterpillars.

Ectatops rubescens..

Samples of bark of Para Rubber bored by one of the shot boring beetles was sent from Sungei Rengam by Mr. BARNWELL. From the state of the bark as received I should imagine that the injury was postmortem and the tree had died from some other cause, unfortunately the beetles themselves had disappeared when I received the box. With them however were sent some Hemiptera, a red bug resembling the Cotton bug *Dysdercus cingulatus* and apparently *Ectatops rubrescens* or an allied species. This was stated to be seen attacking the larvæ of the shot bores, and extracting them from their holes with its long beak. The bug is about half an inch long, the males being smaller, the head is small thorax triangular with the base raised and paler color, the wing cases blunt all bright red with a small black spot at the point where the wings cross and a larger one on the clear part of the elytra. Legs long and black autumœ slender, base red, upper joints black thoracic segments beneath black edged white, abdomen upper half black tip red.

As most of this set of bugs are plant suckers it is interesting to find one which is carnivorous.

LONG DISTANCE TRANSPORTATION OF SEEDS.

In a letter to the Editor, Mr. J. C. HARVEY of San Juan Evangelista, Vera Cruz, Mexico, writes as follows:—

"By the way, I have just completed a most interesting experi-
"ment. As we all know Castilloa Elastica seeds quickly lose their
"vitality under ordinary circumstances and the transmission of
"these seeds long distances, involving say as many as 45 to 70 days,
"has become a matter of some importance. Well, on May 16th of
"this year I packed, in 6 oz. and 8 oz. tins, the fresh seeds dried
"and cured 5 days on mats in a shady place, in charcoal which was
"fairly well pulverized. To every pint measure of the pulverized
"charcoal was added one table spoonful of water, mixing the
"charcoal thoroughly by shaking through a sieve. The seeds were
"then put into the tins little by little, adding charcoal and well
"tapping the tins so that the interstices between the seeds were
"thoroughly filled. No more, no less, than the charcoal was heap-
"ed up, so that the top of the can would have to be well pressed
"down, preventing any movement. The tins were sent to Cali-
"fornia to a friend to keep till September 1st to be then returned
"to me. They arrived here September 10th. On opening the tins
"fully 75 % appeared good. They were immediately sown and
"to-day we have 60 % of thrifty young seedlings 6 inches high.

"I believe at 60 days the percentage would have been 80 % or
"90 % of seedlings. I also instructed a friend who lives in
"Toungoo. Burma, where they have some specially fine varieties

"of Jack fruit (*Artocarpus integrifolia*) how to ship me the seeds. "He followed instructions and I raised 80 % of the seeds sent."

A BIG PARA RUBBER CROP.

According to the United States Consul at Para, it is believed that an exceptionally good crop of rubber will be harvested in that province this season. The rubber fields of the lower river, and especially in the islands, are slowly but surely failing, both in quantity and quality, but the decrease is more than made up by the development of new fields and the expansion of the old fields on the Upper Amazon. While all the more important tributaries of the Amazon are supplying their full quota of rubber, and even making a promising increase, interest, he says will be centred in the now famous Acre territory and in South Eastern Ecuador. In the regions reached by the Purus (of which the Acre is a tributary) Jurua, Beni, Madre de Dios, Jawari, Ucayali, Japura and other great affluents of the Upper Amazon which penetrate Peru, Bolivia and Ecuador, there are illimitable rubber forests as yet unexplored, which will now be gradually developed. Many seringueiros, or rubber gatherers, are making their way to these regions, and it is reported that several syndicates are about to begin operations in new fields in Bolivia and Peru. *Home Paper.*

EXTRACTION OF RUBBER FROM BARK.

The question of extracting rubber from the bark of certain rubber trees has repeatedly been suggested and experimented upon. So far, little success appears to have been achieved.

It certainly does not strike one as a very difficult matter to devise a process for the extraction of the rubber from a bark which really contains a fair amount of it. But it is certainly impossible to devise such a process without any direct reference to be operated upon. In other words, a thorough chemical examination of the bark in question is the first step to be taken. Further, there may be a large quantity of rubber in the bark, but it is most likely accompanied by a considerable proportion of resinous matter, the separation of which from the rubber would be quite as important as the elimination of the bark. Otherwise it might be found that the rubber extracted is of such inferior quality as to be almost valueless commercially. This, to a large extent, is what has been found in the various attempts of extracting gutta percha from the leaves of the gutta trees.

The resin accompanying the rubber in the different rubber trees varies very considerably in properties, and unless these are known it is quite impossible to give any directions as to their separation from the rubber. If the amount of resionous matter present should turn to be so small that its presence in the rubber could be tolerated there would still be the question of the nature of the tissues of the bark which has to be separated from the rubber. Under favourable circumstances, it is quite conceivable that this might simply be dissolved away by a careful alkaline treatment, in which case a very pure rubber indeed might be obtained. But it is impossible to devise an efficient treatment of this kind without a very complete knowledge of the bark to be operated upon.

The first step towards the desired end is therefore obviously a thorough chemical examination of the bark referred to in the enquiry. *India Rubber Trades Journal.* September, 29th 1902.

LAGOS SILK RUBBER IN TRINIDAD.

Mr. HART writes that he has been testing the value of the rubber fluids, latex or milk of young trees of *Funtumia elastica* Stapf, at the Experiment Station at St. Clair, and has found excellent rubber material produced by trees a little more than three years planted. The latex of *Funtumia africana* Stapf. has also been tested, and although found to produce a certain amount of rubber material, yet it is sticky, soft, and decidedly inferior to the produce of *Funtumia elastica.* It is possible, however, that its quality may improve with the increased age of the trees, as is the case with the Central American rubber tree (*Castilloa elastica*). Specimens of the rubber made have been sent to an expert in England for examination and report. The rubber produced by *Funtumia elastica* is solid and elastic, resembling "Para" rubber in appearance and probably equalling it in quality.

The presence of trees of the inferior *Funtumia africana*, at the Experiment Station is of importance as a warning guide as to what should or should not be planted. The two species were recently determined at Kew from specimens grown at the Trinidad Station.

The Agricultural News, Oct. 25, 1902.

ANNUAL REVIEW OF RUBBER MARKET FOR 1901.

KRAMRISCH & COS' (LIVERPOOL AND LONDON) ANNUAL REVIEW OF THE RUBBER MARKET FOR THE YEAR 1901.

During 1901 the Rubber Market has not been characterized by heavy or exceptional fluctuations; it was again not a particularly satisfactory one for holders and importers of the leading grades, and although trade remained exceedingly active throughout the year, the values of all grades of Rubber at the close are less than a year ago, and Fine Para shows a further recession of 3*d* per lb. and other grades in proportion. The bulk of the stocks of mediums has gradually been exhausted, although it must be admitted that the prices realised were exceptionally low and showed an enormous loss to the importers or holders, and even the more recent imports were disposed of at prices which not alone showed no profit, but in most instances the prices realised show a considerable loss. The imports of important medium grades have fallen off considerably, and as the enquiry has increased for same, we do not anticipate a further appreciable decline in values, and one ought certainly to advocate the encouragement of a substantial increase in the imports.

As regards the quality of Para rubber, considerable grievance was again caused by the want of care in the proper selection of these grades, especially from the Island districts, and this has led to numerous disputes amongst contracting parties. Trade in Great Britain and with leading Continental Rubber works was fairly good and the stocks of raw material at the factories are not large, and in spite of the fact that deliveries have been exceptionally heavy, the reported consumption of fine Para exceeds that of previous years. The America market showed the position there not to be so strong except for the first few months, but generally speaking the Rubber trade has been busy and the only important speculative stocks are held by one leading American house, whose position at the close of the year was considered very precarious. Visible supply now of Para and Peruvian is 4,618 tons against 4,100 tons last year. This includes America with a stock 2,005 tons against 1,200 tons last year.

Should the demand for Para rubber continue good, the statistical position at the end of 1901 is certainly a very healthy one. The total for the years' crop (from July 1st to December 31st) amounts to 13,680 tons; this means an increase of 2,400 tons, while against this the total increase of the visible supply gives us only about 480 tons, thus about 1,920 more tons have gone into consumption, this despite the fact that it is well known that the "invisible" supply is exceptionally small. Although grave financial difficulties were experienced by many holders of rubber, the position of the Rubber market is fairly sound, and with constantly increasing consumption, Rubber must be considered very reasonable at present quotations.

Para kinds.—At the beginning of the year we had to record a brisk enquiry for Para grades, and business on a large scale resulted, but owing to continued "bear" operations, prices exhibited an important recession, and while Hard Fine Para was quoted at the beginning of January at 3/10½, Soft at 3/9, Negroheads Scrappy at 2/9½*d.*, Island at 2/1¾*d.*, Cametas at 2/4*d.*, Peruvian Ball at 2/7½*d.* and Slab at 2/2*d.*, prices declined rapidly during the latter portion of the first month, and sales for forward delivery at a marked decline were done on a large scale, with the result that prices for Para grades receded about 3*d.* per lb. by the end of the first three months. In America Fine Para was then sold as low as 3/6*d.*, Scrappies 2/6¼*d.*, Island 1/11*d.*, Ball 2/4*d.* and Slab 1/11*d.* per lb. We then began to receive the first advices from Para of probable short receipts and some important buyers partly relying upon these reports bought large quantities, thereby causing considerable briskness; this improvement was actively maintained for a few weeks, and as high as 3/10*d.* to 3/11*d.* was paid for Fine during the middle of April. Other sorts were 2*d.* to 3*d.* per lb. dearer. Soon afterwards however, the market again showed signs of weakness, the demand being somewhat dragging, and in July

Hard Fine was quoted at 3/8*d.*, Soft 3/6*d.*, but a temporary reaction in August resulted in quotations again reaching 3/10*d.* to 3/9*d.* We have then had irregular declines of 2*d.* per lb. and in November Hard Fine was as low as 3/5¾*d.*, Soft 3/3½*d.* the lowest of the year. Additional cable advices from Para of probable short receipts during the end of the year and the early months of 1902 brought about some recovery on less pressure to sell, and with very large deliveries and moderate receipts we close the year firmly with quotations of Hard Fine at 3/6¾*d.* and Soft at 3/5¾*d.* Negroheads continue to remain very scarce, Scrappy being quoted at 2/9*d.*, Island 2/1½*d.*, Cametas 2/2*d.*, Ball 2/6*d.* and Slab 2/0½*d.* The total amount of Rubber imported from Brazil shows a further increase of 3,200 tons, and the total quantity exported from the State of Amazonas, including Peruvian *viâ* Iquitos and Manaos is 4,000 tons against 3,100 tons. The Peruvian Fine imported has we think been better as a whole, but owing to the Rubber having arrived in most cases uncut and unselected before shipment, new rules had to be adopted in order to provide for this altered mode of shipping this rubber. The Peruvian Ball imported has not been up to the expected quality and at the end of the year the standard of fair average quality was considered lower, although some nice clean Hard Balls when received did realize fairly good and in some cases, exceptional prices. The Slab continues to be of good serviceable quality and the consumption of it is certainly spreading. Bolivian kinds have been very fair, but the imports were not as large as last year. Mollendo again showed a marked improvement in quality, and consequently sold exceedingly well. From Venezuela *viâ* Orinoco the supply was less than last year and the quality not very attractive.

Imports of Ceara Scrap are smaller, but of these grades only the best qualities could be sold easily, others are dragging. Of Manicoba kinds we received less, but quality was good and prices realized were satisfactory. Pernambuco and Assaree qualities have somewhat improved, but owing to the general decline of the Rubber market, the values of these classes receded considerably. There were not very important arrivals of good Mangabeira and although the stocks are going down and available supplies very small, the prices realized for ordinary quality show an enormous falling off in price. The imports of Mattogrosso, in sympathy with Para, showed similar fluctuations, although transactions were only spasmodic. Central America has again been conspicuous by a further considerable decline in its export of Rubber, probably owing to the continued political unrest existing in those parts, and the only Rubber reaching us comes from the Columbia districts, but the quantities were very insignificant. The Equator and Guayakil kinds sold readily, and the prices at the end of the year are only about 1d lower than they were a year ago. Of course this refers to good qualities only. Inferiors and mixed kinds are much cheaper. The imports from Honduras, Mexico and Panama were likewise very small.

Africans.—As expected, at the close of the previous year, the increase in imports of these descriptions was not only not maintained but showed a considerable and serious falling off, and we estimate the difference of imports from Africa to be about 2,000 tons below that of last year.

With the exception of slight spurts in April and again in August, (in sympathy with Fine Para) the year 1901 has been characterised by an uninterrupted decline in African Rubber, the only exception being First Sierra Leone Niggers which are actually rather dearer than a year ago, while all other descriptions show a decline varying from 1*d.* to as much as 6*d.* per lb.

From Angola we received 250 tons less, made up in shipments from Benguela of 1,250 tons, as against 1,500 tons in 1900. Loanda 730 tons, against 678 tons. Quality has been hardly so good. The Congo has slightly increased, but the quality has seriously declined, about 5,300 tons, against 5,000 in 1900. The average price shows a very considerable fall because so much was of poor quality. The supply from Sierra Leone and French Guinea has again fallen off, partly owing to the prohibition by the French authorities of the exportation of dirty wet and inferior Rubber from Conakry. The quality being thus reliable has caused consumers to look on this kind with favour, and their appreciation is reflected in the price which is usually high compared with other Rubbers, both African and Brazilian.

Quite an extraordinary decline in supply of Gold Coast, Accra, Lagos &c. and only moderate from Cameroons, Sierra Leone, Gaboon &c. and small of Senegal. Prices of nice hard only about 2*d.* lower, but soft common and Lagos fully 4*d.* decline for the year. We no longer quote Strips and Biscuit, the pressing of Lump Rubbers being practically abandoned. Liverpool imports of West African 4,200 tons, against 5,140 tons in 1900 and 5,600 in 1899.

The Congo Free State has given increased exports to Antwerp, but other kinds of African have gone there in reduced quantities, so that the total Antwerp imports show little change.

During January, African Rubber met with a disappointing demand at rather easier prices. February and March were very dull and prices declined for most sorts, closing with lower values all round. In April, fairly good trade was done at rather better prices, closing however somewhat quieter. A moderately large business was done in May at irregular prices. Good Sierra Leone sorts were then well in demand, showing however, little if any, change in price, whilst Lump descriptions were ½*d.* to 1*d.* per lb. lower. During June and July, African Rubbers met with a moderate to poor demand at general lower rates, and only a comparatively small trade was done at barely steady prices. The demand was better in August, especially for parcels of good quality which arrived from Sierra Leone. This position of the market was not maintained, and we see a constant falling off in the demand which remained disappointing with only small business passing at generally lower rates, until the end of November when quite a steady trade was done at generally unaltered and in some instances slightly increased prices. The demand continued to improve during December for all the better grades, and rather higher rates were paid all round.

East Coast of Africa (*Zanzibar &c.*) The supplies of these descriptions have continued to gradually fall off, and to this must be ascribed the fact that at the close red hard Rubber is only 1d. per lb. lower, but white and common Ball Rubber declined about 4d. per lb. Lamu Ball (Mombassa) the arrivals were not important although the quality was fair and good clean Rubber sold fairly well, prices however, showing a decline of 2*d.* for the year. Nyassaland sent us very good Rubber, but the consignment were small, and when they reached the market, were bought up readily at fair to full prices. Madagascar supplies were again on the decrease, and have only been about half of what they were last year, and values were consequently well maintained.

Imports from *Ceylon,* were again insignificant, but whatever small quantity reached this market, if proved very attractive, as the quality and condition continued to be excellent, and many buyers were anxious to secure even the small arrivals, owing to the specially clean condition of this Rubber. We confidently expect that if larger imports could be arranged a great circle of consumers would come in and pay full prices for these grades, especially if the quality be kept up. It would be advisable to encourage the planters and others interested in this product in giving particular attention to this most valuable Rubber. High prices were realized, and 3/9¾*d.* was recently paid for fine and 2/4*d.* for the Negroheads. It is of course known that this Rubber should practically be of the same kind as the one coming from the State of Amazonas, being grown from Para Seed.

Rangoon and Penang has also been in much reduced supply. Of the latter description we practically received no further shipments this year, but in spite of this, all the old stocks held were most difficult of sale, and what was disposed of showed an enormous decline and thus Rubber that was quoted at 3s. 2d. a little more than a year ago sold at about 2s. 2d. to 2s. 5d. per lb. according to quality. If good quality of these descriptions could be imported to sell at present rates, it is certainly worth encouraging as with scarceness of good Red, Mozambique Ball, the demand for these Red Penang kinds would again grow gradually.

Small quantities of *Assam* were shipped, but the quality was very poor and sandy, and consequently did not meet with any requirement or interest.

Borneo. Of this Rubber the supplies have not been excessive, but in sympathy with the general tendency of the market, prices declined. These grades are still held for higher prices, and with a continuance of the lower quotations all round, we must also look for much reduced values in these grades before one will be able to effect larger sales. *Pontianak.* Supplies were about the same as those of last year and sold readily, prices showing very little change at the close of the year.

Rubber from *French Cochin-China* and from *Lower China* have continued to sell well, the quality and condition of nearly all arrivals were satisfactory and the small trade done must have been profitable to the importers.

Java Rubber and *New Guinea* have been very scarce, but generally speaking these qualities were not in great demand and quotations were only nominal.

Balata. We had reduced arrivals of these descriptions, and all the imports of these grades have met with a good demand, although at one time Block *Balata* was as low as 1s. 7d. The year closes with buyers at 2s. and sellers at 2s. 1d. Nearly the whole of the stock in first and second hand has been cleared off and gone into sonsumption, and all new arrivals are selling very readily at full prices. *Sheet Balata.* Owing to the increased consumption the prices have also gradually gone up, and the market closes with buyers at 2s. 7d. showing 4d. per lb. advance for the year.

Gutta Percha. The year opened with a very poor demand, and the market continued weak throughout almost the whole of the year. It was only during November that, owing to larger contracts for cables being placed, extensive buying orders appeared on the market, thus increasing values of Gutta Percha, and since then a fairly large business has been done. There seems to be every prospect of a continued good market with fair prices being paid for good and desirable qualities of Gutta Percha.

THE HEVEAS OR SERINGUEIRAS.

BY

J. BARBOSA RODRIGUES.

DIRECTOR, BOTANIC GARDENS, RIO DE JANEIRO, BRAZIL,

Translated by

A. D. MACHADO,

Assistant Superintendent, Botanic Gardens, Singapore.

Chapter I.

HISTORICAL RÉSUME.

The knowledge and the use of elastic gum date from the remotest antiquity.

The primitive races of America—when into their harbours sailed Christopher Columbus—were already acquainted with this article employing it in their manufactures and their games. Its use was introduced into this great continent by those Asiatic immigrants who in prehistoric times, had settled here. Divided, each race employed this substance produced by the flora of the locality in which they resided and containing the same properties, consisting always of a milk, which, when prepared, gave elasticity and impermeability.

For example, the *Mayás* and the *Nauhás* of Mexico, not only utilized it but likewise traded in the article, exporting it in great quantities to other places. According to the best historians, the cities along the Gulf of Mexico, were in the habit of paying to the *Astecs* annually, among other products, a tribute of 16,000 cargoes of elastic gum. Among other uses to which this article was put included the manufacture of balls used by them in their games which use extended, among certain of our indigenous tribes, right down to the South of Brazil.

The primitive name given to elastic gum in Mexico was *Ulé*, (1) *ule*, or *hule* which was adapted and got perpetuated by those of our savages descended from the Caribs.

By the human avalanche occurring from north to south and spreading into South America, the use of elastic gum became vulgarised. One of the subdivision of the tribe of Nauhás reaching New Grenada and there establishing themselves, were accused of cannibalism and harassed by the Spanish conquerors, when dispersing again, one section descended and reached the Amazon River.

This section of Nauhás took various names, becoming corrupted eventually into *Nauhuá, Maguá, Omaná and Omagua.* Warred against by the tribes already established along the margins of this great river, they were by these tribes called *Cambebas* (2) that is to say, *flat heads* from their use of the *platycephalia*, which custom disappeared towards the end of the last century, on the advent in that region, of religion and civilization.

This tribe of Omanas gave to those tribes already inhabiting this region, their knowledge of elastic gum, of its application and of its preparation for the use of civilization.

The Nauhàs utilized the *Ulé* (Castilloa *elastica* Cerv.) and the Omanas, not finding this in the Amazons, substituted with advantage the *Hevea*, giving to it also the name of *Ulé*. This name the Caribs of Guiana corrupted into *Hevé*. The French botanist AUBLET adopted this name scientifically and from it arose the genus *Hevea*.

By the coagulation of the milk furnished by these trees, the Omanas prepared, by processes acquired from their ancestors, flambeaux, balls, tubs, flagons &c., for their domestic use and as repositories for their beverages. Among other objects prepared by these people figured the syringe (*Seringa*) using it in their festivals, likewise in cases of sickness.

Though elastic gum was known to the Cambebas since the sixteenth century, they were yet ingorant of the source from which it came or how it was prepared. Later on, towards the end of the seventeenth century, when the Portuguese missions began to extend, and through them, products from the Amazons were remitted to Europe, were many articles made by these Cambebas or Omauas from Ulé.

The first known elastic gum in Europe, came from the East Indies, and its use was exclusively confined, until 1820, to erasing pencil lines made on paper, hence the derivation of the name

(1) *Ulé* is an Asiatic word introduced by the Phœnicians from Greece. meaning *dripping water*, and which gave origin to the word *uligo*, humidity.
(2) From *Akong* head, and *pena* flat.

India Rubber. This rubber was extracted from the *Ficus Elastica* Roxb.

The few first men to recognise the utility of the American elastic gum were La Condamine, and the Carmelite friar Manoel da Esperança, who, in 1783, was evangelizing in the Amazons.

Inasmuch as among the utensils prepared from this gum, appeared always the syringe, the Portuguese gave to the tree producing this milk the name of syringe wood (*pâo Seringa*) or *Seringueira*, and continuing to call the product from this tree the *Seringa*, it, to this day is known by that name.

Taken to Peru by the Spanish Jesuit missionaries, the Omauas, meeting there the *Castilloa elastica* and the *Galactodendron utilis*, gave them also the name of Ulé and of *Caaochô*. It is this latter name which, corrupted, became known throughout the world. From *caaochô* pronounced by some *caaochû*, appeared through the Spanish pronunciation, the *caotchu* turned again by the French into *caoutchouc*. The Peruvians called it *caocho*. It is known by that name in Peru to-day. (1).

The Portuguese who kept their liquids in leather sacks or bottles with distended sides or bellies to which the name *borracha* was given, seeing among the native aborigines, similar vessels manufactured from elestic gum, called them also *borrachas*. Eventually this name came to be applied to the substance from which these vessels were made.

Till then elastic gum was used for no other purpose but the indigenous one.

In the work of evangelising the natives, the missionaries, living always in swampy surroundings, started to cover their shoes with this milk, and later on making them entirely of elastic gum, by means of clay woulds, which they afterwards broke. Then began a trade with the Indians in balls, syringes, flagons, shoes &c. which were supplied in exchange for mummeries and other useless articles.

These products being brought into the market, their consumption and subsequent exportation assumed large proportions.

In 1755 the use of rubber foot-gear was already in vouge in Para and in Lisbon. King Joseph, being presented by missionaries with samples of these useful shoes, profited by the invention and sent to Para several pairs of boots to be covered over with rubber, an example followed by great many others.

In consequence if its qualities and its impermeability, it was used in the manufacture of haversacks for soldiers. About this time, the brigantine *Gaveão*, took back to Lisbon, more than 2,000 such haversacks rendered impermeable.

Already in 1735, the Astronomer La Condamine had sent to France the first sample of rubber. There the Surgeon MACQUER, experimented with it in the manufacture of catheters, and finding it superior to metal, wrote in 1768 a monograph on same to the Academy of Sciences of Paris, in which he justified the uses and advantages of this product.

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(1) The English name for this substance is Para Rubber.

It then began in Europe its industrial use, and much profit accrued to the manufactures of catheters. In 1779 the Portuguese Government sent to Para the physician Dr. FRANCISCO X. D' OLIVEIRA, with a view to encouraging the manufacture of surgical instruments and to enliven this industry.

In 1791, Grassart, applied elastic gum in the manufacture of tubes, and later, Nadler, in the preparation of thread, and from thence arose the woven or tissue industry.

In 1850, Para still exported to the Provinces, and to foreign parts, shoes and syringes, these constituting one of the sources of trade of that Province.

The exportation of these elastic products to Europe began in 1825, but with them were also sent elastic gum in its crude state. Its use spread and very much increased after the discovery of the process of its vulcanization.

Till 1840, its exportation consisted almost entirely of shoes. After 1850 this indigenous industry ceased. In 1825, a lb. of pure rubber was worth 100 Reis, and until 1840, it was purely a native industry, like that of the *guaraná*. (1)

Increasing gradually this exportation through the development of foreign industries, the extraction of gum passed from native hands into the keeping of civilized people and of *tapuyos* i.e. Brazilian savages.

The formation of rubber extracting depôts followed as a matter of course into which flocked the descendants of the Indians, who, abandoning their homes and other ties, and lured by the seductions of this industry, eventually found themselves delivered bodily into the fetters of the slaver. It should however be noted that this industry was always in the keeping of free-men notwithstanding the existence of slavery in those days; nevertheless such was the system then in vogue, that those engaged in it were reduced to misery and to the condition of slavery.

Then appeared on the scene the travelling merchants or pedlars, and with them, the further degradation of existing customs, immorality, and its concomitants.

The population began to diminish and with this diminution languished all other industries, such as those of indigo, coffee, cotton, tobacco, and tapioca, all to make room for this foreign trade in rubber, which continued to flourish, killing everything before it, tillage, husbandry and all.

Rubber trading depôts increased in proportion, rivers were explored, Indians took to flight and concentrated, yet, notwithstanding this agglomeration of population, those in the villages kept diminishing to supplant those in the depôts, who were being decimated by disease or migrated from one river to another. Thus declined and disappeared whole villages.

In 1877, Ceara was in the throes of a famine fanned by a long drought, causing the population of that province to emigrate *en masse* to the Amazons. This gave rise to an increased production of rub-

(1) Paullinia sorbilis.

ber, but existing customs were transformed, savages withdrew from the district abandoning their lairs; even the language proper was forgotten, giving rise to new names to localities, plants &c. Characteristic Amazonian features were lost, being supplanted by those of a new California.

In 1890, exchange declined, with it, rose the price of rubber. Then appeared the Gold famine, and with it fortunes were made from hour to hour. Before this, the rubber fever, like an epidemic, extended from one end to another of Brazil, producing by this transition the transformation of this southern agricultural land, with only a thought for the present, and to the detriment of the future of the State.

INTRODUCTION OF CEYLON CROWS INTO SELANGOR.

KLANG, SELANGOR,
FEDERATED MALAY STATES,
28th January, 1903.

THE RESIDENT-GENERAL, F. M. S.,
CARCOSA,
KUALA LUMPUR.

Ceylon Crows.

Sir,—In continuation of my letter of the 5th instant, I have the honour to report as follows:—

1. There have been no more fatalities amongst the crows. The whole batch of 56 have now been set free, and so far show no inclination to desert the locality. They were released as recorded below:

On 9th	January	12	birds.
12th	,,	6	,,
16th	,,	14	,,
17th	,,	12	,,
27th	,,	12	,,
	Total	56	,,

The first lot were let out within 4 days of their arrival, because several of them looked weakly and as if they were suffering from the confinement. An equal number of healthy crows were at the same time given their liberty as I thought that the example of those able to take care of themselves would perhaps be beneficial to their less robust brethren in the way of encouraging them to forage for food, etc. Finding the first birds disinclined to fly away from the place, I gradually let the others out as shown above, keeping a dozen only until yesterday, in order to observe their behaviour in captivity, and see if a prolonged confinement would in any way affect them adversely. I am pleased to say, that far from this being the case they got fresher every day, and their plumage brighter.

2. *Food.*—From the date of their arrival here, the birds always fed well, preferring raw meat to anything, and not being inconvenienced by it being several days old. At one time they had a plentiful supply of elephant meat, which kept them going for the best part of a week. They also ate bananas and boiled rice, though not with the same avidity, and were always specially fond of bathing in the pans of water which I had placed in their cages. When first they were introduced to the caterpillars of the Bee Hawkmoth they regarded them with some suspicion, and only ate one or two. In a very few days time however, they devoured every caterpillar, chrysalid, and moth, that they could get hold of. Many thousands of these insects have been given to them daily, and there have never been any left over. There can be no doubt whatever therefore that a caterpillar diet is quite acceptable to them, directly they get used to it. Since their release, they have flown away to the coffee, and have evidently been looking for food there, but I have not been able to see them actually catch the Bee Hawk Moth caterpillars, though they very assiduously clean the plantain trees of the caterpillars which roll themselves up in the leaves of this plant. It seems to me, that the utility of the crows, as enemies to the coffee caterpillar, will depend largely upon the numbers of the birds in the place, and the consequent scarcity of the food to which they have been accustomed in Ceylon, that is to say, the refuse in the vicinity of human dwellings It is only natural that they should *prefer* such food, especially as it is more easily procured. It was only when the caterpillars appeared in very large numbers, that the crows in Ceylon were attracted to them, and so it will be here, in all probability. But there is always the factor with our importations, that they will have got to recognise the coffee caterpillars and chrysalids, as palatable articles of diet, before they get their freedom. It has been suggested that the crows should be let loose amongst coffee trees that are badly attacked by caterpillars, and which have been previously covered over with netting to prevent the birds from flying away. I should have given this a trial, as no harm could result from letting the birds understand where the caterpillars are to be found, but the present consignment is such a small one that it seemed better to leave them altogether, and not separate them, as I should have been obliged to, for there are no coffee trees close by, just now, on which the caterpillars are to be found in any numbers. So I decided to leave this part of the experiment to a future occasion, when we get in a fresh batch.

3. *Breeding.*—I am satisfied that as soon as the crows decide on a suitable spot, they will begin to breed. They are often to be seen flying about in pairs already, though I have observed no actual attempt to commence building their nests. Whilst the last batch were still in their cages, it was evident that the question of mating had not been consigned to oblivion. There were at least two pairs, whose attitude towards each other was distinctly suggestive of something more than ordinary friendship, and I also noticed that one of the caged birds had an obvious preference for

one of those that had secured its liberty, calling regularly to the outside crow which always kept in the vicinity of the cage.

4. It may be of interest to record that upon the arrival of the Ceylon crows, some dozen or more of the ordinary carrion crow of this country appeared on the scenes, and seemed to regard the new comers with considerable interest, but never made any attempt to molest them in any way. Indeed as far as I can see the Ceylon crows have nothing to fear from any natural enemies in this country. I have seen kites and eagles flying round since they have been here, but on no occasion have they attacked the crows. I have a large number of young ducks and chickens where the crows have been let loose, but they have not been disturbed by their new neighbours at all, and I do not think that the crows will do any mischief of this sort, as some people anticipate. I may mention however, that the young ducks proved too much of a temptation to the big carrion crows, which killed and carried off several every day, until I was obliged at last to shoot two of them. They were only wounded, and I was able to keep them in one of the empty cages for some days, when one of them, having evidently sustained internal injuries, died. The other, however, is still alive and it has been very interesting having the two species side by side for comparison. The carrion crow readily eats the largest coconut beetles and their larvae, his powerful bill enabling him to split up and devour the former with the greatest ease. The Ceylon crows will also eat the larvae greedily, but cannot manage the beetle unless it is killed and broken up for them first.

General.—I venture to think that the experiment as far as it has gone has been an unqualified success. It has been demonstrated that the crows will thrive in captivity, that they can stand without any serious ill effects the long journey over to this country, that when released they do not at once fly away, but show every sign of an intention to adapt themselves to their altered circumstances, and that, when given to them, they readily eat the caterpillars, the destruction of which was the reason for their importation. It now remains to be seen if they will breed, and should they do so, I do not see what more can be expected from them, for, as I have said, it is scarcely likely, while so few in numbers, that they will hunt the coffee for caterpillars, when there is so much food of other sorts available. The remedy for this is to import several thousands of the birds, and I shall sincerely hope to see this done.

I have, &c.,

E. V. CAREY,
Chairman, U. P. A., F. M. S.

COAGULATION OF RUBBER.

Singapore, 28th January, 1903.

THE EDITOR,
THE AGRICULTURAL BULLETIN OF THE STRAITS AND FEDERATED MALAY STATES.

Dear Sir,—You are aware that I have filed the specification of an invention "for the rapid coagulation of fresh latex from rubber "trees." A few words explaining my method may perhaps be of interest to the readers of the Bulletin.

So far we know of 3 modes of coagulation.

1. Spontaneous coagulation such as takes place on the tree from the heat of day, producing scrap.

2. Coagulation by chemicals.

3. Coagulation by artificial dry heat such as that employed by the Amazon native.

I make no mention just now of coagulation by formaldehyde recently preconised by Dr. WEBER, to which Mr. PEARS has lately drawn the attention of planters; nor of coagulation by centrifugal action. I shall come to them presently.

Spoutaneous coagulation is uncertain, unclean and wasteful; decomposition is liable to occur in the milk if exposed in any quantity, especially that of Hevea which is apt to turn putrid in a few hours.

Coagulation by chemicals is a handy, clean and expeditious way of preparing rubber, but we cannot blind ourselves to the fact that it has not yet established its efficiency to the satisfaction of the rubber trade. There is a keen suspicion abroad that, as Dr. WEBER says "coagulation of rubber by acids results in differentia-"ting it more or less from the original product" and I believe it is a fact that its behaviour in the manufactured state does not tend to give it a good name. If that is so, why, the treatment of rubber latex by acids must go to the wall.

We have to consider now the third method. *viz.* coagulation by artificial dry heat as employed by the Amazon natives. The method is so well known that there is no need to describe it here, but it will be well to settle one point in connection with it, *i.e.*, the precise action of the smoke on the latex.

It was thought at one time that the smoke of the nuts often used by the natives had a strange and peculiar property of coagulating the milk independently of the heat evolved; but this is not so. As consul Temple says: "It is a mistake to suppose that all, or, even "a large proportion of the rubber coming from the Amazon is cured "in this way (with the nuts). It is on the contrary very rarely "that the rubber cutter will be at the trouble to collect these nuts; "he nearly always prefers to use wood chips which give him less "trouble to procure."

We may infer from this that any white smoke developing sufficient heat, and not actually deleterious, will do for the purpose; and further that the smoke coagulates not because of any virtue of the nuts or of the material employed, but simply because it is hot, just as spontaneous coagulation is brought about by the heat of day. The native employs smoke in preference to an open fire because of the risk of burning the rubber, a frequent occurrence even in the case of smoke coagulation. The smoke has, moreover, antiseptic qualities, but, as a set-off against this, the particles of soot which it contains, constitute in themselves an impurity. I think the main secret of the success of the Para method is this;

The native does not attempt to deal with a mass of milk at one time; he dips his spatula in the milk and presents only a very thin coating to the smoke; that first layer having solidified, the operation is repeated; the final result is a series of thin layers, overlapping one another, each of which has been penetrated through and through by the heat, and antiseptised by it.

But, with all its effectiveness, the Brazilian method is slow and tedious; it requires an amount of sustained attention of which the native is not often capable; sometimes a portion of the rubber will be burned; another portion, insufficiently smoked, will readily decompose. Moreover, it is quite unsuited to meet the requirements of an estate of some size.

My invention is a mechanical adaptation of the Brazilian process, so contrived that the work is performed automatically or nearly so. The flow of the filtered latex can be regulated at the start of the operation, to the thinness of a mere film and the substance runs in an uninterrupted sheet on to a heated surface kept at a uniform and constant temperature throughout. The flow of the latex remains even until the whole milk is worked off. I have simply aimed at reproducing exactly the conditions under which the Brazilian method is conducted, while at the same time regulating it and freeing it from the defects inherent to the listlessness of the native operator. It is not contended that the process does away with the proteids any more than chemical coagulation does; but there is more in the action of heat thus employed, than the mere evaporation of the water of the latex. Presented in the shape of a thin film, the latex is seized and penetrated through and through by the heat, the result being a kind of "pasteurisation" of the thin mass, which robs the proteids, now solidified and insoluble, of their septic properties. Hence the freedom of well cured and dried para-rubber from decomposition.

This brings me to the process preconised by Dr. C. O. WEBER of coagulation by formaldehyde. Formaldehyde or formol, sold in the trade under the name of formaline as a 40% solution is known to form compounds with albuminous substances often rendering them insoluble; and, being at the same time a most powerful antiseptic it would appear to be a complete coagulant. And yet, even in this case, the removal of the proteids does not seem to be completely accomplished, for we see that, after the coagulation has been effected, it is recommended, "in order to remove all traces of "albumen that may be suspended, to cut the rubber into strips and "subject it to a thorough washing upon an ordinary rubber washing machine."

Perhaps, then, the last word of "proteid-free" coagulation is not yet found?

Strange to say, Mr. HAMET who experimented with every conceivable re-agent, gives fluoride of sodium as the complete coagulant to-tally destroying proteids; and after enumerating the other coagulants which he employed with more, or less success, he winds up by saying; "other antiseptics, salol, gaiiol, formol etc. do not "coagulate."

Formol! the very coagulant preconised by Dr. C. O. WEBER. When Doctors disagree &c. &c. I do not say this in disparagement of Dr. WEBERS' statement; he is far too great an authority for me to dispute his statements, but his method has against it that it is open to the same objection as other chemical coagulations *viz:* that we do not yet know the behaviour of the product in its ultimate manufactured state.

The fact is, the very nature of india-rubber in its pure state is so litttle known, the particular physical arrangement of molecules which gives it its tensility and the property of re-traction is so little understood: we have such dim notions of the way in which the various elements of the latex, which go to form the constituents of pure rubber, combine or separate in the act of coagulation, that we must be content, in the present state of our knowledge, yet awhile to tread the old beaten tracks of empirism.

Take for instance, centrifugalisation of the latex. In aiming at producing a pure crude rubber, we strive, after all foreign impurities have been eliminated, to work out the destruction of the fermentescent elements or proteids; well! centrifugising does it, and what is the result?—a rubber which in the vulcanizing process loses its tenacity and vitality—a product inferior to that of coagulation by heat!

I will not linger on the "centrifugal" process. To obtain 7,000 revolutions a minute—the speed required in the treatment of Hevea—a motor will be required—that disposes of the matter for the present at any rate.

To resume this already too long letter, my invention is simply a mechanical and automatic adaptation of the Brazilian method. That method has stood the test of time; it has answered all the requirements of manufacturers. It stands on proved merits, which cannot be said unreservedly, so far, of any other method of preparing rubber.

The apparatus itself is extremely simple; one coolie can work it without effort; it is light; it requires no special installation and can be transported to the fields, if need be.

E. MATHIEU.

Singapore, 28th January, 1903.

PARA RUBBER TREES AT HIGH ELEVATIONS.

In reply to an enquiry, whether Para rubber would be profitable if grown at an elevation of 1,600 feet to 1,800 feet, Mr. F. J. HOLLOWAY of Kepitigulla, Matale, Ceylon, writes to the *Times of Ceylon:*—I am now tapping some trees at about 1,600 feet, on a hillside, and am very pleased with the excellent results obtained. Trees at this elevation, although a good deal smaller than the ones of the same age at a lower elevation, are now being proved to yield *better* than those lower down.

They only require one incision in the morning, and the cups are emptied at 11 a.m. and replaced under the same cut immediately, and are again emptied at 3 p. m., thus giving the same yield from one cut as would be obtained from two cuts on trees at the lower elevation. I have never been able to do this at the low elevation, as the latex does not flow at 10 a. m. This is proof positive that Para rubber yields better at 1,600 feet, than at 600 feet.

I think this a very important fact, and one that will, no doubt, be noted by all concerned in Para.

It is probably due to the cooler atmosphere at the higher elevation, which does not tend to coagulate the pure latex as it exudes from the wound, whereas, at the lower elevation, the temperature being much higher, the latex scarcely has time to run into the cups before it coagulates on the way, owing to the heat.—*From the Indian Gardening and Planting of January 17th, 1903.*

RUBBER IN CEYLON.

Mr. J. B. TENNANT of Berredewelle, Matale, went down to Kalutara in September to inspect the Para rubber cultivation on Culloden Estate, Neboda. A "Standard" representative, who was in Kalutara on Saturday, in a brief conversation with Mr. R. W. HARRISON, the manager of the estate, learnt that the prospects of Para rubber in the low country were very bright. Recent sales in London fetched exceedingly good prices. All the trees have been tapped and are yielding very freely. Trees have been planted in all parts of the estate (Culloden), which belongs to the Rosehaugh Tea Company of Ceylon, and is the best estate in the low country where Para rubber has been fully planted, Arrapolakande also in Neboda, coming next. Mr. HARRISON informed our representative that he expects an output of nearly ten thousand pounds this year which is considered a splendid record. Large quantities of seed have been sent to Southern India, and several local estates have also been supplied. Mr. HARRISON used to do a tremendous business all over Java, Sumatra, the Cape, North Borneo, Thursday Island and Queensland. Small quantities have also been shipped to London and Paris but the foreign demand is now practically over.—*India Rubber and Gutta Percha Trades' Journal.*

PRESERVES, NUTMEG AND LIME.

LIMAU KASTURI PRESEVE.

Two days.
150 Limau Kasturi.
4 lbs. Sugar
2 Coconuts.
Some leaves of Chukup Manis.

Scrape the outer rind of the fruit sparingly.

Make 4 downward slits in the rind, and squeeze out the juice and pips.

Drop the fruit into a basin of cold water, and leave to soak for 24 hours.

Squeeze out the rest of the juice and pips.

Wash and squeeze ten times, till all the acid is out, taking care not to break the fruit.

Prepare the coconut water, mixing the colouring with it—(the colouring is made by grinding the leaves of Chukup Manis with a little water and then straining.)

Boil the fruit in this green coconut-water till it is quite green and fairly soft.

Meanwhile the sugar should be boiling.

When the sugar is boiling, drop the fruit in, and boil till the syrup thickens.

Add a tablespoonful of brandy.

Note.—This preserve is not easy to make, because of the fruit being so acid, and it is not easy to cut the rind carefully, so as to avoid spoiling the round shape of the fruit. This preserve is however much valued.

Nutmeg Preserve.

Two days.
20 Nutmegs.
4 lbs. of Sugar.

Cut open the fruit and take out the nuts.

Soak the fruit in salt and water for 24 hours.

Wash about ten times in plain water.

Leave the fruit soaking in cold water, while the water is boiling.

When water is boiled, put in the fruit and boil till quite soft. Drain, and put in basin of cold water.

Peel outside and inner skin.

Cut in neat slices and place in cold water.

Boil the sugar and strain.

Put sugar again to boil and drop the fruit in, first drying it.

Boil till the sugar thickens to a right consistency, and add a dash of brandy.

Note.—The fruit ought to be ripe when picked, or the preserve will be hard. It should be a pretty red colour and the flavour is exceptional.

L. E. BLAND.

CORRESPONDENCE.

Dear Ridley,

The "exquisite" sample of Para mentioned pp. 470 of the "Bulletin" came from Lord Ribblesdale's estate whereever that may be. Perhaps you know, in which case it would be interesting to ascertain their method of coagulation.

Your truly,
F. PEARS.

Dear Mr. CURTIS,

It may interest you to get the following report on the Rubber sample you sent me a short time ago, and which I forwarded to my agent in London. He writes as follows. "I took the Rubber "sample you sent to JACKSON and TILL" (who are one of the leading brokers in this article). "They call it *very fine quality*, and "valued it at the time at 3/10*d.* against 3/4*d.* for fine Para. They "said that the sheets should be thinner than yours. What comes "from Ceylon is made in the shape of and about the size of a dinner plate and sells at about the above price, but it is a limited "market and were the quantity to increase much the price would "not be over Para.

Thanking you again for the trouble you took in the matter, and assuring you that I shall be glad, should you require the use of my services at any time to reciprocate the same.

I am, Yours sincerely,

DAVID BROWN.

To The Editor

AGRICULTURAL BULLETIN

Straits Settlements and Federated Malay States.

Below is London report and valuation on a sample of Para-rubber prepared by Mr. STANLEY ARDEN, with acetic acid.

E. V. CAREY.

Messrs. FIGGS & Co's report on sample of India rubber.

We have examined your sample of India Rubber :—

It is fine clean quality and as good as we have seen from Ceylon.

To-days value about 3/10-3/11*d.* We do not think the curing by acid will deteriorate the value.

7th October, 1902.

NOTICES.

(1).

It is suggested that Subscribers who are not residents of Singapore should send Money Orders in preference to Cheques in order to avoid the loss due to Bank discount.

(2).

The delay in publishing the January number of the Bulletin is due to pressure of work in the Government Printing Office.

SINGAPORE MARKET REPORT.

November, 1902.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	5	32.00	31.00
Bali	150	24.00	23.00
Liberian	250	26.00	21.00
Copra	4,936	9.80	8.40
Gambier	2,882	15.15	14.72½
Cube Gambier, Nos. 1 & 2	195	23.25	21.50
Gutta Percha, 1st quality	...	450.00	250.00
Medium	...	300.00	150.00
Lower	...	150.00	50.00
Borneo Rubber Nos. 1, 2 & 3	...	151.00	73.00
Gutta Jelutong	...	7.80	6.75
Nutmegs, No. 110's	...	61.00	50.00
No. 80's	...	102.00	87.00
Mace, Banda	...	125.00	100.00
Amboyna	...	105.00	80.00
Pepper, Black	836	35.50	34.00
White	285	61.00	53.50
Pearl Sago, Small	150	5.75	5.15
Medium	15	6.50	5.60
Large	...	7.00	6.25
Sago Flour, No. 1	3,155	4.45	3.85
No. 2	421	2.00	1.65
Flake Tapioca, Small	855	7.00	4.30
Medium	184	6.00	5.00
Pearl Tapioca, Small	707	6.50	4.35
Medium	726	6.87½	4.25
Bullet	60	6.50	5.25
Tin	2,855	83.62½	81.50

SINGAPORE MARKET REPORT.

December, 1902.

Articles.	Quality sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	31.75	31.00
Bali	22	23.50	22.50
Liberian	143	23.00	21.00
Copra	2,787	9.80	8.85
Gambier	1,877	15.37½	14.80
Cube Gambier, Nos. 1 & 2.	105	23.00	21.50
Gutta Percha, 1st quality	...	350.00	250.00
Medium	...	250.00	150.00
Lower	...	150.00	40.00
Borneo Rubber	...	160.00	80.00
Gutta Jelutong	...	7.20	7.05
Nutmegs, No. 110's	...	70.00	63.00
No. 80's	...	104.00	102.00
Mace. Banda	...	130.00	110.00
Amboyna	...	122.00	105.00
Pepper, Black	563	37.00	35.25
White	95	61.00	60.50
Pearl Sago, Small	35	6.25	5.40
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	1,844	4.65	4.25
No. 2	335	1.95	1.80
Flake Tapioca, Small	658	5.75	4.90 Fair quality.
Medium	105	5.40	5.30 Fair quality.
Pearl Tapioca, Small	412	5.45	5.00 Fair quality.
Medium	502	5.15	4 45 Fair quality.
Bullet	...	5.50	5.25
Tin	2,555	88.50	83.12½

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th November, 1902.

Wired at 2 p.m. on 17th Nov., 1902.

To England :—

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports -	1,200
Gambier	from Singapore	to London -	20
,,	,, ,,	to Liverpool-	...
,,	,, ,,	to U. K. & / or Continent -	490
,,	,, ,,	,, Glasgow -	20
Cube Gambier	,, ,,	,, England -	40
White Pepper	,, ,,	,, ,, -	70
Black ,,	,, ,,	,, ,, -	...
White ,,	,, Penang	,, ,, -	20
Black ,,	,, ,,	,, ,, -	20
Pearl Sago	,, Singapore	,, ,, -	40
Sago Flour	,, ,,	,, London -	290
,,	,, ,,	,, Liverpool -	...
,,	,, ,,	,, Glasgow -	50
Tapioca, Flake	,, S'gapore & P'nang	to England -	350
,, Pearl & Bullets	,, ,,	,, ,, ,, -	170
,, Flour	,, Penang	,, ,, -	700
Gutta Percha	,, Singapore	,, ,, -	50
Buff hides	,, ,,	,, ,, -	10
Pineapples	,, ,,	,, ,, -	...

To America :—

Tin	form Singapore & Penang	-	950
Gambier	,, ,,	-	625
Cube Gambier	,, ,,	-	10
Black Pepper	,, ,,	-	10
,,	,, Penang	-	380
White Pepper	,, Singapore	-	50
,,	,, Penang	-	...
Nutmegs	,, Singapore & Penang	-	36
Tapioca, Flake & Pearl	,, ,, ,,	-	380
Pineapples	,, ,, ,,	cases	500

To the Continent :—

Gambier	from Singapore	to South Continental Ports	20
,,	,, ,,	,, North ,, -	180
Black Pepper	,, ,,	,, South ,, -	60
,,	,, ,,	,, North ,, -	10
,,	,, Penang	,, South ,, -	...
,,	,, ,,	,, North ,, -	...
White Pepper	,, Singapore	,, South ,, -	10
,,	,, ,,	,, North ,, -	20

				Tons Steamer.
White Pepper	from	Penang	to South Continental Ports	...
,,	,,	,,	,, North ,, -	20
Copra	,,	Singapore & Penang	to Marseilles -	360
,,	,,	,,	,, Odessa -	2,200
,,	,,	,,	,, South Continental Ports (other than Marseilles and Odessa.)	400
,,	,,	,,	,, North Continental Ports	640
Tin	,,	,,	,, Continent -	110
Tapioca Flake	,,	,,	,, ,, -	280
TapiocaPearl	from	Singapore & Penang	to Continent -	170
Cube gambier	,,	Singapore	,, ,, -	...
Pineapples	,,	,,	,, ,, ,,	cases 500

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,000 tons Gambier
200 ,, Black Pepper
(in Singapore)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(B)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 30th November, 1902.

Wired at 2.15 p. m. on 1st December, 1902.

To England.

				Tons Steamer.
Tin	from	Singapore & Penang	to England (and U. K. optional any ports.) -	1,200
Gambier	from	Singapore	to London -	...
,,	,,	,,	to Liverpool -	190
,,	,,	,,	to U. K. &/ or Continent -	200
,,	,,	,,	,, Glasgow -	70
Cube Gambier	,,	,,	,, England -	10
White Pepper	,,	,,	,, ,, -	110
Black ,,	,,	,,	,, ,, -	...
White Pepper	,,	Penang	,, ,, -	70
Black ,,	,,	,,	,, ,, -	50
Pearl Sago	,,	Singapore	,, ,, -	100
Sago Flour	,,	,,	,, London -	650
,, ,,	,,	,,	,, Liverpool -	975
,, ,,	,,	,,	,, Glasgow -	100
Tapioca, Flake	,,	Singapore & Penang	to England -	400
,, Pearl & Bullets	,,	,, ,,	,, ,, -	530
,, Flour	,,	Penang	,, ,, -	380
Gutta Percha	,,	Singapore	,, ,, -	70

			Tons Steamer.
Buff hides	from Singapore	to England -	150
Pineapples	„ „	„ „ cases	2,000
Copra	„ Singapore & Penang	„ Liverpool-	200
To America:			
Tin	from Singapore and Penang	-	360
Gambier	„ Singapore	- - -	460
Cube Gambier	„ „	- - -	30
Black Pepper	„ „	- - -	50
„	„ Penang	- - -	...
White Pepper	„ Singapore	- - -	50
„	„ Penang	- - -	...
Nutmegs	„ Singapore and Penang	-	9
Tapioca, Flake and Pearl	„ „ „	- -	50
Pineapples	„ „ „	- -	350
To the Continent:			
Gambier	from Singapore	to South Continental Ports	200
„	„ „	„ North „	120
Black Pepper	„ „	„ South „	10
„	„ „	„ North „	10
„	„ Penang	„ South „	...
„	„ „	„ North „	10
White Pepper	„ Singapore	„ South „	...
„	„ „	„ North „	90
„	„ Penang	„ South „	...
„	„ „	„ North „	50
Copra	„ Singapore & Penang	to Marseilles	360
„	„ „	„ Odessa	...
„	„ „	„ South Continental Ports (other than Marseilles and Odessa.)	1,750
„	„ „	„ North Continental Ports	600
Tin	„ „	„ Continent	520
Tapioca Flake	„ „	„ „	210
Tapioca Pearl	„ „	„ „	190
Cube Gambier	„ Singapore	to Continent	60
Pineapples	„ „	„ „	1,000

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,600 tons Gambier
520 „ Black Pepper
(*in Singapore*)
contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(*C*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th December, 1902.

Wired at 3 p. m. on 16th December, 1902.

To England.

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports. -	950
Gambier	from Singapore	to London -	10
,,	,, ,,	,, Liverpool-	...
,,	,, ,,	to U. K. & / or Continent -	...
,,	,, ,,	to Glasgow -	...
Cube Gambier	,, ,,	,, England -	...
White Pepper	,, ,,	,, ,, -	60
Black ,,	,, ,,	,, ,, -	...
White Pepper	,, Penang	,, ,, -	40
Black ,,	,, ,,	,, ,, -	...
Pearl Sago	,, Singapore	,, ,, -	...
Sago Flour	,, ,,	,, London -	200
,, ,,	,, ,,	,, Liverpool-	...
,, ,,	,, ,,	,, Glasgow -	...
Tapioca, Flake	,, Singapore & Penang	to England	190
,, Pearl & Bullets	,, ,, ,,	,, ,, -	150
,, Flour	,, Penang	,, ,, -	300
Gutta Percha	,, Singapore	,, ,, -	50
Buff hides	,, ,,	,, ,, -	20
Pineapples	,, ,,	,, ,, cases	5,500

To America.

Tin	from Singapore & Penang	-	925
Gambier	,, Singapore	- -	1,200
Cube gambier	,, ,,	- - -	40
Black Pepper	,, ,,	- - -	70
,,	,, Penang	- - -	50
White Pepper	,, Singapore	- - -	...
,,	,, Penang	- - -	...
Nutmegs	,, Singapore & Penang	- -	45
Tapioca, Flake & Pearl	,, ,, ,,	- -	650
Pineapples	,, ,,	- - cases	2,200

To the Continent.

Gambier	from Singapore	to South Continental Ports-	...
,,	,, ,,	,, North ,, -	100
Black Pepper	,, ,,	,, South ,, -	60
,,	,, ,,	,, North ,, -	50
Black Pepper	,, Penang	,, South ,, -	90
,,	,, ,,	,, North ,, -	...
White Pepper	,, Singapore	,, South ,, -	...
,,	,, ,,	,, North ,, -	20
White Pepper	,, Penang	,, South ,, -	...

			Tons Steamer.
White Pepper	from Penang	to North Continental Ports -	10
Copra	,, Singapore & Penang	to Marseilles -	...
,,	,, ,,	,, Odessa -	1,200
,,	,, ,,	,, South Continental Ports - other than Marseilles and Odessa	200
,,	,, ,,	,, North Continental Ports -	700
Tin	,, ,,	,, Continent -	240
Tapioca Flake	,, ,,	,, ,, -	100
Tapioca Pearl	,, ,,	,, ,, -	280
Cube gambier	,, Singapore	,, ,, -	40
Pineapples	,,	,, ,,	cases 1,000

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,000 tons Gambier
360 ,, Black Pepppr
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(*D*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st December, 1902.

Wired at 11.20 a. m. on 1st January, 1903.

To England:—

			Tons Steamer.
Tin	from Singapore & Penang	to England - and U. K. optional any ports.	970
Gambier	from Singapore	to London -	...
,,	,, ,,	,, Liverpool -	...
,,	,, ,,	to U. K. & / or Continent -	500
,,	,, ,,	to Glasgow -	...
Cube Gambier	,, ,,	,, England -	30
White Pepper	,, ,,	,, ,, -	20
Black ,,	,, ,,	,, ,, -	...
White Pepper	,, Penang	,, ,, -	20
Black ,,	,, ,,	,, ,, -	30
Pearl Sago	,, Singapore	,, ,, -	70
Sago Flour	,, ,,	,, London -	200
,, ,,	,, ,,	,, Liverpool -	...
,, ,,	,, ,,	,, Glasgow -	...
Tapioca, Flake	,, Singapore & Penang	to England -	330
,, Pearl & Bullets	,, ,,	,, ,, ,, -	170
,, Flour	,, Penang	,, ,, -	550
Gutta Percha	,, Singapore	,, ,, -	90
Buff hides	,, ,,	,, ,, -	40

			Tons Steamer.
Pineapples	from Singapore	to England	cases 3,500
To America:—			
Tin	from Singapore & Penang		470
Gambier	,, Singapore		925
Cube gambier	,, ,,		20
Black Pepper	,, ,,		60
,,	,, Penang		...
White Pepper	,, Singapore		...
,,	,, Penang		...
Nutmegs	,, Singapore & Penang		27
Tapioca, Flake & Pearl	,, ,, ,,		430
Pineapples	,, ,,		cases 2,500
To the Continent:—			
Gambier	from Singapore	to South Continental Ports	150
,,	,, ,,	,, North ,,	250
Black Pepper	,, ,,	,, South ,,	20
,,	,, ,,	,, North ,,	...
Black Pepper	,, Penang	,, South ,,	...
,,	,, ,,	,, North ,,	30
White Pepper	,, Singapore	,, South ,,	10
,,	,, ,,	,, North ,,	10
White Pepper	,, Penang	,, South ,,	...
,,	,, ,,	,, North ,,	80
Copra	,, Singapore & Penang	to Marseilles	300
,,	,, ,,	,, Odessa	...
,,	,, ,,	,, South Continental Ports other than Marseilles and Odessa.	...
,,	,, ,,	,, North Continental Ports	740
Tin	,, ,,	,, Continent	210
Tapioca Flake	,, ,,	,, ,,	150
Tapioca Pearl	,, ,,	,, ,,	250
Cube gambier	,, Singapore	,, ,,	30
Pineapples	,, ,,	,, ,,	1,000

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,050 tons Gambier
240 ,, Black Pepper
(in Singapore)
contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E.C.

Singapore.

Abstract of Meteorological Readings for the month of December, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·869	132·9	78·2	85·9	70·8	15·1	76·6	·860	75·5	83	S. E. & N.E.	12·21	3·66

K. K. Hospital Observatory,
Singapore, 17th January, 1903

A. B. LEICESTER,
Meteorological Observer.

J. LEASK,
Acting Principal Civil Medical Officer, S. S

Penang.

Abstract of Meteorological Readings for December, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·901	138·6	80·2	88·3	74·2	14·1	75·4	79·5	70·8	71	N.W.	12·52	2 98

Colonial Surgeon's Office,
Penang, 8th January, 1903.

M E. SCRIVEN,
Asst. Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang

Malacca.

Abstract of Meteorological Readings for December, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
General Hospital.	29·826	151·	81·7	89·	70·	19·	81·	1·046	63·	93	N.	5·03	1·12

Colonial Surgeon's Office,
Malacca, 10th January, 1903.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for December, 1902.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Humidity.	Total Rainfall	Greatest rainfall during 24 hours.
Taiping ...	153	81·27	91·5	69	22·5	77·	871	82	9·29	1·44
Kuala Kangsar ...	...	79·79	90	68	22	76·02	848	83	5·53	1·10
Batu Gajah ...	163	80·41	92	70	22	76·55	872	84	6·08	1·10
Gopeng ...	...	79·99	91	63	28	76·16	856	84	6·44	1·82
Ipoh ...	...	80·58	91	68	23	76·19	855	81	11·37	2·24
Kampar ...	...	...	91	70	21	...	...	...	13·35	2·74
Teluk Anson ...	...	80·35	90	70	20	77·02	886	86	12·87	2·12
Tapah ...	..	80.55	92	68	24	76·49	860	82	9·38	1·50
Parit Buntar ...	...	81·00	92	69	23	76·83	870	83	9·92	1·93
Bagân Serai ...	...	81·11	90	71	19	76·96	873	83	8·93	2·30
Selama ...	...	82·45	91	69	22	77·93	898	81	10·46	3·12

STATE SURGEON'S OFFICE,
Taiping, 9th January, 1903.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for December, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·881	148·7	80·2	87·3	71.5	15·8	75·9	0·812	73·0	79	Calm	10·10	2.44
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	13·83	2·41
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	11·80	1·86
,, Klang	...	...	...	84·1	74·5	9·6	...	...	...	...	...	16·71	4·33
,, Kuala Langat	...	...	...	84·0	72·1	11·9	...	...	...	...	...	15.30	2·89
,, Kajang	...	...	...	84·7	75·6	9·1	...	...	...	...	...	13·26	3·21
,, Kuala Selangor	...	...	...	85·9	76·3	9.6	...	...	...	...	...	7·71	2·19
,, Kuala Kubu	...	...	...	89 8	72·0	17·8	...	...	...	...	...	12.50	3·85
,, Serendah	...	...	...	88·3	75·5	12·8	...	...	...	...	...	15·93	3.80
,, Rawang	...	...	...	85·6	76·9	8·7	...	...	...	...	...	14·88	3·58
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	14·24	5·25

STATE SURGEON'S OFFICE,
Kuala Lumpur, 22nd January, 1903.

E. A. O. TRAVERS,
State Surgeon, Selangor

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for November, 1902.

District.		Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Pekan	...	...	...	...	87·5	71·	10·3	...	...	...	...	...	7·98	2·16
Kuala Lipis,	...		...	...	...	...	...	...	...	...	...	...	...	...
Raub,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bentong	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kuantan,	...	...	...	...	84·	71·	13·	...	...	...	...	...	9·68	4·30
Temerloh	...	...	...	...	90·	70·	20·	...	...	...	...	...	7·80	1·42

A. ANNESLEY WOODS,
District Surgeon, Pahang.

Pekan, 2nd January, 1903.

Muar.

Abstract of Meteorological Readings for December, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	80·0	91·0	72.0	19·0	76·0	...	...	...	N. E.	6·96	1·15

Muar, 1st January, 1903.

FRANCIS PEARS.

No. 2.] FEBRUARY, 1903. [Vol. II.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M.A., F.L.S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F. L. S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

Brucea Sumatrana, Wall.

AGRICULTURAL BULLETIN
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BRUCEA SUMATRANA.

PLATE II.

For this month we give a figure from a photograph by Mr. MACHADO, of Brucea Sumatrana grown in the Botanic Gardens at Singapore showing its habit. An account of the plant was published in Vol. I, No. 9, p. 342. A large number of plants raised from seed were planted in the Gardens last year and have grown remarkably well and steadily, fruiting in six months from the seed. It seems to grow best in soil that is not too wet, but does not otherwise appear to be particular so long as the weeds are kept from getting over its head. No manure was given to the plants though it is probable that manuring would stimulate its growth and make it fruit even faster.

Ten pounds weight of seed were sent to Messrs. BURROUGHES and WELCOME last year, for experiment and investigation. These seeds were obtained from Pahang where the plant is abundant in a wild state. No report of the result of their investigations has yet been received. In the meantime, however, several letters from persons in India and elsewhere have been received speaking very highly of the effects of the drug. Like most or all other plants it has an enemy, and this is the caterpillar of the dark coloured Death's head Moth, *Acherontia Lachesis.* The caterpillar is three inches long when full grown and very stout, of a bright apple green colour, with six sloping yellow stripes on each side continued up to the back but not meeting, along each yellow stripe is a light blue one, the spiracles are yellow, the back dotted finely with black, and on its tail there is a yellow rough horn ¼ inch long. The caterpillars are very voracious and soon strip a plant of its leaves, but are easily seen and can be collected. They were full grown in November, and hatched out in December, but I found caterpillars also in that month. The chrysalis is placed under ground. The moth is four inches across the upper wings and thorax of a dark grey colour marbled with black and yellow ocre lines with a small yellow spot in the centre of each wing; underwings yellow with two curved blackish bars near the edge; body yellow with transverse black rings and a blue central line. The moth comes into light readily, and like all Death's head Moths is very quiet, generally sitting down in a corner of the verandah and remaining motionless.

Another enemy is the omnivorous caterpillar of the Atlas Moth, (*Attacus Atlas*). I found a full grown caterpillar of this together with one of the Death's head devouring the same leaf at the end of February. Such big caterpillars as these make short work of the foliage of a small plant like *Brucea*, but being large are more easily detected and destroyed.

Mr. ARDEN'S REPORT ON PARA RUBBER.

In September of last year Mr. ARDEN published an excellent report on the experiments which he had for some time been making on the Para Rubber tree, *Hevea braziliensis*. The whole report is too long to publish *in extenso* but a few notes in it may be of interest.

It commences with a short history of its introduction into the Malay Peninsula, but in respect of this it is only necessary to refer our readers to the fuller account published in the last number of the Bulletin. In the next section on cultivation, he deals with the locality suitable for planting, and points out the excellent growth of the tree in abandoned mining land in Perak, being rather inclined to condemn the selection of swamp land, quoting the Director of Agriculture in Zanzibar who states that trees planted there in typical rice swamps were nearly all dead, and also an article by WICKHAM in which he says that the rubber in the Tapajos and Madeira river districts whence our seed was originally derived occurred in well drained stiff soil in the upland plateaus and that the theory that it was a tree of the low-lying inundated forests is an error. However the trees of the Singapore Botanic Gardens have certainly done very well in this low-lying inundated wet soil, and Mr. BONNECHAUX, who had considerable experience in the rubber of the Amazons, stated that the best rubber came from the wet low-lying ground by the Amazon river, which was constantly flooded, and that the rubber of the hill and dryer localities was inferior. On pointing out to him a tree grown in the Gardens in stiff clay, and kept as an example of the bad growth made under such circumstances he said it was quite similar to those of the dry upland regions, and pointed out that the latex from that tree was peculiarly yellow and not of the pure white color of those grown in the low swampy ground, a phenomenon well known to the rubber collectors in the Amazons. However there are also in the Singapore Gardens some very fine tall and healthy trees, grown in low and dryer hills, and indeed in many places in the Peninsula, I have seen trees doing well in dry localities.

Mr. ARDEN'S remarks on germination of the seed are well worth study, and it is probable that he is correct in his suggestion that termites attack the trees through the cut end of the tap root, and that the latex protects the tree from these and other such pests, so that they cannot attack the wood when defended by the latex, and hence he condemns the system of cutting the tap root. However among the numerous stumps some of considerable size in which the tap root has been cut off, I have never seen one tree killed from attacks of termites or any other insect in that way, and the destruction of the tap root, often very long in wet ground, causes a greater output of lateral roots, which besides giving the tree a greater area of feeding ground, usually give it a stronger hold on the soil and make it less liable to be overset in a storm. With respect to the destruction of trees by *Helicobasidium,* the root parasite, Mr. ARDEN suggests that if the trees had been *killed* by the fungus there would have been some indication of its presence before the tree collapsed, and there doubtless would have been to a carefully searching mycologist, but to the ordinary observer, the death of a tree from a fungus root parasite is usually as sudden as the death of any plant can be. In the case of an outbreak of a root parasite on certain trees and shrubs the destruction was so rapid that for some time I thought that by some accident some poisonous liquid had been thrown on the plants. All who have grown Tomatos and have come one morning when the fruit is getting ripe and found all the plants looking as if boiling water has been thrown on them due to an attack of Tomato fungus will know how sudden the death of a plant from a fungus often appears.

With respect to distancing as the author suggests we have much to learn. Under some circumstances it may pay to plant close, under others at wide distances.

I should be very doubtful as to strongly advising covering the tapping wounds with a coating of tar to keep off fungi and insects. It seems that this interferes with the growth of the cambium which would cover the wound up again, and for tapping wounds it should not be necessary. The best protecting covering is that of rubber. In the case of big accidental wounds, such as those caused by the tearing off of a bough, wounds which the cambium can never completely cover, tar will do much to delay the death of the tree.

Twenty pages of the report deal with the extraction of the latex, the methods of tapping and the wound effect. The experiments were made both with V shaped cuts and the herring-bone system. The tables of yield are very instructive and bring out many important points as to the wound effect, and the area of bark giving the largest quantity of latex. They confirm what has been previously pointed out that the base of the tree contains the greatest quantity of latex, but also that from the upper part of the tree need not be neglected. However the author suggests that as the latex did not cease to flow at the end of experiments made at the base of the tree, that from the upper part of the tree might have been obtained from the cuts at the base had the experiments been continued, but as this would have required the renewing of the wounds on at least 28 occasions, this would have endangered the life of the tree. These experiments should be tried with a less injurious plan than the herring-bone system. Either the V shaped incisions or better the simple cuts as employed in the Amazons district. The wound effect experiments and observations are based on the effects of re-opening old wounds by taking off a thin slice each day. However wound effect is not confined to cases where this method is adopted.

Experiments made in the Singapore Gardens seem to show that what is known in Brazil as calling the latex is really producing this wound effect though the incisions are not made in the same part of the tree. Indeed Mr. ARDEN notes himself that in some trees which had been previously tapped, a larger return was obtained from the other side of the tree than was obtained from a previously untapped tree. That the wound effect is diminished by allowing the trees to rest between the renewing of the incisions seems to be shown by some of the experiments, but further researches in this direction are required.

Some experiments were made on the yield when leafless, when commencing to grow and when in full growth, showing an increase during the resting period, but more information is required on this point, as the author remarks, and in all experiments of this kind the condition of the weather at the time and for some time previously should be taken. With respect to the tapping age, some quantity of rubber can be obtained as shewn in the report from 3½ and 4 year old trees, but this is probably much too young to commence to work profitably and it is stated in some works that this young rubber is of inferior quality. It is probable that the size of the trees which varies a good deal according to position, soil, etc. is almost as important as age.

As to the preparation of the rubber by acetic acid the samples turned out by Mr ARDEN left nothing to be desired in appearance and were highly valued by experts.

The last section deals with the cost of opening and maintaining an estate, the figures seem approximately correct, though I should be inclined to consider the estimate for weeding too high, and am much inclined to doubt the advantages of keeping the ground absolutely bare of low weeds at least, especially during the earlier years of the plant's life before the ground is sufficiently shaded by the foliage to protect the roots from the sunheat. The estimate of returns and value of the product is also very moderate, and is probably much underestimated.

The whole report is an excellent piece of work and worth the study of all those interested in Rubber. It is printed at the Taiping Government Printing Office.

RUBBER TAPPING EXPERIMENTS IN THE BOTANIC GARDENS.

In the month of February, we had a visit from M. BONNECHAUX, a man of great experience in the rubber business of the Amazons, where he had spent some time among the Seringueiros, investigating their methods and collecting notes and observations on all subjects connected with Para rubber. Having seen attempts made to cultivate rubber in Africa and Madagascar, he was by no means prepared to see the rubber plantation in the Botanic Gardens, which astonished him. He stated that the damp low-lying ground, and the soil in which the trees were growing was exactly similar to that of the best Amazons districts, and that the trees in every way resembled those found there, both in kind, appearance and development for age. The herring-bone method of tapping which we had been adopting and which has been often described, he did not approve of, and declared that trees so cut would in the Amazons be speedily destroyed by insects attacking the exposed wood. At his suggestion and with his aid we tapped 150 trees in the Amazons method. This has often been described and figured and is briefly this. The collector cuts a single cut on each tree as high as he can reach with a small axe, the edge of which is an inch or an inch and-a half long. Next day he cuts again 4 fingers' breadth below and so on to the base of the tree, making one cut a day for every four inches of diameter of the tree, so that a tree 12 inches through would have three cuts a day. Small tins tapering to the bottom are pushed into the bark by their sharp edges below the sloping cut so that the latex is caught in them. The first day the latex is watery and scanty, and is generally neglected, but it increases in quantity each day, though it often does not flow really well for 6 or 8 days. The preliminary cuts are made with a view of "calling the latex". It has often been shewn that in the herring-bone method, the flow of latex gradually increases as the wounds are again and again re-opened, the greatest flow usually occurring on the eighth day, and this phenomenon is doubtless due to the same cause as produces the increased flow in the latex cuts made in the Amazons method.

At M. BONNECHAUX'S suggestion an iron axe (not steel) of the exact pattern used by the Seringueiros of the Amazons, was made by a Chinaman in a few hours at a cost of twenty-five cents, and failing anything else, small conical tins used for cake-moulds were used to catch the latex. These were not altogether satisfactory, as they were too large and too broad at the bottom, allowing the latex to coagulate too quickly. They were also not strong enough to be easily fixed by pushing the edge into the bark below the cut. However, they did pretty well till more suitable ones could be made. The tapping takes place in the early morning as soon as daylight appears, and the milk is collected when a sufficient number of trees have been done, 150 to 250 in a morning, the collector stopping about 10 or 11 o'clock and going round again pours the milk into a specially made can, and takes it to the fire to be smoked. The trees are tapped thus for 180 days continuously and then allowed to rest for six months, and seem so little the worse that M. BONNECHAUX declares he knows of trees which have been tapped thus for eighty years.

The wounds seem to close up with surprising rapidity, especially if the latex remaining in them is not removed, so that the risk of injury to the tree from fungi or insect attacks is very slight.

It might be thought that the amount procured from each tree would be very small and the work would be slow and so expensive, but it really does not entail so much labour as would appear, as the cut and fixing the cup done by two men experienced in the work takes a very short time.

We found that the latex here coagulates more quickly than it does in the Amazons, probably on account of the greater heat during our late experiments, and to prevent this the man who fixes the cup puts a few drops of water in the bottom, which prevents its coagulating at once. The addition of water does not give much trouble in recovering the rubber even if by accident, as during a heavy rain storm, the cups are filled. This occurred on one afternoon when during the tapping a violent shower diluted the milk to overflowing. The milk was strained and acidified by acetic acid, and though the water was in excessive proportion, on re-straining the liquid, it was found quite easy to recover the whole of the rubber.

One attempt was made to prepare the rubber by smoking it in the Brazilian method, but as the apparatus was not satisfactory the result was not successful. In the later experiments the rubber was coagulated in enamelled plates with acetic acid as described in Mr. ARDEN'S paper.

After M. BONNECHAUX left, Mr. MACHADO continued experiments on a hundred trees tapping them each day, using sometimes the little axe, at others a chisel and mallet. The former is undoubtedly the quicker instrument, but is apt to start the bark on either side of the cut; whether this will prove injurious to the tree or not remains to be seen. At the same time the axe makes a wound of the same size and shape each time and by getting an axe made of suitable size and with a cutting edge of the right form, a coolie can make fewer blunders in cutting, while with the mallet and chisel he is very apt to cut out too large a piece of bark, and so make a wound which takes longer to heal.

It was observed that when the tree was beaten with the mallet in the vicinity of the cut but not hard enough to bruise the bark, the flow of latex appeared distinctly to increase.

On March 4th, Mr. MACHADO commenced experimental tapping on 100 trees in a triangular plot of ground near the entrance of the Economic Gardens. The circumference of all the trees at four feet from the ground was 281 feet 7 inches. Average circumference per tree 2 feet 10 inches. The largest tree was 5 feet 1 inch in circumference, the smallest one foot 3 inches. The oldest trees here are about 15 years old, but many are seedlings of later date. At least 25 were under two feet in circumference and obviously young plants of 6 or 8 years. The trees are not quite ten feet apart. The soil is damp and low-lying and occasionally flooded.

The trees were tapped at 6 o'clock in the mornings every day except Sunday, and one other day, and twice when the tapping was done in the afternoon. For the first five days each tree received one tap, *i.e.* a single cut, on the next four two each, and on two days 20 trees received ten cuts each. In the table appended it will be noticed that it took two days to call the latex, only a very little being produced then. Thence there was a tolerably steady increase. On the 13th a hundred trees were tapped with two incisions in the morning and afternoon, giving 17 oz. altogether. The sudden increase from the 13th onwards was undoubtedly due to the rainfall which commenced at that time. It will be noticed that 40 trees with five incisions each give as much latex as 20 with ten incisions and 100 with two, which shows that each cut gives approximately the same amount, and the return depends more on the amount of incisions than on the size of the tree.

It was noticed that a tree which at one time produced but little rubber, after being cut 10 days in succession, suddenly became very productive. It is probable that some trees which may contain a very fair amount of latex, require a larger period of "calling" than others.

Another curious phenomenon was that after the hot and dry season when the rains commenced the old wounds which had long ceased to flow, suddenly after a violent shower, broke out again and produced long tears of rubber.

Date.	No. of trees tapped.	No. of incisions to each tree.	Dry rubber produced.	Scrap produced.	Total for the day.	Remarks.
March.			oz.	oz.	oz.	
4	100	one	—	1¼	1¼	Scrap from a bough riddled by beetles gave 2 oz.
5	100	one	—	¾	¾	Weather dry, no rain.
6	100	one	3	¾	3¾	,, ,,
7	100	one	3¾	1	4¾	,, ,,
9	100	one	7	1¼	8¼	,, ,,
11	100	two	6½	2	8½	,, ,,
13	100	two	8	1½	9½	Morning tap.
13	100	two	6	1½	7½	Afternoon (1 p. m.) tap.
16	100	two	19½	2	21½	Rained all afternoon yesterday.
17	20	ten	15¾	7	22¾	Rainy.
18	20	ten	15	½	15½	Rainy.
19	40	five	19½	1	20½	
20	20	ten	15	4½	19½	
21	20	ten	15½	3	18½	
23	100	four	65	2	67	
25	100	four	77	4	79	
27	100	four	96½	1½	98	
30	100	four	96½	3	99½	
31	100	four	80½	2	82½	
April.						
2	100	four	67	2	69	Rained the best part of the morning yesterday. No coagulants used on this occasion.
3	100	four	71½	2½	74	Flow of latex from one tree quite phenomenal.

To be continued.

NOTE ON A BOUGH OF PARA-RUBBER DESTROYED BY ROT.

In a Para rubber tree in the Botanic Gardens which had several erect branches at the top, it was noticed that a good deal of rubber had been dropping and was still exuding. A man was sent up the tree, and cut off the bough, which was then sawn in two to observe the cause of this. The bough is $5\frac{7}{8}$ inches in diameter on one side (the outer one) a smaller branch had fallen or been broken off and the wound 1 inch across had not healed, but the wood had decayed forming a space. 7 inches long and 3 inches wide. Fungi had attacked the wood and the decomposition had spread downwards for about 9 inches and upwards for 20 inches. The bark on this side was nearly twice as thick as that on the other side (the inner side) and was quite dry and perforated by beetles, which had however not penetrated into the living wood. The very small beetles, belonged to the group of shot-borers which habitually feed on dead wood, and from their holes the rubber had exuded. Here and there in the dead bark were spaces which were filled with rubber but no liquid latex could be seen in this part of the bark. The living bark exuded latex freely, but in greatest abundance just above the point to which the death of the wood had reached, and much more freely than from the thinner bark on the inner side of the tree. It appears then that in the case of an injury of this kind the wood dies before the bark covering it. As the death caused by the fungus spreads vertically up or down the stem the beetles attack the decaying wood but do not touch the living tissue. At the same time the flow of latex to the affected part increases so that the greatest amount is to be found near the injury. This increase of flow in the neighbourhood of an injury, corresponds to what has been named "calling the latex." It is known that the first wound inflicted on a tree produces but little milk, but when the wound is re-opened daily, the flow gradually increases. In the Amazons method of tapping described in another article, a cut is made the first day high up, and next day a fresh one, two or three inches lower, and so on to the foot of the tree, the first wound produces very little latex, the second more and so on. This is not due to the fact that there is more latex low down the tree than above, but rather due to the wound action, which appears to produce a flow of latex to the wounded side of the trunk. A tree thus is said to milk better when it is accustomed to it.

JOURNEY TO A RUBBER PLANTATION ON THE ISTHMUS OF COLUMBIA.

By Dr. C. O. Weber.

The well known difficulty of investigating satisfactorily in Europe any of the numerous questions of importance connected with the collection of the latex from the rubber trees, its composition, and the most satisfactory manner of converting it into india rubber, made the commission I received in the early part of this year, to inspect and report upon the state and possibilities of the extensive rubber plantation of the Las Cascadas Plantations Company Limited, at the very outset an acceptable one. The fact that this plantation is situated in the Isthmus of Panama seemed to me a comparatively slight matter, although I must own to occasional apprehensive pangs on being treated by some of my friends, and others, to somewhat vivid descriptions of the terrors of mosquitos, malaria, yellow fever, and small-pox. I will say at once here that I found all these blood-curdling stories gross exaggerations. Colon is certainly an abominable hole, but had I to take the choice, I would, without an instant's hesitation, prefer to live at Colon rather than in the slum districts of either London, Manchester or Salford. The same, only more so, is to be said of Panama, which is a fairly well built town upon rocky sub-soil. Particularly the mosquito bogey appears to me an absurd exaggeration as far as the isthmus is concerned. Only once during the whole journey did I get really badly bitten, this was in my cabin on board the R. M. S. "Para" on the first night after leaving Jamaica for Colon. It appears that besides taking in coal at that port, we had also shipped a liberal consignment of mosquitos.

The real trouble of an expedition like the one I undertook was never suggested to me; it consists in the fact that as soon as one leaves the beaten track (Colon to Panama) every trace of civilized comforts at once vanish. The food is atrociously bad, the cooking worse; all drinks, even water taken direct from the streams, are at almost fever heat and often there is nothing to be had but rain water. It is this bad food, the monotony of the diet, and the insipidity of tepid drinks which I felt to render a stay in the Tropics rather trying. Of course, on a plantation with a well established settlement, all these difficultities largely disappear.

As is well known, the stretch of the isthmus from Colon to Panama, through which runs the track of the illustrated Panama Canal, is all low-lying, on the Colon side largely swampy land, the mean elevation of which above sea level does certainly not exceed 80 feet. There are a number of banana plantations along side, or within near distance of the canal track, but nothing of any magnitude.

Shortly after leaving Colon, the mountain ranges appearing in the far distance, south and south west of the town, begin to slowly close in upon the track of the canal, coming eventually near Panama, right upon it, and it is this hill district which, intersected by innumerable small rivers and brooks, very gradually rises to altitudes 1,200 feet and upwards, which furnishes at altitudes of from 200 to 800 feet, or perhaps even somewhat higher, the most suitable land for the cultivation of India-rubber, cacao and coffee.

In this hill district, connected by their own road with Las Cascadas station, lies the plantation of the Las Cascadas Plantations Company Limited, which comprise a total area of very many acres, a large part of which is planted out with rubber (Castilloa elastica) cacao and coffee. The number of rubber trees on the plantation now amounts to 70,000 of which 15,000, are from 11 to 12 years old.

After arriving upon the plantation and fitting up the laboratory required for the examination of the latex, and the testing of rubber on the spot, my first concern was to ascertain the exact species of the Castilloa on the plantation. This appeared to me all the more important, as there is one species of Castilloa known which yields plenty of latex, but one containing no rubber and there appear to be several varieties yielding either a poor quality, or very little rubber. Of course, coming on the plantation in the rainy season, when the trees bear neither flowers nor seeds, was not exactly calculated to facilitate the botanical determination, and I was therefore compelled to make a fairly close study of the morphological and physiological feature of the trees. On the other hand, it had to be borne in mind the fact that the whole of our present day information respecting the botanical characteristics of the various species of Castilloa, and the respective value of each of them for cultivation purposes, are in quite a hopeless state of confusion.

According to the usual description, Castilloa elastica is a tree growing to a height of from 36 to 54 feet, the trunk at about 3 feet above ground attaining to a diameter of from 24 to 48 inches. The bark is smooth and yellow, the wood soft and perishable. The leaves are from 6 to 12 inches in length, of a clear and brilliant green, and their lower side is more or less covered with a growth of fine brown hairs. Very characteristic of Castilloa elastica is the phenomenon known as dimorphism of the branches and which consists in the branches which spring from the tree at an angle of 45 degrees at a certain point rather abruptly taking up a horizontal position. I purposely omit entering here upon a discussion of the flowers and fruits of Castilloa elastica as a comparison of their characteristics with those produced by the trees at Las Cascadas, is at the present moment not possible. CROSS, the well known Kew botanist, describes these trees as growing to a height of from 160 to 180 feet, with a diameter of 5 feet, but he gives no information respecting the age of these trees. In all probability these trees were an enormous age, to be reckoned by centuries rather than tens of years. J. H. HART, Superintendent Royal Botanic Gardens, Trinidad, states that the oldest Castilloa tree there, is over 75 feet high and has a girth of 4 feet at three feet above ground. Some trees 15 years old are from 58 to 60 inches in girth. Against these two authorities we possess however the certain information that in Mexico, Honduras, Nicaragua and Ecuador, the height of Castilloa elastica varies between 40 and 60 feet.

There are a number of other species or varieties of Castilloa, with regard to which a considerable amount of uncertainty exist. Indeed, only one of these, *C. tunu, Hemsley,* is satisfactorily established as a distinct and different species, which, moreover, although containing a large quantity of latex, yields no India rubber at all. The *C. markhamiana* described by COLLINS as being found in the isthmus is considered by several very competent authorities not to be a Castilloa at all, but a Perebea. I searched everywhere for this species without ever coming across it, nor had any of the various experienced native collectors I questioned ever heard of any other but the Caucho tree (C. Elastica)

KOSCHAY, in a letter which last year appeared in the March issue of the "Tropenpflanzer" describes four different Castilloa as occurring in Costa Rica. Of these *C. tunu*, has already been mentioned. Of the rubber yielding Castilloa, the best is the one possessing a whitish bark; it yields plenty of excellent rubber. Another variety has a black bark with a rough and irregular surface, it yields a rubber as good as the white variety, but the tree is rapidly exhausted. A further variety is characterised by a reddish bark, very thin and fragile; it yields very little latex, but the rubber produced is of good quality.

To this must be added that the Castilloa of Panama appears to differ from all other known varieties by the occasionally quite enormous size of the leaves. Leaves 20 inches in length occur very commonly, especially upon young trees. For this reason it has been suggested that the Castilloa of Panama is a separate species.

Now, as regards the trees at Las Cascadas, while at first sight they certainly strike one as typical Castilloa elastica, on closer examination show a number of differences which, at any rate in the absence of flowers, render the identification of the species none too easy. In the first instance, the bark of these trees, although very smooth, is certainly neither yellow nor white, but a delicate pale pinkish brown. The leaves even on the older trees are not very great, but still distinctly larger than the leaves on grown up trees of C Elastica in Guatemala, Honduras, Nicaragua and Mexico. The hairy covering on the lower side of the leaves is much less striking, but the young leaf shoots at the end of the branches appear quite as densely haired as those of any typical Castilloa. Also. the phenomenon above referred to as so characteristic of Castilloa is very strikingly displayed by all the Castilloa trees at Las Cascadas.

On the other hand, the only valueless species of Castilloa, *C. tunu* is absolutely unknown on the isthmus, and in my wandering I have never encountered it. It is equally certain that the Las Cascadas Castilloa is entirely different from KOSCHAY'S black and red varieties; the appearance of its bark could not possibly be described in in the terms used by KOSCHAY for the latter two trees. In how far KOSCHAY'S white Castilloa corresponds to the Las Cascadas tree is difficult to say, The bark of the latter might, with some appearance of justification, be described in KOSCHAY'S term as whitish, but considering that the large silvery patches on it do not appear to be the actual colour of the bark, but seem to be due to a lichen, and considering further that all the lichen-free portions of the bark are by no means whitish, but as I stated before, of a light pinkish brown colour, I prefer to adhere to this latter description.

Taking all these points in conjunction it will readily be seen that the Las Cascadas rubber trees exhibit all the characteristics of Castilloa elastica in regard to the general appearance of the tree, the shape of the leaf, the hairy growth on the margin of the leaves, their under side, leaf stem, and the leaf shoots, as also the phenomenon already alluded to as the "dimorphism of the branches." I hold these data sufficiently conclusive to demonstrate that the Las Cascadas rubber tree is indeed the true Castilloa elastica. The fact that these trees produce a good yield of an excellent quality of rubber may well be taken as contributory evidence in the same direction.

As regards the unquestionable differences of these trees from the C. elastica as generally described, I cannot say that I ascribe any importance to them. Castilloa elastica possesses such an enormously wide geographical distribution—from Lat. 6° S. to Lat. 22° N.—it occurs under so very greatly varying conditions of soil, elevation humidity and temperature limits that it would be most extraordinary if it accommodated itself to all those different conditions without at least some morphological change. Indeed, it seems highly probable that some of the varying statements regarding the growth of Castilloa elastica in different districts may find their explanation in the influence upon this tree of different climatic conditions. To some extent this may also be true with regard to the various conflicting statements regarding the yield of rubber obtainable from these trees.

On this question of the amount of rubber yielded by Castilloa elastica the information at our disposal from numerous sources is characterised by a degree of discrepancy perfectly appalling. According to CROSS, a Castilloa of from 18 to 24 inches in diameter produces 13 lbs. of rubber annually, but he asserts that certain exceptional trees may yield as much as 100 lbs. COLLINS observed that a 6 year old Castilloa possessing a diameter of 19 inches on being tapped in April in the dry season furnished 20 gallons of latex, from which 49 lbs. of rubber were obtained and he declares this an average yield of all trees, the trunk of which before branching out, reaches a height of from 18 to 27 feet above the soil. In Nicaragua, it is found that from its sixth or seventh year, a Castilloa tree yields from 4 to 6 lbs. of rubber annually (Crawford). Dr. MORRIS states that a Castilloa, when first tapped, should yield 16 lbs. of rubber. In Mexico, it appears to be generally assumed that Castilloa trees, when from 4 to 5 years old, will produce an average yield of 6 lbs. of rubber. However the "Bureau d'Informations Agricoles du Mexique" is rather more careful, giving the yield of the trees in question as amounting to from 4 to 5 lbs. of latex, corresponding to 2 lbs. 6 ozs. of rubber.

J. H. HART (Trinidad) states the yield of Castilloa as amounting to 2 to 6 lbs., but from quite a recent communication, I take it that an experimental tapping of one of his largest trees only produced about 14 ozs. of rubber.

According to these above set out statements we would have to come to the delightful conclusion that, from its sixth or seventh year, Castilloa elastica will yield from 6 to 49 lbs. of rubber annually.

On the other hand, we have the results of the experiments of

Dr. TRIMEN, Superintendent of the Botanic Gardens of Ceylon, and these results are as follows:—

5 year old mean yield of	77 trees:	2. 3 oz.	per tree.
6 ,, ,,	61 ,,	2. 0 ,,	,,
8 ,, ,,	61 ,,	1. 8 ,,	,,
12 ,, ,,	61 ,,	4. 3 ,,	,,

My chief reason for quoting Dr. TRIMEN'S figures is merely to call renewed attention to the absolute necessity of carefully ascertaining the yield of the Castilloa tree in any district in which it is intended to cultivate it. Dr. TRIMEN'S figures cannot be looked upon as representing the yield of Castilloa elastica anywhere but in Ceylon or Java, but they convey a vivid idea as to the extraordinary degree to which different conditions of soil and climate may affect the yield of rubber.

My own results obtained at Las Cascadas are as follows:—

Age of tree.	Yield of latex.	% of rubber in latex.	Yield of rubber.
6	1 lb. 13 oz.	26	7.5 oz.
7	2 ,, 5 ,,	26	9.6 ,,
8	3 ,, 1 ,,	29	14.2 ,,
11	5 ,, 3 ,,	31	1 lb. 9.7 ,,

As the trees can with perfect safety be tapped twice yearly, the annual rubber yield may be taken double that in the last column of the above table. These yields as regards the trees of 8 and 11 years of age respectively, are the means of a number of fully developed trees of the two respective ages. The yields of the younger trees above given were obtained on tapping two representative trees of the respective ages, and taking the mean of the yield obtained as the real yield, I consider the above figures rather below than above the mark. But it is nevertheless well worth pointing out that as even Castilloa trees of the same age are apt to exhibit astonishing differences in their development it is only to be expected that they do so likewise as regards the quantity of rubber they produce, and it is perhaps not and altogether safe procedure to ascertain the aggregate yield of a rubber plantation by simply multiplying the number of trees on the plantation with the however carefully ascertained yield of a limited number of trees. It is further my opinion that the method of planting and rearing young rubber plantations, always speaking of Castilloa elastica, is a matter deserving of much closer and more careful study than it has so far obtained. The method of simply planting out in a forest clearing so many seeds, or seedlings. at so many feet distance, I consider altogether inadequate. With this highly important matter I propose to deal at some future occasion.

The question regarding the best method of tapping the rubber trees is one which just now is engaging the attention of most of those occupied in rubber planting. Of course, there are always the methods of the natives to fall back upon, but it could not be said that these are on the whole calculated to inspire much confidence, and this for the simple reason that the native collectors in all parts of the world never show the slightest regard for the trees they are tapping. If they do not actually cut the trees down, or in some other way deliberately bleed them to death, they still tap them with an utter disregard of all precautions for their preservation. Such methods are out of the question when we come to tap the trees on the rubber plantation. Here absolutely the first consideration is not only to conduct the tapping in such a way as to preserve the life of the tree but even to prevent this operation from injuring its vigour and growth.

It does not require much demonstration to show that the process of tapping must to a considerable extent depend upon the position, distribution and arrangement of the laticiferous vessels in the trees. It is generally stated that the milk-ducts of rubber trees lie in the layer of bast underneath the bark, and that no milk-ducts are to be found in the inner parts of the trees, the wood or cambium. This, as a general statement may be true enough, but it certainly does not strictly apply in the case of Castilloa elastica. If we chop one of the stout branches off a Castilloa tree, or, better still, if we cut down a young tree, and carefully examine the cut, we can easily see with the naked eye that although the bulk of the exuding latex issues from the layer of bast immediately beneath the bark, still there are quite a number of apparently rather large milk-ducts distributed through the wood of the tree, and also that there is a considerable exudation in the lignified tissue surrounding the pith centre of the trees. It will be a highly interesting problem to ascertain by a carefully microscopic study of the various strata of the trunk of the Castilloa tree, whether there is any direct communication (anastomose) between these widely separated milk-ducts in the various parts of the tree. How far similar conditions exist in other rubber trees, I am at present unable to say, but it seems to me very improbable that Castilloa stands alone in this respect.

Whether there is any communication between the milk-ducts in the different parts of the tissues of the trunk of Castilloa or not, can however, not alter the fact that in tapping the trees on a rubber plantation only those layers of the trunk situated on its periphery can be drawn upon. Indeed, it is the layer of bast only immediately underlying the bark which is worth considering for tapping purposes, as it is generally admitted that any cuts into the wood of the tree are liable to permanently injure, or even altogether destroy it. It is therefore quite clear that as regards the rubber plantation entrusted to me, one of the most important questions to be solved was to ascertain and decide upon the most satisfactory method of tapping the trees.

A microscopic examination of longitudinal sections of the bast layer of Castilloa at once revealed the fact that while this layer contains an enormous number of milk-ducts running longitudinally through the tissue, there are surprisingly little evidence of lateral intercommunication (anastomoses) between them. In exact agreement with this observation is the fact that longitudinal incisions produced an absurdly small flow of latex, indeed, in many cases, none at all, this for the simple reason that the number of milk-ducts opened by a vertical incision is, in the absence of horizontal branchings, simply the number of milk-ducts occupying the width of the cut in the horizontal direction. Compared with the total number of milk-ducts in the layer of bast surrounding the cambium, the former number is, of course, insignificantly small. Moreover, we must bear in mind that the latex is held in the milk-ducts by capillary force, and in order to obtain a flow of it from any incision we largely depend upon the pressure exerted upon these milk-ducts by the turgescence of the cellulose tissues of the tree. It will readily be seen that a vertical incision largely relieves this pressure, and consequently the flow of latex obtainable by such an incision will not even be proportional to the number of milk-ducts, however small, which have been cut into.

On the other hand very little reflection will show that in applying a horizontal incision, not only do we open all the milk-ducts running through the area defined by that incision, but moreover the pressure due to the above mentioned turgescence is not in the least interfered with, and assists materially in producing a most copious flow of latex. It would therefore appear to follow that while vertical cuts are entirely useless, at any rate, as far as Castilloa elastica is concerned, horizontal cuts produce the maximum flow of latex, and a system of horizontal cuts therefore offers the best prospects for an effectually tapping of the trees. This, no doubt is so, but the circumstance must not be overlooked that a horizontal cut is not very satisfactory for the gathering up of the exuding latex, this particularly in conjunction with the fact that a Castilloa tree cannot be drained by a single small horizontal cut as is, for instance, the case with Hevea, but requires a whole series of cuts. This renders it desirable that instead of tapping Castilloa with a number of small cuts a continuous cut would be preferable and one which drains practically the whole area of the trunk. There is only one cut of this description, and this is the one known as the spiral cut which indeed, has always been largely employed by the native collectors exploiting Castilloa trees. I have indeed satisfied myself that the flow of latex obtainable from a spiral cut applied at angle of not more than 45 degrees produces excellent results as far as the flow of latex is concerned.

There is also the repeatedly advocated system of an ascending series of V. shaped cuts, the apices of which are connected by a a vertical cut which serves as a channel down which the milk is enabled to flow. In the first instance, I consider this vertical cut objectionable, as, while it defaces the tree, it does not contribute to the yield of latex obtained. Moreover, in the case of the Castilloa trees at Las Cascadas this vertical cut would be quite useless as the latex yielded by the trees issues from the cuts as a thick cream which does not flow, so that in this case the V. shaped cuts would only about have the effect of a double system of crossing spiral cuts.

The next question to be settled was the tool with which the above named spiral cuts are to be applied. The instrument in universal use for this purpose throughout Central America is the *machete*, a sort of cutlass. This formidable tool requires very dexterous handling in order to produce a regular cut, and even in the hands of the most experienced *hulero* produces an enormous mass of woody *debris* which clings to the cuts, and subsequently are taken up with the latex. The extraordinary mass of wood and bark in the Central American rubbers is entirely due to the tapping being performed with the *machete.* There is certainly no difficulty of removing from the latex these particles of wood and bark, but it goes without saying that if it should be possible to avoid this or any other contamination at the outset, it is much to be preferred to any, however effectual, process of subsequently removing it from the latex.

For this reason a narrow plane has been recommended for the tapping of the trees, but there are several drawbacks to it. It certainly gives a perfectly continuous cut, and one free from the above-named *debris* but it very soon gets clogged. The layer of bast to be cut through in order to obtain the full yield of latex is very considerable, and necessitates the blade of the plane protruding very considerably, a circumstance not calculated to facilitate its use. The thickness of the layer of bast to be cut through not only varies not inconsiderably from tree to tree, but it varies also in the same tree at different heights of the trunk. A plane gives under these conditions very little chance of adapting the depth of the cut to the depth of the layer of bast, and consequently, according to the setting of the plane either the layer of bast is not entirely penetrated, or the cuts pass more or less deeply into the wood itself.

I therefore made experiments with a triangular cutting tool, the cutting edge of which is formed by one of the (rounded) angles, and after several modifications, I arrived at a form which answers the purpose admirably. To cut or tap the trees with this instrument requires some experience but certainly very much less than the *machete.* The cuts are absolutely clean and continuous and their width is naturally regulated by the cutting angle and the depth of bast to be cut through. This is exactly as it should be. For trees of different age, or of different diameter, tools with different cutting angles may be employed.

It has often been proposed to provide the instruments used for tapping with guards so as to prevent their penetrating into the wood. This is, no doubt, a very praiseworthy notion, but unfortunately one which it will be found practically impossible to adopt for the already stated reason that the thickness of the layer to be cut through varies within such wide limits as to render the proposal quite impracticable.

The just described tapping tool does not, of course, prevent the penetration of the cuts into the wood, though I may at once state that its liability to do so is certainly much less than with any other instrument operated by striking such as the adze or machete. But in the experiments I concluded at Las Cascadas I gradually came to the conclusion, rather heretical in view of the nature of the numerous statements on this point, that the tapping to begin with has surprisingly little effect upon the well being of the tree, and further that cuts penetrating into the wood of Castilloa elastica, although they may retard the healing up of the wounds, are not necessarily injurious to the tree. They certainly do not affect its physiological functions, but only represent a danger as they offer a chance to certain insects to lay their eggs into the wood, so that subsequently the trees may suffer from or even succumb to the ravages of the larvæ and insects (wood-burrowing beetles) emanating from these eggs. But this danger is easily avoided by painting the cuts after the co'lection of the latex and "scraps" with an antiseptic paint. It also appears that this simple and inexpensive treatment assists materially in the healing of these cuts, as all the cuts thus treated began to heal up already within a week after the tapping. *Dr. C. O. Weber, Ph. D., in the India Rubber and Gutta Percha Trades' Journal of September, 29th 1902.*

To be continued.

THE HEVEAS OR SERINGUEIRAS.

BY

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Chapter II.

BOTANICAL.

The *Ulé, borracha, seringa,* or *caoutchouc,* are synonymous names given indiscriminately to the various species of the genus *Hevea* of the family of the Euphorbiaceæ. They are majestic trees, erect, with few branches except at the apex, attaining from 30 to 40 metres in height, with one, more or less, in diameter. The leaves are alternate, bistipulate, with long petioles and digitato-trifoliate. The petioles are at the apex, on the upper side, glandular, and the petiolules are small and naked. The inflorescence is hermaphroditic, in axillary or terminal panicles, producing trispermous, trisulcate, large and dehiscent pods with hard seeds resembling those of the castor oil plant (*Ricinus communis,* L.) Animals devour them with avidity, while even men will eat them, without fear of consequences, notwithstanding that they produce a very excellent oil.

In September, all leaves are shed, to be in October, covered with new foliage, after which blooming commences and lasts till November, when the period of rains sets in. Fruits appear only in April and May, at the time when as a rule, the ground is sodden by flood. It is a fact worth recording that the genus Hevea is noted not only for the quality of milk it produces, but also for its properties. And yet it is not the Euphorbiaceæ alone that produce milk, but as my concern is solely with the Amazonian flora, to which the Heveas form part, I will but briefly quote a few examples of other trees whose milk is useful. The Apocynaceæ, the Sapotaceæ, the Clusiaceæ, the Asclepiadaceæ and others, are represented by useful lactiferous plants, among them the *Couma utilis*, Mart. *Couma macrocarpa*, Barb. Rod. *Plumeria phagedenica*, Muell. *Mimusops elata*, Fr. Allem. *Calophyllum Brasiliense*, Mart. *Platonia insignis*, Mart. *Moronobia coccinea*, Aubl. *Simphonia globulifera*, Linn. f. and many others, whose milks produce rubber, gutta percha and resin.

From these families spring the Landolphias, the Castilloas, the Tabernæmontanas, the Ficus, the Urceolas and other exotics, all of which have been of some benefit to the rubber industry in Asia, in Africa and in America.

Various are the species of *Seringueiras* in the valley of the Amazon, but these are known only to the more intelligent of the aborigines, some of whom are experts in spotting their differences.

Scientifically ten species have been described, yet, not all these present the same properties which will all be defined solely by their leaves, since by this means, the uninformed will probably be able all the better to distinguish them, thus omitting their floral characters, not always within the power of every one to observe.

We now proceed to describe the general shape of the leaves and their position, by their details, separating the species as follows:—

1. H. SPRUCEANA, *Mull. D'Arg.* Leaflets oblong-obovate, obtusely acuminate, sharp at the base, above shining, below glaucous-tawny with glabrous nerves conjointed to small petiolules on one petiole with five glands at the apex, and of o m, 09-o m, 12 × o m, 05, 06 in length.

2. H. DISCOLOR, *Mull. D'Arg.* Leaflets similar to the species above, but rigidly membranous, opaque, oblong-elliptical or oblong-obovate, with the nerves pubescent.

3. H. MEMBRANACEA, *Mull. D' Arg.* Leaflets membranous, lanceolate-obovate, straight at base, acuminate, glabrous on both sides, dark green above and glaucous-tawny below, of o m, 08-o m, 15 × o m, 035-o m, 055 in length.

4. H. PAUCIFLORA, *Mull. D'Arg.* Leaflets coriaceous lanceolate-obovate, obtusely acuminate, with the base acute, above smooth, below glaucous, glabrous, of o m, 10-o m, 12 × o m, 05-o m, 08 in length.

5. H. RIGIDIFOLIA, *Mull. D'Arg.* Leaflets coriaceous, with margins recurved, of same length as petioles, oblong elliptical, acuminate with the base acute, rigid, above smooth and shining, below glaucous, with the secondary nerves prominent and of o m, 09-o m, 012 × o m, 04-o m, 05 in length.

6 H. NITIDA, *Mull. D'Arg.* Leaflets with the petioles biglandular at apex, oblong-elliptical, very shining, acuminate, rigid, glabrous, pale below and of o m, 13-o m, 18 × m, 055-o m, 08 in length.

7. H. BENTHAMIANA, *Mull. D'Arg.* Leaflets membranous, oblong-obovate, of the size and form of *Spruceana*, pubescent and below tawny-glaucous.

8. H. LUTEA, *Mull. D'Arg.* Leaflets rigidly membranous, obovate-lanceolate, with the base sharply cuneate, shortly acuminate, olivaceous-tawny, opaque, below glaucous, tawny, glabrous, on both sides, of o m, 10-o m, 012 in length.

9. H. BRASILIENSIS, *Mull. D'Arg.* Leaflets rigidly membranous, lanceolate-elliptical, oblong-obovate in the middle, acute at base, acuminate, glaucescent, and glabrous below, of o m, 05-o m, 07 x o m, 08 in length.

10. H. GUYANENSIS, *Aublet.* Leaflets membranous, oblong-obovate, with the base acute or cuneate, obtuse or apiculate, glabrous, shining above and tawny-glaucous below, shorter than the petioles and of o m, 25 x o m, 08 in length.

The first to have classified the rubber three (Hevea Guianensis) was the French Botanist AUBLET in 1781, and RICHARD in 1785, who described it by the name of *Caoutchouc.* SCHREBER in 1879, not adopting AUBLET'S description, created for it the genus *Siphonia.* But LINNÆUS in 1781, had already placed it under the genus *Jatropha,* with the specific name of *elastica,* while PERSON renamed it later on *Siphonia* adding to it LINNÆUS'S specific name, which WILLDENOW eventually altered into *cahuchu.* The name *Siphonia elastica* was the one by which this tree was more commonly known at the time rubbers belonged to the Hevea, by right of priority and because this said genus Siphonia was no more than a synonym.

The names *caoutchouc* and *seringa* belong to all the species of Heveas, the word *cáocho* being to-day applied to the *Castilloas* and *Galactodendrons.* The name *coácho,* is, as we have seen, a corruption of *caaochô* or *caaochu,* a native word derived from *caa* wood, timber, and the verb *o chô* or *o chu* to *distil,* or to *run* or *weep,* in other words, timber that weeps.

In some places, rubber is obtained from one species only of the local flora growing together, in others, there is promiscuity and the consequent mixture of milks, from which results the various qualities of the prepared article, an occurrence common also with the oil of copaiba.

Among the species that produce the superior qualities of rubber, are others called *barrigudas,* which notwithstanding that they produce milk in abundance, is however, poor in rubber and of bad quality at that. This name of *barrigudas* is derived from the fact that some of these trees have bellied on bulging trunks, as often occur on the margins of the Amazon. The true rubbers, those that produce rubber of the best quality, are the *H. Brasiliensis,* the *H. Discolor* and the *H. Guyanensis,* all of which are rich in the production of a milky juice, known scientifically as *latex.*

This milk is exuded from the trunk, the branch, the bough and the petioles; however, it is only that which exudes from the trunk that is of any use, that from the extremities being aqueous and poor in rubber. The nearer it is to the ground, the greater the abundance and the better the quality of milk the trunk produces.

This milk * which constitutes the wealth of the tree, is a white

* Dissolved in small quantities in Castor oil, it has anthelmintic properties.

juice, opaque, and very similar to that of the mammal, though when administered internally, it produces lethargy, from its being transformed in the stomach, into rubber.

This opaqueness is due to the presence of numerous globules of a matter, which, when dry, turns elastic, and which is held in suspension, in an aqueous fluid, clear, and having the appearance of an emulsion. This aqueous fluid contains various albuminous substances held in solution.

Pure rubber composed of these globules, consists solely of Carbon and Hydrogon in defined proportions C_4 H_7.

The latex circulates by a system of longitudinal cellular veins or vessels. These vessels are to be found in the inner layer of the bark, between it and the wood and known as the *cambium*. From this cambium the two layers are formed, the external producing the bark, and the internal the wood. It is in the internal layer that these laticiferous vessels reside.

The bark is usually ten millemetres in thickness while the cambium is from 2 to 3 millemetres.

During the fruiting season, or at the shedding of the leaves, that is, from May to July, the milk is then abundant, and is then rich in rubber, from this being the time the sap descends. During this epoch, a kilogramme of milk will produce half a kilogramme of rubber. When the sap ascends, the milk is then poor in rubber, is aqueous, producing no more than 200 grammes of rubber to every kilogramme of milk.

The milk from the branches and boughs, is always watery, is deficient in globules, and its chemical composition does not appear the same as that exuding from the trunk. Milk should only be extracted from healthy trees, adult and after they have flowered. A tree does not attain its full growth till after 20 to 25 years, though at ten years a tree can be bled, but not before it has flowered, at least twice.

It is true that in the Amazons, milk is extracted from trees of five years growth, but as I have observed, in small quantity and of poor quality, demonstrating the fact that at this age, the latex coagulates before there is time to prepare it, giving a product of very inferior quality.

Taken also the milk, even in the case of adult trees, above two metres from the ground, it will tend to sicken the tree or to shorten its milk producing period. Some ambitious men, careless of the sacrifice it entails, go the length of erecting a *mutá* (fixed ladder) in order to tap the upper part of a tree, a proceeding which should be prohibited and which has been one of the causes which has led to the extinction in some places of rubber producers.

To be continued.

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CORRECTIONS AND OBSERVATIONS ON THE HISTORY OF THE INTRODUCTION OF PARA RUBBER.

Readers of last bulletin will note that on page 2, line 37, and page 3, lines 10 and 28 a 9, has been printed accidentally for a 7 the dates being 1873, 1877 and 1876 respectively, the context however sufficiently indicates this; also that the inverted commas beginning on line 37 page 2, have dropped out after the word "perished" on page 3.

His Excellency Sir FRANK SWETTENHAM who calls my attention to these misprints writes—" It is nowhere stated a matter of some importance in a real history of the introduction etc. that in 1884 I then acting as Resident in Perak collected 400 Para seeds of the then single tree in bearing planted them in a box where 399 germinated and were planted out by me on the banks of the Kangsar river. I believe over 200 of these trees are still there and they have supplied Federated Malay States planters with hundreds of thousands of seed for a good many years."

I may add to the previous paper that the first lot of seeds recorded as sent out from the Botanic Gardens in Singapore were sent to Sarawak, December, 26th 1882, and next to the Resident Councillor, Malacca, and Resident of Selangor June 8th, 1883.

EDITOR.

RAMIE.

My note on ramie in the May number of the Bulletin elicited in subsequent numbers two interesting letters from Mr. BAXENDALE, and one from Mr. ANDERSON. As further information on this subject is desirable I have been in correspondence with the latter gentleman and sent him a parcel of ribbons stripped by hand from the fastest growing and tallest variety we have in cultivation here. I gather from his letter that "Black Ramie" is not a term applied to all ramie ribbons but to one particular kind which he considers to be the form we have in cultivation here and which I sent him to experiment on. Although the yield in clean fibre in this variety is less, and the cost of preparing greater than in others, the greater yield per acre might possibly counter-balance this? This is a point to be worked out and I now propose sending a sample of another kind which I feel sure will give a better percentage of clean fibre but it never attains to anything like the size or length of the one already sent. Later on I will give the approximate yield per acre &c. but for the present will be content to place before the readers of the Bulletin Mr. ANDERSON'S two letters on the subject containing as I think they do some suggestions worthy of consideration.

C. CURTIS,

Superintendent of Gardens and Forests.

(LETTER NO. 1.)

DEAR SIR,—I received your interesting letter and sample of Ramie by last Mail which proves to my mind that you are in the ideal place for growing this fibre. There is a question about the growing of it that you will know better than I can possibly do and that is as regards cutting at the proper time. This I consider ought to be done only when the flower is beginning to fall and the seed to form on the plant. It ought not to be a matter of height of stems or the time those have grown and should be solely one of maturity of fibre. This that you send me seems to want this but possibly this arises from the plants being young. From all that I have seen it appears to belong to the black variety, the worst that can be grown. I arrive at this from a quantity that I have of the wild black variety which only differs from this in its length which is two-thirds less than this of yours. In that letter of Mr. BAXENDALE'S in the October No. of the Bulletin he mentions the black variety, and the fact of its having been sent to the public destructions at Liverpool. Through the firm that he represents I was aware of this as they told me no one would take it at a gift. Why Mr. BAXENDALE or any one else should persist in growing this stuff is a mystery to me as I am of opinion it is as easy to grow the best as the worst, that is to say if the best can be got. Nothing that I have seen can equal the beauty and quality of the China grass ribbon and I somehow think that no European grower has ever got the genuine roots of this finest of the ramies. Good as some of it is that I have handled it cannot compare with this for quality and length of fibre. The waste on it too is only about a half as compared with good fine ramie and only about a quarter of what this sample of yours will lose. In removing the black skin on this of yours I lose fully 22 ounces. After this I have the gum to get rid of so that the sample will lose not less than 50%. By this you will see how expensive and wasteful it would be to grow this if better can be had. At the same time it could be freely used if put on the market at a low figure as it could be used easily with the bark removed similar to the enclosed sample. It says much for Mr. BAXENDALE'S perseverance that with such meagre results he has not lost faith and hope of ultimate success. To get 2½% of ribbons only = to 56 lbs. from one ton of stems would have disgusted most men. Such a result as this in its pottering insignificance proves the uselessness of any machine for such a purpose and if better result than this could not be obtained the growing of ramie would be better left alone. I enclose sections of stems that were grown in the Glasgow Botanic Gardens and which came off quite clean and the ribbon did not shrivel in the way that most of it does that is taken off when green. In taking it off I get every particle of fibre that one can get when the stem is green as there is always an inner peel that adheres to the woody portion of the stem. As you want to know the selling value of the fibre I enclose a sample of some for which £37.10 a ton is asked. I also enclose a strip of the cream of this fine fibre which I recognize as China grass which no effort ought to be spared to produce. Most that has come here is that black stuff which has simply damned the fibre and disgusted all who have taken it in hand. As to getting an outlet and market for the fibre if it could be had in quantity and delivered ready for use in the manufacturing linen centres of Scotland no difficulty would be experienced. As I have already maintained from what I know of other fibres this is one of the most easily dealt with, if the best is produced, and will give the most generous results if reckoned in the dry state with the tons of sap left out of the count as it ought to be along with the enormous leafage, all of which ought to be got rid of before being handled and the ribbons taken off. The broader this is removed the better. To make ramie pay it will have to be handled by the ton and turned out in hundredweights and not in pounds as at present by the use of patient-pottering machines. All this I can do at a comparatively low cost.

J. ANDERSON.

(LETTER NO. 2.)

DEAR SIR,—I herewith return part of the ribbons you kindly sent me. In the condition you see it the wastage is about 50% for comparison I send along with this the best class of Ramie the waste on which is 25%. The trouble and expense in cleaning is not more than a half as compared with this of yours and the results are much superior as it takes on a far better finish, especially as the fibre is mature which yours was not. This accounts for the woolly look that yours has got. Independent of this if nothing better could be had this of yours would pay to grow. From your experimental plot you ought to have no difficulty in showing growers what they might except from an acre of suitable ground. You can at the same time compare this with flax grown in Ireland and which has to be annually sown and which does not yield more than an average of 3 cwt. of cleaned flax to an acre worth on an average not more than 50/ per cwt. for the past ten years according to printed returns. Although I do not regard your ribbons as being the right sort I recognise the splendid possibilities of the country you are in for the development of this grand fibre and considering the time your roots have been in the ground the result is amazing and confirms the impression of all I have seen and read that there is nothing grown under the sun finer than Ramie and no plant grown for fibre that could yield more generous results except Jute. In the condition of these samples any quality could be sold and used at prices that neither flax no cotton could obtain. I have shown these to men largely interested in manufacturing and they all admit and predict a great future for this finest of vegetable fibres.

J. ANDERSON.

RECLAIMING ABANDONED MINING LAND.

Copy of Minute by MR. RIDLEY, *dated 15th June, 1896.*

HON. RESIDENT, SELANGOR,

I have carefully read this paper and agree with most of the recommendations, though it is probable that in the view of the formation of a Forest Department here some slight modifications will be found convenient.

With respect to the reclaiming of abandoned mining land, I would first urge that if possible the miners on abandoning the land should be compelled to level the large spoilheaps as these are very troublesome to deal with in planting. I have examined the abandoned land at Pudu and notice that there is but little lalang there, but that the ground is being covered with a vegetation of common grasses, weeds and small shrubs, and I think it is clear that there will be no great difficulty in replanting it now with trees if suitable kinds are used. I should recommend the following trees for these places:—

Kelat (Eugenia lineata), Bintangor Bunga (Calophyllum inopyllum), Tembusu (Fagraea fragrans). These trees are useful timbers, the latter one of our most valuable kinds of which there is but little in the State. Also the following inferior timbers which would serve to cover the ground and aid in forming humus:—Ru (Casuarina), Jambu Ayer Laut (Eugenia grandis), Ketapang (Terminalia Catappa), Gelam (Melaleuca).

This latter to be planted where water has accumulated. The trees should be planted in blocks at first pretty close together, so as to form small woods and eventually the interspaces would fill up or could be planted up. The trees would have to be protected against the attacks of goats and cows till they were grown up sufficiently. Seeds or young plants of the trees above mentioned could be procured from Singapore. The expenses need not be very heavy especially if the seeds are raised in nurseries near the places to be afforested.

H. N. RIDLEY.

June 15th, 1896.

RED BEETLES IN COCONUTS.

Mr. DUNMAN who owns large Coconut Estates in Singapore writes: "There are still a few red beetles about Tanjong Katong, I have recently got half a dozen on the old worn out trees on the outskirts of the "grove". Considering that 4 years ago we had to cut away some 15 or 20 acres of trees for this reason, it is marvellous that there are so very few of them about." The greater part of these beetles came, I think, from the small native gardens in the Gaylang and Rochore district. The one or two trees in each little patch, having been attacked, the owner never thought it worth while to do anything to the tree to save it, and simply gathered what nuts there were till the tree was dead. All these infected trees were destroyed by the Inspector, and the breeding ground of these red beetles was practically cleared away. Hence the disappearance of the pest.—(EDITOR).

COCONUT BEETLES.

By L. C. Brown.

It would I feel certain be very difficult to find any more striking illustration of the enormous harm that can be done to Coconut plantations by the ravages of the beetles than in the proximity of the towns of Kuala Lumpur, Klang and Kuala Selangor, Districts belonging to the State of Selangor. It is the more distressing when you are informed that only a few years ago these plantations looked most promising and this easily creditable considering how excellently suited the soil is for this cultivation. The attention of the Government naturally having been drawn to it, steps are now being taken which I am sure will, although it may take some considerable time, practically overcome the evil, but to prevent its recurrence proper supervision must continue to be exercised as the extensive area under cultivation, and which it is satisfactory to note is largely increasing, consists chiefly of numerous small holdings owned by natives who are often careless in looking after them and also to the fact that the surroundings in many places are conducive to the harbourings of the beetles that do the damage if sufficient precaution is not observed.

The whole of the destruction has been done by the two beetles "Rynchophorous ferrugineus" and "Oryctes rhinoceros" commonly known as the red and black coconut beetles. The reason why these insects have done so much havoc is due to neglect on the part of the owners or tenants who have taken no proper steps to keep them down, while the difficulty of doing so has no doubt been aggravated by the large quantities of manure, refuse and rubbish heaps that have been allowed to accumulate in these vicinities, forming perfect "hot beds" for the continual breeding of these pests. To the habits of the beetles and the best means of destroying them and reduce their power of doing serious damage, I now propose to enter upon.

Red Beetle.—This insect after it is fully developed does no harm to the tree of itself. It generally lays its eggs at the base of the branches covering the cabbage and so well are they secreted or hidden away that the harm being done is often not detected until it is too late to save the tree. The grub is what does the havoc, and soon after it is hatched commences its operations by gnawing and boring its way inwards until it reaches the very heart of the cabbage. The work is rapid and effect so deadly that these grubs are, in my opinion, very much more dangerous to the life of the tree than the ravages done by the black beetles, but fortunately the red beetle is scarcer. It occasionally takes advantage of the borings made by the black beetles to lay its eggs in these cavities, only here it is more easily discovered in searches for the black beetle, so that with proper supervision it may or should be caught before any serious harm has been done. Apart from these haunts my experience is that it does not appear to have many other breeding places, a few will be found in manure or rubbish heaps, more again in the rotten dead stumps and roots of sago and serdang palms, and most numerous in a coconut tree from which the top has fallen away through their ravages or a decayed stump of the same tree. Here the grub will be found covered in a cocoon made of the fibre and so well does it conceal itself in this way that it is practically not noticeable to the ordinary view and is only discovered when the inside of the tree or stump is scooped out which I need scarcely say must be done very effectually otherwise one or two of the cocoons may escape observation.

Black Beetles.—It is on account of their great numbers that these beetles are so much to be feared, and their borings, as I have stated previously, afford a means for inroad by the dangerous red beetle. There absolutely seems to be no limit to the beetles and their grubs provided the breeding places are sufficiently abundant and these comprise not only those mentioned in connection with the red beetle but a great many more, such as, underneath and in dead palms of several kinds, sawdust, paddystraw, coconut, coffee and paddy husks and refuse heaps of all descriptions. The grubs especially can simply be found in thousands in quite a small dung heap. When the beetles reach maturity they leave their breeding grounds and it is then they make for the coconut trees and commence thair ravages slightly above and near the top of the cabbage boring their way downwards and lay their eggs at the end of the cavities so formed. Owing to their constant and continual onslaughts they do great damage to the trees, nipping as it were the leaves and the stem that bears the fruit just at the time they are forming; the leaves in consequence afterwards present a jagged or frayed appearance and what is more serious the stem often is killed, and if it does shoot out probably bears little or no fruit. There is difficulty in ascertainingh ow far the beetle can travel in one stage of its journeyings which it makes at night, but I should say no great distance and about a mile would, I think, be an extreme limit. However it manages to fly to plantations considerable distances away from one another and this may be accounted for by its finding several breeding haunts intervening to avail of during its flight.

Destruction.—The only way to exterminate and get rid of these pests is to diligently search out and thoroughly destroy all the breeding grounds already described and everything that is likely to harbour them must be burnt. Some advantage is to be gained from this burning, for provided the heaps are not placed too close to the trees so as to harm them, the smoke most undoubtedly does good as it tends to form and harden the fruit on the stem producing heavier crops. Attention must also be given to the trees themselves which should be searched periodically and all the beetles extracted. For this purpose a stiff bit of wire about 18 inches long with a barb at the end is usually used and in addition to this after the beetle has been extracted it will be found efficacious to put a few drops of "Zotal" into the cavity and also, by means of a small brush, smear over the entrance to the hole with the same composition. This preparation if applied in the way I have indicated will not harm the tree, on the other hand experiments have shewn that it gives a decided stimulating and recuperative power to it and prevents other beetles from making use of the hole.

General.—While the plantation is young or if there are a great number of trees not in bearing, it will of course be necessary to keep some coolies to look after and give special attention to the beetles, but when all the trees are in full bearing or nominally so and the plantation has been previously well maintained, it may possibly be sufficient, to keep away any real harm from attack by beetle, merely to employ the coconut collectors while collecting the nuts, generally every two months, to extract the beetles from the tree. This is the common practice in Penang and other places I know of, the collector usually receiving a cent for every beetle he catches.

The land all along the sea coast of Selangor and some miles inland is most admirably suited for the cultivation of coconuts and there are some particularly fine plantations to be seen here. According to my idea it is a perfect home for coconuts, the trees come very quickly into bearing, (four to five years by no means uncommon) produce magnificent crops, and owing to the fertility of the soil absolutely require no manure except perhaps at the time they are planted so as to give the young plants a good start. With these and other advantages it would be supposed that owners would give the plantations every care and attention so as to obtain the best possible results out of them, but I regret to say from what I have seen that this is by no means always the case. It is a well known fact that a strong and healthy tree resists the attack of the beetle far better than a stunted or sickly one, and I would therefore lay particular stress on the very great importance of keeping the trees free from lalang and brushwood of all sorts and point out how seriously this undergrowth affects the well being of the trees.

There is only one other matter that I would mention which I consider bears on the subject and may prove instructive where new land is being opened for the cultivation of coconuts. I have noticed that in opening up forest land sufficient precaution has not been taken while burning off the jungle to completely destroy all the sago and serdang palms, also the soft wood trees, the consequence has been that where coconuts have been planted on these clearings among coffee and rubber, the beetles have been found in considerable numbers owing to these decayed stumps, and as the coffee and rubber will not stand any burning, it is both costly and difficult to get rid of these pests. Had there been a little extra burning, as I have explained, when the place was originally opened up I feel sure the present trouble would have been very much minimised if not practically avoided altogether.

L. C. BROWN.

Kuala Lumpur, 5. 1. 03.

SUMMARY OF RUBBER PLANTING IN MEXICO.

In answer to a circular letter sent by the *India Rubber World* to the various incorporated rubber planting companies now operating in Mexico, asking for details regarding their progress, to be held in confidence except for use in making up statements of totals, responses have been received from most of the companies that have actually begun planting. From a few substantial companies the desired details have not yet been received, and in a few other cases the statements have not been made in a form to permit of their use in the computations which follow. The returns which appear in the table of total planting below are supplied by twenty-six companies. Of the companies referred to, one was incorporated in 1897, two in 1899, three in 1900, nine in 1901, and two in 1902; regarding the other nine we are not informed. It will be seen that the companies are mainly new, and some have done very little of the planting contemplated. Two however state that they have finished planting.

The total number of trees planted by the twenty-six companies, by years, is reported as follows:—

Planted 1897	-	5,200	Planted 1901	-	1,101,678
„ 1898	-	21,700	„ 1902	-	2,991,000
„ 1899	-	370,785	-	Total...	5,443,105
„ 1900	-	952,742			

The total acreage reported is 11,117. The acreage cannot be presented by years in some cases, but by partially estimating, from the returns supplied, it appears that about 5,300 acres were put into rubber in 1902. Thirteen of the reports, in which exact details appear, give the following average number of trees planted per acre in that year.

400	1,000	820	800	2,000
500	200	800	587	600
496		250		611

These thirteen companies report a total planting of 2,671,000 trees in 1902, on 4,113 acres, or an average of 650 trees per acre. It will be understood of course that the practice is general of close planting, both to allow for failures, and with the idea of extracting some rubber from the surplus trees when they have grown so as to make their removal necessary.

While some of the companies have tried various methods of planting as regards shade, generally one plan has been adhered to in each case, and further planting as a rule, will be done under the same method as in the past. The distribution of the total planting to date has been as follows:—

Planted in the open - -	3,202,920 trees.
Planted in the open and semi shade	1,117,000 „
Planted in semi shade - -	1,019,185 „
Planted in shade - - -	4,000 „
Not stated - - -	100,000 „
Total..	5,443,105 trees.

Ten companies planted in the open, two in the open and semi shade, eleven in semi shade, one in shade altogether, and two fail to report.

Nine companies planted from nurseries and at stake, twelve from nurseries principally, three at stake alone, and two fail to report.

In regard to transplanting from nurseries, and planting seeds at stake, while the practice of the different companies varies, in most cases the plan adopted in the past will be continued. The total planting has been distributed as follows:—

From nursery and at stake	-	2,075,400 trees.
From nurseries alone	- -	1,895,705 ,,
At stake alone	- -	372,000 ,,
Not stated	- - -	100,000 ,,
	Total...	4,443,105 trees.

To give an idea of the extent of the preparation made for future planting, it may be mentioned that nineteen of the twenty-six companies reported having in nurseries at the end of the season a total of 11,462,000 young plants, in numbers ranging from 7,000 to 2,000,000 each. Two companies reported no nurseries, having completed planting, and five made no report. *The India Rubber World of February 1st, 1903.*

GUNDA SIKKIMA.

A Rambong pest.

Some time back I received some leaves of rambong (*Ficus elastica*) from Klang among which was the pupa of a small brown moth, the larvæ of which had been eating the leaves. This moth I sent to Sir George Hampson of the British Museum who named it *Gunda Sikkima,* a well known Indian insect, of which I can find no account of the life history.

On February 13th, 1901, I got also from Selangor, some caterpillars which had been devouring the leaves of the same tree. They were an inch long smooth and hairless entirely of a raw sienna color, darker along the back. The head rather small, the thoracic segments very broad and abruptly elevated like those of the English puss-caterpillar. There was a curved horn on the tail like that of a hawk-moth caterpillar. They pupated in woolly coccoons, and developed as moths an inch and a half across, with short curved plumed antennæ, and very woolly legs. The thorax was woolly the front edge yellowish brown, the rest hoary, the body ¾ inch long ocre yellow and woolly. Fore wings narrow at the base, dilated at the end and hooked at the tip, the edge waved, fawn color with a dark > at the base and a broader V in the centre with a dark olive crenate line beyond, outside of which was a grey patch with two white spots, the edge olive colour, the under side dull orange with two brown stripes and a white spot. The lower wings pale orange with three wavy brown lines. This moth is evidently also a species of *Gunda,* but I cannot find any description or figure to fit it. These insects are likely to prove very destructive, and the caterpillars should be killed on sight.

H. N. RIDLEY.

REPORT ON SAMPLES OF RUBBER EXTRACTED FROM HEVEA BRASILIENSIS.

By Mr. Stanley Arden.

(Copy)
Straits Settlements.
Native States.
[No. 432.]

Downing Street, 31st December, 1902.

Sir,—I have the honour to transmit to you for your information and for communication to Mr. Stanley Arden, Superintendent of Experimental Plantations, the papers noted in the subjoined schedule.

I have, etc.,
(Sd). ONSLOW,
For Secretary of State.

The Officer Administering the Government of the Straits Settlements.

Date.	From.	To.	Subject.
24th December, 1902.	The Director of the Royal Gardens, Kew.	The Colonial Office.	Report on certain samples of Para rubber, coagulated by various methods.

(Copy)

Royal Botanic Gardens, Kew,
December 24th, 1902.

Sir,—I have the honour to inform you that I have received from Mr. Stanley Arden, Superintendent of Experimental Plantations in the Federated Malay States, a series of samples of Para rubber coagulated by various methods, with a request that I would obtain a commerical report upon the results. A copy of the brokers' report is enclosed.

2. Without entering into unnecessary details it is sufficient to notice that Nos. 1 and 6 were naturally coagulated; No. 2 was coagulated by the addition of acetic acid; No. 7 was "scrap rubber" collected off the tree; the remaining samples were coagulated by various mineral acids.

3. It is quite clear from the brokers' report that natural coagulation affords the best results and that the only admissible artificial coagulating agent is acetic acid.

4. The point, however, which it is important to notice, is that Para rubber can be produced in the Straits Settlements from ten years old trees, which is worth eight pence a pound more than the best equivalent Brazilian product. I may be permitted to feel some satisfaction at this result seeing that the trees which have furnished the rubber now reported on are the descendants of those transmitted from Kew to the Straits Settlements in 1877; these were para of the first consignment of Para rubber trees to the tropics of the Old World.

5. I have no doubt that the Straits Settlements is now in possession of a new and important cultural industry. The facts stated above are therefore of sufficient importance to bring under the notice of the Secretary of State and to be placed on permanent record. Mr. CHAMBERLAIN will no doubt cause them to be communicated to Mr. STANLEY ARDEN, in official course.

I am, etc ,

(Sd). W. T. THISELTON-DYER.

(Copy)

MESSRS. HECHT, LEVIS AND KAHN TO ROYAL BOTANIC GARDENS, KEW.

36, FENCHURCH STREET, LONDON, E.C.,
December 19th, 1902.

DEAR SIR,—We have examined the samples of Para Rubber from Selangor which you submitted to us. We are of course not chemists, and can only judge the Rubber from its elasticity, strength and freedom from dirt.

With ordinary Hard Cure Fine Para worth to-day 3*s*. 8*d*. per lb., we should estimate the value of your samples as follows:—

No. 1	...	about	4/4 per lb.
Nos. 2 and 6		,,	4/3 ,,
No. 5	...	,,	4/2 ,,
No. 4	...	,,	4/1 ,,
No. 3	...	,,	4/ ,,
No. 7	...	,,	3/4 ,,

Numbers 3 and 4 are decidedly weaker than others, and on the whole we think the less acid used in coagulation the better. Sample No. 1, coagulated without acid at all, is certainly the best of the lot.

We remain, etc ,

HECHT, LEVIS AND KAHN.

CORRESPONDENCE.

PADANG RENGAS,
March 21st, 1903.

To the Editor

THE AGRICULTURAL BULLETIN,
SINGAPORE.

Dear Sir,--In your Journal of November, 1902, there appeared a letter from Mr. CYRIL BAXENDALE, describing the tapping of two Para Rubber trees in my garden here, which resulted in the collection of 30 lbs. of Rubber in two months.

Mr. BAXENDALE sent the Rubber through his office to one of the largest manufacturing Companies in the world and was favoured with a special report after the Rubber had been properly dried and cleaned.

The bulk of the consignment realized 3/1*d.* per lb; the Scrap which contained a great deal of bark at 2/2*d.* per lb.

The highest quotation for American Para at the time was 3/3*d.* per lb.; the difference of two pence in the price was accounted for by the excessive amount of water, owing to the Rubber being dried in thick slabs.

No chemical of any description was used, and in the opinion of the Managing Director we were well advised not to use any, since the use of acids is liable to deteriorate the Rubber.

After paying all charges and postage Mr. BAXENDALE has sent me a cheque for forty-five dollars. It would have been over fifty dollars had the despatch of the Rubber been delayed for a few weeks.

The cost of collection (based on the rate of wages prevailing on this Estate) was two pence halfpenny a lb. and therefore in spite of the depression of the market at the time, the result was profitable.

Mr. BAXENDALE advises me that he is now filtering his latex and drying the Rubber in slabs of less than a quarter of an inch in thickness.

Samples of this have been forwarded to his manufacturing friends. This latter has been taken from four year old trees growing on Jugra Estate, Selangor.

I have, etc.,
G. R. SALISBURY.

GAPIS ESTATE,
PADANG RENGAS, PERAK,
April 1st, 1903.

Editor

AGRICULTURAL BULLETIN,
SINGAPORE.

Dear Sir,—In answer to your letter of March 28th, the age and girth of the trees from which I obtained the Rubber was given in your Journal of November, 1902, and consequently I did not think it necessary to repeat.

For your information the following is extracted from the letter of Mr. CYRIL BAXENDALE:—

Tree No. I.—Girth at 1 yard from ground 89 inches.

Tree No. II.—Girth at 1 yard from ground 56 inches.

Ages of above trees must be about 20 years old.

If you think it desirable to add this to my letter, I shall be very much obliged, if you will do so.

Yours faithfully,

G. R. SALISBURY.

NOTICE.

It is suggested that Subscribers who are not residents of Singapore should send Money Orders in preference to Cheques in order to avoid the loss due to Bank discount.

SINGAPORE MARKET REPORT.

January, 1903.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	32.00	31.00
Bali	20	22.50	21.75
Liberian	143	21.00	21.00
Copra	3,015	9.85	8.70
Gambier	1,903	15.30	15.00
Cube Gambier, Nos. 1 & 2	385	22.75	21.50
Gutta Percha, 1st quality	...	350.00	250.00
Medium	...	250.00	150.00
Lower	...	150.00	40.00
Borneo Rubber Nos. 1, 2 & 3	...	190.00	83.00
Gutta Jelutong	...	7.70	7.12½
Nutmegs, No. 110's	...	90.00	72.00
No. 80's	...	125.00	107.00
Mace, Banda	...	130.00	125.00
Amboyna	...	125.00	115.00
Pepper, Black	947	37.25	34.54
White	139	61.00	59.00
Pearl Sago, Small	110	6.25	5.60
Medium	...	6.50	6.75
Large	...	6.75	7.25
Sago Flour, No. 1	1,820	4.65	4.25
No. 2	245	1.95	1.80
Flake Tapioca, Small	593	8.25	5.25
Medium	104	5.40	6.00
Pearl Tapioca, Small	646	6.00	5.00
Medium	474	7.00	4.75
Bullet	...	5.75	6.25
Tin	3 280	97.50	89.00

SINGAPORE MARKET REPORT.

February, 1903.

Articles.	Quality sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	12	31.50	31.00
Bali	23	22.25	22.00
Liberian	179	20.50	19.50
Copra	1,765	9.75	8.80
Gambier	2,843	16.25	15.15
Cube Gambier, Nos. 1 & 2.	95	23.00	21.75
Gutta Percha, 1st quality	...	350.00	250.00
Medium	...	250.00	150.00
Lower	...	150.00	40.00
Borneo Rubber		190.00	90.00
Gutta Jelutong	...	7.75	7.25
Nutmegs, No 110's	...	95.00	60.00
No. 80's		145.00	125.00
Mace, Banda	...	145.00	140.00
Amboyna	...	130.00	120.00
Pepper, Black	781	35.87½	34.40
White	121	59.25	53.50
Pearl Sago, Small	75	6.15	5.70
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	1,786	5.25	4.35
No. 2	325	2.00	1.85
Flake Tapioca, Small	672	7.87½	5.25
Medium	140	...	...
Pearl Tapioca, Small	294	6.00	5.00
Medium	479	6.00	4.75
Bullet	...	... 6.25	
Tin	1,445	99.00	95.50

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st January, 1903.

Wired at 7.55 p.m. on 2nd Feb., 1903.

To England:—

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports	1,050
Gambier	from Singapore	to London	30
,,	,, ,,	to Liverpool	...
,,	,, ,,	to U. K. & / or Continent	350
,,	,, ,,	,, Glasgow	...
Cube Gambier	,, ,,	,, England	20
White Pepper	,, ,,	,, ,,	60
Black ,,	,, ,,	,, ,,	210
White ,,	,, Penang	,, ,,	60
Black ,,	,, ,,	,, ,,	...
Pearl Sago	,, Singapore	,, ,,	60
Sago Flour	,, ,,	,, London	240
,,	,, ,,	,, Liverpool	...
,,	,, ,,	,, Glasgow	100
Tapioca, Flake	,, S'gapore & P'nang	to England	350
,, Pearl & Bullets	,, ,,	,, ,, ,,	310
,, Flour	,, Penang	,, ,,	1,500
Gutta Percha	,, Singapore	,, ,,	210
Buff hides	,, ,,	,, ,,	60
Pineapples	,, ,,	,, ,, cases	15,750

To America:—

Tin	form Singapore & Penang	1,700
Gambier	,, ,,	300
Cube Gambier	,, ,,	10
Black Pepper	,, ,,	70
,,	,, Penang	100
White Pepper	,, Singapore	...
,,	,, Penang	...
Nutmegs	,, Singapore & Penang	60
Tapioca, Flake & Pearl	,, ,, ,,	320
Pineapples	,, ,, ,, cases	4,500

To the Continent:—

Gambier	from Singapore	to South Continental Ports	90
,,	,, ,,	,, North ,,	380
Black Pepper	,, ,,	,, South ,,	300
,,	,, ,,	,, North ,,	190
,,	,, Penang	,, South ,,	80
,,	,, ,,	,, North ,,	...
White Pepper	,, Singapore	,, South ,,	20
,,	,, ,,	,, North ,,	20

			Tons Steamre.
White Pepper	from Penang	to South Continental Ports	...
,,	,, ,,	,, North ,, -	...
Copra	,, Singapore & Penang	to Marseilles -	460
,,	,, ,,	,, Odessa -	1,900
,,	,, ,,	,, South Continental Ports (other than Marseilles and Odessa.)	1,050
,,	,, ,,	,, North Continental Ports	..
Tin	,, ,,	,, Continent -	330
Tapioca Flake	,, ,,	,, ,, -	350
TapiocaPearl	from Singapore & Penang	to Continent -	360
Cube gambier	.. Singapore	,, ,, -	70
Pineapples	.. ,, ,,	,, ,,	cases 2,000

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,000 tons Gambier }
200 ,, Black Pepper } contracted for during fortnight ending as above.
(in Singapore) }

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E. C.

(B)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th February, 1903.

Wired at 5.15 p. m. on 16th February, 1903.

To England.			Tons Steamer.
Tin	from Singapore & Penang	to England - (and U. K. optional any ports.)	1,075
Gambier	from Singapore	to London -	40
,,	,, ,,	to Liverpool -	180
,,	,, ,,	to U. K. &/ or Continent -	400
,,	,, ,,	,, Glasgow -	20
Cube Gambier	,, ,,	,, England -	100
White Pepper	,, ,,	,, ,, -	40
Black ,,	,, ,,	,, ,, -	180
White Pepper	,, Penang	,, ,, -	40
Black ,,	,, ,,	,, ,, -	...
Pearl Sago	,, Singapore	,, ,, -	20
Sago Flour	,, ,,	,, London -	120
,, ,,	,, ,,	,, Liverpool -	975
,, ,,	,, ,,	,, Glasgow -	150
Tapioca, Flake	,, Singapore & Penang	to England -	300
,, Pearl & Bullets	,, ,, ,,	,, ,, -	290
,, Flour	,, Penang	,, ,, -	350
Gutta Percha	,, Singapore	,, ,, -	80
Buff hides	from Singapore	,, ,, -	80

				Tons Steamer.
Pineapples	from	Singapore	to England cases	12,500
Copra	,,	,, & Penang	,, ,, -	100
To America:				
Tin	,,	Singapore and Penang	-	150
Gambier	,,	Singapore	- - -	...
Cube Gambier	,,	,,	- - -	...
Black Pepper	,,	,,	- - -	30
,,	,,	Penang	- - -	...
White Pepper	,,	Singapore	- - -	...
,,	,,	Penang	- - -	...
Nutmegs	,,	Singapore and Penang	-	2
Tapioca, Flake and Pearl	,,	,, ,,	- -	70
Pineapples	,,	,, ,,	- cases	100
To the Continent:				
Gambier	from	Singapore	to South Continental Ports	100
,,	,,	,,	,, North ,,	60
Black Pepper	,,	,,	,, South ,,	210
,,	,,	,,	,, North ,,	...
,,	,,	Penang	,, South ,,	10
,,	,,	,,	,, North ,,	...
White Pepper	,,	Singapore	,, South ,,	10
,,	,,	,,	,, North ,,	...
,,	,,	Penang	,, South ,,	...
,,	,,	,,	,, North ,,	10
Copra	,,	Singapore & Penang	to Marseilles	260
,,	,,	,,	,, Odessa	...
,,	,,	,,	,, South Continental Ports other than Marseilles and Odessa.	200
,,	,,	,,	,, North Continental Ports	200
Tin	,,	,,	,, Continent	70
Tapioca Flake	,,	,,	,, ,,	10
Tapioca Pearl	,,	,,	,, ,,	...
Cube Gambier	,,	Singapore	to Continent	20
Pineapples	,,	,,	,, ,, cases	...

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,050 tons Gambier
580 ,, Black Pepper
(*in Singapore*) } contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(*C*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 28th February, 1903.

Wired at 3.15 p. m. on 2nd March, 1903.

			Tons Steamer.
To England.			
Tin	from Singapore & Penang	to England and U. K. optional any ports.	530
Gambier	from Singapore	to London	10
,,	,, ,,	,, Liverpool	...
,,	,, ,,	to U. K. & / or Continent	70
,,	,, ,,	to Glasgow	...
Cube Gambier	,, ,,	,, England	...
White Pepper	,, ,,	,, ,,	20
Black ,,	,, ,,	,, ,,	30
White Pepper	,, Penang	,, ,,	10
Black ,,	,, ,,	,, ,,	20
Pearl Sago	,, Singapore	,, ,,	20
Sago Flour	,, ,,	,, London	170
,, ,,	,, ,,	,, Liverpool	...
,, ,,	,, ,,	,, Glasgow	...
Tapioca, Flake	,, Singapore & Penang	to England	200
,, Pearl & Bullets	,, ,, ,,	,, ,,	70
,, Flour	,, Penang	,, ,,	700
Gutta Percha	,, Singapore	,, ,,	40
Buff hides	,, ,,	,, ,,	20
Pineapples	,, ,,	,, ,, cases	2,000
To America.			
Tin	from Singapore & Penang		1,400
Gambier	,, Singapore		320
Cube gambier	,, ,,		...
Black Pepper	,, ,,		320
,,	,, Penang		...
White Pepper	,, Singapore		10
,,	,, Penang		...
Nutmegs	,, Singapore & Penang		14
Tapioca, Flake & Pearl	,, ,, ,,		250
Pineapples	,, ,,	cases	1,750
To the Continent.			
Gambier	from Singapore	to South Continental Ports	...
,,	,, ,,	,, North ,,	120
Black Pepper	,, ,,	,, South ,,	170
,,	,, ,,	,, North ,,	120
Black Pepper	,, Penang	,, South ,,	40
,,	,, ,,	,, North ,,	...
White Pepper	,, Singapore	,, South ,,	60
,,	,, ,,	,, North ,,	40

			Tons Steamer.
White Pepper	from Penang	to South Continental Ports	10
,,	,, ,,	,, North ,,	...
Copra	,, Singapore & Penang	to Marseilles	600
,,	,, ,,	,, Odessa	1,350
,,	,, ,,	,, South Continental Ports (other than Marseilles and Odessa)	660
,,	,, ,,	,, North Continental Ports	640
Tin	,, ,,	,, Continent	190
Tapioca Flake	,, ,,	,, ,,	250
Tapioca Pearl	,, ,,	,, ,,	280
Cube gambier	,, Singapore	,, ,,	60
Pineapples	,,	,, ,,	cases 750

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,700 tons Gambier
230 ,, Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(*D*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th March, 1903.

Wired at 4.25 p. m. on 16th March, 1903.

To England:—

			Tons Steamer
Tin	from Singapore & Penang	to England and U. K. optional any ports.	725
Gambier	from Singapore	to London	...
,,	,, ,,	,, Liverpool	50
,,	,, ,,	to U. K. & / or Continent	100
,,	,, ,,	to Glasgow	...
Cube Gambier	,, ,,	,, England	60
White Pepper	,, ,,	,, ,,	30
Black ,,	,, ,,	,, ,,	30
White Pepper	,, Penang	,, ,,	...
Black ,,	,, ,,	,, ,,	...
Pearl Sago	,, Singapore	,, ,,	10
Sago Flour	,, ,,	,, London	180
,, ,,	,, ,,	,, Liverpool	1,100
,, ,,	,, ,,	,, Glasgow	...
Tapioca, Flake	,, Singapore & Penang	to England	200
,, Pearl & Bullets	,, ,, ,,	,, ,,	330
,, Flour	,, Penang	,, ,,	300
Gutta Percha	,, Singapore	,, ,,	50

				Sailing	Tons Steamer.
Buff hides	from Singapore	to England	-		200
Pineapples	,, ,,	,, ,,	cases		8,000
To America:—					
Tin	from Singapore & Penang		-		1,950
Gambier	,, Singapore		(sailing)	300	520
Cube gambier	,, ,,		- ,,	50	20
Black Pepper	,, ,,		-	-	180
,,	,, Penang		-	-	10
White Pepper	,, Singapore		-	-	...
,,	,, Penang		-	-	...
Nutmegs	,, Singapore & Penang			-	48
Tapioca, Flake & Pearl	,, ,, ,,		-	-	80
Pineapples	,, ,,		-	cases	350
To the Continent:—					
Gambier	from Singapore	to South Continental Ports			...
,,	,, ,,	,, North ,,		-	...
Black Pepper	,, ,,	,, South ,,		-	70
,,	,, ,,	,, North ,,		-	...
Black Pepper	,, Penang	,, South ,,		-	...
,,	,, ,,	,, North ,,		-	...
White Pepper	,, Singapore	,, South ,,		-	10
,,	,, ,,	,, North ,,		-	20
White Pepper	,, Penang	,, South ,,		-	...
,,	,, ,,	,, North ,,		-	...
Copra	,, Singapore & Penang	to Marseilles		-	600
,,	,, ,,	,, Odessa		-	150
,,	,, ,,	,, South Continental Ports other than Marseilles and Odessa.		-	...
,,	,, ,,	,, North Continental Ports		-	110
Tin	,, ,,	,, Continent		-	...
Tapioca Flake	,, ,,	,, ,,		-	170
Tapioca Pearl	,, ,,	,, ,,		-	10
Cube gambier	,, Singapore	,, ,,		-	10
Pineapples	,, ,,	,, ,,		-	350

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

650 tons Gambier
230 ,, Black Pepper
(in Singapore)
contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E.C.

Singapore.

Abstract of Meteorological Readings for the month of January, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·910	140·3	79·2	85·7	73·5	12·2	77·2	·886	75·8	83	N.E.	17·38	3·75

K. K. Hospital Observatory,
Singapore, 20th February, 1903

A. B. LEICESTER,
Meteorological Observer.

J. LEASK,
Acting Principal Civil Medical Officer, S.S.

Penang.

Abstract of Meteorological Readings for January, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.					Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.				
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%			ins.	ins.
Criminal Prison Observatory	29·903	141·9	81·5	90·1	74·6	15·5	75·9	·789	70·7	68		North	4·89	1·28

Colonial Surgeon's Office,

Penang, 11th February, 1903.

M. E. SCRIVEN,

Asst. Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang

Malacca.

Abstract of Meteorological Readings for January, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
Durian Daun Hospital.	29·845	152·9	79·6	89·8	69·9	19·9	81·3	1·056	63·3	93	N.E.	3·09	1·15

Colonial Surgeon's Office,
Malacca, 14th February, 1903.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for January, 1903.

Districts.	Max-imum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall	Greatest rain-fall during 24 hours.
			Max-imum.	Min-imum.	Range.	Mean wet Bulb.	Vapour Tension.	Humi-dity.		
Taiping ...	155	82·33	92	69·50	22·50	77·62	884	80	13·54	2·80
Kuala Kangsar ...	...	81·41	92	66	26	76·09	826	77	6·12	1·82
Batu Gajah ...	163	81·65	92	69	23	77·28	879	82	8·05	2·93
Gopeng ...	...	81·29	91	64	27	76·74	858	81	5·39	1·12
Ipoh ...	...	81·91	92	70	22	76·77	850	78	5·77	1·30
Kampar ...	...	...	90	70	20	...	...	...	11·03	3·61
Teluk Anson ...	...	81·74	91	70	21	77·63	890	82	5·70	1·43
Tapah ...	..	81·13	92	66	26	76·94	873	83	7·19	1·43
Parit Buntar ..	...	81·54	92	71	21	77·45	888	83	7·63	1·40
Bagan Serai ...	...	81·18	91	70	21	76·98	871	82	6·22	1·60
Selama ...	...	...	...	...	...	...	...	...	...	...

STATE SURGEON'S OFFICE,
Taiping, 10th February, 1903.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for January, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·887	150·8	81·2	89·6	71.6	18·0	76·9	0·843	74·1	75	Calm	4·41	1.43
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	6·22	1·33
District Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	4·99	1·80
,, Klang	...	...	...	85·3	74·9	10·4	...	...	...	...	...	10·61	1·56
,, Kuala Langat	...	...	...	84·9	72·7	12·2	...	...	...	...	...	13·58	2·80
,, Kajang	...	...	...	86·3	76·2	10·1	...	...	...	...	...	4·03	1·58
,, Kuala Selangor	...	...	...	86·5	76·8	9.7	...	...	...	...	...	11·91	4·35
,, Kuala Kubu	...	...	...	90·7	72·9	17·8	...	...	...	...	...	4.66	1·17
,, Serendah	...	...	...	88·6	75·9	12·7	...	...	...	...	...	5·33	1.25
,, Rawang	...	...	...	86·2	76·9	9·3	...	...	...	...	...	9·21	2·10
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	6·72	1·85

State Surgeon's Office,
Kuala Lumpur, 13th February, 1903.

E. A. O. TRAVERS,
State Surgeon, Selangor

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for January, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfa'l.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan ...	...	...	...	85·	72·	8·9	...	...	...	...	...	14·80	4·71
Kuala Lipis, ...		...	83·0	96·0	72·0	24·0	...	...	...	...	...	10·66	4·59
Raub, ...	...	...	78·2	92·0	68·0	13·6	...	...	...	...	...	8·86	1·58
Bentong ...	...	...	81·0	90·0	72·0	14·7	...	...	...	...	...	18·17	2·06
Kuantan, ...	...	...	...	83·	72·	11·	...	...	...	...	...	11·64	1·30
Temerloh ...	...	...	...	90·	71·	19·	...	...	...	...	...	10·06	1·26

Pekan, 2nd February, 1903.

A. ANNESLEY WOODS,
District Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for January, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	81·0	90·2	71·4	18·8	76·	...	...	...	N. E.	4·45	0·89

Muar, 1st February, 1903.

FRANCIS PEARS.

Singapore.

Abstract of Meteorological Readings for the month of February, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory, Singapore ...	29·947	138·7	79·0	86·1	73·9	12·2	76·3	·847	74·4	81	N.E.	9·46	2·18

K. K. Hospital Observatory,
Singapore, 18th March, 1903.

A. B. LEICESTER,
Meteorological Observer.

W. GILMORE ELLIS,
Acting Principal Civil Medical Officer, S.S.

Penang.

Abstract of Meteorological Readings for February, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·930	146·8	81·3	91·1	74·8	16·3	75·6	.782	71·19	68	North	3·56	1·56

Colonial Surgeon's Office,
Penang, 6th March, 1903.

M. E. SCRIVEN,
Asst. Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for February, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
Durian Daun Hospital.	29·835	150·3	79·3	89·3	69·8	19·5	81·0	1·046	62·1	93	N.E.	3·36	60·

Colonial Surgeon's Office,
Malacca, 13th March, 1903.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for February, 1903.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Humidity.	Total Rainfall	Greatest rainfall during 24 hours.
Taiping ...	156	82·58	93	68	25	76·93	·850	76	11·80	3·73
Kuala Kangsar ...	...	81·48	93	67	26	75·14	·787	74	3·75	1·23
Batu Gajah ...	164	81·60	93	69	24	76·72	·853	80	7·15	2·36
Gopeng ...	...	80·92	92	64	28	76·27	·845	79	4·65	2·13
Ipoh ...	...	81·59	93	68	25	75·98	·823	78	2·94	0·81
Kampar ...	...	...	90	70	20	...	...	...	8·28	2·13
Teluk Anson ...	...	81·78	91	70	21	76·85	·862	79	7·99	1·82
Tapah ...	..	81·12	93	65	28	76·00	·830	78	6·42	1·48
Parit Buntar ...	...	82·29	93	69	24	76·78	·850	77	2·88	1·29
Bagan Serai ...	...	81·67	91	68	23	76·89	·859	80	3·03	0·84
Selama ...	...	81.72	91	70	21	76·87	·856	80	6·95	2·04

State Surgeon's Office,
Taiping, 11th March, 1903.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

. bstract of Meteorological Readings in the various Districts of the State, for February, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·893	150·7	81·3	90·5	70·6	19·9	76·3	0·816	73·0	74	S.E	3·06	1.72
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	5·44	1·06
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	3·68	2·10
,, Klang	...	...	...	86·2	75·1	11·1	...	...	...	...	...	3·84	1·00
,, Kuala Langat	...	...	...	85·0	72 6	12 4	...	...	...	...	...	4·58	1·19
,, Kajang	...	...	...	86·9	75·4	11·5	...	...	...	...	...	1·69	0·48
,, Kuala Selangor	...	...	...	87·5	77·2	10·3	...	...	...	...	...	3·24	1·57
,, Kuala Kubu	...	...	...	91 8	72·1	19·7	...	...	...	...	...	3.02	0·70
,, Serendah	...	...	...	89·2	76 0	13·2	...	...	...	...	...	4·16	2.01
,, Rawang	...	...	...	86·4	76·4	10·0	...	...	...	...	...	7·43	1·72
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	4·80	2·04

State Surgeon's Office,
Kuala Lumpur, 20th March, 1903.

E. A. O. TRAVERS,
State Surgeon, Selangor

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for February, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kuala Lipis, ...		...	82·0	95·0	69·0	26·0	...	...	...	...	...	3·62	1·24
Raub, ...	...	...	78·14	89·0	70·0	13·96	...	...	...	...	...	3·26	·75
Bentong ...	...	...	79·0	88·0	70·0	18·0	...	...	...	...	...	6·38	1·05
Kuantan, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Temerloh ...	...	...	...	90·	71·	19·	...	...	...	...	...	4·36	1·14

A. ANNESLEY WOODS,
District Surgeon, Pahang.

Pekan, 13th March, 1903.

Muar.

Abstract of Meteorological Readings for February, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	81·0	90·0	71·0	19.0	74·0	...	...	...	N. E.	4·59	1·23

Muar, 1st March, 1903.

FRANCIS PEARS.

No. 3.] MARCH, 1903. [VOL. II.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M.A., F.L.S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

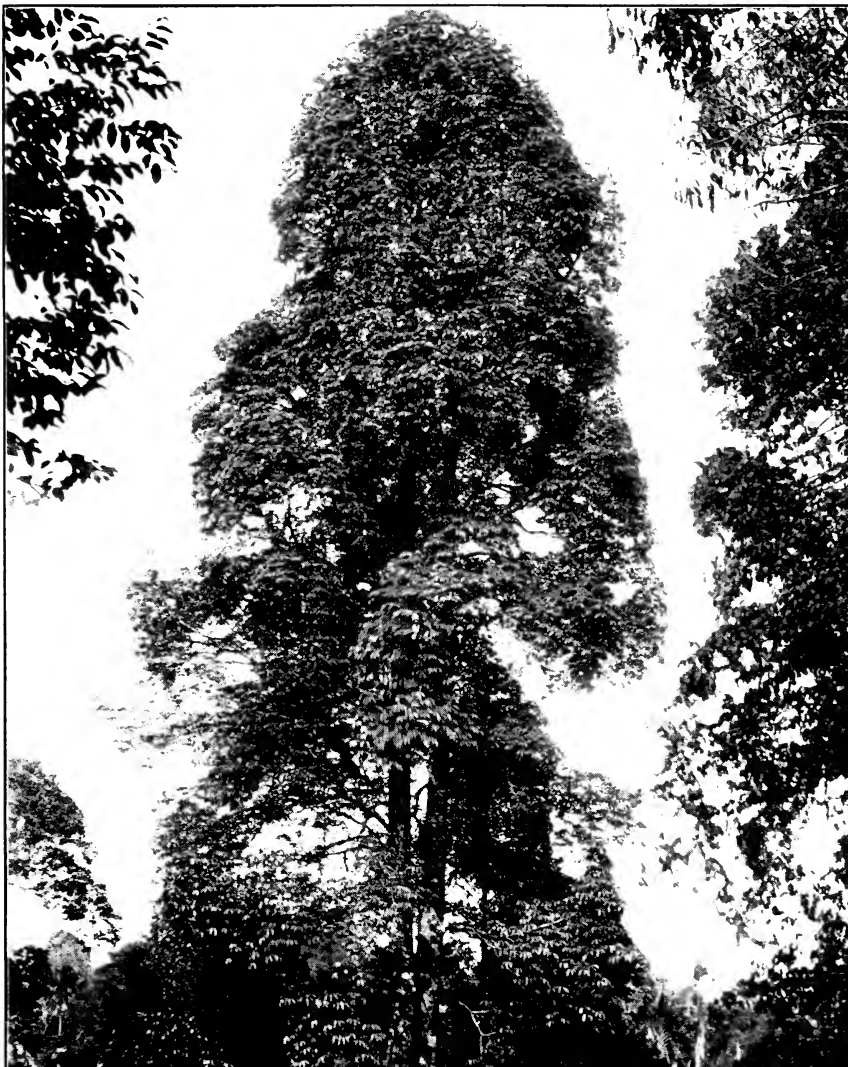
His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua- "tion regarding new or little known natural or manufactured pro- "ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F. L. S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.



Getah Jelutong (Dyera Costulata Hook).

Photo by A. D. M.

Flower and Fruit of Dyera Costulata. Hook. fil.

AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
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No. 3.] MARCH, 1903. [VOL. II.

JELUTONG (Dyera Costulata).

PLATES III & IV.

The Jelutong tree *Dyera Costulata* is one of the biggest tree of the Malay Peninsula, attaining a height of over two hundred feet. It belongs to the order *Apocynaceæ* and is allied to *Alstonia*. The stem is covered with grey bark, and is straight and cylindric, remarkable for having no buttresses, a very unusual circumstance in a tree attaining so great a size. Unlike most of our gigantic trees also, it retains its lower branches for a long time so that the form of the tree is more or less cone-shaped. The leaves are whorled at the ends of the branches, rather leathery dark dull green above and glaucous beneath, oblong blunt or occasionally subacute at the top, with a broad base, the edges waved, nerves very prominent beneath about 15 pairs, length 6 to 8 inches long, 2 to 3½ inches wide, petiole bright green thick 2 inches long. The flowers are produced once a year in March or earlier in lax corymbs, about 5 inches long, in the axils of the leaves: They are whorled or tufted at the ends of the pedicels, white, ¼ inch long. The calyx tubular short. The corolla tube is short much shorter than the five oblong obtuse lobes which have the characteristic twist of the Apocynaceæ. The stamens are five in number bright brown, anthers conic blunt on a very short thick filament. Pistil conic. The fruit is a very large pair of deflexed woody pods 10 to 14 inches long sub-cylindric at first but slightly narrowed to both ends, brown. They split longitudinally for their whole length, on the outer edge showing a broad inner flange on each margin. The seeds are very thin and flat nearly an inch long, furnished at each end with a thin papery wing, making the whole oblong in outline, and 2½ inches long and ¾ inch wide.

Before flowering the Jelutong sheds its leaves and becomes nearly bare for a day or so after which the buds appear and it is soon covered with leaves again.

Three species of *Dyera* have been described, *D. laxiflora*, Hook., fil. and *D. Costulata*, Hook., fil. both from the Malay Peninsula, but I do not think that these two species are distinct and *Dyera Lowii* from Borneo. This latter is distinguished by its leaves being obovate and narrowed into the petiole. No more description of it has been published (Hooker, fil. Journ. Linn Soc. XIX, 293). In Dr. HAVILAND'S Collections of Sarawak Plants there are specimens (No. 2170) of a Dyera which are probably of this species, of which the leaves are of the shape described, but are still more distinct in having twice as many nerves. He labels it Jelutong, and found it flowering in December. It is from *Dyera Lowii* that the Jelutong rubber is obtained. *Dyera Costulata* is found in the whole of the Malay Peninsula growing in the low lying forests, from Singapore to Penang, where two very large trees were formerly used as land marks by vessels at sea. It occurs also in Sumatra.

Uses.—The Jelutong tree produces both timber and a kind of caoutchouc. The timber is soft and white, and was formerly used for models and Chinese clogs only, being easy to cut but it is not at all durable. Of late years it has been used for planking and boxes, for want of any cheap wood as suitable (see Bulletin.)

Its most important product however, is its latex, formerly chiefly used to adulterate the white gutta perchas (Getah Sundek) from *Payena Leerii.* But for some years the Jelutong Gutta has been imported from Borneo chiefly into Singapore and exported mainly to America. For some inexplicable reason, the trade name was altered a few years ago, and the stuff was called "Pontianak" in England, which naturally caused some confusion between Gutta Pontianak *i.e.* Jelutong, and Pontianak Gutta percha, *i.e.,* Gutta percha from Pontianak.

The latex of Jelutong is very abundant and liquid, pouring out at a cut. It is neither acid nor alkaline, being quite neutral, speedily coagulating on exposure to air, it has not the least elasticity, but becomes a hard brittle white mass, which on being plunged in hot water it becomes quite plastic like putty and can be moulded into any shape. Owing to this property, it was at one time used for forming mouldings for picture frames and such like work in place of plaster of Paris. It is also used for mixing with viscose (an alkaline cellulose treated with carbon bisulphide) in the manufacture of compound rubber, and is said to be superior to Euphorbia gum and potato rubber as a cheap binding ingredient in certain rubber mixings (*India Rubber World*). Its chief use appears to be, however, for making a waterproofing mixture used in the walls, floors and roofs of houses, and this use which is of comparatively recent date, appears to be the cause of the very large demand for it of recent years. It is used also in making all sorts of cheap rubber goods especially rubber shoes, when mixed with other materials.

The method of obtaining the Jelutong is described by Mr. SHELFORD of the Sarawak Museum, as follows:—The bark of the tree is nicked in several places and the gutta exudes from the scars. It is scraped off and put into a receptacle, if not thick enough a white powder (probably sago flour) is added to it to thicken it: Mr. VOGLER, of Huttenbach Brothers, who has given me much information on this subject states that it comes into the

Singapore market in balls of 40 to 50 catties weight, mixed with petroleum and water, and shipped loose in bags or packed in cases ready for shipment. It is not treated in any way in Singapore but simply repacked where necessary and reshipped. It is often adulterated with sago flour, clay, earth, wood and stones.

All that is imported is exported again except a little used by the Chinese for adulterating Gutta percha. The greater part comes from Borneo, *viz.* Pontianak, Sambas and Sarawak and is exported to Great Britain, America and the Continent of Europe.

The price fluctuates a good deal, in 1895, the price was $1.60 per picul, and it gradually rose in value to $8 a picul, but is constantly fluctuating between $6 and $8. At present it is $7 a picul.

Exports from Singapore in piculs.

		To Great Britain.	U. S. America.	Europe.
1899	...	2,527	74,987	4,139
1900	...	21,935	58,169	5,836
1901	...	6,394	104,893	12,867
1902	...	3,500	140,000	11,600

I am indebted to Mr. VOGLER, of Huttenbach Brothers & Co. for the above details of Import and Export, and to Mr. SHELFORD for notes on the plant of Borneo.

H. N. RIDLEY.

THE BUSINESS OF GATHERING RUBBER.

Of all natural products which have become widely recognized as necessities among civilized peoples, India-rubber stands alone in that, with all the aids of modern industrial, commerical, and financial development, the means of securing this commodity have undergone little improvement, and the cost of securing it becomes greater rather than less other tropical products, with places of origin equally remote from the world's markets. have been rendered vastly more accessible of greatly reduced in price to consumers. While new rubber districts continue to be opened, in order to meet the constantly growing demand for the raw material, crude rubber now, as in the beginning, continues to be produced on a small scale, by unintelligent labourers employing primitive methods and between the forests and such markets as Manaos and Para or Antwerp a single lot may change hands half a dozen times before it comes within the control of the traders who supply the manufacturers.

There is little rubber in use to-day which does not cost the manufacturer, at least, $1,000 per ton, and within recent years large quantities of the better grades have gone into consumption at a cost at the factory of more than $2,000 per ton. Naturally it has occurred to capitalists aware of these facts, that through operating on a large scale and by the introduction of economies under intelligent supervision, rubber might be produced at a cost so far below the prevailing prices for this material as to afford handsome returns on the capital invested. From time to time, The India Rubber World has chronicled the organization of a number of companies, having for their object the application of modern business methods to rubber gathering in the Amazon valley, but in every case has also been chronicled their lack of success if not total failure.

In this connection a contribution to our columns this month by Mr. ASHMORE RUSSAN, an English gentleman who has had some interest in most of these companies, is of particular interest. Mr. RUSSAN having invested his money, naturally has taken pains to inquire why he has not received any dividends. It is especially interesting to learn that he believes the rubber properties purchased by these companies to have been substantially what they were represented to be, and besides that they are still capable of yielding large quantities of rubber. As for the failure to make any profits, Mr. RUSSAN points to mismanagement as the cause only in part, and mismanagement can be remedied. But the principle obstacle seems to be certain conditions existing in the vast and sparsely settled and loosely governed districts in which the rubber trees grow, which, for the time at least are most unfavourable to foreigners investing their money there. A recent example of this unfriendly feeling toward foreign enterprise has been the attitude of one Brazilian state toward the Acre concession project, the success of which, at least for the present, must depend upon the privilege of navigating the Brazilian watercourses which connect the Amazon with the Acre district in Bolivia. It would be surprising, however, if this latter condition should act as a permanent bar to the investment of foreign capital in the collection of a commodity so much needed as India-rubber and the consumption of which is wholly outside of the countries of production.

But South America is not the only field in which rubber working under foreign supervision has proved less profitable than was promised by the promoters of companies organized for this purpose. On another page of this issue appears the annual report of a Belgian company formed to exploit rubber in the Congo Free State, by which it appears that last year the company, although actually collecting and selling 101 tons of rubber, closed the year with a loss. The same company, however, during two years preceding had earned a satisfactory profit, which would show that the case is not altogether hopeless. As for the large profits reported by some other Belgian companies on the Congo, it must be remembered that the state is largely interested in these companies, and that every official and every soldier in the rubber districts is required to do his utmost to induce the natives to gather rubber, from which results the stories of atrocities practised on the natives that come constantly from Africa.

That much remains to be learned of the proper treatment of rubber is suggested by still another article in this paper, by Mr. VAN DEN KERCKHOVE, of Antwerp, who insists that much of the rubber produced on the Congo finds a market at a price much lower than its original quality would warrant, on account of improper handling. After rubber has once been gathered it ought not to be difficult for its owners to enforce proper regulations for its care, and here again appears a ray of hope for the rubber collecting companies. With all the discouraging conditions, however, the collection of rubber continues to increase, and attention is directed to some figures we give elsewhere, showing a growth in the rubber exports from Bolivia of about eleven fold in eleven years. The total for 1901 was nearly 8,000,000 pounds, mostly of high grades, and this from a country scarcely known twenty years ago to contain rubber, and yet the most inconveniently situated country on the globe with regard to transportation.

An item of news published this month that will attract much attention relates to the negotiations of the United States Rubber Co. who consume more rubber than any other company in the world for obtaining supplies of rubber direct from the producing countries, instead of buying through importing houses. This would involve the investment of part of their capital outside of the manufacturing field, and as it is the first time that a manufacturing company has made such a venture, and in view of the large scope of the plans under consideration, the experiment will be watched with great interest.

It will be seen from the foregoing that there are many problmse connected with rubber yet to be solved, outside of those which daily confront the factory superintendent, the rubber chemist, and the inventor in the rubber field. These problems have an ultimate bearing upon every user of rubber in the world, and it is impossible that the sources of rubber should always remain less accessible to the people who require it than the sources of any other commodity in general demand. While the conditions do not appear propitious for the investment of large sums in tropical America and Africa, in charge, perhaps, of managers who have had no experience to fit them for such business, it does appear to us that a field offers for intelligent young men to make a study of rubber districts, of the present methods of work, of the possibilities of improvement, of the character of the natives and of the best means of dealing with them, with a view to becoming qualified to manage large rubber concessions. With qualified men available, there will always be a possibility of securing capital for working rubber, and, at the prices which promise to prevail for a long time to come, we still feel that good profits are possible from the more direct transition of rubber from the forest to the consumer.

WORKING RUBBER ESTATES ON THE AMAZON.

By Ashmore Russan, "London"

I have read with great interest the account of the interview with Mr. N. H. Witt, of Manaos, on the subject expressed in my heading, which appeared in the July number of The India Rubber World, and I may say at once that I agree generally with his views that the time has not yet arrived if it ever will when foreign companies will be able to compete with native producers, and successfully work Rubber properties in the great valley of the Amazon and its myriad feeders. Mr. WITT says that he has seen not a few failures; the present writer, unfortunately, has been a shareholder in several of the companies correctly alluded to as "failures" by Mr. WITT.

With regard to the Comptoir Colonial Français, referred to by that gentleman as having lost about $2,000,000 in little more than a year's trading in rubber on the Amazon, I do not think the whole of that loss was incurred in Brazil. The Comptoir Colonial Français owned estates on the Congo in Central Africa in French territory, and, I believe, also in the Congo Free State. Doubtless some of the $2,000,000 was lost in Africa, but assuming that the company only lost half the amount ($1,000,000) on the Amazon during about a year's trading, that result is bad enough, and discouraging enough, in all conscience.

I am more or less familar with the history of, I think, the whole list of foreign rubber companies which have attempted to work rubber in Brazil and Bolivia, and I have before me at this moment copies of many of the documents which were placed bofore the Comptoir Colonial Français by the owners of the estates, in working which that company has come to grief. The vendors of the properties to the French company were Messrs. F. M. MARQUES & Co. of Para and the estates are situated on the river Javary, an affluent of the river Amazon, and on another smaller tributary in the same district.

According to the papers before me, the properties on the Javary and its affluents numbered twenty-seven, with 2,500 estradas opened out and 250,000 trees (more or less) ready for tapping, the approximate area of the whole being given as 768,116,600 square meters, or about 300 square miles This is believed to be one of the finest estates. in the Amazon region. According to the documents, it comprised everything necessary in the shape of houses, stores, sheds (barracoes), etc., for the collectors. There were three steam launches two of 40 tons and one of 10 tons: two iron lighters, and nine boats and canoes. All these adjuncts were apparently taken over by the French company. The amount of rubber produced from these estates is known to have been very large. I have before me the production for each year from 1891-92 to 1897-98. During the worst year (1891-92), the estates produced 215,927 kilos, and during the best year (1892-93), 348,920 kilos, the total for the seven years being 2,053,492 kilos, or 2,053 metric tons, an average of about 293 metric tons per annum, of the annual value, taken at the low average figure of £300 per ton, of £87,900, or, say, about $439,000. I know of no reason why these figures should not be taken as correct.

I am able to give a few extracts from a statement signed by F. M. MARQUES & Co., describing how they became possessed of the properties, giving the reasons for selling, and estimating the profits. These extracts, read in the light of the results, will, I think, assist the reader to form his own opinion as to the desirability of attempting to work such properties by means of companies whose headquarters are established in foreign countries. The extracts are as follows:—

Our trade on the Javary river dates as far back as 1888, when we began to work it up, not possessing at that time any properties or land of any kind. By degress we bought with ready cash or by transfer contracts (mortgages) the India-rubber plantations which we now possess, but having insufficient capital to develop them thoroughly, we decided to transfer the same to some concern or person possessed of sufficient means to do so, and we feel sure that a return of 50 per cent. on the capital employed will be obtained, and even much more if the estates are properly worked. With the exception of one trader we have the monopoly of the Javary and Curuca (a tributary) trade; so that if the trader to whom we have alluded were bought up, a matter of no difficulty, the entire control of those rivers would be obtained. To conclude we beg to state that our properties are of enormous extent, and are connected, a great advantage not easy to be met with, and we feel confident that if properly worked the revenue will be trebled in say three years.

The net profits are given in this statement as 19·73 per cent. on the turnover, in addition to which there is 10 per cent. commission on the gross value of the goods supplied for the keeping of the working staff. The documents is very voluminous and I forbear from quoting any more, but it is at the Editor's disposal at any time. It represents the position on October 19th, 1898, as stated by the owners.

The Comptoir Colonial Français was formed, I believe, in 1899, and got to work early in 1900. It is now, as Mr. WITT has pointed out, in bankruptcy. I will give my views as to the reason for this unfortunate result further on.

But the Comptoir Colonial Français was not the first company formed to work rubber estates in South America. The earliest of which I have any knowledge was the Orton (Bolivia) Rubber Co., Limited, floated a year or two before the Comptoir Colonial Français. The properties lately belonging to the Orton Company are situated on the river Orton, which is in the Acre territory, near Sir MARTIN CONWAY'S concession, and only a few miles from the headquarters of the river Acre. The estates were the property of Dr. VACA DIEZ and a partner. DIEZ came to Europe, interested some French financiers, and a company was formed under the company laws of Great Britain. A considerable amount of working capital was provided, and VACA DIEZ, having enlisted the services of a number of Basques (*Natives of the Biscay provinces of Spain and the neighboring French provinces*) and others, returned to the Amazon, chartered a large steamboat at Para, and started for his estates. I have conversed with more than one member of that unfortunate expedition. Somewhere about 200 Europeans would-be rubber collectors left Para for the estates; I have been told that only six reached it. VACA DIEZ and the principal leaders were drowned in attempting to reach the property in a small launch by the Rio Madeira route. The only survivor was my informant. The large steamboat carrying the Basques, etc., never got to the Rio Orton at all, nor even, I believe, so far as the river Acre. The Orton (Bolivia) company was wound up a few weeks ago; the properties were, I understand, taken back by Dr. VACA DIEZ'S widow.

The next company formed in England was the Amazonas Rubber Estates Limited, which was floated towards the end of 1897 or early in 1898, with a capital of £300,000, to work estates situated on the river Teffe, a tributary of the Amazon above the river Purus. This company has lost the whole of its working capital; it has never succeeded in getting a ton of rubber from its estates. Rubber cutters were taken there and buildings and stores erected, a steamboat purchased and shipped out, etc., but the actual collecting was never commenced. The company is still in existence, and I believe, all hope is not yet abandoned.

Very soon after the formation of the Amazonas Rubber Estates, Ltd. that is, early in 1898, the Rubber Estates of Para, Limited, was formed with a capital of £350,000 to work estates with an area of over 284 square miles, situated in the "Island," district of Anajas, state of Para. These estates were acquired from the Visconde de Sao Domingos, who have been working them for many years. The number of full grown trees was estimated at 1,300,000, which number has scarcely been questioned. In the three years before they were taken over by the English company, the estates were declared to have produced 751 tons, an average of 250 tons per annum, of the annual gross value in Europe or the United States of over £90,000. I have no reason to doubt that these estates actually did produce the quantity of rubber given above, but the largest quantity which the English company ever succeeded in obtaining was 60 tons, during last season. After about £35,000 of the working capital had been lost during the two years following the formation of the company, the writer was asked to become a director and accepted. The working capital being lost, it was necessary to reconstruct the company, which was done on the basis of a capital of £37,500, the new company (The Brazilian Rubber Trust, Limited) taking over the properties and paying all liabilities of the old company. Since then nothing that experience, heavily paid for in the past, could suggest, has been left undone. Every possible economy that could be thought of was urged upon the company's employés in Brazil, but the Brazilian Rubber Trust found itself unable to work the estate profitably, money still continued to be lost, though on a much smaller scale than in the past, and a few months ago the company decided not to remit any more money to Brazil, but to lease the estates to a Brazilian firm. This has been done, to the relief of every director of the company.

The history of the Belgian company, La Bresilienne, which purchased estates very near those belonging to the Rubber Estates of Para, is similar to that of the other companies. It has come to grief more or less complete. I believe that all the before mentioned companies (and, I may add, all the companies that have been formed in Europe to work rubber estates in Brazil) have lost their working capital, and have either ceased to exist, or are in considerable difficulty. The company that really showed the best results was the Rubber Estates of Para, which, as I have said, lost about £35,000 in the first two years of its existence and even when reconstructed, never succeeded in making a profit.

Mr. WITT has set out the reasons pretty clearly. The directors and managers have very little knowledge of the conditions surrounding the trade, but in one case, had the company.—The Rubber Estates of Para, Limited,—followed the advice of its first estates manager, it might have been successful, or at least, it would not have lost so heavily. This gentleman, however, had had eight years' experience of Brazil.

Most of the men who go out know nothing about the business. They do not know the language well, and have few facilities for learning anything of value. Indeed, it is not in the interest of the Brazilians to teach them anything, but, on the contrary, to pluck them and the companies they represent of every feather.

As Mr. WITT has pointed out, the collectors have to be imported. They mostly come from the state of Ceara, and the importation expenses are very heavy. Provisions have also to be imported, and instances have come before me of perishable food stuffs consigned to an English company, being detained three months in the custom house at Para. When cleared the goods were useless. This was of common occurrence some two years ago, but the customs' service has been improved since. The taxation is tremendously heavy; whether a profit is made or not, a company will be taxed anything from £600 upwards a year, that is, if its office is in a foreign country. If a company tries to grow its own foodstuffs, it will find it impossible to get labour. The natives will not work at agriculture of any kind. I am not aware that there is a farm, or anything approaching one, within a thousand miles of Para. The men will only collect rubber, and unless the planter could pay them as much for agricultural labor as they can earn in rubber cutting, there is no possibility of getting them to work at the former. Mr. WITT has very ably pointed this out. He suggests the importation of coolies from India, but the British government would never permit it. He also refers to Chinese, a question which I have studied, as my company commissioned an agent at Singapore to make enquiries with regard to obtaining Chinese labourers from the Straits Settlements. They cannot be got from China, as was pointed out by Sir HALLIDAY MACARTNEY, of the Chinese Embassy in London to the writer, for the reason that China has no diplomatic or Consular representative in Brazil, and no Chinese subjects would be allowed to go. The Chinese in the Straits Settlements are mostly British subjects. They also would not be allowed to leave if the British government knew where they were going, and the only way to get them is to ship them unknown to the British government, and run the risk of being found out and losing the men. The importation of Chinese labourers also would have to be renewed again and again, for they would be certain, as Mr. WITT says, to turn traders, or start collecting rubber on their own account. Yet I believe it is absolutely necessary, if a foreign company is to be successful, that it should import labour from outside, for, in my opinion, it is impossible for such a company to succeed with Brazilian labour only.

The reason is really a very simple one. When a man or a company buys an agricultural estate or other landed property in a foreign country, such as Spain or France, or even Mexico, the produce of that estate belongs to, and is the property of the owner, be he a private person or a company. In the rubber regions of Brazil the produce does not belong to the owner of the estate. It belongs to the collector, the rubber cutter who sells it to the owner for cash or goods at a price a little below the market price at the nearest centre, whether Para or Manaos. If a rubber cutter goes to a store on the estate and does not find in that store what goods he requires, he is pretty sure to sell his rubber to outsiders, and he cannot easily be prevented from doing so. If he owes money to the company, and the company tries to wipe off the debt by reducing the cash or quantity of goods given in exchange for the rubber delivered, the collector, if he can, will certainly sell his rubber elsewhere, where he will get the full "river" value for it without deductions. In the writer's experience, goods advanced on credit to the collectors beyond a certain small amount by a foreign company are never or very rarely paid for, the advances might almost as well be written off as soon as made. The Brazilian Rubber Trust, which took over the properties of the Rubber Estates of Para, inaugurated a "no credit" system which was fairly successful, the liabilities of the cutters and tenants when the company decided to lease the estates being only about £500, whereas previously, under the old system, they had amounted to near £6,000 or £8,000 at the end of each season. But the company found it impossible to do away altogether with the credit system, as it could not get sufficient men. I believe that the properties now owned by the Brazilian Rubber Trust have, since they were worked by an English company, produced on an average nearly as much rubber as the Visconde de Sao Domingos, the Brazlian owner, obtained from them, that is, about 250 tons per annum. But the English proprietors have never got more than 60 tons, and the average is only about 50 tons. What has become of the balance, the 200 tons? There is little doubt that something like that amount of rubber each year was sold to the rubber pirates. Consequently, the Brazilian Rubber Trust, though directed with some knowledge has, like all the other foreign companies, failed to succeed.

What is the remedy? I am afraid there is none so far as the foreign company is concerned, except foreign labour. The Brazilian owner will, after due warning, promptly shoot the first rubber stealer or river pirate he comes across. He may not do the shooting himself, but the thief will be shot all the same, and nothing will happen. If the representative of a foreign company were to follow this example, that gentleman, and perhaps some of his staff, would be pretty certain to spend a few years in prison, even if worse did not befall them. They are strangers in a strange land, and all their neighbours (natives) who are engaged in exploiting rubber, are their rivals and therefore their enemies.

I have very little doubt that the Brazilian firm, to whom the Brazilian Rubber Trust have leased their estates, will earn very considerable firofits every year, and will pay their rent promptly in advance, as they did the first year.

The experienced Brazilian seringueiro knows how to work these estates to advantage. He knows how to checkmate the "river" thief; how to prevent his rubber cutters from selling elsewhere. If necessary to his own existence and success, he can, and will, remove the offender from the face of the earth. The foreigner lacks the experience, and even if he has lost all respect for the sixth commandment, he dares not break it in Brazil.

There is little more to be said. Good foreign labourers, Chinamen, or Japanese, who will work for a wage at anything they are set to do, seem to me essential to the success of the foreign company working rubber properties in Brazil. I may add here that Barbadian niggers and their like are useless. Needless to say, the foregoing observations do not apply to the exploitation of rubber estates in Africa, Mexico, Peru, parts of Bolivia, Venezuela, Colombia, or any other rubber producing country where fairly efficient labour can be obtained for a comparatively small wage.

The India Rubber World—October 1st, 1902.

CULTIVATION OF CASTILLOA ELASTICA IN JAVA.

Dr. SPIRE contributes to a French Journal devoted to tropical planting (L'Agriculture pratique des pays chauds, Paris, 1-6, May-June, 1902, pp. 689-698), a comprehensive report on the planting of Mexican rubber (Castilloa elastica) in the Dutch East Indies, based on personal observations made in the summer of 1901, from it appears that considerable interest in this species exists in that region. He mentions, by way of introduction, former reports on the same subject by Dr. P. VAN ROMBURGH, of the Botanical Garden at Buitenzorg, Java, who has been much interested in watching the development of the Castilloa in that colony, and to which credit is given for some of the details presented here. Dr. SPIRE is unable, however, after a study of Th. F. KOSCHNY'S monograph on the Castilloas, to determine which species has been planted in Java.

An interesting fact is that all the Castilloa plantations in Java have resulted from two trees planted as seedlings in 1883 by a Mr. HOFLAND, a coffee planter near Buitenzorg. These began to fruit in 1886 and in December of that year 136 plants from seeds yielded by them were placed in the Botanic Garden at Tjikeumeuh, in an open field, about 10½ feet apart, in two lines forming the letter V. In the third year twelve of these seedlings bore fruit, and in the fourth year the more thrifty of them were 55½ feet high, and had a girth of 41 inches. In 1901 there were 131 of these trees standing, measuring from 50 to 65 feet high, and 31 to 53 inches in circumference, breast high. Their crowns form sufficient shade to prevent the growth of weeds, though the ground is spaded up every year. A second planting was made in the garden in March, 1888, when 56 seedlings were set out $17\frac{1}{2}$ feet apart. A marked difference in the size of these trees is now apparent, those standing near a lane being much larger and more thrifty than those further from the open space, though Dr. SPIRE fails to mention the character of the growth, if any, in contact with the smaller trees. These trees range from $32\frac{1}{2}$ to 40 feet in height. The same conditions apply to a third planting made in 1889.

In May, 1901, Dr. VAN ROMBURGH caused some of the above Castilloa trees to be tapped, for the benefit of Dr. SPIRE. The Malays use for this purpose an implement similar to a butcher's cleaver, with which gashes, 5 to 8 centimeters = 2 to $3\frac{1}{4}$ inches long, and about 5 millimeters = $\frac{1}{5}$ inch deep, are cut in the bark, obliquely, on opposite sides, and converging to a common line, from which the latex may be gathered. The cutting extends up the trunk as high as 3 to 4 meters. Two of the trees had been bled before, and the resulting scars were so thick that they interfered with the fresh tapping, but at least, 150 gashes were cut in those two trees that day. The sap flowed freely into a tin pail supported by a hook beneath the lowest cut, and to provide against any loss, large banana leaves were placed at the base of the trunk to catch any sap that might go astray. The latex was at times very white and again of a brownish cast, while some incisions brought out only a blackish humor which exuded very slowly. The flow did not appear to depend upon which side the tree was cut.

The pails of latex, together with what was collected on the banana leaves, were taken to the laboratory and kneaded in water, next passed over a fine copper sieve, and then put away to settle. In time the rubber floated, the remaining watery material being drawn off from the bottom from day to day. At the end of the eight day the cake of rubber was removed and placed under a press to remove any remaining water. Returning to the field on the day following the tapping, the man in charge collected from the wounds on the trunks any shreds of rubber that had resulted from the spontaneous coagulation of latex, which, when cleaned, were as valuable as that prepared mechanically.

In general practice the collection of latex is performed wholly by Malays, an overseer assigning to each worker a certain number of trees which he must visit each day. At least $\frac{3}{4}$ catty = about 1 lb. of Caoutchouc must be delivered daily, for which the worker is paid 10 c. gold, without regard to the hours of labour. The men are watched closely to prevent the reckless tapping of the tree and their ultimate destruction. When brought to the factory the latex is cleansed by women in running water, then exposed to the air, but in the shade, for three or four days to dry, and finally sacked for shipment. The cost of collecting, cleansing, drying and sacking, amounts to about 3 florins a picul = \$1.21 for 132 lbs.

A Castilloa tree eight years old should yield an average of 175 grams$=\frac{39}{100}$ lbs. of rubber. In 1900, 2,849 castilloas yielded 7 plculs=924 lbs. which sold for 2,100 florins=$844.20. A neat little income is derived from the sale of seeds, the usual price being 6 francs per kilogram (3,000 or 4,000 seeds). They are packed in layers of charcoal dust and will keep for twenty days. Many seeds are shipped from Loebang, particularly to Sumatra, where the culture of Castilloa elastica has been begun on large scale, as at Tebbing Tenggi, Deli, near the north-western extremity of the Island.

To return to the details of the tapping done under Dr. VAN ROMBURGH'S supervision, the weight of latex obtained from six of the trees tapped on two days was as follows:—

		1st day.	2nd day.	Total.
First two trees	... grams	28	130	158
Second two trees ...	,,	220	290	510
Third two trees ...	,,	125	205	330
	Total	373	625	998

The result in dry Caoutchouc was 340 grams for the first day's tapping and 600 grams for the second, or a total of 940, equal to slightly over 2 pounds, of a quality then valued at 5 florins per kilogram (91 c. a pound). The two trees indicated in the table as giving the largest yield were planted in 1884, and are not elsewhere mentioned in Dr. SPIRE'S article.

Dr. SPIRE learned from Dr. VAN ROMBURGH that in 1886 there were planted at the Botanic Station at Tjidjerock 60 castilloa seedlings, supplied by Mr. HOFLAND, already mentioned. Half were planted in moist and swampy land, and the remainder in a high and dry location. The former did not thrive, and were transplanted. In 1891 they all fruited and 20,000 seeds were gathered. The details of planting are not given, but in 1893 there were 10,000 trees standing as the result. Later plantings were made from seeds from the same source, so that by 1900 there were about 26,000 trees standing, but none had been tapped at last accounts.

In August, 1901, Dr. SPIRE visited the Castilloa plantations at Pamanoekan. On the premises of Mr. VAN GENT, and situated near his coffee factory, was a tract planted with rubber in argillaceous, ferruginous soil which has been burnt over at one time with a view to erecting buildings there. The plants were about 10 feet apart, but had attained an average height of 2 meters and the crowns were touching each other. In the same vicinity another and larger tract of 50 bouws ($87\frac{1}{2}$ acres) had been planted for 19 months. At the same date the proprietor had planted Castilloa seedlings along paths in his coffee estate, and these had attained an average height of 4 meters. At one time a thousand Castilloa trees on his plantation had been attacked, apparently by some fungus growth, and were removed and burned.

Dr. SPIRE also visited the plantations of Mr. DINET, at Loebang, where Ficus elastica and Castilloa were growing mixed; about 18 months from planting. The young rubber, set in ground covered with coconut palms, had not thriven well, especially the Castilloa, which only in a few cases had grown up to 2 meters. This slow growth was attributed to the hardness of the ground caused by the interlacing roots of the palms, and the owner was attempting the difficult task of eradicating the latter. Mr. DINET was convinced in favour of growing the two kinds of rubber together. The Castilloa grows much more rapidly than the Ficus, but does not interfere with it. The altitude here is only a few meters above sea level. Experiments in planting Castilloa in the neighbourhood of Korwang, at an altitude of 3,500 feet were unsuccessful.

At the State platation of Gutta-percha, at Tjipetir, 2,000 feet above the sea, Dr. SPIRE noticed some Castilloas. One tract, planted 18 months before, showed satisfactory growth, and on another, trees 28 months old measured from 55 to 60 inches high. About 100 eight year old trees were as well developed as those at Tjikeumeuh. In some of the coffee and cinchona plantations in the eastern part of the island a few specimens of Castilloa may be found, which, though receiving no attention, have developed well. One, six years old, was 42½ feet high and 32½ inches in girth.

HERR RUDOLF SCHLECHTER, of Germany, who visited Sumatra last year, in an account of his trip in Der Tropenpflanzer (Berlin), mentions two plantations of Castilloa—that of Mr. RUNGE, Deli Moeda, and one at Haut Tador. In the first named the two-year-old trees were 12 feet high and at 3 feet from the ground measured 11.8 inches in circumference. At Tador he saw 50,000 Castilloa plants in a nursery, awaiting the rainy season, to be planted with Ficus. At Boeloe there were 76 Castilloas, one planted in 1898 measuring 17.7 inches in circumference. The latex was abundant, but charged with resin.—*The India Rubber World, p. 43, Nov. 1, 1902.*

PREPARING "PARA RUBBER" IN CEYLON.

To the Editor of

THE INDIA RUBBER WORLD.

I have much pleasure in complying with your request for full patriculars as to the method of collecting and coagulating rubber, up to the time of despatch for market, employed on the Kepitigalla estate (at Matele, Ceylon). After considerable experience, with several methods employed in other parts of the globe, I think there is none other equal to the one adopted in Ceylon and if this were used in other countries it certainly would mean a rise in price of at least 6 pence a pound for rubber.

The tool employed for tapping rubber trees on this estate is not equalled by any other in use, for its clean cut and absolutely safe incision, the tree not being damaged in the least. (The tool much resembles the ones figured in Vol. 1, page 332 of this Bulletin.)

After two cuts have been made, converging in the shape of the letter V, another labourer places a small tin cup at the lower point of the V. Care should be taken that at this point the two cuts do not run together, but that a small space be left between them. The incisions should be about 4 inches long with a space of at least 3 inches between them at the top. The same space (3 inches) should be left before beginning the next pair of incisions in going around the tree. This is absolutely necessary, for if the cuts join, the flow of sap to the tree will cease, and the tree will die. The first series of incisions should be made as far up the tree as a person standing on the ground can reach. Every second day a new band of incisions may be made lower down, as indicated in the drawing. About twenty rings or bands of incisions can be made around a tree within a distance of 6 feet from the ground. About five V shaped incisions may be made around a tree 40 inches in circumference.

The tin cups used are about two inches in diameter and two in depth. As the latex flows immediately after the cuts are made, the tapper's assistant at once presses the edge of a tin cup into the bark, no nails or putty or wax being required to hold it in place. A third labourer follows with a pail of water, putting a small quantity into each tin to prevent the latex from coagulating —a very necessary precaution, especially on a hot day. The tapping as above described is done early in the morning, and in this way three men can place 400 cups in a half day, and attend to the rubber obtained.

The contents of all the tins are stirred once or oftener, besides which the labourers must see to it that none of them overflow. Work is started about 6 A.M. and by 11 A.M. all the tins have been taken off and emptied into a pail. While one coolie carries the pail of latex to the factory, the others wash out the tins and at once replace them under the same cuts. The tins are again emptied, in the same manner, at 3 P.M., which completes the yield of latex from a given set of incisions. In the meantime, after the tins are washed, the coolies pick off any rubber that may have dried in the wounds made on the last round, which is called scrap. So much for the collection of the latex, we come now to the curing of the rubber, which is simpler still.

As the latex is brought to the factory in a liquid state (mixed with water, which is necessary to enable the latex to go through the process by which the rubber is preserved), it is strained through a very fine wire mesh—a milk strainer, for example—into shallow tin pans 7 inches square by 2 inches in depth, in which it is left to stand overnight. By morning the rubber will have coagulated naturally, without the use of any chemicals, and most of the water will have become separated from the pure rubber. The lumps of rubber is then taken out and placed on a table and gently pressed with the hand to exclude the water, after which a wooden roller worked by hand is passed over it, back and forth, until more of the water has been expressed, leaving a flat sheet of rubber about 8 inches square and ⅛th inch thick. The lumps of rubber thus made are placed on caned trays or frames about 6 x 3 feet, caned like the bottom of a chair, though not so closely woven. After the rubber sheets have remained on the trays for four or five days, they are hung to dry on wire stretched across the room, after which they will require frequent attention to prevent mildew, a man being detailed to rub off all mildew spots with a rag. About two months are required for the rubber to become thoroughly dry and free from white patches. So long as these patches appear, it is an indication of dampness and further drying will be required.

When thoroughly dry the sheets of rubber are ready for shipment, and are packed in boxes about 18 x 18 inches square and 8 inches deep—usually about 50 pounds to a box. The secret of the high prices obtained for rubber from Ceylon lies (1) in the straining of the latex, by which every particle of dirt is kept out and (2) in the thinness of the sheets of rubber, which permit any one to see that theyare free from dirt, sand, &c. No chemicals are used, and no heating is required. On the whole this is the simplest method, when one knows how, that could possibly be adopted. The rubber from most countries now comes to market in large pieces, and can conceal any amount of impurity, while in other cases the latex is allowed to dry on the stem of the tree and when pulled off contains a large percentage of bark and dirt, which mean loss to the buyer and extra work in the factory.

The last sales of rubber from this estate have brought probably the highest average price of any rubber sold in the world during the same period, and this is saying a good deal, namely: an average of 3*s.* 11*d.* per pound. The total output for Ceylon for 1903 will be about ten tons, of which this estate will send two tons.

FRANCIS J. HOLLOWAY,

Kepitigalla Estate, Matale, Ceylon
January 8, 1903.

KEPITIGALLA ESTATE AND ITS PRODUCT.

The Kepitigalla estate is situated in the Central province of Ceylon, in the valley of the Matale river, eight miles from Matale town. The India Rubber World of December 1, 1902 (page 80), contained some details regarding the extent of the rubber tapping on this estate, to August, 1902, by the Manager, Mr. HOLLOWAY. It was stated at the time that the trees were planted at the rate of 150 per acre, at a distance which fitted them for shading cacoa. His experience to that date pointed to one hundredweight (112 pounds) as the average yield per acre, based upon a result of tapping about 4,000 trees He gave then also an estimate of the cost of preparing rubber and forwarding it to the sea-coast, which equalled $17 per acre. At 3*s.* 11*d.* per pound, the product of an acre would realize $106.73, which, after deducting freight to London and brokers' commissions, should allow a very good profit.

The India Rubber World's report of the London rubber auction of November 14, 1902, contained this item: "Ceylon 14 cases offered and retired, after 3*s.* 11½*d.* had been bid for fine (from Para seed)". Amazon rubber at the same date brought 3*s*. 2½*d*. to 3*s*. 6*d*. the latter being paid for fine old Bolivian. From the Ceylon Observer of December 8, 1902, it is learned that the Ceylon rubber referred to was produced by Mr. HOLLOWAY, on the Kepitigalla estate, besides. the very good prices finally obtained for this rubber are given, as follows:—

4 cases valued at 3*s*. 11*d*., sold at 4*s*.
8 cases valued at 3*s*. 11*d*. sold at 4*s*.
1 case scrap, valued at 2*s*. 8*d*., sold at 2*s*. 10*d*.

These cases contained 50 pounds each, except in the case of the scrap, which weighed 42 pounds the total being 642 pounds, and the proceeds £125.12*s*. ($611.23.)

Mr. H. G. TIPPETT, managing director of the Liverpool Rubber Co., Limited, who has used some of the Ceylon rubber, says in regard to it, in a letter to The India Rubber World: "The weight of the cases at present is irregular, roughly about 100 to 130 pounds, but they will probaby settle down as the supply becomes regular to 1 cwt. (112 pounds) cases. The rubber is excellent made up in round pancakes (just like buckwheat cakes), about ⅛th inch thick, and 6 inches diameter; semi translucent absolutely clean and dry loss about 1 per cent. Quality equal to fines Bolivian Para."

At the London rubber auction on January 23, sales included 19 packages, fine thin Ceylon biscuits (from Para seed), at 4*s*. 2*d*. and 4*s*. 3*d*. fair to good clean scrap, 3*s*. 2*d*. and 3*s*. 4½*d*. Sales of Brazilian Para on the same date were made at 3*s*. 9*d*. and 3*s*. 9½*d*. spot. The source of this rubber is not now known to The India Rubber World.

The India Rubber World, 1st March, 1902.

RUBBER TAPPING EXPERIMENTS IN THE BOTANIC GARDENS.

Continuing the observations on the tapping experiments in the economic section of the Botanic Gardens, it was observed that when the trees were first tapped, the side of the trunk exposed to the heat of the morning sun, gave a smaller flow of latex than the opposite or unexposed surface. Subsequent experiments however prove this not to be quite the case, and at present, any side of the trunk flows with equal freedom.

There can be no doubt that in very dry weather, the flow of latex is considerably decreased. A glance at the table below will illustrate this. The weather has been getting gradually dry of late and from the 14th to the 24th April, hardly any rain fell and as will be seen in this table, the output of rubber during that period, very materially declined. In periods of drought, tapping should be altogether stopped. One result of the experiments conducted here, proves that the flow of latex is more copious, thicker and therefore contains more rubber, at from the base to say about a height of four feet on the trunk of a tree. Higher up, the latex is more aqueous and not nearly as abundant, in addition to which, it is also said to contain a larger percentage of resinous matter.

Much has been said of the advantage to be derived from the reopening of fresh wounds, giving rise to that phenomenon often alluded to as the "wound effect". On the advice of Mr. W. W. BAILEY, of Lowlands Estate, Klang, who witnessed the tapping one morning, this experiment was tried. On the 16th April, one hundred trees gave a yield of 80 oz. of pressed rubber. On the 18th April, the incisions made (four to each tree) on the 16th April to the hundred trees were reopened resulting in $58\frac{3}{4}$ oz. of pressed rubber, or a sudden drop of $21\frac{1}{4}$ oz. This certainly seems to point out that reopening an old wound is not to be recommended.

A sample case of about 60 lbs. of rubber prepared by different methods has been sent to London for sale. The result of this small shipment will in due course appear in the columns of the Bulletin.

Below is a continuation of the table of the output of rubber previously published.

Date.	No. of trees tapped.	No. of incisions to each tree.	Pressed rubber produced.	Scrap produced.	Total for the day.	Remarks.
April.			oz.	oz.	oz.	
6	100	four	96	$2\frac{1}{2}$	$98\frac{1}{2}$	Rain 0
8	100	four	$87\frac{1}{2}$	9	$96\frac{1}{2}$	,, 0
10	100	four	98	14	112	Ap. 9 rain ·50 ,, 10 rain ·90
14	100	four	84	14	98	Very dry weather.
15	100	four	$68\frac{1}{2}$	4	72	No rain
16	100	four	77	3	80	Rain .70
18	100	four	$48\frac{3}{4}$	10	$58\frac{3}{4}$	Incisions made on 16th reopened.
20	100	four	58	4	62	Ap. 19 rain ·35
22	100	four	$71\frac{1}{2}$	4	$75\frac{1}{2}$	
24	100	four	$50\frac{1}{2}$	4	$54\frac{1}{2}$	Rain .70
27	100	four	$88\frac{1}{2}$	4	$92\frac{1}{2}$	,, ·75
29	100	four	58	2	60	Rain 0
May.						
1	100	four	59	6	65	,,

Conjointly with the above, ten large trees growing under much more favourable conditions than the hundred alluded to have on alternate days been tapped. The total circumference of these trees at four feet from the ground was 56 feet 7 inches. The largest tree has a circumference of 9 feet (tri-branched at 3 feet 6 inches from the base) and the smallest of 4 feet 4 inches. All these trees have on previous occasions been very heavily tapped with the herring bone incisions on and off for the last ten years. Their bark is now very thick necessitating much deeper wounds to arrive at the laticiferous cells.

Below is a table showing output of rubber to date from these ten trees:

Date.	No. of trees tapped.	No. of incisions to each tree.	Pressed rubber produced.	Scrap produced.	Total.	Remarks.
March.						
26	10	20	11½	2	13½	No rain.
28	10	20	12	2¼	14¼	Rain ·10.
April.						
4	10	20	11¾	2	13¾	No rain.
7	10	20	16¾	1	17¾	,,
9	10	20	16	7	23	Rain ·50.
17	10	20	24	10	34	No rain.
21	10	20	40	4	44	,,
23	10	20	28½	4	32½	,,
25	10	10	36	3	39	,,
28	10	10	31¾	6¼	38	,,
30	10	20	48	2	50	Rain ·50.
May.						
2	10	20	43½	5	48½	

RUBBER IN THE MALAY STATES.

Mr. R. PORTER, of Ceylon, who paid a visit of inspection to the Federated Malay States about a month ago in connexion with rubber and coconuts, returned on Saturday by the S. S. *Annam*, and went up country where his headquarters are situated, this morning. While staying at the Grand Oriental Hotel in Colombo, a representative of the *Times of Ceylon* was accorded an interview with him.

At the outset, Mr. PORTER emphasized the fact that rubber and coconuts are to the Malay States what tea is to Ceylon. They are the staple product there, and the prosperity of the country is, to a very large extent, dependent upon the success of the rubber and coconuts. At the same time Liberian coffee is a not unimportant factor in the Federated Malay States. To us in Ceylon comparative figures are always interesting, and particularly at a time when rubber cultivation looms so important in the investing eye. Mr. PORTER explained that the idea of cultivating rubber must have occurred to Ceylon and the Malay States simultaneously. That is to say the first plants were introduced into both places at practically the same time, a quarter of a century ago. Yet, strange enough, he explained, that it was scarcely quite fair to judge of the rubber industry as yet, as many of the plants were young and untapped. The planters expected to tap the trees when they are about five years old. Mr. PORTER explained and added "I am happy to say that everything is going on well there. Of course there is a great deal more rubber cultivated there than in Ceylon, and it seems to grow fully as well. The soil is very suitable for it, the land being flat, and the climate is also very much in favour of the cultivation of rubber."--From the *Times of Ceylon.*

Malayan Substitutes for Cork.

To the Editor of

THE AGRICULTURAL BULLETIN:

Dear Sir,—In the Bulletin for May, 1902, you raised the question of local substitutes for Cork. It may possibly interest some of your readers to hear of two common products of these regions which are frequently used in Borneo as stoppers for bottles.

One is the young wood of the Pulai, *Alstonia scholaris.* I have known this to last in good condition for a long time. It is particularly suitable for bottles containing oil of any kind.

The other is the conical protuberance which grows from the roots of the common Pedada, *Sonneratia acida*, and is seen at low water. This also is good for corking bottles; and I have used it successfully for the purpose you mention, the lining of insect boxes. If I am not mistaken, Sir EMMERSON TENNANT speaks of this last use of it in his history of Ceylon. The natives of Borneo call it "Jungkong Pedada", the word "Jungkong" being applied by them to any wart-like vegetable excrescence.

Faithfully yours,

G. F., Singapore & Sarawak.

Bishop's House, Singapore,
April 23rd, 1903.

NOTICE.

It is suggested that Subscribers who are not residents of Singapore should send Money Orders in preference to Cheques in order to avoid the loss due to Bank discount.

SINGAPORE MARKET REPORT.

March, 1903.

Articles.	Quality sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang - -	10	30.50	30.00
Bali - - -	23	22.00	21.50
Liberian - -	373	19.50	17.75
Copra - - -	3,217	9.65	8.10
Gambier - - -	2,024	16.25	15.12½
Cube Gambier, Nos. 1 & 2. -	140	23.00	21.50
Gutta Percha, 1st quality -	...	350.00	250.00
Medium - -	...	250.00	150.00
Lower - -	...	150.00	40.00
Borneo Rubber - -	...	180.00	85.00
Gutta Jelutong - -	...	7.50	6.75
Nutmegs, No. 110's - -	...	90.00	85.00
No. 80's - -	...	130.00	125.00
Mace. Banda - - -	...	200.00	160.00
Amboyna - -	...	162.00	140.00
Pepper, Black - - -	557	34.40	33.00
White - - -	176	56–5%	51.50-5%
Pearl Sago, Small - -	24	6.50	6.00
Medium - -	...	8.00	7.50
Large - -	...	8.10	7.75
Sago Flour, No. 1 - -	2,518	5.27½	4.80
No. 2 - -	327	2.00	1.75
Flake Tapioca, Small - -	737	7.50	4.25
Medium - -	81	5.40	5.00
Pearl Tapioca, Small - -	346	6.00	4.20
Medium - -	534	6.00	4.20
Bullet - -	...	6 50	6.00
Tin - - - -	3,160	97.50	93.50

SINGAPORE MARKET REPORT.

April, 1903.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	30.00	30.00
Bali	16	21.25	20.75
Liberian	254	19.00	17.75
Copra	2,797	8.40	7.70
Gambier	2,509	15.60	15.25
Cube Gambier, Nos. 1 & 2	231	23.00	21.50
Gutta Percha, 1st quality	...	350.00	250.00
Medium	...	250.00	150.00
Lower	...	150.00	40.00
Borneo Rubber	...	168.00	85.00
Gutta Jelutong	...	7.25	6.75
Nutmegs, No. 110's	...	85.00	80.00
No. 80's	...	120.00	120.00
Mace, Banda	...	190.00	190.00
Amboyna	...	150.00	140.00
Pepper, Black	385	35.75	34.75
White	92	56½-5%	52-5%
Pearl Sago, Small	87	6.75	6.00
Medium	...	8.00	7.00
Large	...	8.50	7.25
Sago Flour, No. 1	2,884	5.30	4.30
No. 2	225	1.85	1.60
Flake Tapioca, Small	920	7.00	4.25
Medium	50	5.10	5.00
Pearl Tapioca, Small	377	5.50	4.20
Medium	728	5.50	4.20
Bullet	...	5.50	5.00
Tin	1,820	97.00	94.25

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st March, 1903.

Wired at 4 p.m. on 1st April, 1903.

To England:—

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports	1,700
Gambier	from Singapore	to London	...
,,	,, ,,	to Liverpool	...
,,	,, ,,	to U. K. & / or Continent	120
,,	,, ,,	,, Glasgow	...
Cube Gambier	,, ,,	,, England	50
White Pepper	,, ,,	,, ,,	40
Black ,,	,, ,,	,, ,,	...
White ,,	,, Penang	,, ,,	30
Black ,,	,, ,,	,, ,,	70
Pearl Sago	,, Singapore	,, ,,	70
Sago Flour	,, ,,	,, London	370
,,	,, ,,	,, Liverpool	1,300
,,	,, ,,	,, Glasgow	50
Tapioca, Flake	,, S'gapore & P'nang	to England	330
,, Pearl & Bullets	,, ,,	,, ,, ,,	180
,, Flour	,, Penang	,, ,,	1,300
Gutta Percha	,, Singapore	,, ,,	80
Buff hides	,, ,,	,, ,,	90
Pineapples	,, ,,	,, ,, cases	13,750

To America:—

Tin	from Singapore & Penang		800
Gambier	,, ,,		900
Cube Gambier	,, ,,		20
Black Pepper	,, ,,		320
,,	,, Penang		...
White Pepper	,, Singapore		...
,,	,, Penang		...
Nutmegs	,, Singapore & Penang		5
Tapioca, Flake & Pearl	,, ,, ,,	(sailing) 120	350
Pineapples	,, ,, ,,	cases	2,000

To the Continent:—

Gambier	from Singapore	to South	Continental Ports	20
,,	,, ,,	,, North	,,	200
Black Pepper	,, ,,	,, South	,,	40
,,	,, ,,	,, North	,,	300
,,	,, Penang	,, South	,,	10
,,	,, ,,	,, North	,,	...
White Pepper	,, Singapore	,, South	,,	40
,,	,, ,,	,, North	,,	50

			Tons Steamer.
White Pepper	from Penang	to South Continental Ports	...
,,	,, ,,	,, North ,, -	20
Copra	,, Singapore & Penang	to Marseilles -	600
,,	,, ,,	,, Odessa -	...
,,	,, ,,	,, South Continental Ports (other than Marseilles and Odessa.)	600
,,	,, ,,	,, North Continental Ports	580
Tin	,, ,,	,, Continent -	160
Tapioca Flake	,, ,,	,, ,, -	270
TapiocaPearl	from Singapore & Penang	to Continent -	380
Cube gambier	,, Singapore	,, ,, -	20
Pineapples	,, ,,	,, ,,	cases 2,500

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,050 tons Gambier
220 ,, Black Pepper
(in Singapore)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(B)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th April, 1903.

Wired at 2.40 p. m. on 16th April, 1903.

To England.

			Tons Steamer.
Tin	from Singapore & Penang	to England - (and U. K. optional any ports.)	450
Gambier	from Singapore	to London -	...
,,	,, ,,	to Liverpool -	...
,,	,, ,,	to U. K. &/ or Continent -	130
,,	,, ,,	,, Glasgow -	...
Cube Gambier	,, ,,	,, England -	10
White Pepper	,, ,,	,, ,, -	30
Black ,,	,, ,,	,, ,, -	...
White Pepper	,, Penang	,, ,, -	20
Black ,,	,, ,,	,, ,, -	50
Pearl Sago	,, Singapore	,, ,, -	60
Sago Flour	,, ,,	,, London -	230
,, ,,	,, ,,	,, Liverpool -	...
,, ,,	,, ,,	,, Glasgow -	...
Tapioca, Flake	,, Singapore & Penang	to England -	240
,, Pearl & Bullets	,, ,,	,, ,, ,, -	50
,, Flour	,, Penang	,, ,, -	975
Gutta Percha	,, Singapore	,, ,, -	50

			Tons Steamer.
Buff hides	from Singapore to England	-	10
Pineapples	from Singapore „ „	cases	4,500
To America:			
Tin	„ Singapore and Penang	-	440
Gambier	„ Singapore - -	-	320
Cube Gambier	„ „ - -	-	...
Black Pepper	„ „ - -	-	50
„	„ Penang - -	-	...
White Pepper	„ Singapore - -	-	...
„	„ Penang - -	-	...
Nutmegs	„ Singapore and Penang	-	3
Tapioca, Flake and Pearl	„ „ „ -	-	20
Pineapples	„ „ „ -	cases	1,750
To the Continent:			
Gambier	from Singapore to South Continental Ports		20
„	„ „ „ North „		100
Black Pepper	„ „ „ South „		20
„	„ „ „ North „		20
„	„ Penang „ South „		...
„	„ „ „ North „		...
White Pepper	„ Singapore „ South „		10
„	„ „ „ North „		30
„	„ Penang „ South „		...
„	„ „ „ North „		...
Copra	„ Singapore & Penang to Marseilles		340
„	„ „ „ Odessa		240
„	„ „ „ South Continental Ports (other than Marseilles and Odessa.)		340
„	„ „ „ North Continental Ports		100
Tin	„ „ „ Continent		260
Tapioca Flake	„ „ „ „		130
Tapioca Pearl	„ „ „ „		90
Cube Gambier	„ Singapore to Continent		60
Pineapples	„ „ „ „	cases	750

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,200 tons Gambier
120 „ Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London. E. C.

(*C*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 30th April, 1903.

Wired at 3.10 p. m. on 1st May, 1903.

		Tons Steamer.
To England.		
Tin	from Singapore & Penang to England and U. K. optional any ports. -	300
Gambier	from Singapore to London -	10
,,	,, ,, ,, Liverpool-	50
,,	,, ,, to U. K. & / or Continent -	280
,,	,, ,, to Glasgow -	...
Cube Gambier	,, ,, ,, England -	30
White Pepper	,, ,, ,, ,, -	40
Black ,,	,, ,, ,, ,, -	...
White Pepper	,, Penang ,, ,, -	40
Black ,,	,, ,, ,, ,, -	130
Pearl Sago	,, Singapore ,, ,, -	60
Sago Flour	,, ,, ,, London -	170
,, ,,	,, ,, ,, Liverpool-	...
,, ,,	,, ,, ,, Glasgow -	...
Tapioca, Flake	,, Singapore & Penang to England	100
,, Pearl & Bullets	,, ,, ,, ,, ,, -	130
,, Flour	,, Penang ,, ,, -	580
Gutta Percha	,, Singapore ,, ,, -	70
Buff hides	,, ,, ,, ,, -	30
Pineapples	,, ,, ,, ,, cases	8,500
To America.		
Tin	from Singapore & Penang -	1,350
Gambier	,, Singapore - -	1,300
Cube gambier	,, ,, - - -	10
Black Pepper	,, ,, - - -	270
,,	,, Penang - - -	100
White Pepper	,, Singapore - - -	...
,,	,, Penang - - -	...
Nutmegs	,, Singapore & Penang - -	50
Tapioca, Flake & Pearl	,, ,, ,, - -	190
Pineapples	,, ,, - - cases	1,500
To the Continent.		
Gambier	from Singapore to South Continental Ports-	10
,,	,, ,, ,, North ,, -	20
Black Pepper	,, ,, ,, South ,, -	130
,,	,, ,, ,, North ,, -	...
Black Pepper	,, Penang ,, South ,, -	40
,,	,, ,, ,, North ,, -	...
White Pepper	,, Singapore ,, South ,, -	10
,,	,, ,, ,, North ,, -	...

				Tons Steamer.
White Pepper	from Penang	to South Continental Ports	-	10
,,	,, ,,	,, North ,,	-	...
Copra	,, Singapore & Penang	to Marseilles	-	1,000
,,	,, ,,	,, Odessa	-	1,050
,,	,, ,,	,, South Continental Ports other than Marseilles and Odessa	-	150
,,	,, ,,	,, North Continental Ports	-	1,000
Tin	,, ,,	,, Continent	-	410
Tapioca Flake	,, ,,	,, ,,	-	180
Tapioca Pearl	,, ,,	,, ,,	-	400
Cube gambier	,, Singapore	,, ,,	-	20
Pineapples	,,	,, ,,	cases	1,000

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,800 tons Gambier
360 ,, Black Pepper (*in Singapore*) } contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

Singapore.

Abstract of Meteorological Readings for the month of March, 1903:

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·871	144·3	80·1	88·5	74·2	14·3	77·2	·859	75·2	70	N.E. & Calm.	6·23	1·40

K. K. Hospital Observatory,
Singapore, 21st April, 1903

A. B. LEICESTER,
Meteorological Observer

J. LEASK,
Acting Principal Civil Medical Officer, S.S,

Penang.

Abstract of Meteorological Readings for March, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·918	148·8	82·1	91·9	74·8	17·1	76·5	.807	71·3	68	N.W.	0·32	0·18

Colonial Surgeon's Office,
Penang, 7th April, 1903.

M. E. SCRIVEN,
Asst. Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang

Malacca.

Abstract of Meteorological Readings for March, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
Durian Daun Hospital.	29·840	150·5	79·3	89·2	69·7	19·4	81·2	1045	69·7	94	N.N.E.	1·02	0·30

Colonial Surgeon's Office,
Malacca, 30th April, 1903.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for March, 1903.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall	Greatest rainfall during 24 hours.
			Maximum.	Minimum.	Range.	Mean wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	156	83·51	93	71·50	21·50	78·13	895	78	12·03	2·04
Kuala Kangsar ...	...	80·81	94	69	25	76·34	847	80	2·64	1·11
Batu Gajah ...	160	82·21	94	72	22	77·39	877	80	7·36	3·22
Gopeng ...	...	82·51	94	67	27	77·09	855	77	2·22	0·54
Ipoh ...	...	82·68	95	71	24	77·20	861	77	4·12	1·29
Kampar ...	...	...	92	70	22	...	...	...	5·64	1·50
Teluk Anson ...	...	82·48	92	70	22	77·75	889	80	4·31	1·60
Tapah ...	..	82·15	93	68	25	77·30	875	80	9·65	2·49
Parit Buntar ...	...	82·59	93	71	22	77·52	877	79	4·14	2·42
Bagan Serai ...	...	82·62	92	70	22	77·71	883	79	4·82	1·45
Selama ...	...	83.09	93	71	22	78·11	894	79	6·15	1·23

STATE SURGEON'S OFFICE,
Taiping, 9th April, 1903.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for March, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	09·889	148·8	80·2	90·1	70·7	19·4	76·6	0·844	74·1	81	S.W	11·73	1.70
Pudoh Gaol Hospital ,, ...	...	...	...	no record		..	...	...	...	...	...	10·50	2·07
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	9·19	2·37
,, Klang	...	...	...	86·0	75·4	10·6	...	...	...	...	...	7·20	2·32
,, Kuala Langat	...	...	...	85·8	73·6	12·2	...	...	...	...	...	2·86	0·73
,, Kajang	...	...	...	87·2	76·0	11·1	...	...	...	...	...	5·13	0·93
,, Kuala Selangor	...	...	...	88·4	77·4	11·0	...	...	...	...	...	2·11	0·60
,, Kuala Kubu	...	...	...	93.2	72·3	20·9	...	...	...	...	...	8·95	2·43
,, Serendah	...	...	...	89·1	76·2	12·9	...	...	...	...	...	13·14	3.15
,, Rawang	...	...	...	87·0	75·2	11·7	...	...	...	...	...	10·28	1·96
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	1·40	0·70

State Surgeon's Office,
Kuala Lumpur, 27th April, 1903.

E. A. O. TRAVERS,
State Surgeon, Selangor

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for March, 1903.

District.		Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
				Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis,	...	...	...	83·5	96·5	70·0	21·2	...	...	...	...	...	2·38	1·10
Raub,	...		...	79·19	90·0	70·0	14·77	...	...	...	...	...	3·38	1·70
Bentong	...	...	...	80·0	90·0	70·0	20·0	...	...	...	...	...	2·44	·65
Pekan	...	...	...	79·5	88·0	71·0	16·0	...	...	...	...	...	5·49	1·16
Kuantan,	...	...	...	...	85·0	71·	14·0	...	...	...	...	...	·35	·25
Temerloh	...	...	...	...	92·0	73·0	19·0	...	...	...	...	...	1·60	0·88

A. ANNESLEY WOODS,
District Surgeon, Pahang.

Pekan, 23rd April, 1903.

Muar.

Abstract of Meteorological Readings for March, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	82·0	94·0	72·0	22.0	78·0	...	...	...	N. E.	8·62	1·95

Muar, 1st April, 1903.

FRANCIS PEARS.

No. 4.] APRIL, 1903. [VOL. II.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F. L. S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

Photo by A. D. M.

Malacca Cane (Calamus Scipionum) Lour.

AGRICULTURAL BULLETIN
OF THE
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No. 4.] APRIL, 1903. [VOL. II.

RATTANS.

PLATE V.

The Rattans of commerce consist of the woody stems of a variety of climbing palms belonging to the section *Calameæ*, and to the genera *Calamus*, *Dæmonorops*, *Korthalsia* and *Plectocomia*, to which may be added the less known genera *Myrialepis*, *Plectocomiopsis* and *Ceratolobus*. They are unisexual plants, forming tufts of stems some of which attain an enormous length. The leaves are always pinnate, with broad and narrow leaflets, often hairy, and armed with recurved hooks on the back of the midrib, which is in many cases prolonged into a leafless veryt horny portion, the flagellum by which the plant climbs. In a certain set of rattans the flagellum is not a portion of a leaf, but an independent organ rising from the axil of a sheath and apparently an abortive flower spike. The stem of the plant is covered with leafsheaths, armed strongly with sharp flattened thorns.

The inflorescence varies in form according to the genus. In *Calamus*, it is usually long pendulous and much branched with tubular spathes, sometimes prolonged into a limb.

In *Dæmonorops* the inflorescence is much more short and compact, with large usually spiny boatshaped bracts quite covering up the flowers at first, and later falling off altogether.

In these rattans the stems go on flowering for a long time producing one inflorescence after another from the axils of the leaves. In *Korthalsia* and *Plectocomia* the inflorescence is terminal, or rather produced all at once from the top joints of the stem, the whole stem dying to the ground when the fruits have been produced. The *Korthalsias* are peculiar in having the leaves trapeziform or at least narrowed at the base and widest at the top, and usually white beneath, and some have a large boatshaped sheath just above the leaf stalk (the ocrea) which is usually perforated and used as a nest by ants, whence they are known as "Rotan Semut." *Plectocomia* is an enormous plant, the stem of which is narrow at the base and thickens as it develops upwards. It is certainly the bulkiest rattan we have and attains a vast length, climbing to the tops of the highest trees and often by its great weight it pulls off branches and breaks down small trees by its long flagella.

Its inflorescence consists of branches bearing pendent tail-like spikes 6–12 feet long of dark brown bracts, enclosing a few yellow flowers.

The fruit of all these plants is globular, dark red, green or yellow and covered with triangular scales, smooth and shining. Beneath the thin outer coat of scales is a single round ruminated seed enclosed in a thin sweet eatable pulp, popular with Malays and Sakais. In some species of *Dæmonorops* the scales of the fruit contain a red resin known as Dragon's blood, and used in medecine and various arts as a colouring matter. The fruit of *Plectocomia* differs from that of the other rattans in having the tips of the scales which are dark brown turned up at the ends, so that the fruit is quite rough.

The rattans grow in forests usually in damp ground, or on river banks often in great abundance forming thickets. Far the greater number occur in the Malay Peninsula and islands, but *Calami* occur in Western Africa, India, Ceylon and Cochin China, and as far North as Yunnan. About 175 species of *Calamus* and 77 of *Dæmonorops* have been described, with 20 *Korthalsias*, 4 or 5 *Plectocomias*, 3 or 4 *Ceratolobus*, 3 *Plectocomiopsis* and one *Myrialepis*. Further research in our region will certainly discover a considerable additional number, for it is by no means easy always to get flowers and fruit of these plants, as many seem to produce them very rarely. At the same time there is very little doubt that of the large number described, some book-species are merely forms or based on incomplete specimens of other well known kinds. Often, especially in populated districts the useful classes of rattans are exterminated by the natives who for many years have cut all the flowering stems before producing fruit, so that eventually the species unable to reproduce itself disappears. I was once struck by seeing at Pulau Tawar, on the Pahang river immense abundance of *Dæmonorops crinitus*, Bl., not a very abundant rattan usually, and absolutely no full grown plants of any other species, but this was accounted for by the fact that this kind was considered worthless by the Malays, whereas everything else in the form of a rattan was cut for sale or use. It is in fact due to the flowering stems being constantly cut before the fruit is ripe that the present supply of rattans for the market from the Peninsula has so much fallen off of late years. The most important rattans of commerce belong to the genus *Calamus* which the species, as a rule, are by no means heavy fruiters. Some species indeed seem to produce flowers very rarely, and unless there are both sexes in flower at the same time in the neighbourhood it is unnecessary to state that no seeds are produced. *C. micracanthus*, Griffith, a very slender and useful little rattan which is quite common in many woods, no one seems ever to have seen flowers or fruit of. *Calamus javensis*, the Rotan Lilin, a much sought rattan, flowers and fruits more commonly but is by no means a heavy fruiter producing but few fruits at the best of times.

Cultivation and Preparation.

At present, practically, nearly the whole supply of rattans is derived from the wild jungle plants. The Malays and Dyaks merely cut the long climbing stems and beat and pull off the spiny sheaths with sticks, lay them out to dry for a short time and then coil them up and bring them down for sale. In a few places attempts have been made to cultivate rattans for profit, chiefly in Muar, Johor and I am informed also in Borneo.

The plant cultivated in the Peninsula is *Rotan Segar*. The seed is raised in a bed, till the plant is about 6 inches tall and then planted out. This rattan seems to do better in tolerably dry spots, damp or wet ground not suiting it. Like all rattans the growth is rather slow, at first, but it does not appear to make a bush at first of short stems as the *Dæmonorops and Plectocomias* do. Seeds obtained here from Muar in 1902 have now developed into plants about 5 feet tall. Rattans undoubtedly make the best growth in open jungle as they certainly grow faster when they can climb. The best way to grow rattans would certainly be to plant them out in open woods, with sufficient trees for them to climb, but enough light for them to develope well. Though rattans should be cut before flowering it would of course be necessary to leave some stems in a plantation to reproduce. In many species a large number of shoots are first thrown up forming a bush, later some or all of these develop into climbing shoots, but it is not till the bush is fairly large that the climbing shoots begin to develop, then the rattans begin to come faster, and there are a considerable number produced, each shoot climbing. The slender *Calami* as a rule make but small bush, *i.e.*, each shoot starts climbing almost at once.

The preparation of ordinary rattans for the market is very simple, the canes as brought in being washed in a running stream, and well rubbed with sand till they are quite smooth. They are then straightened by being pulled round posts fixed in the ground and eventually tied up in bundles. Malacca canes and others generally intended for walking-sticks, are smoked as described later.

The greater number of the canes exported from Singapore are obtained from the Malay Islands, especially Sumatra and Borneo.

The uses of rattans are very varied. For walking-sticks, the Malacca cane *Calamus scipionum, C. ornatus, C. aquatilis,* and other smaller species are used. For basket work, chairs, tables and furniture generally, the Rotan Segars, Rotan Bakau. For fenders for ships, cables, bridges, chicks, floor-coverings, baskets, saddlery, rattans of various kinds are extensively used. The shields of the Malays in old times were often made of coiled rattan. In house building, fish-traps and fishing stakes, a great quantity is used, both in the form of split rattan, and whole canes. Split rattan is necessary for attap-making to fasten the pandan leaves together.

In Europe "crushed cane", rattan waste cut into small bits is used for stuffing cushions being apparently preferred to coir.

The uses being almost endless, and the demand being very great both for local and foreign consumption, it is not to be wondered at that the supply of an almost exclusively jungle product is not adequate for the demand. Sooner or later it will be doubtless requisite to institute plantations of rattans on a large scale, to supply the demand. Quite recently a firm in Europe was inquiring here for osier or willow twigs for basket work in Europe as a substitute for cane which was getting too expensive.

Names of Rattans.

There are a very large number of names for rattans, the same plant possessing usually three names at least. There is the jungle name known to the rattan collectors, the name under which it is imported and purchased by the dealer, and finally the export name. The difficulty of correlating the rattans of commerce with the plants of the jungle is almost insurmountable. The canes being classed into a large series of groups according to size, colouring, length of internodes, etc. quite irrespective of the plants which produce them.

The following is a list of the jungle names as far as I am at present able to identify them :—

Rotan Batu	*Calamus insignis*, Griff.
R. Bakau	*C. aquatilis*, Redl.
R. Buah	*Dæmonorops hystrix*, Mart.
R. Bulan	*Myrialepis Scortechinii*, Hook.
R. Chin-chin	*D. verticillaris*, Mart.
R. Chiche	*C. den iflorus*, Becc.
R. Chochor	*D. longipes*, Mart.
R. Dahan	*Plectocomia elongata*, Mart.
R. Dudok	*D.* sp. (see under R. Kerai).
R. Gajak	*Myrialepis Scortechinii*, Hook., f.
R. Getak	*D. didymophyllus*, Becc.
R. Gulang	*D. verticillaris*, Mart.
R. Gunong	*C. exilis*, Griff.
R. Hudang	*D. didymophyllus*, Becc. The name is also applied to *Korthalsia*, and in trade to a very slender rattan unidentified.
R. Jerenang	*D. Draco*, Mart.; *D. propinquus*, Becc. The Dragon's blood rattans. It is very doubtful whether the real *D Draco* occurs in the Peninsula.
R. Kerai	*D.* sp. near *D. verticillaris* and confused with it in the books, but quite distinct.
R. Layo	*C. singaporensis*, Becc.
R. Lilin	*C. javensis*, Bl.
R. Manana	*C. Lobbianus*, Becc., a very ornamental plant but the rattan is very short and useless.
R. Machap	*D. longipes*, Mart.
R. Muruseh	*D. leptopus*, Mart.
R. Minyak	*D. angustifolius*, Mart.
R. Pella Tidor	*D.* sp. near *grandis*, Mart.
R. Rajah	*C. scipionum*, Lour.
R. Sabut	*D hystrix*, Mart.
R. Segar Perak	*C. coesius*, Bl.
R. Segar Badak	*C.* sp. (see under *C. ornatus*). Specimens in the Singapore Herbarium, collected by

CANTLEY labelled Rotan Segar Badak and Rotan Kumbong are not *C. ornatus* but have more of the appearance of *C. palustris*, Griff.

R. Semambu Malacca cane. *C. Scipionum*, Lour.
R. Semeiyang *C. intumesceus*, Becc. Also applied to another slender species near *C. micracanthus*, Griff.
R. Semut *Korthalsia scaphigera*, Mart.
R. Sepak *Dœmonorops longipes*, Mart.
R. S'pat *Dœmonorops*, n sp.
R. Sindek *C. javensis* var *peninsularis*.
R. Sunang *D. grandis*, Mart.
R. Tahi Ayam *C. micracanthus*, Griff.

There are a great many more names of rattans known which have not yet been certainly identified with the plants. Griffith records (Palms of British India) the names under which he received many of his species but unfortunately in many cases the labels seem to have got shifted as the native names he gives in many cases do not belong to the plants.

The rattan purchasers who clean the canes for the traders have a smaller number of names.

Rotan Bakau appears to be used chiefly for *C. aquatilis*.

Rotan Batu for *C. insignis*, but probably includes other canes which are as slender and hard. It is over ¼ inch. through with joints over 9 inches long, strong and flexible.

Rotan Segar, includes a number of slender canes, but Rotan Segar Badak, often called Rotan Segar only, is applied to much stouter ones, less stout than Rotan Bakau.

Rotan Hudang, is not with them *D. didymo phyllus*, Becc. which is a rather thick and poor cane, but a slender species of *Calamus*, very much like Rotan Lilin *C. javensis*, ⅙ inch. through, joints about 7 inches through.

Rotán Rachak is a slender rattan with long joints, resembling the trade rattan known as Boolongan sutra segar.

It is used for making chicks.

Rotan semambu is the name for *C. scipionum*, but it also includes the white Malacca cane, which appears to me a distinct species. It is said to come from Palembang in Sumatra.

Among the trade rattans are a great variety of names, and as these canes are obtained from all over the Malay Archipelago, where no botanist has as yet properly studied the rattans it is still more difficult to correlate the species. The following notes as to some of the trade kinds may be of use.

Stout Goruntalo Ayer, Cane ⅜ to ½ inch thick or more nearly round, joints 10 inches long, rather a rough cane, resembling Rotan Bakau.

Palembang Ayer, ½ inch through or less joints 4—7 inches long.

Passir Pakay, ⅜ inch through, joints 7 or 8 inches, finely striate transversely.

Medium Pahang No. 1 a smooth yellow cane ¼ inch through, joints 7 to 10 inches or more inches long somewhat angled.

Medium Pahang No. 2 is similar, duller in colour.

Macassar Ayer, dull coloured $\frac{3}{8}$ inch through ribbed, joints about 8 inches, rather a stiff cane.

Jambi Soontie, $\frac{1}{4}$ inch through, joints 8 inches long, a polished cane with fine transverse striations.

Brown Segar, rather dark coloured shining striate $\frac{1}{4}$ inch through, joints over a foot long.

Batavia Segar, the same class of rattan but bright yellow polished, flexible.

Bulongan Segar, rather more slender bright yellow, hardly polished.

Thin Padang segar, Shining yellow cane, $\frac{1}{4}$ inch through or less' joints 9 inches long.

Bulongan Sutra Segar, slender $\frac{1}{8}$ in. through light coloured, ribbed, flexible, joints 7 inches long.

Palembang Segar, slender $\frac{1}{4}$ inch through joints 6 inches, light coloured, and ribbed.

Cotie Pakay, Slender under $\frac{1}{4}$ inch through with very long joints 14 or more inches, yellow shining.

Kiri Ayer, slender and rather dull, joints 14 inches long.

Thin Goruntulo Ayer, a light coloured cane under $\frac{1}{4}$ inch through, surface dull, joints 12 inches or less.

Kangboy Ayer, dull brownish cane $\frac{1}{4}$ inch through, joints 7 or 8 inches long, rattan stiff.

Penang Ayer, dull, longitudinally ribbed, stiff, $\frac{1}{4}$ inch or less through, joints 7 inches.

Indragiri Ayer, under $\frac{1}{8}$ inch through, yellowish rather dull, flexible.

Stout Padang Ayer is a smooth shining cane, half an inch through with long joints.

Sincooloran is over half an inch or less, duller in color, but shining.

Loontie, smooth, light coloured $\frac{1}{4}$ to $\frac{1}{3}$ inch through, stiff and hard.

Banjargigit, $\frac{1}{4}$ inch through, brownish stiff.

Malacca Canes, Rotan Semambu.

There are at least two rattans which supply the Malacca canes, the brown and white canes being of different species. The brown cane is derived from *Calamus scipionum,* Lour. This is a very large plant, forming a good sized bush of young shoots before climbing. The leaves are rather light green about 9 feet long with lanceolate leaflets 24 inches long and 3 inches wide equally spaced on the thorny rachis.

The sheaths are armed with very large flat dagger shaped thorns, yellow, the petiole over 2 feet long is thick, and armed with similar but shorter thorns, below its junction with the sheath is a large swelling, and there is a long triangular brown ligule above the junction.

The flagella rise from the sheaths and there are none on the leaves, they are 10 or 12 feet long and very thick. The stems are about

40 to 60 or more feet long and with the sheaths 3 inches through, light dull green. The rattan beneath the sheaths 1½ inch. through dull green. The male inflorescence is very long, about 20 feet, produced at the top of the long full grown stem, the female is only about half as long. The fruit is small and dark brown.

The Malacca cane occurs all over the Peninsula, but is not now by any means common. It occurs however still in Johor, Selangor, Perak and also in Borneo and Sumatra whence it is imported into Singapore. The canes cleaned of their sheaths and washed and then smoked over a wood fire, for some time. Common canes are tied in bundles of 25 to smoke, specially good ones are smoked singly, after this they are washed and rubbed and finally rubbed with oil and made into walking-sticks. These canes are imported into Singapore at about 12 dollars a thousand chiefly from Palembang, and after being cleaned, smoked and made up into sticks sell according to quality from one to 100 dollars.

I have no clue at present as to what plant the white Malacca cane is derived, but it appears certainly to be a distinct plant, and is obtained with the other from Palembang. Some years ago plants of *C. scipionum* were obtained with considerable difficulty from Malacca and planted in the Botanic Gardens in Singapore. One of them flowered, a male, this year. The other is figured in Plate V. The single stems which have as yet developed to full size are about 60 feet tall.

A very large species allied to the Malacca cane is *C. ornatus*, Bl. It differs in the leaflets being grey underneath, and the stem thicker than in the Malacca cane, has much shorter joints, 9 inches long, the cane itself is 1¼ inch. through. GRIFFITH gives the name "Rotan Ruga Bodak" evidently a miscopy for Segah Badak, but it cannot be the plant commonly known by that name.

BLUME says it is used for bridges and such work on account of its great size and strength. It occurs all over the Peninsula.

Rotan Bakau, *Calamus aquatilis*. Ridl. is a large very thorny dark coloured rattan common in tidal swamps. It is about 30 feet long, the sheaths covered thickly with black bristle-like spines, the leaves large with numerous equidistant linear leaflets a foot long and an inch across, and ending in a long flagellum. The inflorescence is very large and stout, with very thorny tubular sheaths. The fruit is small globular beaked half an inch long yellow, or brownish yellow.

The rattan is moderately stout, white, ½ inch through the joints 6 to 7 inches long.

It is used for making legs of chairs, walking sticks and for split rattan.

Rotan Segar Perak, *Calamus cæsius*, Bl. has a very slender stem ¼ inch through light green covered with a grey bloom easily rubbed off, and armed with short sharp thorns. The leaves are about 4 feet long with a slender rachis ending in a fine flagellum armed with thorns. The leaflets in distant alternate pairs or fascicles of 3 or 4 together lanceolate, narrowed at both ends, edged with bristles at the tip, light green above and white beneath.

The flowers I have not seen but the fruit spray is very large and stout several feet long with long branches, the spathes armed with very short sharp thorns with swollen bases. The fruit is oblong ½ an inch long, shortly beaked yellow with about 14 rows of rather small scales, longer than broad grooved down the centre, yellow with a slightly darker edge. The fruit is pedicelled by the rather large cylindric broad based calyx.

I suppose this is BLUME'S *C. cæsius*, which was collected at first in Borneo, but of which he only saw a leaf. He mentions that the traders esteem it as a rattan and says it is called in Borneo Rotan Latong and andjan-jan.

Rotan Batu, *Calamus insignis* is another very slender rattan which is much sought by rattan collectors. The stems are not more than half an inch through, and fifty or sixty feet long, light green, and sometimes marbled with bars of grey when young. The sheaths bear long thorny flagella. The leaves are about two feet long, with a long thorny leaf-stalk and usually 2 pairs of broad oblong lanceolate leaflets 8 inches long 2½ inches wide, but there are often more leaflets. The leaf-stalk is not swollen at the base where it leaves the sheath, but above it is a distinct brown lanceolate ligule. The upper pair of leaflets are joined at the base. All are bright green. There is often a flagellum from between the two upper leaflets. The flowers seem never to have been met with.

This rattan occurs in woods all over the Peninsula and is especially valued for tying fishing stakes and such like work.

Rotan Lilin *Calamus javensis* is another of the slender rattans of the same style as the Rotan Segar. The stems are twenty or thirty feet long green and armed with short sharp thorns.

The leaves about a foot long bear broadly lanceolate acute leaflets 6 inches long and 1-2 inches wide in gasciles of two or three together, or solitary about 7 to 13 to a leaf, green, or in the hills purplish, on both sides, the lowest pair of leaves are deflexed over the stem as if clasping it. The upper leaves end in long very slender flagella. The flower sprays are very long and slender with only a few spikes of flowers at the end of the long peduncle.

This rattan is common in our woods, and is known by the names Rotan Sindek and Rotan Tungul besides Rotan Lilin. The rattan as prepared is smooth and white $\frac{1}{6}$ of an inch through with inconspicuous points some inches apart, so that it is very suitable for basket work.

To be continued.

FUNTUMIA ELASTICA.

The following notes on the Silk Rubber of Lagos are taken from an article by M. E. DE WILDEMAN published in the Revue des Cultures Coloniales.

The plant is specially cultivated at present in Western Africa in the Congo Free State and on the Cameroons, and is according to the author the best rubber plant to cultivate in these regions, and this is so for several reasons, it is easy to procure seed as the plant is wild in this part of the world and one can be sure that it will grow well as the soil and climate are naturally suitable for it. The German Colonial reports show that Funtumias of the same age as Castilloas are relatively more advanced, the Funtumias give seed at the end of two years and a half while Castilloa fruits only at the end of from three and a half to four years. If one compares the latex of the two, at the same age, one can see that it is much more concentrated less watery and sticky in Funtumia than in Castilloa and that it can give a return more quickly. Castilloa according to M. KOSCHNY can only be milked when eight years old. As to the rubber itself that of Funtumia is as good or better than that of Castilloa. The results of comparative researches with Funtumia and Castilloa in West Africa are in favour of the former. In three or three and a half years these trees have grown to 4 or 5 inches in height and a considerable thickness. The Funtumia is attacked by the caterpillar of a species of *Glyphodes*, near or identical with *Gl. ocellata*, of Sierra Leone. (We have several species of this genus of moths in the Straits, one of which has been troublesome with *Ficus elastica*, as described in a recent number of the Bulletin.) This caterpillar chiefly attacks the young plants, in the nurseries spinning the leaves together, and devouring the parenchyma. They are destroyed by hand after a year and a half or two years they are less readily attacked. Snails and the larvæ and adults of some species of beetles are also recorded as attacking the young plants.

The seed, sown freshly gathered, sprout after about 15 days and grow very rapidly, and the plants are readily transported. If at first the stem bifurcates forming a bush, either a shoot is developed above the bifurcation, or one branch grows more strongly than the other eventually forming the trunk. Among the advantages of Funtumia one may mention that the latex flows more easily and quickly than that of Castilloa or Ficus and the seeds keep good for 6 weeks and even germinate after three months. Nor is the Funtumia particular as to soil it grows equally well in lateritic, or basaltic soils, in soils rich in humus or stony. As to altitude, it has been noticed that it does best below 800 metres. It is reckoned that in April, 1902, there were in the Cameroons 200,000 plants, exclusive of wild ones. The plan of planting Funtumias in a lightly cleared forest as has been frequently done is not recommended. They do not grow so well in shade as in full sun, when they are too weak to resist the drying action of sun and wind, they naturally should be protected, but when they are strong enough to resist this they develop better when fully exposed to the sun, provided that the ground is damp enough. From the experiments made in plantations in German territory the Funtumias should be planted 6 metres apart.

The tree is one of the best shade trees for Cocoa, but as it is pyramidal in form it will be necessary to plant close which is not a disadvantage. It is also recommended to use the tree to grow Vanilla on as in ten years when the vanilla is dying out the rubber trees will be ready for tapping. The latex is coagulated by boiling, but this must be done gently and can only be done after the addition of water. It is advisable also to stir the mass while boiling slowly to prevent the formation of a porous mass in which portions of uncoagulated latex may be included. After coagulation the rubber must be carefully washed.

So little is known at present as to Funtumia under cultivation that any notes made by cultivators are worth recording, but as far as our experience of Funtumia in the Straits is concerned one cannot say that it grows nearly as rapidly here as it appears to in Africa.

PARA RUBBER IN COCHIN-CHINA.

In the Bulletin Economique of Hanoi, (1903, No. 15), M. HAFFNER gives some notes and photographs of Para rubber cultivation in Ong-Iem, Cochin China. A thousand trees were planted in October, 1898, in different parts of the Experimental grounds, (1) in very wet places flooded for a part of the year, these trees all died; (2) in similar ground well drained, moisture at 60 centemetres depth in the dry season; (3) in land a metre higher; (4) on the slope of a hill, a little less sandy than the others, where traces of moisture are only to be met with at a depth of 6 to 10 metres in the dry season. The best result has been obtained from the last planting. This is certainly not what one would expect. Another remarkable feature about the plants in this region is that they shed all their leaves and remain bare for four months in the dry season January to April, budding again on the appearance of the rains. Judging from the photographs and measurements the trees seem fairly up to average growth, but they are too young yet to form an estimate of their value as rubber producers.—Ed.

UNITED PLANTERS' ASSOCIATION.

Report for 1902.

GENTLEMEN,

Your Committee have now the pleasure to submit for your consideration the Sixth Annual Report of the UNITED PLANTERS' ASSOCIATION, F. M. S.

During the past year, there have been four Committee and three General Meetings at which there has been a fair attendance. We recommend that in future the Committee should meet regularly every month, and that there should be an ordinary General Meeting every second month.

The Selangor Planters' Association was dissolved during the year under review, and we regret that the Negri Sembilan Planters' Association is no longer affiliated. The members of the former body have, however, elected to retain their membership of the UNITED PLANTERS' ASSOCIATION, and we sincerely trust that Negri

Sembilan may follow suit. We fully recognise the desirability of a local Association in Negri Sembilan, but confidently look to the individual planters and other labour employers in that State for continued support.

We are pleased to be able to report that four gentlemen from Perak have expressed their desire to join the UNITED PLANTERS' ASSOCIATION, and trust that many others may soon copy their example.

LABOUR.—On the whole the supply of coolies from India has not been maintained, and complaints of shortage are to be heard on all sides. There are various reasons for this. A good paddy season in India, the heavy fall in exchange and consequent increase in the cost of living, higher wages offered by other countries, and a rapidly growing demand for the services of the Tamil coolie wherever his employment is permitted by the Indian Government, all provide an explanation for the inadequate supply in the Malay Peninsula. The Governor in Council has just stated that the F. M. S. during the past year have paid, as forfeit to the British India Cpmpany, the sum of $44,000, the equivalent of 4,000 tickets unused, against the guarantee to which a lengthy reference was made in your last annual report. Two labour conferences have been convened by the Government, one in Penang, and one more recently in Singapore. At these all classes of Tamil labour employers were represented, your Chairman attending on behalf of the Coffee, Coconut, and Rubber interests of the F. M. S., and it has been finally decided that a monopoly, as regards professional recruiting, will be granted to the Madura Company, Negapatam, the wages offered ranging from 35 cts. to 45 cts. subject to exchange fluctuations, and according to the locality in which the coolie recruit will have to work. These Conferences were arranged with the double object of ascertaining the views of planters and other unofficial employers, especially with respect to wages, and so of avoiding the risk of friction, attendant upon possible Government competition, and also of considering a scheme for putting the whole question of recruiting upon a sound basis, which emanated from Messrs. O'SULLIVAN and HILL as the result of a visit which these gentlemen have recently paid to India. It should be clearly understood that, whilst no professional recruiting will be permitted except through the Madura Co., the Kangany system will not be interfered with in any way. It may be that the offer of wages, so much higher than those ruling at present, will compel the employers of Kanganies to raise their rates also, but that has yet to be seen, especially if recruiting by professionals is practically to be confined to Indentured labour, and there was a remarkable consensus of opinion amongst the various delegates that the wages at present paid are quite insufficient to attract the Tamil coolie, in any numbers, to this country. There can be no doubt that if the Rubber industry is to achieve the success which is at present foreshadowed, the importation of very large numbers of coolies in the near future is distinctly indicated. It will not do for planters to wait until their trees are actually ready to tap, and then look round for labour and expect to find a sufficient supply at hand. Your Committee wish earnestly to impress upon you their emphatic conviction that there exists the most urgent need for anticipating a serious scarcity, by importing labour now largely in excess of present requirements, and at the same time they desire to again record their appreciation of the strenuous efforts of the Government to get into closer touch with the great labour market of India and, whilst endeavouring to procure sufficient coolies for their own requirements, at the same time to keep in line with unofficial employers. Attached are various statistics in connection with labour, which should prove of interest :

STATEMENT OF COOLIES IMPORTED BY RAILWAYS AND PUBLIC WORKS DEPARTMENT DURING THE YEAR 1901.

	No. of coolies landed at Klang	Cost of coolies landed at Klang.	Average cost of each coolie landed at Klang.
		$	$
Railway	1,732	43,840.11	25·31
Public Works Department ...	514	12,166.38	23·67
Negri Sembilan	316	...	29·10
Perak	117	...	34·68

STATEMENT A.

Statement Showing the Number of Coolies Imported into Natal, Mauritius, Fiji, and British Guiana during 1900.

Colonies.		Males.	Females.	Boys.	Girls.	Infants. Males.	Infants. Females.	Total.
Natal	From Madras ...	2,855	1,168	352	260	169	157	4,961
	Calcutta ...	313	137	7	5	8	4	474
Mauritius	Madras ...	2,439	860	212	173	130	108	3,922
	Calcutta ...	470	157	10	7	4	4	652
Fiji ...	... ...	1,460	656	55	40	38	26	2,275
British Guiana ...	...	2,710	1,334	224	182	20		4,470
	Total, ...	10,247	4,312	860	667	668		16,754

T. H. HILL,
Protector of Labour,
F. M. S.

Office of Protector of Labour, F. M. S.
Seremban, *6th October, 1902.*

STATEMENT B.

Statement showing the Death-rate and population of the Colonies of Natal, Mauritius, Fiji, and British Guiana.

Colonies.		Population up to 1901.	Death-rate. per Mille.	Remarks.
NATAL	... ...	72,965	15.62 (1900)	
MAURITIUS	Indo-Mauritans ...	190,027	28.00 (1901)	
	Other Indians ..	71,109		
FIJI ...	... ...	17,105	28.40 (1900)	
BRITISH GUIANA	On Estates	68,789	25.50 (1901)	
	Not on Estates ...	57,086		

OFFICE OF THE PROTECTOR OF LABOUR, F. M. S.,
Seremban, 6th October, 1902.

T. H. HILL,
Protector of Labour, F. M. S.

Experimental Gardens.—During June, 1902, the Committee appointed by the Resident General to confer with and advise the Superintendent, paid a visit to these gardens. At this time the land had not been finally acquired, and there was but little progress to report. Since that date no official inspection by the Committee has been made, but it is reported that some 60 acres have been felled and cleared, and that the Superintendent's Bungalow, with a considerable approach road, has been built. The next report of the Committee, following a further inspection which will be shortly made, will be awaited with interest. The Superintendent has compiled an elaborate treatise upon the extraction and preparation of latex from the Para Rubber tree (*Hevea Braziliensis*), accompanied by extensive statistics in connection with his experiments. The samples of rubber prepared by him were reported upon by the London experts, at the instance of the Kew Garden authorities, with the most satisfactory results, the best quality being valued at 4/4*d.* per lb. Your Committee are of opinion that the treatise referred to above is a most valuable contribution to the literature of Rubber, and that the Superintendent has succeeded in absolutely dispelling the idea prevailing in certain quarters, that the rubber produced in this part of the world is of inferior quality.

Agricultural Bulletin.—This periodical has not only survived the first year of its existence, but is growing in popularity as it is becoming more generally known. A great all round improvement upon the first numbers has been effected, and same very instructive photographs have been reproduced successfully. The opportunity provided in its pages for the exchange of ideas upon matters agricultural might certainly be more fully availed of, and it is to be hoped that additional interest in this respect may be evidenced during the coming year.

Agricultural Show.—It has been decided to hold an Agricultural Show at Kuala Lumpor in July, 1904, and a Committee has been appointed to arrange preliminaries, but at present no definite programme has been drawn up.

Public Auctions of Coffee.—This question has, for the time being, been shelved, those interested in Singapore, with whom the matter was left, not having so far made any move.

Savings Banks for Coolies.—The idea of providing facilities for coolies to put by their savings, was suggested to your Association, and recommended to the authorities for consideration, the Protector of Labour signifying his sympathy with the proposal.

Customs Duties Enactment.—This has been amended at the instance of your Association, and now stands as below with respect to the export duty on coffee of all grades.

SCHEDULE A.

COFFEE.

Export Duty, calculated on the Singapore Market price at the end of previous month, less $1 a pikul for freight and charges between Klang and Singapore.

Item.					*Duty.*
When the price is below $19 per pikul					Nil.
When $19 per pikul up to $21 (inclusive)					1 per cent. *ad valorem.*
When above $21	,,	,,	$23	1½	,, ,,
,, ,, 23	,,	,,	25	2	,, ,,
,, ,, 25	,,	,,		2½	,, ,,

The duty on Parchment Coffee is calculated on two thirds of the gross weight, and on Dry Cherry on one third of the gross weight.

Insect Pests.—WHITE ANTS (*Termes gestroi*).—The ravages of this pest have been perceptibly less since it has come to be recognised that a disturbance of the soil round the area of attack, and the destruction of the jungle wood on the ground in which they breed, notably nibong stumps and trunks, do more to disorganise their operations than any other treatment. The percentage of affected trees which actually die, is now comparatively small, at any rate on alluvial land. On the hills it is of course more difficult to get at the ants on account of the depth to which they go, but even there, no more satisfactory remedy than continual disturbance wherever they make their appearance, has yet been discovered.

THE BEE HAWK MOTH.—The caterpillars of this species have, during the past year, caused a great deal of anxiety to owners of coffee estates in the Klang district. It has only been by the most sustained effort and the expenditure of very large sums of money, that their ravages have been kept within bounds. A feature of the attack, has been its persistent recrudescence in spite of the apparent completeness of the measures taken for its suppression. A small batch of Ceylon crows were imported by the Government at your Chairman's suggestion, in the hope that these useful birds would settle in the country, and perhaps help, in course of time, to keep the caterpillar pest down. The experiment has so far proved a success in that the birds readily devoured the caterpillars when supplied to them whilst in captivity, and have not since their release deserted the locality. It yet remains to be seen, however, if they will breed.

COCONUT BEETLES.—"The staff which I hope shortly to have "at my disposal will, I believe, prove sufficient to carry out the "necessary measures for the protection of coconut trees, and I trust "that before long the disastrous effects caused by the present "ravages of the beetles, may be minimised as much as possible." The above is a verbatim extract from a letter addressed by the Federal Inspector of Coconut Trees to your Association, when first he entered upon the duties of his appointment, and your Committee have great pleasure in testifying to the excellence and already far-reaching effects of the measures that have been taken for the suppression of the beetle pest. It does not seem too much to hope that within the very near future a serious danger to an important industry will have been averted by the ready and liberal assistance extended by the Government at a most critical juncture.

Chief Planting Products.—Coffee.—In spite of the fact that most of the large coffee estates are now thickly planted through with Para Rubber, which will undoubtedly kill the former product in course of time, the export of coffee from Selangor alone in 1902 amounted to 48,906 piculs, against 37,664 piculs for the previous year, an increase of no less than 11,242 piculs, or about 30%. This result can only be due to the fact that a large acreage has just come into full bearing, and your Committee consider that the returns for 1902 will probably constitute a record for the F. M. S., and further that in two years' time the export will not amount to much more than half its present proportions. During the season under review the extensions in coffee alone have been practically nil, but in some cases it is being planted as a catch crop with Para Rubber at varying distances through the fields, and of course, if this system appeals to investors, it may be that there will be a continuous, if lessening, supply for same time to come. The outlook, however, is by no means encouraging, and although well opened estates on rich alluvial land can, even at present prices, be worked at a profit, still the counter attractions and prospects of Para Rubber, Rambong, and Coconuts, will probably divert attention from coffee.

Coconuts.—A return is attached showing that the export of copra from Selangor in 1902 amounted to 15,146 piculs, towards which practically nothing has been contributed by European-owned plantations, which are only now coming into bearing. Splendid growth is reported on all sides and it seems probable that by the time the trees are 5 years old, heavy pickings will be commencing. From an estate in the Jugra district, 4 years and 4 months old at the end of 1902, thousands of nuts are already coming in, and there are many individual trees carrying over 100 each. Given freedom from the beetle pest, there can be no doubt that such fine results must very soon attract capital to the country, especially as the coconut planter, his estate once opened, can usually be assured of sufficient labour for his requirements; Chinese and Malays, neither of whom are much use on coffee and rubber estates, being generally available when Tamil coolies are hard to get.

Para Rubber.—The attached statistics (incomplete though they are at present) serve to some extent to show how important an industry is growing up in our midst. It is a significant fact that from Ceylon comes the most pronounced inclination to invest in this product. Ceylon planters and capitalists, with the decline of coffee, have had little cause to congratulate themselves on their connection with the Malay Peninsula, yet it is undoubtedly owing chiefly to the visits to, and personal inspection of, our rubber estates, by some of their foremost men, that they are willing and anxious, if they can get an opportunity, to put more money in. Such support, in your Committee's opinion, is of infinitely greater value to the country and to the enterprise, than would be the influx of capital where expert knowledge on the part of its investors, was absent. As far as it is possible to judge at present, the Malay Peninsula appears to possess every factor necessary to the successful cultivation of rubber. Climate, soil, transport facilities, the quality of the product, and the yield of the trees, leave little to be desired. As regards labour, this country is at any rate, infinitely better off than any other with which we will be brought into competition, excepting Ceylon, and India itself, where, however some of the other conditions are far less favourable. It may be contended that little is known of the yield over a large area, which is true, but on the other hand we *do* know what considerable numbers of indifferently cultivated individual trees have given, and there is no reason whatever for fearing that our average yield will be less than that of any other country. The vexed question of the proper distance to plant, has yet to be settled and your Committee would urge upon all those interested, to institute experiments, if they have not already done so, with the object of arriving at a definite conclusion. The distance perhaps most in favour at present is 15′ by 15′, which, allowing for sites for buildings, roads, etc., gives about 175 trees to the acre. 10′ by 10′ planting provides more than double that number, and it is a question for serious consideration whether the closer distance is not the best, in view of the very slight additional outlay, and the fact that superfluous trees can always be removed at will. Providing the cost of collection be not prohibitive, the best financial results will be secured from the largest returns per acre, not per tree, and although it must be apparent to all that a space of 10 feet is not sufficient for a tree with a natural spread of, say, 60 feet still, it is possible that the gross returns from six small trees may be more than from one large one, and also that a system of coppicing may be introduced, or some other method for artificially retarding the upward and whippy growth, and thickening the stems, with a corresponding increase in yield. If such a result can be achieved, those who have their estates planted 20′ by 20′, will find themselves unable to put matters right, for supplies, and additional trees, planted after their neighbours have had a year or two start, rarely make good growth. The best method of tapping has not yet been definitely settled either. Ceylon planters appear to favour small V shaped incisions cut fresh every day. Short herring-bone cuts, gradually widened out by the daily removal of a thin slice of bark, to make the latex flow afresh, are most in vogue in this country, and some interesting experiments are now being carried on in the Singapore Gardens under the direction of Mr. RIDLEY, which may prove to be the best of all. The injury to the tree is practically nil only a small piece of bark, about 2″ long by $\frac{1}{4}$″ wide, being removed at a time, and although the daily yield is naturally very much less than by the other methods, the cuts being few and far between, still it seems probable that tapping may be continued almost the whole year round, which of course has also an important bearing upon the distribution of labour. The curing of the latex is now so thoroughly understood that no remarks upon the subject are called for here, but your Committee would draw your attention to the unanimous opinion of all the manufacturers that absolute purity and freedom from foreign matter, is the most important point of all. The latex is easily strained, and all impurities removed, and if, in course of time, over-production begins to make itself felt, those who have established a reputation for the quality of their produce will be the last to suffer.

GUTTA RAMBONG (*Ficus elastica*).—A small sale of this rubber from about 4 year old trees was put through at $190 per picul, the average yield per tree being about 10 oz. The lot in question was the most ordinary "scrap" and for really good stuff a much higher price would probably have been paid. The cost of collection was very heavy, the quantity being only a very small one, still the margin of profit is sufficiently wide, at the price quoted, to make the cultivation of Rambong well worth considering. This variety has the advantage of yielding nearly two years sooner than Para, and gives a heavier return per tree. It is also cheaper to open, being planted not less than 30′ by 30′, spreads with great rapidity, consequently keeping the weeds down well, and is indigenous to the country. It moreover grows with great luxuriance in well-drained peat land where no other cultivation does any good at all. Tapping is easy, and requires nothing like the care that is necessary with Para, but the latex is slow to coagulate when poured out in pans, and the value of really good Rambong "biscuits" is at present an unknown quantity. The idea seems to be that the quality of this rubber is inferior, but so little is known about it when really carefully prepared, and the price realised for the "scrap" referred to was so satisfactory, that it would certainly appear to merit much greater attention.

For the Committee,

HERBERT M. DARBY, E. V. CAREY,
Honorary Secretary. *Chairman.*

NOTICE.

It is suggested that Subscribers who are not residents of Singapore should send Money Orders in preference to Cheques in order to avoid the loss due to Bank discount.

EXPORT RETURNS OF COFFEE AND RUBBER FROM THE STATE OF PERAK FOR 1902.

Articles.	Quantity Exported.	Value.
		$
Copra	716,504 Katis	68,231
Coffee	498,647 do.	93,613
Gutta	2,062 do.	3,051

STATEMENT OF COOLIES EMPLOYED ON, AND RECRUITED FOR ESTATES IN THE FEDERATED MALAY STATES, DURING 1902, INCLUDING STATEMENT OF BIRTHS AND DEATHS.

No. of Coolies on Estates on 1st January, 1902.	No. of Coolies Recruited in India during 1902.	No of Coolies Recruited Locally during 1902.	Total.	No. of Coolies Paid Off in 1902.	Deaths during 1902.	Births during 1902.	Total No. of Coolies on Estates on 31st December 1902.	REMARKS.
3,008	1,269	170	4,536	1,040	106	69	3,459	No returns received from Negri Sembilan, and only one from Perak, Jebong Estate, which is included in this statement.

RETURN OF EXPORTS OF COFFEE, COPRA AND RUBBER FROM SELANGOR DURING 1902.

Names.	Pickuls.	Amount.	Remarks.
		$ c.	
Coffee	48,906 83	869,565 01	
Copra	15,146 86	144,770 13	
Rubber (Para) ...	— 24	60 00	

(Sd.) W. G. C. WALTER,
Registrar of Imports and Exports,
Selangor.

Singapore.

Abstract of Meteorological Readings for the month of April, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·852	145·3	80·9	88·6	74·7	13·9	77·9	·895	78·8	80	E.N.E S.S.E.	9·32	2·66

K. K. Hospital Observatory,
Singapore, 16th May, 1903.

A. B. LEICESTER,
Meteorological Observer.

J. LEASK,
Acting Principal Civil Medical Officer, S.S,

Penang.

Abstract of Meteorological Readings for April, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·896	150·0	81·3	91·2	74·1	17·1	76·6	·821	71·9	71	S.	5·43	1·75

Colonial Surgeon's Office,

Penang, 8th May, 1903.

M. E. SCRIVEN,

Asst. Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for April, 1903.

Districts.	Max-imum in Sun.	Mean Dry Bulb.	Temperature. Max-imum.	Temperature. Min-imum.	Temperature. Range.	Hygrometer. Mean wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Humi-dity.	Total Rainfall	Greatest rain-fall during 24 hours.
Taiping ...	152	82·75	93	71	22	77·66	·883	79	16·80	2·09
Kuala Kangsar ...	...	82·10	95	72	23	76·57	·840	77	3·49	1·10
Batu Gajah ...	161	82·46	94	72	22	77·67	·882	80	7·09	1·34
Gopeng ...	...	81·57	93	65	28	76·96	·866	81	8·61	1·13
Ipoh ...	...	82·33	95	71	24	77·26	·868	79	7·28	1·76
Kampar ...	...	...	92	70	22	...	...	...	17·09	3·21
Teluk Anson ...	...	82·38	92	70	22	77·69	·884	80	13·11	2·67
Tapah ...	..	82·67	94	70	24	78·00	·896	80	11·02	1·87
Parit Buntar ...	...	82·37	93	71	22	77·76	·883	80	8·55	2·71
Bagan Serai ...	...	82·16	92	71	21	77·47	·875	80	7·16	4·37
Selama ...	...	81.93	92	72	20	77·66	·890	82	17·11	8·35

STATE SURGEON'S OFFICE,
Taiping, 9th May, 1903.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for April, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29.891	132.7	80.5	90.4	70.8	19.6	76.6	0.845	74.1	81	Calm.	9.22	1.69
Pudoh Gaol Hospital „	...	...	...	no record			...	...	...	...	...	7.62	1.23
District Hospital „	...	...	...	...	...	...	...	...	...	...	...	7.23	1.42
„ Klang	...	...	...	86.3	75.4	10.9	...	...	...	...	...	3.85	1.60
„ Kuala Langat	...	...	...	86.0	73.0	13.0	...	...	...	...	...	5.89	1.44
„ Kajang	...	...	...	87.8	76.3	11.5	...	...	...	...	...	9.94	2.30
„ Kuala Selangor	...	...	...	88.7	77.5	11.2	...	...	...	...	...	6.79	2.83
„ Kuala Kubu	...	...	...	93.6	72.9	20.7	...	...	...	...	...	8.63	2.08
„ Serendah	...	...	...	89.5	76.7	12.8	...	...	...	...	...	11.51	2.08
„ Rawang	...	...	...	87.2	75.5	11.7	...	...	...	...	...	10.24	2.50
„ Jeram	...	...	...	...	...	...	...	...	...	...	...	5.18	1.70

State Surgeon's Office,
Kuala Lumpur, May, 1903

E. A. O. TRAVERS,
State Surgeon, Selangor

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for April, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raub, ...		...	...	...	...	...	...	...	...	...	...	...	...
Bentong ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pekan ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kuantan, ...	...	...	...	86·0	73·0	13·0	...	...	...	...	...	5·57	4·65
Temerloh ...	...	...	...	95·0	73·0	22·0	...	...	...	...	...	3·66	1·12

A. ANNESLEY WOODS,
District Surgeon, Pahang.

Pekan, 1st May, 1903.

Muar.

Abstract of Meteorological Readings for April, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	83°	94°	72°	22°	79	...	..	...	S. W.	4·44	1·08

Muar, 1st May, 1903.

FRANCIS PEARS.

No. 5.] MAY, 1903. [VOL. II.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua- "tion regarding new or little known natural or manufactured pro- "ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F. L. S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN

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No. 5.] MAY, 1903. [VOL. II.

RATTANS—(*Concluded*).

The genus *Dæmonorops* includes two groups, the *Cymbospathæ* with very short panicles of flowers which are at first enclosed in boatshaped spiny bracts, and the *Piptospathæ* in which the inflorescence is much longer, and not entirely enclosed in the first outer bract. These plants have stems shorter than the *Calami*, and none are as thin as some of the latter, nor are they considered as valuable to the rattan collector. They fruit heavily and as they are, as a rule, not collected for trade purposes, and so not exterminated, several species are among the most abundant in our forests.

Among them are Rotan Sabut, or Rotan Buah *Dæmonorops Hystrix*; Rotan Getah or Rotan Hudang, *D. Didymophyllus*; Rotan Kerai, Kamunting, Gulang, *D. geniculatus*; Rotan Dudok, Machap, *D. longipes*.

Several of the species have in the fruit scales a peculiar red resin, known as Dragon's blood, and such rattans are known as Rotan Jerenang.

Rotan Sabut, *Dæmonorops hystrix* is a very common stout rattan 30 or 40 feet long, with long pinnate leaves with narrow leaflets, armed with a long thorny flagellum. The stem is very thorny and the mouth of the sheath armed with very large erect flat thorns 3 inches long, by which it is easily known. The flower and fruit sprays are very long, and it produces great masses of light yellow oblong fruits.

The cane is about half an inch long with joints four inches in length. I doubt if it comes into trade to any extent but is used for rigging of ships, split rattan and other purposes of this nature.

The Rotan Kerai or Gulang, *D. geniculatus* is a shorter very stout rattan with an exceedingly thorny stem, covered with long yellow thorns. The long leaves have the leaflets in groups with a space between. It is very abundant in our forests, and is usually about 15 or 20 feet long. The cane is over half an inch through, the joints 7 inches apart and thick. This makes good walking sticks but does not seem to be much in request.

The *Korthalsias* are recognized by their peculiar cuneate leaves usually white underneath and the subterminal inflorescence of thick woolly spikes. In several species there is at the top of the sheath a swollen ocrea used as a nest by ants, whence these rattans are known as Rotan Semut. The best of these is the long slender species *Korthalsia scaphigera,* with a slender stem 50 or 60 feet long and about a quarter to half an inch through. The leaves a foot or more, light green above white beneath, with a few rhomboidal cuneate leaflets, about 6 or 8 inches long and 2 inches across, the petiole 4 or 5 inches long very thorny, as is also the sheath. The ocrea is rounded about an inch long. There is a long very slender flagellum at the end of the leaf.

The cane itself is a quarter of an inch or less through, the joints not very conspicuous 3 or 4 inches apart. This is a very good quality rattan for tying, split rattan, and basket work. It fruits abundantly when fully grown, and grows tolerably fast when it gets sufficient light.

K. echinometra, Becc., is also a common species and attains a length of 60 feet or more. The leaves are 4 feet long with a long flagellum, the leaflets are narrow green above and white beneath, the ocrea is oblong 2 or 3 inches long and armed with slender thorns, so that it is easily recognized. The cane is little more than ¼ inch through, strong and flexible, the joints not very conspicuous 6 inches apart. It is brownish in colour much less white, than most rattans.

Plectocomia, Rotan Dahan, is the largest rotan in the Peninsula and is very abundant. The stem is about 150 feet or more long rooting along at the nodes where it touches the ground, the lease is comparatively slender, 1 inch through with joints 8 inches long, as it ascends it thickens rather irregularly, getting thickest at the top, about 2¼ inches through. The leaves are about 12 to 15 feet long ending in a powerful flagellum, the leaflets broad and lanceolate, 20 inches long green above white beneath, two or three together with a space between. When the stem has reached its full height it usually flowers. The plants are unisexual. The inflorescence is an enormous mass of very long spikes of brown bracts with a few yellow flowers in each. The fruit as already described is round dark brown with recurved tips to the small scales.

The great thickness and irregularity of diameter of this rattan make it of very little value but it is used for legs of long chairs and mining baskets. The common species here has been described as *P. Griffithii.* I doubt however, that it is more than a form of *P. elongata.*

Cultivation of Rattans in Sumatra.

I am informed that the Malays at Palembang are cultivating two species of rattans for the market, *viz.*, Rotan Segar Perak and Rotan Segar Benar. The former is probably the *Calamus calsius* described above. The latter is not yet identified. The seeds are sold at 50 cents a gantang. It takes 6 or 7 years before the rattans can be cut, when it has produced the seed. The canes are not cut till the seed is produced.

Trade in Rattans.

For the following information on the trade in rattans in Singapore we are much indebted to Messrs. BEHN MEYER & Co.:

H. N. RIDLEY.

The varieties of Rattans exported to Europe and the United States of America and their native names.

1. Rattans from Borneo:

		per picul.
1	Sincoelorans	$12 to $15
2	Bentulus	14 ,, 16
3	Boojongs	12 ,, 15
4	Stout Labuans	13 ,, 16
5	Sandakan Segars	12 ,, 15
6	Pontianak Straits	5 ,, 6
7	Cotie Passirs	18 ,, 22
8	,, Pakays	22 ,, 26
9	Passir Pakays	21 ,, 25
10	Pulo Lauts	19 ,, 23
11	Boolongan Segars	17 ,, 19
12	,, Jekabs	12 ,, 13
13	Cotie Jekabs	11 ,, 13
14	Brown Segars	13 ,, 15
15	,, Jekabs	11 ,, 13
16	Boojew Pakays	17 ,, 20

2. Rattans from Celebes:

1	Toehitis	6 ,, 8
2	Stout Dongalas	5 ,, 7
3	Toli-tolis	5 ,, 7
4	Singkangs	7 ,, 9
5	Pagoyamas	10 ,, 13
6	Loewoes	$5.50 to $6.50 ℔ pl.
7	Taboenkoes	6.50 ,, 8.00 ,,
8	Salabangkas	5.00 ,, 6.00 ,,
9	Talauts	5.00 ,, 6.00 ,,
10	Kiris	6.00 ,, 10.00 ,,
11	Selumpirs	5.00 ,, 6.50 ,,

3. Rattans from Sumatra:

1	Kroe Segars	16.00 ,, 19.00 ,,
2	Palembang Segars ...	14.00 ,, 16.00 ,,
3	,, Ayers, white	5.00 ,, 6.00 ,,
4	,, ,, red	6.00 ,, 7.00 ,,
5	Padang Segars ...	11.00 ,, 15.00 ,,
6	,, Ayers ...	6.00 ,, 7.50 ,,
7	Penang Segars ...	13.00 ,, 16.00 ,,
8	,, Ayers ...	6.00 ,, 7.50 ,,
9	Lampong Segars ...	14.00 ,, 16.00 ,,

4. Rattans from the Malay Peninsula:

1	Kelantan Segars ...	14.00 ,, 17.00 ,,
2	Muar Segars	10.00 ,, 13.00 ,,
3	Pahang Segars ...	5.00 ,, 7.00 ,,

2. *Prices of different vareties see above.*

The values given represent an average of the last two years:

3. *Fluctuations in price during the last five years:*

We saw very high prices in 1900 especially for better grades from Cotie (Borneo), the drop in Exchange during the last years and as a consequence the low value of the Straits Dollars as compared with Dutch guilders has the effect that prices generally went up and just at present we may say that owing to a more limited demand for the United States of America and for Europe the quotations for Rattans have given way, although not at all to the same extent as prices went up some two or three years ago.

4. *Is the supply diminishing?*

No, not at all, supplies are heavy and have been heavy all the years, at any rate we cannot say that the article on the whole has lost any ground whatever.

5. *Destination.*—By far the most of all Singapore Rattans are exported to the Continent, Hamburg and Bremen are the principal places for the export, besides Havre, Amsterdam, Marseilles and Genoa. The United Kingdom too is one of the importers of Rattans, Liverpool and London being the centres for this trade. The United States of America do also an important Rattan business, mostly in the very best grades obtainable. The United States factories buy these Rattans in nearly always prepared qualities (washed, smoked, measured) while Europe receives by far the bulk of the imported rattans in original quality.

6. *Uses.*—Manufacturers use rattans for making whips, baskets, chairs, corsets, mats, mattresses, bentwood furniture, fancy rattans furniture.

The better the colour of any rattans, the better the quality and more expensive is the Cane. Hard material is wanted with a good rattan and the length is worth a good deal. Thinner grades are all round better paid than thicker ones. A yellowish looking rattan with a medium measurement and good length and strength is always sure to fetch good prices.

RATTAN EXPORT 1897 TO 1902.

	United Kingdom.	United States.	Continent.	Total.
	Weights in	piculs of $133\frac{1}{3}$	lbs. a.d.	
1897	56,264	56,454	248,873	361,591
1898	31,582	61,002	203,478	296,062
1899	61,089	46,225	217,124	324,438
1900	73,303	100,938	231,525	405,766
1901	46,332	101,969	190,355	338,656
1902	41,274	69,752	170,939	281,965
Total				2,008,478

BEHN MEYER & CO.,

A. JAHNS,

Singapore, 28. 5. 03. *Rattan Department.*

Extracts from the annual report of the Inspector of Coconut trees, Federated Malay States, for the year 1902.

3. In October, I was able to make a partial inspection of the districts of Kuala Lumpur, Klang and Kuala Selangor, and owing to the serious harm I found being done by the beetles in these localities, I deemed it best to confine my attention to the State of Selangor at first, and with the exception of a short visit to Negri Sembilan, I have devoted my attention entirely to this State.

5. I found trees cut down under instructions either lying on the ground or half buried, rotten and simply full of the grub and beetles, while the stems that remained, perhaps three feet or so above the ground, in an equally infected condition. In addition to this, no proper steps had been taken by the authorities to have the numerous rubbish, refuse and manure heaps lying about in the vicinity of the towns and villages destroyed, the dumping grounds in a most unsatisfactory state and the owners of cattle sheds utterly callous as to the removal or where they put their manure, in fact the general state of affairs was such that no one with any experience at all could have been surprised at the inroads and havoc done by the beetles to the trees adjacent with such a harvest of "hot-beds" for breeding grounds for these pests.

6. It is true that many of the owners were shamefully neglectful of their plantations, but the surroundings so conducive to the harbouring of the beetles, placed them without doubt at a great disadvantage. I may mention here that the few trees belonging to Government themselves were in a very bad state and as an example appeared to me to be deplorable.

7. With this state of affairs, by no means exaggerated, and the evil spreading, it is easily accountable how some hard things which appeared in the *Straits Times* regarding the difficulty of coconut cultivation in the States should be taken as having more than a semblance of truth in it.

8. Referring especially to the localities where the beetles have proved most troublesome, I feel sure, slowly perhaps, but surely and in time, it will be possible to eradicate the evil and bring about a distinct change for the better in the appearance of the plantations, and also I hope entirely to remove all grounds of complaint on which the correspondence above alluded to was founded.

9. It is very noticeable how much the plantations improve the further you proceed from the towns and villages, which strengthens the opinion which I first formed that the evil to a great extent was attributable to the large quantity of grub in the manure and rubbish heaps that have been allowed to collect in these vicinities, and the beetles, taking advantage of these breeding places and the shelter made by them in the trees attacked, have gradually spread their way to the plantations further away; in a word, the plantations situated at any long distance from the towns and villages have not been infected by these pests in nearly as serious a degree

and the trees here ought with proper supervision to recover themselves in a few months.

10. I have naturally had great trouble with the natives, who are very indifferent to looking after their plantations, and although I have done my best to use persuasive means and point out to them how much it is to their benefit to keep the plantations properly cleaned &c., I have not met with the response I would have liked. However, it has not been entirely without success and some of the owners are at last beginning to see the advantage of giving more attention to their gardens, and by perseverance and other means I still hope that the majority may ultimately be brought round to see where their interest lies and become better agriculturists. In any case, it is encouraging to know that the cultivation is rapidly extending.

11. The largest estates owned by Europeans are in the districts of Kuala Langat and Klang, and as regards these plantations I am pleased to say I am able to report most favourably. They vary in size from about 200 to 500 acres in extent, trees looking strong and healthy and of superb growth. I may, in passing, mention Klanang Estate near Jugra, about 450 acres under cultivation, and although the oldest trees are not more that five years in age, still several of them are now in bearing. I am sorry to say that the white ant has been very troublesome in these parts.

12. There are many fine plantations also all along the coast of Selangor, mostly native holdings. The land everywhere in these parts is most suitable for coconuts, and for some miles inland. In my opinion, it is a perfect home for coco-nuts, the trees come quickly into bearing, produce magnificent crops, and owing to the fertility of the soil, they absolutely require no manure; it would therefore I think be difficult to find any locality where the coco-nut palm can be grown under more favourable conditions.

13. With these advantages I anticipate the cultivation of coconuts may prove in a few years to be one of the most important agricultural industries in the State, provided it is properly encouraged and guarded; and I think I cannot do better than conclude this report by repeating the views I have previously expressed on this subject, which, though general, certainly apply to the State of Selangor.

14. I feel confident the encouragement and continued protection of the cultivation must add very materially to the future prosperity of the States. The area under coco-nuts is already very extensive the soil exceptionally fertile and particularly suited to the growth of the trees, while there is plenty more good land available. I may be considered partial, but I am of opinion, taking it all round, that the production of coco-nuts is probably one of the safest and most paying of the agricultural industries in the States, and certainly the most lasting, with very ordinary care and practically at small expenses; but I think the great advantage lies in the fact that the native, with comparatively small means, who owns his five, ten, or twenty acres, properly kept, is, in his own way, as well and comfortably off as the more wealthy owners of the larger estates, and

for this reason alone the furthering of the cultivation must prove the means of subsistence in comport to a large number of the inhabitants and add generally to their welfare as also to the benefit of the States both directly and indirectly.

L. C. BROWN,
Inspector of Coco-nut Trees, F. M. S.

From the Selangor *Government Gazette* of 15th May, 1903.

THE CAMPHOR TREE.

Dyrobalanops aromatica.

The Camphor tree, *Dryobalanops aromatica,* Gaertn, belonging to the order *Dipterocarpeæ,* is a native of Sumatra, Borneo and the Malay Peninsula, where however it appears to be very local, at present the only localities known for it here are the Endau River, Johor, Rawang in Selangor, Kwantan in Pahang where it has just been discovered by Mr. CRADDOCK and at Bundi in Kemaman. Some account of it has already been published in Vol. 1 p. 61 of the Bulletin and an account of its collecting and the peculiar customs connected with it in the Journal of the Straits branch of the Royal Asiatic Society Vol. 26 p. 35.

Mr. CRADDOCK sends the following notes together with specimens of wood leaves, a seedling, and the two forms of Camphor.

"There are said to be three kinds of Kapor found in the forests of the northern part of Kwantan in the vicinity of Baloh viz. Kapor tembaga or Kapor batu, Kapor bunga and Kapor Tuman." The specimens he sends are those of Kapor Tembaga which proves to be *Dryobalanops aromatica,* Gaertn.

The other two kinds are not yet identified, no specimens of them having been received. I heard lately however from Mr. NISBET who was travelling in British North Borneo lately that there also were three recognised species of Camphor tree. There are altogether four kinds of *Dryobalanops* described viz. *D. aromatica,* Gaertn, *D. beccarii,* Dyer, *D. oblongifolia,* Dyer and *D. lanceolata,* Burck. The last three are only known at present from Borneo.

D. aromatica, is a very large tree about 150 feet tall and three or four feet through and buttressed at the base, adult leaves round with a long point 2 inches long 1½ inch wide, point ½ inch stiffly coriaceous with a short $\frac{1}{6}$ inch petiole. They are polished green, with a turpentiney scent. Young leaves of seedlings are larger and narrower as well as thinner. The flowers in small terminal bunches about 2 inches long. They are white and sweet scented with a calyx of 5 lobes oblong obtuse ¼ inch long, 5 ovate petals barely as long and 20 linear stamens with very short filaments.

The fruit is 3 inches long including the wings, the calyx cup is short and broad about ¼ inch long and ¾ inch across, the lobes developed into oblong blunt wings narrowed at the base 2¾ inch long nearly ¾ inch wide red.

The Kapor batu yields says Mr. CRADDOCK the following products.

"Minyak an oil which is obtained in the same way as other wood oils," *i.e.* by cutting with a chizel a hole in the trunk sloping downwards and flat or excavate at the base and lighting a fire inside.

"This oil is mixed with Getah Sampang (a product I have not yet come across) the mixture boiled and used for varnishing Kris-scabbards."

Getah obtained from wounds and incisions in the inner bark and sap-wood. This dries hard and can be crushed with the fingers into a white powder something after the fashion of rosin. This powder is used as an application for wounds.

Isi Kapor, this is the true Camphor and is obtained as a crystalline deposit in longitudinal crevices in the heart of the tree. All trees do not have it and there is great waste occasioned by felling large trees on the chance of their containing it. I saw two large trees felled outright and several badly hacked to the centre to see if they had the Isi. The headman of Sungei Karang buys up all the Isi at 25 dollars a catty. In Tringanu the Camphor collectors get 40 dollars for the same product."

The Camphor oil, (Minyak) is valued by the Malays as a rheumatism Medicine. Specimens of it were sent home from the Camphor forests in Selangor in 1898 and Mr. J. C. UMNEY reported on it, he said "the oil consists in all probability of the more volatile portions only almost solely of Terpenes so far as I know it would have no medicinal virtue nor any commercial value over ordinary turpentine oil. It differs very largely from Camphor oil (from Cinnamomum Camphora) imported into this country containing large quantities of Saffrd.

Specific gravity at ... 15°c. = .856
Optical rotation in a tube of 100 mm + 29°
It completely distils between 156° and 160°c.

This sample was a distilled one from the wood, probably the heavier and less volatile oils were left behind in the still. It might be as well to have the oil reinvestigated, the minyak being taken in the usual Malay way.

"Papan Kapor, at Cherating a certain amount of timber is sawn into planks which are brought by men from Kelantan and Tringganu for coffins, its price being less than that of Chengie."

The Getah Kapor seems to represent the Damar of other Dipterccarpeæ. Thc specimen sent is in pipe form, very light yellow powdering white, and of a very strong Camphor odour, but somewhat turpentiney.

The Isi Kapor, is crystalline and white and the sample sent "number Dua" has a somewhat foxy smell.

H. N. RIDLEY.

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BARRINGTONIA SEED AS A SAKAI FOOD.

From Mr. W. H. CRADDOCK of the Forest Department, I have received specimens of a fruit and seed of a species of Barringtonia of which he writes as follows. I send you an article of Sakai Diet which I procured at a Sakai camp near here (Kuantan). The Malays call it Putat Gajah. The large kernel of the fruit is grated on a thorny piece of cane a yard long, (the kernel being rubbed up and down like a fiddle bow with rosin) water is added to the gratings and squeezed out by hand as a milk not unlike the milk from coconut gratings. This milk is allowed to settle in boat-shaped dishes of palm sheaths, the water is decanted off and the deposit made into cakes which are roasted and eaten. The gratings if eaten before water is added are said to make one "Mabok" (sick.)

With the specimens came the cane used for grating, a portion of stem of a Calamus the sheaths of which was removed at one end so as to make a handle, and the thorns on the upper part removed so as to leave their bases only which made the cane rough enough to act as a rasper. The boat for collecting the milk is about a foot long made of palm sheaths, the ends fastened with split rattan. The barringtonia fruit is about the size of a turkey's egg oval about 4 inches long and 7 inches girth. The pericarp is not very thick about ¼ inch, the endocarp is fibrous and woody nearly as thick, the seed 2 inches across round and grooved, the embryo white and large.

The seeds of several species of *Barringtonia*, are eaten in the Fiji islands and Formosa, but many of them contain an intoxicating property analogous to Tuba which is used in stupefying fish.

I am not certain as to what species of *Barringtonia,* this belongs to. The fruit somewhat resembles that of the sea-shore *B. racemosa,* Roxb. but is larger than any form of that which I have seen. There are at least eleven species of the genus in the Peninsula of several of which ripe fruit is unknown.

The name Putat Gajah, I have found applied to several species viz. *B. fusiformis*, *B. sumatrana* Miq. and *B. Scortechinii,* King I suspect that this fruit belongs to the latter species of which I have not seen ripe fruit. The name Putat applied to all species of *Barringtonia*, here. Pudja or Pucha (in Macassar) is doubtless connected with the word Vutu applied to them in Fiji.

EDITOR.

THE MOSQUITO PLANT.

Ocimum viride.

A good deal of interest has been caused by the discovery in Africa of the fact that a kind of wild basil there viz. *Ocimum viride* has been found to keep away Mosquitoes when planted in or round houses, as seeds of this plant have been received in the Botanic Gardens, Singapore, and have germinated well, it may interest our readers to see what has already been within about it, when the plants have grown sufficiently to give a supply of young plants for distribution it is hoped to be able to distribute it to various parts of the Peninsula to test its beneficial qualities. The following letter from Captain LARYMORE appeared in the Times Weekly of May, 2nd.

THE MOSQUITO PLANT.

To the Editor of the Times.

SIR,—A growing specimen of the "mosquito plant" (*ocimum viride*), which I have just succeeded in bringing home alive from Northern Nigeria, has been accepted by the authorities at Kew, where it can now be seen.

I can personally testify to the extraordinary effect which is produced on mosquitos by the pleasant odour of its fresh leaves, and, by placing two or three growing pots of the plant in each room and along the windward verandah, a house can be kept practically free from these insects.

One of the malaria-giving specimens which I caught alive and tenderly enclosed within a leaf of the plant lost consciousness in a few seconds.

The scent of the bruised leaf partly resembles wild thyme and eucalyptus. The ordinary wild mint, the leaves of which are somewhat similar, should not be confounded with it. The natives where the plant is found prefer an infusion of its leaves to quinine in cases of malarial fever when they themselves or their children are attacked, and declare that, at any rate for them, the infusion invariably proves more efficacious than our antidote.

The schools of medicine which follow the modern mosquito-malaria theory might therefore give the matter some attention in the way of experiments on fever patients.

In India alone, where soldiers in barrack rooms are not supplied with mosquito nets, the use of the plant would prove an undoubted comfort, even if found wanting as a complete protection against malaria.

I am, &c.,

H. D. LARYMORE, Capt. R.A.,

Northern Nigeria.

Christ's College, Cambridge, April, 26.

HISTORY OF THE SERINGUEIROS.

In the January number of the Bulletin, I published a translation of Chapter I of a pamphlet entitled the "Heveas or Seringueiras" by the Director of the Botanic Gardens of Rio de Janeiro, Brazil. This chapter gives a short history of the Para Rubber industry from the remote past to the present day.

Professor A. H. KEANE, F. R. G. S. our most eminent ethnologist, and author of innumerable works on ethnology, philology and kindred subjects, to whom I submitted a copy of this translation, has written to me a letter in which occurs the following criticism, viz:

"Many thanks for the Agricultural Bulletin, which I was glad to "have. Mr. RODRIGUES is evidently a sound historical botanist, "but he makes a fearful hash of the ethnological side of the rubber "question. The *Nauhás* as he spells the name, are the *Nahuas* "(*Nahua*, plural of *Nahuatl*) general name of the *Nahuatlan* "family, of which the Aztecs are a branch. But none of these ever "reached South America at all, and it is quite certain that the "southernmost Aztec colonists were the now extinct *Seguas* "(*Siguas* or *Sivas*) of the Chiriqui Lagoon, where they were met by "the first Spanish invaders of the present Costa Rica district. "Segua meaning "Outlanders" "Aliens", was not their real name, "but that given to them by the Chiriqui natives, who of course "looked on them as intruders. They probably called themselves "*Pipil* (plural of *Pilli*) "Masters" Superior persons" as did all "the Aztec settlers of Nicaragua and other parts of Central America. "With them the Omaguas had nothing whatever to do, though he "is right in saying that these were called *Cambebas* (or *Cavpewas*) "*i.e.*, "flatheads" in the Tupi language, the *lingua geral* of Brazil "since its adoption by the Jesuit missionaries. But his derivation "is wrong; it comes not from *akong* head and *pena* flat, which are "no words, but from *akanga* head and *pewa* flat, which are good "Tupi. The Omaguas themselves were a distant branch of the "great Tupi-Guarani stock, and had penetrated up the Amazons "to the Peruvian Montaña (its upper reaches, Solimões and Mara-"ñon) before the advent of the whites. He should consult on all "these matters J. C. R. Milliet de Saint Adolphe or rather the "Portuguese translation ("Diccionario Geographico Historico e des-"criptivo do Imperio do Brazil" &c. &c. Paris 1863) from Milliet's "French ms. which I believe was never published. * * * *

"You are quite welcome to put the above *corrigenda*, into the "next Bulletin, if so disposed."

A. D. M.

Journey to a Rubber Plantation on the Isthmus of Columbia.

BY C. O. WEBER, Ph. D.*

(Concluded from page 371.)

The Latex.—I have already stated that the latex obtained from Castilloa elastica at Las Cascadas does not flow like milk, but issues from the cuts in the form of a thick cream containing a very high percentage of india-rubber. This is certainly curious in view of the fact that the same tree in other districts produces a fairly thin milk, although I have been told that the Castilloa trees in certain districts of Guatemala and Venezuela exhibit the same pecu-

* From the India Rubber and Gutta-Percha Trades' Journal, Sept. 29. 1902.

liarity. I have not been able to discover any reason for this difference. It cannot be due to a difference of species, nor to the elevation at which the trees are growing, nor to the temperature-limits of the respective districts, as in other districts, at both higher and lower elevations, and higher and lower temperature limits, *e.g.*, Mexico on the one part, and Ecuador on the other, the Castilloa trees produce a perfectly fluid latex. It is not impossible that the condition of the soil, and the annual rainfall may have some influence upon this point, but in the absence of any positive proof I prefer to leave this matter for the present undecided.

The latex of Castilloa at the moment of issuing from the cuts forms an almost pure white, thick creamy mass, which, however, almost immediately begins to discolour, assuming at first a pale drab colouration, which, in the course of a very short time darkens into a brownish black. This phenomenon, which is at least one of the causes of the very bad colour of all the Central American rubbers of the present day, in fact, of all the rubbers obtained from Castilloa elastica, I found to be due to the presence in the latex of an oxidising ferment (oxydase) and it is, therefore obvious that in attempting to produce a high-class, pure rubber from Castilloa latex the presence of this ferment has to be taken into consideration.

The taste of the Castilloa latex is intensely bitter. This appears to be due to the presence in it of a substance of the class of bodies chemically desçribed as glucosides. It is this same body which is the cause of the intense dark green colouration produced by the addition to the latex, or better to its aqueous vehicle, of a few drops of a solution of ferric chloride. I presume that this reaction has been observed before, and led the observers to the altogether erroneous assumption that the Castilloa latex contains tannic acid, which latter as is well known, produces much the same colouration with ferric-chloride. As a matter of fact, there is not the slightest trace of tannic acid to be found in this latex, and I doubt whether it occurs in the latex of any other rubber tree. It is really only necessary to state that the latex of Castilloa elastica, beside the bodies already named, contains a very large proportion of albumen, and to remind the reader that albumen may be quantitatively precipitated with tannic acid, in order to prove that the presence of tannic acid in the latex is an impossibility. Indeed, on adding to solution of the aqueous vehicle of the latex of Castilloa a few drops of a dilute solution of tannic acid, a most copious precipitate of albumen-tannate is at once obtained. Considering that all the different specimens of rubber latex I have so far an opportunity of examining contain albumen in varying quantities, though none as much as the latex of Castilloa elastica, is at the same time sufficient proof of the absence of tannic acid in every case.

A quantitative determination of the amount of albumen and albuminous matters in general in the latex yielded the rather surprising result that there is as much as 11 per cent. of these bodies present. This, I believe, is the cause of the extreme ease with which the latex of Castilloa elastica can be coagulated. I am quite aware that this has been attributed to the comparatively large size of the rubber globules in the Castilloa latex, but for reasons, based upon evidence, I shall produce in another paper on this important subject, I believe this assumption to be erroneous.

In my communication I showed that the latex of an 11 year old Castilloa tree contains 31 per cent. of pure rubber, and it will, therefore, be seen from the above statement regarding the amount of albuminous matter in the latex that if we coagulate the latter without first removing from it this albuminous matter we obtain a rubber containing over 25 per cent. of albuminous matter. The native rubber collectors prepare the rubber from the latex in such a way that at least part of the aqueous vehicle of the latex is drained away before coagulation takes place, and consequently we never find a Central American rubber (crude) which contains as much as the above stated quantity (25 per cent. of albuminous matter), but lots containing from 9 to 13 per cent. are quite common. It is indeed the presence of such a large amount of albuminous matter in the Central American and some other Castilloa rubbers which is largely responsible for their frequently reaching American and European ports in a state of pronounced putrid fermentation, of the atrocious smell they emit on washing, and of their often very unsatisfactory behaviour in the process of vulcanisation. When such rubber in a state of advanced putrid fermentation is subjected to the washing process a very considerable proportion of the coagulated albuminour matter, rendered soluble by the fermentation, is removed, but the rubber, although not taking itself an active part in this fermentation, is, nevertheless, found to have suffered more or less severely from it, to possess little strength, and, after vulcanisation, only very moderate distensibility (elasticity). If, on the other hand, the rubber reaches the factory in fair condition, it contains practically the whole of the albuminous matter in an insoluble condition and so intimately intermixed with the rubber that the washing altogether fails to remove more than a mere trace of it. We obtain then a washed rubber, which contains a very large proportion of albuminous matter, the presence of which in the washed and dried rubber is scarcely noticeable, but which is the cause of such rubber forming invariably a peculiarly "short" and none-resilient vulcanisation product. It will thus be seen that whatever happens to such rubber during transit it is always a very inferior product from what it might be if the albuminous matter were kept out of it. In fact, I scarcely think I want any further justification for the statement that the Castilloa rubber of the present day owing to the above discussed defect, occupies a much lower position than it would hold considering the intrinsic quality of the pure rubber it contains. I am, indeed, of the opinion that properly prepared Castilloa rubber is superior to most of the present day Para grades.

Incidentally I may remark here that the presence of substantial quantities of albuminous matter not only Castilloa rubber, but also in some other (African) brands, and the odour they produce owing to fermentation has given rise to the now almost ineradicable nursery tale that in certain districts the rubber is coagulated by means of one of the by-products in the economy of the human body the use of which would be far more commendable on account of its inexpensive character than for its attractiveness. This fable has never been substantiated, and I believe that its origin is simply to to be found in the offensive urinal smell developed on the fermentation of the albuminous matter in crude rubber.

The methods followed by the native collectors for the coagulation of the Castilloa latex vary considerably:

1. * The latex is washed with water, but just as often this is neglected, and then treated with a decoction of the crushed stem of the moon-plant, Calonyction speciosum. This, according to Dr. MORRIS, is the process practised in British Honduras.

2. The latex is treated with the juice expressed from Ipomœa bona nox which is stated to be highly alkaline. (?)

3. The latex is collected in shallow holes dug in the ground and mixed with a boiling solution of soap in water. This process is extensively practised in the Isthmus of Panama.

5. The latex is treated with a solution of alum.

These various methods call for the following remarks:—All of them effect the so-called coagulation by adding to the latex substances—acids, or alkalies—capable of coagulating the albumen. In other words there is no such thing as the coagulation of the *indiarubber itself*. What takes place is that through the addition to the latex of either an acid, or faintly alkaline solution the albumen, of which I have shown there is such a large amount in the Castilloa latex, is coagulated and carries down with it the rubber globules suspended in the latex. If the latex is entirely freed from all albuminous matter by a carefully conducted series of washings it may still be diluted with water, and then forms a liquid milky liquid of a somewhat lighter colour than the original latex, but otherwise indistinguishable from it. But if we now try to coagulate this albumin-free liquid with any of the abovenamed coagulants we find that the rubber remains quite uneffected, no coagulation taking place. Therefore, whenever we coagulate the rubber, we can only do so by coagulating it in conjunction with the albumen present, and we have at once a product possessing all the irremediable drawbacks which above we discussed at some length.

On the plantation at Las Cascadas, Calonyction speciosum is very common, and I ascertained that decoctions prepared from it have a strongly acid reaction. Therefore, coagulation with such a decoction is simply the wellknown coagulation of solutions of albumen with acids. I have not been able to discover at Las Cascadas Ipomoea bona nox. but I very much doubt the highly alkaline character of its juice which it is almost certain to possess likewise a distinctly acid reaction. The treatment with alum, a process due to H. A. STRAUSS, and purchased from him by the local Government of the province of Pernambuco, owes its coagulating action entirely to the strongly acid reaction of that salt. This process is a bad one from every point of view. The removal of the alum solution from the coagulated rubber is physical impossibility, and the pernicious action of an alum solution upon the drying rubber is quite sufficient

The following footnote should be inserted on page 170:—

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* Note—Calonyction speciosum and Ipomœa bona-nox, are the same thing.—Ed.

to render its continued employment most deplorable. The coagulation with soap as practised in the Isthmus of Panama is barbarous in the extreme, and it is not surprising that it yields a product of very bad quality indeed.

Amongst the above-named process I have not enumerated a process said to be practised in Mexico, and simply consisting in the boiling of the latex in earthen vessels (jacaras). If this process is actually used, it can certainly not be carried out with the fresh latex for the simple reason that over and over again I have satisfied myself that even on very prolonged boiling of the slightly diluted latex furnished by the tree at Las Cascadas no coagulation can be obtained. The cause of this is to be found in the fact that the aqueous vehicle of the latex, although it certainly contains a large amount of albuminous matter when rapidly separated from the latex immediately after this has been obtained, is of a very light olive green colour and even on very prolonged boiling does not coagulate, nor even become turbid. On standing exposed to the air this aqueous vehicle very rapidly assumes a darker colour, and eventually forms an almost inky liquid. This, on boiling, undergoes immediate coagulation, and a most copious deposit of insoluble albumen is obtained. In entire agreement with this observation is the fact that if the Castilloa latex be allowed to stand for sometime until it has assumed a very dark colour it will now be found that on short boiling rapid and complete coagulation takes place. I have not yet succeeded in ascertaining the cause of this curious phenomenon, but it is obvious that unless the Castilloa latex obtained in Mexico differs very considerably from the latex yielded by the same trees in the Isthmus coagulation by boiling in Mexico, must be preceded by an ageing of the latex as otherwise no coagulation would take place.

It is not very easy to see that the chief point in attempting to prepare a pure rubber from the latex of Castilloa elastica, and as a matter of fact, from the latex of any other rubber tree, must consist in the elimination from the rubber, prior to its "agglutination," of all albuminous matter. The first step in this direction is the diluting of the crude latex with water, of which at least five times the volume of the latex treated should be used. In the case of the thick, curdy latex yielded by the trees at Las Cascadas it is preferable to use actually boiling water, but in how far this applies to the latex obtained in other districts or from different trees is a matter for experiment. Boiling water at once converts this latex into a thin, very fluid milk which through a common cotton gauze is strained in order to remove from it any insoluble impurities such as earth, wood, bark, and the like. This milk is best strained into thoroughly well washed petroleum barrels. As soon as the barrel is completely filled, about 8 ozs. of formaldehyde are added, the whole well stirred, and allowed to stand for 24 hours. The action of the formaldehyde appears to be twofold. In the first instance, it effectually prevents any tendency of the albumen to coagulate in the hot solution, and thereby to cause mischief. But, as comparative experiments showed beyond any doubt, it also has a most distinct effect upon the india-rubber, which collects on the top of the washwater in the form of a snow-white cake of rubber of such strength and toughness that it can in one mass be lifted out from the barrel. On cutting this cake open, it will be found that it is rather spongy, being full of little holes which are still filled with some of the albuminous, though very dilute, mother liquor. If, therefore, the rubber were dried in this state it is obvious that it would still contain a small quantity of the objectionable albuminous matter. For this reason the rubber contained should at once be taken, cut into strips, and subjected to a thorough washing upon an ordinary rubber washing machine. As all albuminous matter present is still in a state of perfect solubility there is no difficulty whatever of completely removing every trace of it by carrying out the washing with a plentiful supply of water on the washing rollers.

The rubber thus obtained is a product of a degree of purity in which no rubber, not even the finest brands of Para, has ever been offered to the manufacturer. It is absolutely free from solid impurities of any description, it contains no trace of either soluble or insoluble organic or inorganic impurities. Of course it contains a small amount of resinous matter combined with only a trace of the constituents known as "ash." The amount of these resinous matters is extremely small, and they are of an entirely innocuous nature, so that any attempts to remove them, which would call for a somewhat energetic chemical treatment, would be altogether out of place. In a further communication I intend to give the analytical data of this pure Castilloa rubber.

When dry, the condition in which the owners of the Las Cascadas plantations intend to ship this rubber, it forms a product which requires no preparatory operation on the part of the rubber manufacturer, but which may at once be taken into operation for the manufacture of rubber goods of every description. Nor need any fear be entertained that rubber of this description is in the least liable to suffer such detrimental changes during transit in the ships' holds, which are at present so common owing to the "heating" (fermentation) of the rubber during transit. Indeed, a considerable lot of this which was purposely packed and shipped in the excessively wet condition in which it came off the rubber washer, had not undergone the least change, still less any deterioration on reaching this country.

An analysis of a sample taken of one of these dry sheets for rubber gave the following results :—

Resinous Matter - - -	2·61 p.c.
Ash - - - - - -	0·44 p.c.
Nitrogenous Constituents -	Nil.
Insoluble Constituents -	Nil.

The sheets themselves are extremely light in colour, semi-transparent, and when dissolved in the usual rubber solvents form almost glass clear solutions. The characteristic rubber smell is almost entirely lacking, certainly much less noticeable than in even the finest Para rubber. The strength of these sheets is distinctly superior to that of washed and dried sheets of Para rubber. How this Castilloa rubber after vulcanisation compares with Para rubber, and how in general it behaves in the vulcanising process as compared with Castilloa rubber in its present day crude and impure form, I have not been able yet to ascertain. This work is, however, in progress, and in due course I will report the results obtained.

The amount of resin in Castilloa rubber shown above is absolutely unobjectionable, and does not in the least affect the quality of the rubber. I am quite aware that now and then all sorts of sinister actions are ascribed to the presence of resins in india-rubber, but there is not the least particle of evidence to show that they are intrinsically detrimental. As a matter of fact, in the manufacture of quite a number of rubber goods resins are deliberately added to the mixings.

It is highly interesting to observe that the amount of resin increases in the trees from the root upwards, as the following table will show:—

RESINS IN RUBBER DRAWN FROM

			Per cent.
Trunk	-	-	2·61
Largest branches	-	-	3·77
Medium ,,	-	-	4·88
Young ,,	-	-	5·86
Leaves ,,	-	-	7·50

A similar increase is observed the younger the trees from which the rubber is drawn:—

RESINS IN RUBBER FROM TREES.

			Per cent.
2 years old	-	-	42·33
3 ,,	-	-	35·02
4 ,,	-	-	26·47
5 ,,	-	-	18·18
6 ,,	-	-	11·59
8 ,,	-	-	7·21

It will therefore be seen that my advice not to tap the trees until they are at least 8 years old is not only justified in the interest of the life and development of the trees, but also in the amount of resin which may safely be admitted in rubber of high quality.

There are very few such observations on the amount of resin in rubber trees at different periods of their life, and in different parts of the tree, but it can scarcely be doubted that other kinds of rubber trees will exhibit similar conditions, although the amount of resin accompanying the rubber in different trees appears to vary not inconsiderable. But they never are entirely absent, and I am inclined to think that the usual view of them as oxidation products of the india-rubber is altogether erroneous.

PURITY.—As far as can at the present moment be seen, the fact is amply demonstrated that it is possible to prepare from the latex of Castilloa elastica a rubber which for purity is absolutely without a rival, and the physical properties of which place it at least on the level with the finest grades of Para rubber. And this result is obtainable in working upon the milk of a tree, which so far has only been conspicuous for yielding the worst of all American rubbers. This is all the more gratifying, as these results are obtained at quite a trifling addition to the cost of production, which addition, on the other hand, is compensated for by an increased value of the final product by at least 40 per cent.

Cost of Rubber.—From what I have shown in an earlier section of this article it will be seen that the Castilloa tree should not be tapped until it is 8 years of age. The cost of clearing the land for planting, transplanting the seedlings, and keeping the planted plots for seven years clear from undergrowth, is astonishingly small, and does not exceed, at the utmost, £25 per 1,000 trees for the whole period until they are 8 years old. If, therefore, at the end of the seventh year the trees are tapped for the first time, and only half a pound of rubber taken per tree, we obtain from these 1,000 trees 500 lbs. of rubber, which at the very lowest estimate would be worth at least 3*s*. per lb. in Liverpool. Deducting, therefore, the cost of collection, preparation and shipment of the rubber, a return of about 100 per cent. would be obtained in the eighth year. This, with careful management, would steadily increase for a number of years.

Cost of Land.—Of course, the cost of the land will play a not unimportant part in such a calculation. I do not know under what conditions and at what price land suitable for rubber cultivation may be obtained in the various Central American States. In Colombia, at any rate in the territories adjoining the Isthmus, land is obtained on the old Roman principle, "res nullius cedit prius occupanti," or, in elementary English, "first come, first served." That is to say, any land not in private occupation may be taken legal possession of by "denouncing" it before a land commissioner, a very simple procedure involving merely payment of a nominal registration fee. For the maintenance of the title it is sufficient to prove the working of the grant. Labour to any amount is easily obtainable from Jamaica, and if the steady influx from this Island should not suffice, the authorities of Barbados would be only too glad to grant facilities for the drafting of labour into Colombia from their enormous coloured surplus population, from whom no work can be found in Barbados. Wages for plantation workers (machete men) range at about $1.20 per day (Colombian money), equal to $0.50 gold, say, 2*s*., the men finding their own food.

Planting.—In planting Castilloa, it would appear that great care is required to make quite sure that the seeds used, or the seedlings obtained, are really those of the best variety of Castilloa elastica. It appears that there are at least three varieties of this Castilloa, which are respectively distinguished as Castilloa alba, Castilloa negra, and Castilloa rubra. There is not the slighest difference between these three varieties as regards the general form of the tree and its branches, and also the flowers and seeds are in all three apparently identical. The above descriptions refer to the colour of the bark. The difference even there is, however, so small that it requires a practised eye to recognise the different varieties. These, differ nevertheless, very greatly in their value to the rubber planter.

ALBA.—Castilloa elastica alba produces a thick creamy milk. It is the hardiest of all Castilloa trees, and suffers very little from the tapping operation. It also yields the largest quantity of rubber. The bark of this variety is white, with a distinct yellowish or pinkish cast.

NEGRA.—Castilloa elastica negra is characterised by a very rough dark bark. It yields very readily a thin milk producing a good rubber, but the tree in tapping easily bleeds to death.

RUBRA.—Castilloa elastica rubra has a reddish bark which is very smooth, thin, and brittle; nor does it show the longitudinal furrows which are noticeable in the two first-named trees. This variety yields a very small quantity of milk, but the rubber obtained, from it is good. The tree is very common all over Central America, and I am afraid that in a number of instances it was this tree which was planted instead of the white Castilloa. Indeed, Koschny is inclined to think that it is this variety with which the experiments in the Botanical Gardens in Ceylon and Java were made which gave such discouraging results.

SHADE OR OPEN.—The question whether Castilloa should be planted in the shade, or in open land has been answered both ways. It is possible that the climatic conditions of the district in which the plantation is situated may have some influence upon this point. However, all the reliable evidence seems to show that the trees grow badly in dense forests, and produce a poor yield of rubber when grown on open ground. They appear to prosper best when growing up together with other trees, so that the trunk is always shaded, whilst the top of the tree at least, for a certain time during the day, receives the direct rays of the sun, from what I have seen at Las Cascadas I entertain no doubt whatever the last named condition is the most favourable for the growth of the trees.

CLEARING.—This being admitted, it is obvious that in planting Castilloa in open land it is necessary to plant at the same time trees to protect and partly shade it. As this adds very greatly to the cost of planting, it stands to reason that in selecting land for the cultivation of Castilloa, preference should be given to forest land. The larger trees are cut out—there are generally plenty of uses for them on the plantation—only the smaller trees being left standing between which the rubber trees are planted.

SOIL.—As regards the configuration of the land, and the best quality of the soil, some little discrimination is also required. Regarding the soil, it may be said that Castilloa is very modest indeed, but, of course, this does not mean that just any soil is good enough. The best results are undoubtedly obtained on a deep, loamy, only moderately sandy soil. Whether Castilloa should be planted on level or on hanging ground is a rather more important question. In Mexico, I believe, rather large level tracts have been planted, but then the rainfall in Mexico is considerably less than what it is in Colombia. It is quite certain that the trees require well-drained land, and this with a rainfall of 130 inches, the figure for the Isthmus, means hanging land. There are immense traces of unappropriated land of this description north and south of the Isthmus.

CLIMATE.—The climate of Colombia more particularly the districts north and south of the Isthmus, is a very great deal better than its reputation. I am inclined to think that the villainous climate of the stretch of land between Colon and Panama, and the frightful death-rate amongst the canal workers, has been taken to apply without distinction to the high-lying land adjoining the district. But it must not be forgotten that the susceptibility of the negro, at any rate those hailing from the West Indies, for zymotic diseases, is nothing short of extraordinary, the death-rate amongst them even from measles being simply appalling. The white races under the same conditions enjoy comparative immunity. Moreover, the higher-lying districts adjoining the Isthmus are incomparably healthier. There is, therefore, no reason why in the next 10 or 20 years rubber cultivation in Colombia should not attain to huge dimensions. Land is to be had practically for the asking, the establishing of even a large rubber plantation is incredibly cheap, and the returns are large, certain and permanent.

RUBBER IN CEYLON.

Mr. J. B. TENNANT, of Berredewelle, Matale, went down to Kalutara in September to inspect the Para rubber cultivation on Culloden Estate, Neboda. A "Standard" representative, who was in Kalutara on Saturday, in a brief conversation with Mr. R. W. HARRISON, the manager of the estate, learnt that the prospects of Para rubber in the low country were very bright. Recent sales in London fetched exceedingly good prices. All the trees have been tapped, and are yielding very freely. Trees have been planted in all parts of the estate. (Culloden), which belongs to the Rosehaugh Tea Company of Ceylon, and is the best estate in the low country where Para rubber has been fully planted, Arrapolakande (also in Neboda) coming next. Mr. HARRISON informed our representative that he expects an output of nearly ten thousand pounds this year, which is considered a splendid record. Large quantities of seed have been sent to Southern India, and several local estates have also been supplied. Mr. HARRISON used to do a tremendous business all over Java, Sumatra, the Cape, North Borneo, Thursday Island and Queensland. Small quantities have also been shipped to London and Paris, but the foreign is now practically over.—*India rubber and Gutta percha Trades' Journal.*

RUBBER IN AFRICA AND SOUTH AMERICA.

The following extracts are taken from an article by EMILE BONNECHAUX, explorer, published in "Le Vieux Corsaire":—

With the extending use of rubber and its thousand and one applications, a serious question presents itself. Will the forests producing rubber and bind weed become exhausted? Several trips to Madagascar and two voyages to Brazil for the purpose of exploring the forests may permit me to express an opinion on this subject. I believe that certain species will disappear in Africa, Madagascar and Brazil—in fact, in all the regions producing rubber now exploited.

Landolphias will disappear both in Madagascar and on the continent of Africa, by reason of the barbarous methods of extraction employed by the natives, which consist in tapping the bind weed close to the place where it issues from the ground, dividing it afterwards into sections about 20 inches in length, from which the milk is drained by placing the sections upright in a gutter of split bamboo supported above the receiving pail by two wooden forks. The *Euphorbiacea intisy* will also be exterminated in the southern part of Madagascar. The *intisy* yields a milky juice, as rich as that furnished by the *Hevea brasiliensis*, but it is impossible to obtain it pure, as the natives allow the juice to flow to the ground, where it at once makes an amalgam elastic only in name. Besides, in their greed to obtain the maximum yield, the natives do not hesitate to tap even the tubercles of the roots, thus killing in one moment what nature has taken a century to produce.

Other varieties will also disappear. But there is one not indigenous to either Africa or Madagascar, which will not. It lives in the forests which are included between 8° north latitude and 8° south latitude. It is a native of Brazil, Peru, Bolivia, Ecuador, Colombia and Venezuela. The species is called Seringa in the Brazilian tongue. The botanical name is *Hevea*, one of the large family of the *Euphorbiacea* which comprises a dozen varieties. The product of these trees is known on the markets of Europe by the name of Para fin, from the town of Para, near the mouth of the Amazon, through which all the gum passes. The denomination Para fin is, however, incorrect. The State of Para produces some rubber, but the greater part comes from the district of Amazonas, from Peru, etc.

In these countries, the *Hevea* has fortunately been protected. The extractors have every incentive to preserve the trees from injury, in order to insure an annual yield which I estimate at from $290 to $347 for one hundred days of actual labour. Some affirm that the gatherers average from $8 to $10 per day. This estimate is exaggerated. The exploitation of the *Heveas* and other rubber trees of South America supports some 100,000 people. One can judge from this of the importance of this industry. The rubber tree is carefully treated here. Already the two States of Brazil, Para and Amazonas, have regulations for the distribution of lands. Both have taken measures to protect their natural resources, in order to preserve the immense revenue obtained from them. Manaos, the capital of the State of Amazonas, a town of 60,000 inhabitants, alone recives 48,000,000 francs ($9,264,000) revenue from the export duty.

I can affirm with certainty that the States of South America included within these latitudes have inexhaustible riches, if they continue to protect them. Brazil and Peru in particular would alone be able to satisfy the consumption of the entire world in rubber. The time is not come for the exhaustion of these immense treasures. Although we penetrate now to the very sources of the large rivers, only the great arteries easily accessible have been explored; the small affluents, which, in my opinion, are even richer in rubber, are yet unknown. Yet it must be acknowledged that Brazil is less known in France today than Central Africa. The whole world has had its eyes turned toward the Dark Continent. The boundless forests on the other side of the Atlantic contain forests accessible to anyone desiring to go there. Marseilles is the port plainly indicated to become the headquarters of this trade and an important market for rubber.

Why should we not go to Brazil, to Peru, and bring gums of the first quality, so necessary for our new industry—motocycles and automobiles? The English and the Germans do this and are making fortunes. I know of one German house in Manaos which has realised from commission alone more than $20,000 profit. There is also an opening for a French line of navigation. One English house—Singlehurst Broklurst, of Liverpool—had, twenty-five years ago, a few sailing vessels coasting along the eastern shore of South America, which touched at Para. Today, under the name of the Red Cross Line, this house has made a fortune. Within the year, the Germans of Hamburg have successfully established a line touching at Havre; the Italians have inaugurated a line from Genoa, touching at Marseilles. The French should learn the lesson.—*India Rubber Trades' Journal*, Nov. 10.

MATALE PARA RUBBER SELLING HIGH.

Kepitigalla, Matale, Dec. 5.

Dear Sir,—As promised in my letter of October 1st last, which appeared in your daily issue, to let you know the results of the sale of the 13 cases Para Rubber dispatched. I now have the pleasure in stating that the 13 cases sold for the handsome average prices of 3/11*d.* per lb.—an average price second to none in the world, as very best Paras were selling at same sale at 3/5½*d.*

Valuation and sales of 13 cases, Kepitigalla, Matale, Ceylon, Para Rubber:—

London, Nov. 14.

To 4 cases 200 B. A1. valued at 3/11*d.* sold at 4/.
To 8 cases 400 B. A. valued at 3/11*d.* sold at 4/.
To 1 case 42 B. rough scrap valued at 2/8*d.* sold at 2/10*d.*
I enclose London Agent's sales memo to verify above figures.

I am, Sir, yours faithfully,
FRANCIS J. HOLLOWAY.

A GOVERNMENT REPORT ON RUBBER.

In a report on "Agriculture in the Tropical Islands of United States," by Mr. O. F. COOK, botanist in charge of investigations in tropical agriculture, less than two pages, under the heading "Rubber and Gutta-percha," form the single reference to the matter under discussion. The spirit in which Mr. COOK writes is decidedly unfavourable to the formation of rubber plantations. He says, for example: "Notwithstanding widespread interest and the investment of millions of dollars, it cannot be said that rubber culture has passed the experimental stage, if indeed that period has been fairly reached." But there is no reference to any experiment made in any country, or to the results, in such detail as will enable the reader to look into the subject further with a view to satisfying himself as to the present status of rubber cultivation, or to investigate the reasons for "the investment of millions of dollars" which is still going on.

Mr. COOK says again; "Moreover, it is known that many rubber plantations established with the most lively expectations have been abandoned because the anticipation, of a profitable yield of rubber from cultivated trees proved to be fallacious." This report would have been more complete and more convincing had it been followed by a list of such plantations and of their locations. As a matter of fact, there has not been time, since the systematic planting of rubber on a commercial scale began actively, for very many of the plantations to becone productive, and, so far as we can learn, the results attained have been such as to encourage very many others to engage in this branch of planting. There is reason to believe that more rubber trees have been planted in Ceylon, the Malay Peninsula, Burma, Mexico, Central America, and the West Indies during the last twelve months than in any previous year, and in the list of plantations on record in the *India Rubber World* office—which includes all that we have been able to gain any knowledge of during the past ten years—there has been no case of abandonment of trees once planted. Mr. COOK admits, however, that "similar disappointments, misapprehensions, and misrepresentations"—referring to the prospectuses of certain companies formed to plant rubber in Mexico and Central Africa—have, of course, marked the early history of many finally successful and important industries." *From the Consular Report for 1902.*

NOTICE.

It is suggested that Subscribers who are not residents of Singapore should send Money Orders in preference to Cheques in order to avoid the loss due to Bank discount.

SINGAPORE MARKET REPORT.

May, 1903.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang - -	20	30.00	27.50
Bali - - -	78	20.00	19.00
Liberian - -	190	19.50	18.00
Copra - - -	2,383	8.65	7.50
Gambier - - -	2,565	15.60	14.80
Cube Gambier, Nos. 1 & 2 - -	355	23.00	19.00
Gutta Percha, 1st quality - -	...	340.00	240.00
Medium - -	...	240.00	140.00
Lower - -	...	140.00	25.00
Borneo Rubber - - -	...	160.00	90.00
Gutta Jelutong - - -	...	7.42½	7.00
Nutmegs, No. 110's - -	...	86.00	80.00
No. 80's - -	...	122.50	120.00
Mace, Banda - - -	...	190.00	175.00
Amboyna - - -	...	143.00	140.00
Pepper, Black - - -	906	35.65	34.75
White - - -	110	57.00	53.00
Pearl Sago, Small - -	...	6.60	6.00
Medium - -	...	7.25	6.75
Large - -	...	8.00	7.00
Sago Flour, No. 1 - -	2,873	4.25	4.00
No. 2 - -	447	1.25	1.05
Flake Tapioca, Small - -	779	7.00	4.25
Medium - -	60	...	...
Pearl Tapioca, Small - -	500	5.50	4.20
Medium - -	741	5.50	4.20
Bullet - -	...	6.25	5.00
Tin - - - -	2,545	95.25	86.75

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th May, 1903.

Wired at 11 a.m. on 16th May, 1903.

To England:—

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports -	1,100
Gambier	from Singapore	to London -	20
,,	,, ,,	to Liverpool -	330
,,	,, ,,	to U. K. & / or Continent -	230
,,	,, ,,	,, Glasgow -	...
Cube Gambier	,, ,,	,, England -	90
White Pepper	,, ,,	,, ,, -	40
Black ,,	,, ,,	,, ,, -	60
White ,,	,, Penang	,, ,, -	40
Black ,,	,, ,,	,, ,, -	50
Pearl Sago	,, Singapore	,, ,,	50
Sago Flour	,, ,,	,, London -	300
,,	,, ,,	,, Liverpool -	1,200
,,	,, ,,	,, Glasgow -	...
Tapioca, Flake	,, S'gapore & P'nang	to England -	270
,, Pearl & Bullets	,, ,,	,, ,, ,, -	300
,, Flour	,, Penang	,, ,, -	600
Gutta Percha	,, Singapore	,, ,, -	80
Buff hides	,, ,,	,, ,, -	130
Pineapples	,, ,,	,, ,, cases	27,000

To America:—

Tin	from Singapore & Penang -	1,600
Gambier	,, ,, -	1,500
Cube Gambier	,, ,, -	40
Black Pepper	,, ,, -	110
,,	,, Penang -	...
White Pepper	,, Singapore -	...
,,	,, Penang -	...
Nutmegs	,, Singapore & Penang -	14
Tapioca, Flake & Pearl	,, ,, ,, -	340
Pineapples	,, ,, ,, cases	4,000

To the Continent:—

Gambier	from Singapore	to South Continental Ports	...
,,	,, ,,	,, North ,, -	40
Black Pepper	,, ,,	,, South ,, -	...
,,	,, ,,	,, North ,, -	...
,,	,, Penang	,, South ,, -	...
,,	,, ,,	,, North ,, -	10
White Pepper	,, Singapore	,, South ,, -	30
,,	,, ,,	,, North ,, -	40

					Tons Steamer.
White Pepper	from	Penang	to South Continental Ports		...
,,	,,	,,	,, North ,,	-	...
Copra	,,	Singapore & Penang	to Marseilles	-	400
,,	,,	,,	,, Odessa	-	460
,,	,,	,,	,, South Continental Ports other than Marseilles and Odessa.		200
,,	,,	,,	,, North Continental Ports	-	360
Tin	,,	,,	,, Continent	-	240
Tapioca Flake	,,	,,	,, ,,	-	70
Tapioca Pearl	from	Singapore & Penang	to Continent	-	140
Cube gambier	,,	Singapore	,, ,,	-	20
Pineapples	,,	,,	,, ,,		cases 1,250

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

650 tons Gambier
310 ,, Black Pepper
(in Singapore) } contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(B)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st May, 1903.

Wired at 3.40 p. m. on 2nd June, 1903.

To England.

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports.	1,700
Gambier	from Singapore	to London	...
,,	,, ,,	to Liverpool	380
,,	,, ,,	to U. K. &/ or Continent	480
,,	,, ,, ,,	Glasgow	20
Cube Gambier	,, ,, ,,	England	80
White Pepper	,, ,, ,,	,,	50
Black ,,	,, ,, ,,	,,	70
White Pepper	,, Penang ,,	,,	10
Black ,,	,, ,, ,,	,,	60
Pearl Sago	,, Singapore ,,	,,	20
Sago Flour	,, ,, ,,	London	20
,, ,,	,, ,, ,,	Liverpool	975
,, ,,	,, ,, ,,	Glasgow	100
Tapioca, Flake	,, Singapore & Penang	to England	280
,, Pearl & Bullets	,, ,, ,,	,, ,,	390
,, Flour	,, Penang	,, ,,	875
Gutta Percha	,, Singapore	,, ,,	20
Buff hides	from Singapore	to England	100
Pineapples	from Singapore	,, ,,	cases 41,500

To America:

Tin	,, Singapore and Penang	750
Gambier	,, Singapore	775
Cube Gambier	,, ,,	20
Black Pepper	,, ,,	150
,,	,, Penang	...
White Pepper	,, Singapore	...
,,	,, Penang	...
Nutmegs	,, Singapore and Penang	7
Tapioca, Flake and Pearl	,, ,, ,,	340
Pineapples	,, ,, ,,	cases 6,000

To the Continent:

Gambier	from Singapore	to South Continental Ports	120
,,	,, ,,	,, North ,,	300
Black Pepper	,, ,,	,, South ,,	...
,,	,, ,,	,, North ,,	10
,,	,, Penang	,, South ,,	30
,,	,, ,,	,, North ,,	10
White Pepper	,, Singapore	,, South ,,	...
,,	,, ,,	,, North ,,	20

Article	From	To	Tons Steamer.
White Pepper	from Penang	to South Continental Ports	...
„	„ „	„ North „	...
Copra	„ Singapore & Penang	to Marseilles	...
„	„ „	„ Odessa	...
„	„ „	„ South Continental Ports other than Marseilles and Odessa.	400
„	„ „	„ North Continental Ports	980
Tin	„ „	„ Continent	180
Tapioca Flake	„ „	„ „	130
Tapioca Pearl	„ „	„ „	340
Cube Gambier	„ Singapore	to Continent	70
Pineapples	„ „	„ „	cases 1,250

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

2,000 tons Gambier
650 „ Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E.C.

Singapore.

Abstract of Meteorological Readings for the month of May, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·886	142·0	81·6	87·8	75·6	12·2	78·5	·906	76·2	79	S.E.	4·53	0·79

K. K. Hospital Observatory,
Singapore, 19th June, 1903.

A. B. LEICESTER,
Meteorological Observer.

J. LEASK,
Acting Principal Civil Medical Officer, S.S,

Penang.

Abstract of Meteorological Readings for May, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·895	150·2	81·5	90·9	74·5	16·4	75·8	·788	70·4	81	S.	7·82	3·12

Colonial Surgeon's Office,
Penang, 8th June, 1903.

M. E. SCRIVEN,
Asst. Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for May, 1903.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Humidity.	Total Rainfall	Greatest rainfall during 24 hours.
Taiping ...	152	82·98	93	72	21	78·16	901	80	14·89	3·00
Kuala Kangsar ...	...	81·83	94	73	21	77·31	877	81	6·56	1·45
Batu Gajah ...	161	82·06	93	72	21	78·01	906	83	7·47	2·50
Gopeng ...	...	81·75	93	66	27	77·56	887	82	10·03	2·40
Ipoh ...	...	81·85	93	72	21	77·62	890	82	8·41	3·03
Kampar ...	...	...	93	71	22	...	...	...	17·65	4·15
Teluk Anson ...	...	83·12	92	72	20	78·46	914	81	5·68	1·77
Tapah ...	..	81·81	92	71	21	78·01	908	86	12·58	1·51
Parit Buntar ...	...	83·42	93	72	21	78·30	900	79	5·09	1·02
Bagan Serai ...	...	82·34	92	73	19	77·85	899	81	7·60	2·20
Selama ...	...	81.90	91	73	18	78·27	920	85	14·51	2·30

STATE SURGEON'S OFFICE,
Taiping, 10th June, 1903.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for May, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·889	148·4	80·3	90·1	69·9	20·2	76·3	0·837	73·7	79	S.E.	10·82	2·15
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	13·50	1.91
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	13·81	3·45
,, Klang	...	...	...	85·7	75·5	10·2	...	...	...	...	...	6.79	1·40
,, Kuala Langat	...	...	...	85·4	74·2	11·2	...	...	...	...	...	1·47	0·65
,, Kajang	...	...	...	86·7	76·5	10·2	...	...	...	...	...	3·58	0·84
,, Kuala Selangor	...	...	...	88·0	77·0	11·0	...	...	...	...	...	3·26	1·31
,, Kuala Kubu	...	...	...	92·8	73·0	19·8	...	...	...	...	...	21·20	3·80
,, Serendah	...	...	...	89·1	76·2	12·9	...	...	...	...	...	18·69	3.10
,, Rawang	...	...	...	85·8	74·2	11·6	...	...	...	...	...	10·87	1·85
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	6·28	1·50

State Surgeon's Office,
Kuala Lumpur, 13th June, 1903.

E. A. O. TRAVERS,
State Surgeon, Selangor

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for May, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raub, ...		...	...	...	...	...	...	...	...	...	...	...	...
Bentong ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pekan ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kuantan, ...	...	...	...	88·0	72·0	16·0	...	...	...	...	...	3·19	·77
Temerloh ...	...	...	...	95·0	74·0	21·0	...	...	...	...	...	3·60	1·44

A. ANNESLEY WOODS,
District Surgeon, Pahang.

Pekan, 9th June, 1903.

Muar.

Abstract of Meteorological Readings for May, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	82·7	93·7	72·7	21·0	78·5	...	...	...	S. W.	6·61	1·30

Muar, 1st June, 1903.

FRANCIS PEARS.

No. 6.] JUNE, 1903. [Vol. II.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M.A., F.L.S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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AGRICULTURAL BULLETIN

OF THE

STRAITS

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No. 6.] JUNE, 1903. [Vol. II.

JELUTONG.

Mr. R. Shelford sends from Borneo samples of leaves and pods of the *Dyera* from which the Jelutong of Borneo referred to in the *Bulletin* for March (II. 3) is obtained, together with a sample of the product and the stone from which the white powder referred to (p. 96) is made. The leaves do not at all resemble those of Dr. Haviland's Jelutong tree, but look like the young leaves off a shoot of *D. costulata* and the pod is quite indistinguishable from that of our species. The leaves are lanceolate and blunt, narrowed into the petiole, 12 inches long and over 3 inches wide, with about 27 pairs of nerves, glaucous beneath, dull green above, petiole 2 inches long, rather slender. The bark is $\frac{1}{4}$ inch thick, dark brown and warty. The branches are 5-angled and brown. I have little doubt that this is the *Dyera Lowii Hook fil* but am rather doubtful as to whether there is really more than one variable species of the genus.

Mr. Shelford gives the following recipe for the making of the gutta:—

1 kerosine tin of water;
1 ,, ,, Jelutong latex;
1 pint (approximately) of kerosine oil;
1 spoonful of the powdered stone.

The mixture does not set till the powder is added. The stone and gutta were sent by Mr. Ong Tiang Ywee.

The stone in question is gypsum, sulphate of lime, apparently derived from a vein passing through slate.

It is derived from China.

RUBBER TAPPING IN MALACCA.

In a minute by Mr. Gagliardi, forwarded by the Hon. Resident Councillor concerning rubber tapping in the Bukit Sebukor Forest reserve he reports that he tapped four Para rubber trees with one herring bone incision for 8 days, viz., from March 23 to April 1 (excluding March 30) and with two similar incisions from April 2 to April 16 (excluding April 12).

The trees were about fourteen years old, and of the following dimensions: Girth at 4 ft. 6 ins. from the ground, No. I., 38½ inches, No. II., 38, No. III., 37, No. IV., 38½; total girth, 152 inches, average, 38 inches. Total rubber obtained, ten pounds and two ounces, scrap, two pounds two ounces, average per tree, three pounds one ounce.

This is a very fair average return of rubber from these trees.

The product seems to be good, though the preparation of the sample was not perfect.

VALUATION OF RUBBERS.

(*a*) From the Botanic Gardens, Singapore.

The following report on the samples of rubber from the Botanic Gardens has been obtained through the Eastern Products Company of Singapore:—

"The samples received from Singapore have been submitted for valuation in Antwerp and our friends quote us the following prices:

No. 1.	Pancake form	4*s.* to 4*s.* 1*d.*	per lb.
,, 2.	Scrap	3*s.* to 3*s.* 3*d.*	,,

"The quality is said to be very good and we are sure to be able to realise with satisfaction large quantities of this produce.

"The moment is very favourable, as the price for Para rubber has gone up 20 per cent. during the last three months. It is preferable that the rubber should be rolled out in sheets a little thicker than the type No. 1. The goods must be very dry. It can also be sent in the form of pancakes and packed in cases of two piculs."

Through the same firm the following additional report has been received:—

"Your samples of Malay Para rubber to hand; we have carefully examined the two samples. No. 1 is fine quality, we cannot suggest any improvement in its shape or cure. It is exactly similar to Ceylon grown Para rubber. It is in very good demand and this quality is selling well at 4*s.* to 4*s.* 1*d.* per lb. No. 2 is the scrap rubber from No. 1. It is fine, clean, strong, and we value it at 3*s.* to 3*s.* 3*d.*, at which price similar lots are selling from Ceylon. The rubber need not be in quite such thin pieces but special care must be taken to have the rubber properly dry before packing, as dampness sets up heat and stickiness which are fatal to any rubber and deteriorates its value considerably.

"The packing must be made in cases of 1 to 3 cwt., but cases of 2½ cwt. are recommended. If your Singapore firm starts with a trial shipment of say 5 to 10 cwts. they will soon judge for themselves the importance of continuing this business."

Dr. P. H. Ledeboer, Ph.D.

VALUATION OF RUBBERS.

(*b*) From Negri Sembilan.

Atherton Estate,
Port Dickson,
Negri Sembilan,
June 12th, 1903.

The Editor,
Agricultural Bulletin, Singapore.

Dear Sir,

I enclose a copy of letter from Messrs. Hecht, Levis & Kahn, 36, Fenchurch Street, London, E.C., which might be of interest to your readers.

The sample in question is from the Linsum Estate, Negri Sembilan.

Yours truly,
Harold Tunnicliffe.

P.S.—I enclose also a report on the same sample from Linsum Estate, from Messrs. Shand, Holdane & Co., 13, Rood Lane, E.C. H.T.

36, Fenchurch Street, London, E.C.,
7th April, 1903.

Harold Tunnicliffe, Esq.,
Atherton Estate,
Port Dickson,
Straits Settlements.

Dear Sir,

We duly received your favour of the 8th March, with sample of rubber grown from Para seed. There are fair quantities of similar rubber beginning to come from Ceylon, and they find a ready market. The sample which you send us, seems to us of very good quality, tho' perhaps a trifle "tacky," which, however, may be due to the way in which the sample has been sent, and may not be the case in bulk. In to-day's market, which is a good one, we should think a parcel of this rubber would fetch from 4*s.* 3*d.* to 4*s.* 5*d.* per lb., and our idea of the immediate future of the article, anyhow until next autumn, being a favorable one, we don't think that a shipment on the basis of our valuation will lead to disappointment.

As you have found our address, we need not tell you that we are amongst the largest rubber dealers and importers in Europe, and have special facilities for judging the markets and finding ready outlets. We are quite prepared to receive consignments, make advances, etc.

Awaiting the pleasure of hearing from you,

We remain, dear Sir,
Yours truly,
HECHT, LEVIS & KAHN.

24, Rood Lane, London, E.C.,
8th April, 1903.

Harold Tunnicliffe, Esq.,
Atherton Estate,
Port Dickson,
Negri Sembilan.

Dear Sir,

We have been pleased to receive your letter of 8th March, enclosing sample of rubber which we have submitted to our rubber brokers Messrs. Lewis, Peat & Co. They say the quality is excellent and they can sell at present as much as you can send of this standard at 4*s*. 2*d*. per lb.

We enclose a sample of Ceylon rubber (*Arapole Kandi*) which was sold recently at 4*s*. 2*d*. per lb.; brokers say your sample might fetch 1*d*. or 2*d*. more, but they suppose it costs more to send it in this thin state and they advise shipping in the Ceylon style.

We shall be very glad to undertake the sale of any rubber you may consign to us on the best terms, and if it would be any convenience, would arrange with the Bank that you should draw upon us up to say two-thirds of value of consignments; we shall also be glad to send you market reports or any information which may aid you in securing the best results for your produce.

The rubber market is very strong and likely to remain so, and we consider those who have the prospect of being able to place supplies in the market soon, have a bright prospect before them.

We are, dear Sir,
Faithfully yours,

SHAND, HOLDANE & Co.

P.S.—Can you grow pepper? We have been selling Ceylon white pepper at 10*d*. to 11*d*. per lb. S.H.

YIELD OF PARA RUBBER IN CEYLON.

Mr. Francis J. Holloway writes to the *Tropical Agriculturist* from his estate at Keppitigalla, Matale, Ceylon, in regard to the yield of rubber from his cultivated Para trees. These trees are at an elevation of 600 to 1,400 feet, and of the ages of 8 to 11 years; the largest girth one foot above the ground is 47 inches. The trees are not inclined to spread, but grow straight up, with few side branches, and make an excellent light shade for cacao planted 12 × 24 feet, thus giving about 150 trees to the acre. Tapping proceeds throughout the year and each tree has two series of tappings, lasting about two months. Now for results: Writing August, 1902, Mr. Holloway had tapped 3,903 trees once since October, 1901, obtaining a total yield of 2,128 pounds, or a trifle over ½ lb. per tree. Some of these trees tapped again within seven or eight months, yielded as much more, or a total per tree per year of one pound. Hence he thinks it safe to estimate an average of $2\frac{3}{4}$ lb. per tree, or $111\frac{1}{2}$ lbs. for 150 trees per year. The principal object of Mr. HOLLOWAY's report, however, is to present his estimate of cost of collection. The amount of rubber collected during the first five months of 1902 was 1,302 lbs. of good rubber and 60 lbs. of scrap; total 1,362 lbs. The cost of tapping and curing was Rupees 570.63, packing boxes and transportation Rupees 31.13; and proportionate share of cost of an outfit of collecting tins, tapping knives, and coagulating tins, Rupees 36.60; total cost of placing 1,362 lbs. of rubber in Colombo, Rupees 638.36. This is equal to about £420.11*s.* 2*d.* or $207.10 gold. The average cost per pound would work out at 4*d.* or 15.2 cents. The expenses to London and commissions are not stated, but most of the rubber was sold at 3*s.* 6*d.* per pound, and the scrap at 2*s.*, equal to $85\frac{1}{6}$ and $48\frac{2}{3}$ cents respectively.—[*The India Rubber World.*]

CEYLON GROWN RUBBER IN LONDON.

LONDON, *February* 27, 1903.

DEAR SIR,

WE wrote you *re* Ceylon grown Para rubber a few weeks ago and now have to report further sales which, we think, will be of interest to your readers:—

MARKS.	CASES.			SOLD AT PER LB.
Culloden	6		Fine thin biscuits	4/2
do	2		Good scrap	3/4¼
do	1		Large balls scrap	3/0¾
do	1		Scrap good	3/2
do	1		Scrap fair	3/0¾
Edengolla	3		Fine thin biscuits	4/2
do	1		Good scrap	3/1¾
Clyde	2		Fine thin biscuits	4/-
do	2		Scrap	3/-
Kumaradola	1		Fine in small biscuits	3/4¾
Yatipauwa	3		Scrap	3/0¾
Igalkande	1	crate	Fine thin biscuits	4/2
Aberdeen	1	case	Fine thin biscuits	3/10
do	1	bag	Good scrap	3/1¼
Tudugulla	5	cases	Fine thin biscuits	4/2¼

The market is strong and prices seem likely to go higher. Kindly insert above in your paper, as planters are much interested.

We are, dear Sir,

Yours faithfully,

LEWIS & PEAT.

P.S.—Fine Para 3*s.* $8\frac{1}{2}$*d.* to 3*s.* 9*d.*

OIL OF PARA RUBBER SEEDS.

Notwithstanding the very excellent prices quoted for samples of Rubber sent home from time to time from the Straits, it is satisfactory to know that the rubber is not the only valuable product of this most valuable tree. At the present moment the experts of the Scientific and Technical Branch of the Imperial Institute are investigating the properties of the Para Rubber seeds, and from the preliminary investigation now in progress it appears highly probable that the oil derived from these seeds may prove to be of commercial value. It will be necessary to wait for a complete report before it can be said exactly in what capacity the expressed oil will be most valuable, but from the fact that Castor oil is expressed from a plant botanically allied we may reasonably infer that the oil from the seeds of *Hevea* will be a useful lubricant. The number of seeds now available in the Native States and the increasingly enormous number in a few years renders this information of considerable interest to Planters.

W. FOX,

Ag. Local Agent for Imperial Institute.

THE MOSQUITO PLANT.

The Hon. W. Hood Treacher, C. M. G., sends for publication in the *Bulletin* the following extract from the *Times* of this year:—

THE MOSQUITO PLANT.

To the Editor.

Sir,—With reference to the letter in *The Mail* of this morning from Captain H. D. Larymore on the so-called "mosquito plant" *(Ocimum viride)*, I may mention that allied basils have been known "from time immemorial" to the Hindu throughout India as a defence against mosquitos, and a prophylactic in malarious districts. They recognize several species, such as *ran-tulsi*, or "wild Tulsi"; *sufaid-tulsi*, or "white Tulsi"; *kala-tulsi*, or "black Tulsi" (sweet basil); Ram-*tulsi (O. gratissimum)*; Krishna-*tulsi*; and *tulsi, par excellence*, called also *parnasa (O. sanctum)*. One or other of these basils is found growing everywhere in India, especially about temples, and most of them are grown in gardens; in Farther India especially they are planted upon and about graves; and a decoction of the stalks and leaves is a universal remedy in cases of malarial fever. The last-named species is sacred to Vishnu, being called after the beautiful Tulsi, who excited the jealousy of his wife Lakshmi, who transformed the fair maiden into the plant which Vishnu at once consecrated to the service of his most distinguishing rites. The "holy basil" is therefore planted before every Vaishnava house, and every Vaishnava wears necklaces, or armlets, and carries a rosary, made up of sections of its stalks or roots; and Hindus are sworn on the waters of the Ganges poured into the palm of the hand, crossed with a sprig of holy basil; and sprigs of the plant are borne by the Brahmans at all funeral ceremonies. One of the most charming sights in India—the India of the Hindus—is that of a fair Brahmini woman, in the villages of the Deccan ("right-hand" country), early every morning, after having ground the corn for the daily bread of the family, and performed her simple toilet, with the fearless frankness of the Athenian ladies at the fair-flowing fountains of Callirrhoe, walking, with stately steps and slow, round and round (*pra-dakshina*, "turning to the right"—*i.e.*, with the sun's shadow), the Tulsi plant placed on the four-horned altar before the house of "the father of her children," invoking on him and them, with outstretched arms and uplifted eyes of supplication, the blessings of all-indulgent heaven—that is, praying for less and less carbonic acid and even more and more oxygen—a perfect object-lesson in sanitation, art, and religion. When the Victoria Gardens and Albert Museum were established in Bombay the men employed on these works were at first so pestered by mosquitos and suffered so much from malarious fever that, on the recommendation of the Hindu *karbari* ("manager"), the whole boundary of the gardens was planted with holy basil and any other basil at hand, on which the plague of mosquitos was at once abated, and fever altogether disappeared from among the resident gardeners and temporarily resident masons. The site of the gardens had before been one of the worst malaria-stricken spots on the island of Bombay. No one in those days knew anything of "the mosquito-malaria theory" of to-day. I myself used myrrh as a protection against mosquitos. They never came near any bed in which a little myrrh was burnt or a little tincture of myrrh sprinkled when retiring for the night. I never knew natives who used much cinnamon or cloves, etc., in their daily diet ever take malarial fever or die of cholera.

I have the honour to be, Sir, your most obedient servant,

April 29. GEORGE BIRDWOOD,

[London "*Times*," 1903].

The basils referred to by Sir GEORGE BIRDWOOD are widely scattered over the East. The common cultivated ones here are:—

Ocimum canum.—Called here Ruku-Ruku is a herb with purplish hairy stems and soft green leaves, with rather a close spike of small white flowers. It is used for cough medicine. The flowers are put with sugar candy and *Kayu manis china* (Liquorice root) in a cup which is covered and put in the rice when boiling, and afterwards put out in the dew, and drink it in the morning. The leaves taste of peppermint.

O. basilicum.—Purple variety, "*Selasih.*" A shrubbier plant with short dense purple spikes, flowers white, leaves lanceolate, stems rather thick and smooth. It has a scent of aniseed, and is used to keep away bugs from houses like flea-bane. The seeds put in water swell up and form with their mucilage a very popular cooling drink.

O. basilicum.—White variety, "*Kamangi*" is more a slender and soft green plant with shorter green spikes and white flowers, larger than those of the Ruku-Ruku. Its scent is something between mint and aniseed. This is used for flavouring fish and other dishes.

I cannot find that any of these are known here as a prophylactic against mosquitos. Nor do I find any of the names mentioned by Sir GEORGE BIRDWOOD known, except the word Tulsi or Tulasi applied to *O. canum. O basilicum*, the purple variety, is called here by Tamils Karun-tulasih or black Tulasih. However, I have not yet met with either *O. sanctum* nor *O. gratissimum* in the Peninsula at present.

Were the prophylactic powers of these basils known to the Malays they would doubtless be extensively planted for this purpose, but as the mosquitos of one country are different from those of another it is possible that some kinds of mosquitos may be affected by them while others are not. Several other plants have from time to time been lauded as doing away with mosquitos, notably the Papaya and Castor oil. The latter certainly appears to be quite useless but a case has been recorded in which a row of Papayas prevented the mosquitos from entering a house. Any experiments with any of these plants would well be worth recording.

H. N. RIDLEY.

RUBBER PLANTING AND EXPLOITATION.

Results of Rubber Tapping at San Miquel.

An exact record was kept of the results of some recent tapping of rubber trees (*Castilloa elastica*) on the "San Miquel" plantation, owned by the Tabasco Plantation Co. (Minneapolis, Minnesota), located on the Macuspana river, in the state of Tabasco, Mexico, which are summarized below. There are on this estate about 400 large rubber trees, which were planted in the shade of cacao and coffee. These trees were not only grown in cacao and coffee, but under the shade of "mother" trees (not rubber) planted for shading the coffee while the rubber was getting a start. The secretary of the company, Mr. James C. Fifield, in communicating these results to *The India Rubber World*, writes: "A fact well known to "the rubber planters is that trees planted in the shade require a "much longer time to attain their maturity and full size than those "planted in the sun. In fact, the most casual observer could not "fail to notice the astonishing difference in size between the trees "grown in the sun and those in the shade. It is believed that the "size of a rubber tree has more to do with the amount of rubber "which it will produce than its age." In the table which follows is given the age of the trees except that the age of those placed at 10 and 12 years is not accurately known; the circumference of the trees three feet from the ground; the weight in ounces of the latex secured; and the average yield per tree of dry rubber (including a small amount of scrap pulled from the trunk of the tree after tapping). The details follow:

Age.	No. of Trees.	Average Girth.	Ounces Latex.	Ounces Rubber.
7 years ...	257 ...	33.80″ ...	11.80 ...	9.30
8 years ...	14 ...	37.75″ ...	20.70 ...	14.25
9 years ...	7 ...	40.14″ ...	21.28 ...	18
10 years ...	4 ...	43.25″ ..	26.75 ...	17.50
12 years ...	21 ...	50.50″ ...	40.50 ...	28.90

Based upon the above figures, the rubber product from an acre of land containing 200 trees seven years old would be 112 pounds; at eight years old, 174 pounds; at nine years old, 240 pounds; and at twelve years old, 314 pounds.

The following account of the rubber tapping at San Miquel was prepared by Mr. Boyer, the plantation manager:—

"We were very fortunate in securing for the plantation a native rubber tapper who has been raised in the rubber district, and for many years has successfully tapped both wild and cultivated rubber trees in the states of Chiapas and Tabasco. With this experience he was able to obtain the best results without injury to the trees.

"The first step in tapping a rubber tree is to clean a small place around the tree, a small gash then being made in the bark with the point of a *machete* and a leaf inserted therein, which serves as a spout to run the milk into pails. This leaf is placed about fifteen inches from the ground. From this point the cuts are made upwards at an angle of 45 degrees and extending in each direction a sufficient distance to include three-fourths of the circumference of the tree. Directly above this, a distance of one meter, another cut is made exactly like the first, the milk flowing down the side of the tree into the first cut and on into the pail. These cuts are repeated on the entire body of the tree, or until the branches are encountered. You will at once see that all the milk has not been secured, but a sufficient amount left to maintain the tree in good condition for another year. The next tapping, which will be made in a year from now, will be made on the same side of the tree, three inches above the cut made this year, and the following year three inches above that, so that it will be possible to make thirteen tappings on one side, or twenty-six on both sides; or in other words, a tree can be tapped twenty-six years without retapping the old cuts. The instrument used by the natives is a *machete*, or long knife. The bark of a ten year old rubber tree is about three-fourths of an inch thick.

"The rubber trees on San Miquel are of the variety known throughout Mexico and Central America as *Castilloa elastica*. This variety is divided into two classes, the first of which is known as the yellow rubber tree or "hule amarillo," this being the male. The milk from these trees flows very freely, having a rich yellowish color. It flows so freely that there is scarcely any left in the cuts after tapping. The other variety is known as the white rubber tree or "hule blanco," this being the female. The cuts made in these trees are not made at a 45 degree angle, but horizontally, a sufficient distance to include three-fourths of the circumference of the tree. The milk from this tree oozes into and fills the cuts, flowing down the tree several inches. The milk is very thick, requiring several days for it to dry so that it can be gathered. Of the two varieties the yellow is regarded as superior.

"The milk, gathered in pails, is taken to the rubber drying house, where it may be converted into rubber through either of the following processes, both of which we have used:—First, it is spread on a cement floor to a depth of three-fourths of an inch, this floor being so situated that the milk is constantly in contact with the sun's rays, thus drying very rapidly. After it is dry the sheets are rolled up into convenient sizes for shipment. The second process is through coagulation with a native vine known as "bejuco de necta." During the coagulation the rubber is left porous, and as it contains more or less water it is necessary to remove the same by using a press. It requires more time to prepare rubber by the first process. The average shrinkage in converting milk into solid rubber is 2·3 or in other words, 2·3 pounds of rubber milk will produce one pound of rubber. I have personally attended to the tapping and the figures herein given are absolutely correct.—*The India Rubber World*, Vol. XXVIII., No. I., p. 252.

THE YIELD OF THE CASTILLOA TREE.

Well may an English writer in a recent article say that "the "question of the amount of rubber yielded by the Castilloa is "characterised by a degree of discrepancy perfectly appalling." To instance this:—According to Cross, the well known Kew botanist, a Castilloa of from 18 to 24 inches in diameter produces 13 pounds of rubber annually, and that exceptionally large trees may give as much as 100 pounds!

Collins observed "that a six year old Castilloa possessing a diameter of 19 inches" (where can such a development be found?) "on being tapped in April in the dry season, furnished 20 gallons of latex from which 49 pounds of rubber were obtained," and he further declares that this is the average yield of all trees, the trunk of which before branching out reaches a height of from 18 to 27 feet above the soil.

Dr. Morris, one of the foremost botanists, now, I believe, Director of the Botanical Department in the West Indies, states that a Castilloa when first tapped should yield 16 pounds of rubber. If my memory is not at fault, Dr. Morris has stated that the first tapping should take place at six years.

In Nicaragua it is found (in Consular reports) that a Castilloa tree yields from four to six pounds of rubber annually. In the U. S. Consular Report for October, 1896, I find that "if the trees "have matured properly in the sixth or seventh year from eight to "twelve pounds of rubber can be taken from each tree biennially!"

The Bureau des Informations Agricoles de Mexique is more conservative, giving the yield of Castilloa trees when four to five years old at 2 pounds 6 ounces of rubber.

Certainly the range is wide enough according to these statements, selected from many similar, showing that the yield of rubber, even of trees not exceeding six years' growth may be anything from 2 pounds 6 ounces to 46 pounds annually.

Now, I am not in a position to prove that these statements, coming as they do from official and authoritative sources, are not correct. I can only say that having given considerable attention to all points connected with rubber culture, my own experience does not bear them out. And I prefer, in common with all who have seriously taken up the cultivation of rubber, to base my calculations of the probable returns on facts as ascertained by actual experiment. The following are the results as obtained myself of the yield of the Castilloa:—The greatest amount of rubber I have secured from one tree was $12\frac{3}{4}$ lbs. which I obtained from 30 lbs. of milk—about 46 per cent. of solid rubber. This was the result of tapping a tree growing on my property which measured two metres nine inches in circumference—87 inches—at six inches from the ground. I may here state that an old *hulero* (native rubber collector), who has worked much with me and in whose statements I have learned to place exceptional belief, a man of long experience, who has collected rubber in all parts of the Republic, told me that the most he ever found a tree to yield was 20 lbs. of solid rubber, which he obtained from an exceptionally large tree measuring three metres in circumference—117 inches—growing in a wild part of the State of Oaxaca. He believed the tree to be from 40 to 50 years old. On 24th November last, I tapped six trees, averaging $40\frac{1}{4}$ inches in girth with a net result of 7 pounds $15\frac{1}{2}$ ounces of rubber. These trees were comparatively lightly tapped. If they had been operated on in the wholesale fashion of the native collector at least half as much again would have been obtained.

On 30th November I tapped two trees of the respective circumference of 63 and 60 inches, obtaining therefrom 6 lbs. 2½ oz. of rubber. As to the age of these trees I can say nothing, as they are wild trees growing on the property. On 3rd December I tapped a rubber tree planted by myself, age 4 years 4 months, girth 26 inches, height 27 feet, the result being 2½ oz. of rubber. Eight days afterwards I again tapped the tree and obtained ¾ of an ounce of rubber, making total product 3¼ ounces. A few days later I tapped ten trees, age 4 years and 4 months, average girth 23 inches, obtaining therefrom 22 ounces of rubber. These trees could all have been bled again, the second operation in no way affecting the tree, as I have proved by the first named experiment. In both cases, the quality of the rubber after preparation was excellent. On 7th December, I tapped a tree of the age of 3 years and 4 months : result ¾ oz. of rubber of poor quality, sticky and little life in it. It need hardly be remarked that these experiments were made not for marketable purposes, but in order to see what the increase in yield might be in each successive year.

In order to compare these figures with others, I will quote those obtained by the writer of the article previously referred to. Mr. WEBER gives the following as the results of his experiments made at the plantation of Las Cascadas on the Isthmus of Panama :—

		Per Tree.
Five-year old trees, mean yield of	77 trees	2·3 oz.
Six-year ,, ,, ,,	61 ,, ...	2·0 ,,
Eight-year ,, ,, ,,	61 ,, ...	1·8 ,,
Twelve-year ,, ,, ,,	61 ,, ...	4·3 ,,

Mr. WEBER states, and in this I quite agree, that the tree can with perfect safety be tapped twice yearly ; thus the annual rubber yield may be taken at double that in the last column of the table. He further observes that he considers his figures as rather below than above the mark. It will be remembered that Mr. WEBER gives the amount of rubber contained in the latex at from 26 to 31 per cent. This is far lower than I have ever obtained. According to Dr. URE and Professor FARADAY, the percentage of pure rubber in the latex is 45 per cent. I have never found the milk of the Castilloa give less than 39 per cent., and in one case, with unusually thick milk from an old much tapped tree, I obtained as high as 49 per cent. If, then, we take the yield of a 6-year old tree at 1 lb. 13 ounces, as given by Mr. WEBER, the result would be at 40 per cent., say 11½ oz. of rubber, which is, I think, a perfectly safe and conservative estimate. I have no doubt, as Mr. WEBER states, that trees can with perfect safety be tapped twice a year, and though the yield may not be doubled, a very material increase of production will result.

My experiments have shown me that trees that have already been bled yield their latex much more freely than those bled for the first time. This was most noticeable in operating on a number of trees in my own land, when I found that the milk flowed more readily and copiously from those that had been apparently maltreated for years than from splendid trunks which did not bear a scar. It is also evident that the yield of the Castilloa depends much more on soil and climate than has been hitherto supposed.

Dr. Trimen, the Superintendent of the Botanical Gardens in Ceylon, gives the following results from trees grown in that island :—

Age of Tree.		Yield of Latex.			Per Cent. of Rubber in Latex.		Hard Rubber.	
		Lbs.	Oz.				Lbs.	Oz.
Six years	...	1	13	...	26	...	0	7·5
Seven years	...	2	5	...	26	...	0	9·6
Eight years	...	3	1	...	29	...	0	14·2
Eleven years	...	5	3	...	31	...	1	9·7

These results bear out the statements so often made by those acquainted with Ceylon that the Castilloa cannot be profitably grown there, owing to shallowness of the soil and the underlying rock bed. It may be that the climatic conditions are also unfavourable, so that planting of the Castilloa has in many cases been abandoned.

Another cause which undoubtedly greatly affects the yield, or at least the free flowing of the latex, is the amount of rainfall in the season preceding the tapping. The fall of rain during the wet season of 1902 was up to the beginning of November not over 50 per cent. of the rainfall in normal years. It is stated on reliable authority that so small a rainfall has not been known for the past 20 years. I am speaking of the central parts of Vera Cruz and the adjoining state of Oaxaca, though I believe the same paucity of rain was remarked in other parts. Clearly owing to this deficiency of rain, many large trees on the property which in former years yielded abundantly gave not more than half the former amount obtained, the milk running sluggishly and coagulating rapidly. The principal yield was thus furnished by the *grenia* (the rubber which dries on the cuts on the trees). As an instance of this from 13 trees, averaging in circumference 33 inches, I obtained only 126 ounces of milk, which gave me 3 lbs. 3 oz. of rubber, or 42 per cent., while the *grenia* collected from the trees amounted to 5 lbs. 12 oz.; total 8 lbs. 15 oz. It was my intention to tap all these trees a second time, but the bad weather of December, when the heaviest rains in the year fell, and subsequently other occupations prevented me from making the desired experiment. But I am firmly convinced that a triennial tapping can, with perfect safety, be carried out, the trees in no way suffering if sufficient time be allowed to lapse between the two operations.—George C. Pearson, in the *Modern Mexico* for April, 1902.

CAUSES OF THE DETERIORATION OF CONGO RUBBER.

By G. Van den Kerckhove. (*Antwerp.*)

In connection with the conditions now existing in the rubber trade of the Congo region, allow me to state that there are several causes which underlie the rise or decline in the value of all crude products, and notably rubber. All grades of rubber have not depreciated in the same relative degree; yet the products of the Congo basin have been particularly affected in this regard because of the very unsatisfactory condition in which they arrive in the European markets. Please notice that I use the word condition and not quality, for it has become the too general belief, and erroneously so, that it is the quality of the Congo rubber that has declined. I am free to admit that the excessive over production of some two or three grades of rubber has led to a shading of the quality, but this is by no means general.

When I take into consideration the enormous quantity of rubber produced in the Congo Free State, I am still of the opinion that the African continent will yet furnish this material in excellent qualities. The chief defect in the crude product lies in the oxidation of the gum, this oxidation being fostered by the long detentions in improper housing at the entrepots near the places of collection. It is a fermentation, in fact, which renders the gum viscous or sticky. In most cases this is not the result of negligence on the part either of the black collectors or the white receivers. Let properly constructed storehouses be erected and placed at the disposal of the receivers, and they will send the gum in the best state of preservation to the European markets. As long, indeed, as the raw product continues to be subjected to the present irrational conditions in Africa, we need not hope for any marked change in the character of the material shipped. True, during the transportation from the storehouses at Leopoldville, Matadi, and other places, to the sea, the rubber is subjected to the deteriorating influence of the sun's rays, yet the character of this action is of less grave a nature than that produced by defective storage. In fact, in the former case the package is affected only upon one side, easily seen in spots on the exterior, while in the latter case the whole package is affected.

Again, if the balls of rubber have remained long in a defective storehouse where they may have contracted noxious germs, their presence for a lengthened period in the hold of a ship carrying them to Europe, will, of course, hasten the oxidation, whereas if the gum be in a perfectly healthy condition when shipped it will not deteriorate from a short detention in the hold. But should a consignment of even healthy rubber remain, let us say, two months, in the unventilated hold of a ship, especially in the tropics, it is certain that it would be seriously affected. Of course, during the months of July, August, and September, even the repositories of Europe must be carefully looked after; for certain soft gums become bad during this season, even in the storehouses at home. On the other hand, if a consignment of rubber reach the European markets in a slightly damaged condition, its lying in a defective storehouse at home during the heated term will undoubtedly cause an aggravation of its viscous character, while the storage in the cold months may be prolonged indefinitely without any deleterious results.

In Africa, as you well know, there are two sources of supply for the commercial rubber, viz., the vines (*Landolphia*) and trees of several species. The gum obtained from the trees is less liable to become sticky, though this is not the only reason that rubber from other places should reach the European markets in a better state of preservation. Most of the localities of western Africa which furnish rubber from trees lie upon the coast and are therefore most conveniently situated; the gum is not allowed to remain long upon the ground but is promptly hurried to the seaports and shipped to Europe with the utmost despatch. Shipments from Lagos, Gold Coast, Senegambia, and Sierra Leone frequently reach Liverpool within 50 or 60 days after the sap from the trees has been dried.

Such favourable conditions are manifestly impossible with the products from the Congo basin, and chiefly for the reason that the perfect construction of the African respositories plays such an important part in the healthful preservation of our products. That rubber should be more or less inclined to become viscous depends much upon the method pursued in its coagulation. Thus the method employed by the Bokako (Bossanga) furnishes a gum of greater resistance, though the process which gives an extra dry rubber, exposes the product to a more pronounced as well as rapid contamination. For example, let us take a ball from Lopori; although it is less desiccated, it resists the contaminating influences to a greater degree than the well dried sheets from Kassai. If the drying has been imperfectly accomplished and the gum is placed in storage in such a manner as to be deprived of the necessary circulation of air, a condition which ensues when the balls are packed too closely together, a sort of fermentation is set up in the interior of the balls which in the long run attacks the elastic fibre, and the gum dies, and this is what the English technically describe as dead, perished, or flaky rubber; it is not viscous but pasty. If, however, reasonable care be taken in the storing of the gum, even watery or moist rubber will not suffer oxidation. At this point it may be well to add that the mixing of several varieties of latex before coagulation is extremely likely to induce organic decomposition; in such cases the viscous character is internal or, so to say, inherent. Happily such cases are of rare occurrence with our rubber from the Congo.

The best known preventive of oxidation consists in the drying of the latex by a low heat, in contact with the smoke. Rubber from Para, Colombia, and Bolivia is dried in this way. It is greatly to be regretted that the milk of the African rubber vines (*Landolphia*) does not lend itself kindly to the smoke treatment, and, strange as it may appear, even the milk from the African rubber trees is equally rebellious under this form of treatment. Some samples of Kickxia rubber, from the Gold Coast, which had been dried in smoke, were critically examined by me, and I found that though the gum was pure and of handsome appearance, yet it had lost its elasticity. This peculiarity is generally attributed to the exceeding thinness or fluidity both of the Asiatic and African rubber latices. Great care should also be taken in the packing, and for all varieties of gum which are destined to lie for any length of time near the points of production I recommend that they be put up in ordinary sacking, and this applies especially to those sorts which have been dried with extra care.

Returning to the subject of the effects of the sun upon the outer surfaces of the balls, I desire to state that I experimented upon some of the balls thus affected, in search of some sort of an antiseptic, and am pleased to say that my endeavors have produced satisfactory results. At this stage I should acknowledge that my experiments have not been exhaustive, since I only applied my tests to small quantities. It remains, therefore, to be seen whether or not the application of the same antiseptics will be equally efficacious when applied to large masses of the affected gum. I am afraid not, and in all that concerns the healthful preservation of the gum I incline to the maxim that it is better to prevent an evil than to provide a cure for it.

Unfortunately the greatest enemy to our Congo rubber trade is the reputation, fostered by others, that there is not a pound of absolutely healthy Congo rubber to be found in Antwerp. Equally unfortunate is the fact that there is no fixed rule whereby the degeneration or depreciation in the value of rubber from oxidation may be satisfactorily computed. I will give here an example of the difference in price obtained for two lots of the same consignment of rubber of which one lot was perfectly healthy and the other in poor condition. The lots were of about five tons each. The first, which we shall call lot A., was sold for 5.50 francs per kilo. Of the second lot, which we shall call lot B., two tons were wholly sound, and three tons more or less sticky (about the normal proportion). Lot B. sold for only 4.90 francs. Compared then with the price obtained for lot A., lot B. suffered a discount of 60 centimes per kilo, or about 3,000 francs ($600) for the 5 tons.

From this case, however, we must not augur that all the lots containing portions more or less viscous suffered a depreciation of 60 centimes per kilo, upon the prices paid for healthy rubber. On the contrary, the discount is sometimes more and sometimes even less; this figure is by no means fixed, and the loss depends upon the quantity of the affected gum and the degree of the oxidation. However, when we consider that the greater part of the lots emanating from the Congo region are more or less tainted, we may easily calculate the importance of the loss on the total caoutchouc production of the Congo.—*The India Rubber World*, October 1, 1902.

GENTSCH'S "NEW GUTTA-PERCHA."

The method of producing the substitute for Gutta-percha referred to at length in *The India Rubber World* of September 1 (page 385) as the "New Gutta-percha" is the invention of Adolf Gentsch, of Vienna, and covered by patents, granted first in Austria-Hungary, and later in Germany and elsewhere. The German patent is No. 116,092 (date of application June 24, 1899), the specification for which states that the method consists of the mixing of India-rubber with vegetable wax, after which thickened oil may be added. The mixture is kneaded in a slowly rising temperature, which may be done to advantage in a kneading machine, care being taken not to bring the temperature so high as to melt the wax. A fixed proportion of ingredients cannot be prescribed. Waxes having a high melting point are used alone or mixed with thickened oil, as described in the German patent No. 76,773, having first been freed from water and dirt by melting. Mixtures may be made according to the purpose for which they are intended, in a proportion of 50 parts wax and 50 parts Caoutchouc, or 40 wax, 10 oil, and 50 Caoutchouc. Outside of palm wax (carnauba wax), few vegetable waxes are known that possess a high melting point, and it is advisable, therefore, as in German patent No. 111,088 to raise the melting point of the wax before kneading. It is also advisable that the rubber be first well dried. The result claimed is a homogeneous product, possessing the characteristics of Gutta-percha and particularly, the electrical properties of the latter.

Gentsch's Gutta-percha, it is stated, behaves like the natural product, except that it possesses a higher softening point and becomes firm again at a somewhat higher temperature than natural Gutta-percha. This is held to be greatly to its advantage, as making it serviceable as an insulator for wires made or erected in situations where the temperature is apt to rise above the normal. Added to this advantage is the low cost of production, as compared with natural Gutta-percha. In addition to its use in insulation work, the new material is mentioned as being suitable for manufacturing certain belting and for various other industrial uses, the new product being given different characteristics for each.

A report of a visit to Mr. Gentsch's factory, by Ed. C. de Segundo, A.M.I.C.E., in February last, describes the work as there carried on as comprising these ingredients: Wax (mineral), tar or pitch, resin, and India-rubber. A mixture of resin, wax and tar was thrown into a kneading machine, steam being applied from below, to keep the temperature at the proper point. Twenty minutes later, the mass having been kneaded meanwhile, the steam was turned off and the rubber (cut into small pieces) added, being fed in slowly to prevent jamming of the knives of the kneading machine. The machine was stopped from time to time to test the condition of the mass, and at the end of three hours the solution of the rubber was found to be complete and the mass was removed from the machine and passed between rollers, coming out in slabs $\frac{1}{4}$ inch thick—the finished material. While the best Para rubber was used, Mr. Segundo considers this unnecessary, believing that a mixture of rubbers of lower grades would effect the same purpose.

The inventor is said to have occupied himself with this material for seven years, and after five years of observation and testing, the German postal authorities certify that it is a proper substitute for Gutta-percha for insulating wires and cables. Two cables, in fact, have been laid for the Government—a submarine cable about $5\frac{1}{2}$ miles long in the North Sea and a telegraph cable about $\frac{1}{4}$ mile long in a river. These cables were made by Felten & Guilleaune (Mülhein-on-Rhine) who acquired the German patents in March, 1901, and who, as a result of their experience with the material, have since acquired the Austrian, Hungarian and Russian patents, and have begun the manufacture of the material in Austria as well as in Germany.

The English rights have been acquired by the New Gutta-Percha Company, Limited, registered on July 30 with a capital of £200,000, and with offices at Dashwood House, New Broad Street, London, E.C., from which address *The India Rubber World* is informed: "Although our factory is not yet ready, we have received a "substantial order for the material for insulating wires from one of "the largest manufacturing companies in England. We have "made arrangements for orders to be executed for us by Messrs. "FELTEN & GUILLEAUNE pending the completion of our factory "premises here."—*The India Rubber World*, page 9, Vol. 27, No. 1.

COCONUT PLANTING IN FIJI.

To THE EDITOR,

Tropical Agriculturist.

ENORMOUS FRUITING ON OUR PALMS.

TAVINNI, FIJI,

February 5th, 1903.

DEAR SIR,

Just a line to describe a very peculiar freak I have just seen. A young coconut tree, 5 years old just coming into bearing: It has three spathes or blossoms and on the largest of the tree I counted 30 spears to the spathes and on one of the spears I counted 51 nuts, making a total of about 1,500, on the one spathe. There are about 1,000 each on the other two so that at the present time there are about 3,400 nuts on the tree. There are two more tremendous spathes that will be blossoming in a few days, when we expect to see over 5,000 nuts on the tree—nearly a ton of copra. Now can you Ceylon chaps beat that? When you can, let me know, will you? I can assure you it is a positive fact I have often seen from 1,000 to 1,200 nuts on a tree, but this caps all.

We are having a magnificent year—better, in fact, than last, I think. I am trying to get hold of some averages this year and will let you know results by-and-bye. The whole country is looking very well.

Yours faithfully,

H. V. TARTE.

A practical coconut planter's remarks on the above are:—

"The degree of 'prolificness' of the coconut palm varies greatly, and although an average of 60 nuts per tree per annum in Ceylon is considered a good yield, yet there are individual trees which bear 400 to 500 nuts a year. However, I have never seen or heard before of such a phenomenon as a coconut spathe with 1,000 to 1,500 fruit on it. I doubt whether such a huge cluster of nuts would reach maturity, as the stalk is sure to break down with their weight before the nuts are even half ripe. Trees of vigorous growth send forth a spathe once a month. The wonderful 5-year old tree, your Fiji correspondent refers to, has already produced 5 spathes, all of abnormal size, and we may expect at least 3 more before the oldest nuts are ripe enough to be gathered.

"The tree should then carry over 9,000 nuts, beside about 3 dozen fronds, but would the stem support such a ponderous load?

Mr. TARTE should have the tree photographed at once, so as to show the several clusters of young nuts of different stages. It would be interesting to know the length and girth of one of these extraordinary spathes. Mr. TARTE says he has often seen 1,000 to 1,200 nuts on a tree. It will be of much interest if he will give the average yield of, say, 1,000 trees in full bearing on his plantation."—ED. *Tropical Agriculturist*. [*Tropical Agriculturist*, Vol. XXII., p. 707.]

CORRESPONDENCE.

CULTIVATION AND PRODUCTION OF RAMIE.

The EDITOR,

The Agricultural Bulletin.

DEAR SIR,

On page 61 of your February number you publish Mr. ANDERSON's criticism of my little article which appeared in last October's *Bulletin*. Mr. ANDERSON finds that I have been growing the wrong kind of ramie and urges planters to give up the "Black Ribbon" in favour of the "China Grass" variety.

I have never lacked advice from my spinning friends on the agricultural side of the question but it is the first time I have met an authority who recognised the botanical distinction between the two forms of product.

It is as if one should say to Towkay LOKE YEW or any other of our mining magnates—"Give up delving for the 'watering can' variety of tin, let us have nothing but the photograph frame kind in future."

"Ribbons" is the name I have always heard applied to the fibre as it is taken off the stem, all the bark and gum being shipped with the fibre. If it has taken long to dry it is called "Black Ribbons" because it looks black. If the drying has been more rapid it will be called "Brown Ribbons" because it looks brown.

"China Grass" which may be produced either by hand or by mechanical means, is a more ambitious product. The bark and most of the gum is removed, and when this product reaches the spinner it is straw-colored. It is possible to extract either product from either variety of Boehmeria Nivea—I say it is possible, because I have done it.

The two varieties of the plant which I allude to are cultivated in the Singapore Botanical Gardens, and a few plants of each on many estates and native holdings all over the Peninsula.

I gather from Mr. CURTIS's covering letter that the large kind is the variety which Mr. ANDERSON condemns. However, my own coolies, who have cultivated it in China, point to this as the kind from which "China Grass" is produced in their districts.

Mr. ANDERSON misquotes my results. I obtained 2½ per cent. of Faure fibre (produce similar to China Grass, not "Ribbons,") against the weight of green stems. Of "Ribbons" I obtained from 5 per cent. to 7 per cent. with the Eke machine.

This machine was loaned to me by a spinner who desired to have the "Black (or Brown) Ribbons" which Mr. ANDERSON saw and despised. The spinner's object was defeated by his bankruptcy and the Liverpool refuse destructor took delivery instead.

I have had both varieties analysed in London. The analyst found little difference in the two varieties and showed that the actual weight of pure filasse was little more than two per cent. against the gross weight of green stems. Under the circumstances one is not surprised to hear of a loss of fifty per cent. in the treatment of "Ribbons."

I may mention that at the figure which Mr. ANDERSON quotes, (*i.e.*, £37.10*s*.) for China Grass, the production of Faure fibre would be very profitable. At the same time I think that any planter would be ill-advised to cultivate a single acre of ramie before he has signed a contract with some sound spinning firm.

I am, etc.,
C. E. S. BAXENDALE.

JUGRA ESTATE,
SELANGOR.

NOTICE.

TOBACCO EXPERT WANTED FOR THE TRANSVAAL.

Mr. JOSEPH BURTT DAVY, State Agrostologist and Botanist of the Transvaal writes:—"I am anxious to know whether you could "recommend a trained tobacco expert of scientific ability who "would be capable of taking charge of tobacco-investigations and "experiments in this Colony. We are badly in need of such a man, "but he seems to be hard to find."

NOTICE.

It is suggested that subscribers who are not residents of Singapore should send Money Orders in preference to Cheques in order to avoid the loss due to Bank discount.

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H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F. L. S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 7.] JULY, 1903. [VOL. II.

PLANTING AND AGRICULTURE in the Federated Malay States in 1902.

From the Resident-General's Annual Report for the year 1902, the following particulars are extracted:—

As regards the planting interest, further experience confirms the belief, or rather endorses the certainty, that the combination of climate and soil in these States pre-eminently adapts them for the cultivation of rubber (Para and Rambong) and coconuts, two products the demand for which is annually increasing, while the success of sugar cultivation has already been proved.

Para.—Export of Para rubber in quantity has not yet commenced and we may have to wait a year or two longer for that consummation, but meanwhile we know that our samples realise high prices in England and that additional outside capital is coming in to extend the area of land under this cultivation.

The Chairman of that influential body—the United Planters' Association of the Federated Malay States—writes in his official report for the year 1902:—

> It is a significant fact that from Ceylon comes the most pronounced inclination to invest in this product. Ceylon planters and capitalists, with the decline of coffee, have had little cause to congratulate themselves on their connection with the Malay Peninsula, yet it is undoubtedly owing chiefly to the visits to, and personal inspection of, our rubber estates, by some of their foremost men, that they are willing and anxious, if they can get an opportunity, to put more money in. Such support, in your Committee's opinion, is of infinitely greater value to the country and to the enterprise than would be the influx of capital where expert knowledge on the part of its investors was absent. As far as it is possible to judge at present, the Malay Peninsula appears to possess every factor necessary to the successful cultivation of rubber. Climate, soil, transport facilities, the quality of the product, and the yield of the trees, leave little to be desired. As regards labour, this country is, at any rate, infinitely better off than any other with which we will

> be brought into competition, excepting Ceylon and India itself, where, however, some of the other conditions are far less favourable. It may be contended that little is known of the yield over a large area, which is true, but on the other hand, we *do* know what considerable numbers of indifferently cultivated individual trees have given, and there is no reason whatever for fearing that our average yield will be less than that at any other country.

The area under rubber (principally Para) at the end of 1902 is given approximately at 16,000 acres.

Rambong.—The cultivation of the Ficus Elastica (*Rambong*) deserves more consideration than it has yet received, and I would draw attention to the following observations contained in the report above referred to, and to the words therein which I have italicised:—

> Gutta Rambong (*Ficus elastica*).—A small sale of this rubber from about 4 year old trees was put through at $190 per pikul, the average yield per tree being about 10 oz. The lot in question was the most ordinary "scrap," and for really good stuff a much higher price would probably have been paid. The cost of collection was very heavy, the quantity being only a very small one, still the margin of profit is sufficiently wide, at the price quoted to make the cultivation of Rambong well worth considering. This variety has the advantage of yielding nearly two years sooner than Para, and gives a heavier return per tree. It is also cheaper to open, being planted not less than 30′ × 30′, spreads with great rapidity, consequently keeping the weeds down well, *and is indigenous to the country.* It moreover grows with great luxuriance in well-drained peat land where no other cultivation does any good at all. Tapping is easy, and requires nothing like the care that is necessary with Para, but the latex is slow to coagulate when poured out in pans, and the value of really good Rambong "biscuits" is at present an unknown quantity. The idea seems to be that the quality of this rubber is inferior, but so little is known about it when really carefully prepared, and the price realised for the "scrap" referred to was so satisfactory, that it would certainly appear to merit much greater attention.

Coconuts.—To ensure united and systematic action against the enemies of the coconut palm—beetles, rats, wild pig, porcupine—a Federal Inspector, under the "Coconut Trees Preservation Enactment," was appointed towards the end of the year. His labours have been highly appreciated by Europeans and natives alike, and have already met with a considerable measure of success. Mr. L. C. Brown, the gentleman appointed to the newly created post, has had great experience of coconut plantations in the Straits Settlements, and he reports that in many districts here the soil is admirably adapted for the growth of the palm, no manure is required, the most favourable conditions exist, the trees come quickly into bearing and produce magnificent crops; he is of opinion that this cultivation will be one of the safest and most paying of the agricultural interests of the States, and the most lasting and least costly. It is an industry suited to both the European and the native. The area under coconuts is given approximately at 40,700 acres.

Coffee.—The Liberian Coffee estates have, to a great extent, been planted up with Para, which will eventually dispossess the coffee. The export during the year reached the largest figure yet recorded—62,580 pikuls—and well-opened and well-managed estates on well-selected land yield a small profit even at present low prices.

Tapioca.—The demand for tapioca appears to be increasing and the East Coast districts of Pahang afford a fine field for those who may be desirous of undertaking the cultivation of this product.

Agriculture.—From an excellent report by Mr. F. BELFIELD, Acting Commissioner of Lands and Mines, I quote the following remarks:—

> In accordance with a suggestion contained in the Resident General's Annual Report for 1901, an endeavour has been made to obtain particulars of the areas under different forms of cultivation, with yield of the various products. The year was well advanced when the collectors were notified that this information was desired, and the particulars given in the attached return G (*not printed*) must be taken as approximate only; but from these it would appear that some 382,000 acres, or about one-half of the total area of agricultural land returned as "occupied," was actually under cultivation at the end of the year.
>
> The collectors have experienced great difficulty in obtaining information as to yield of the various products, and from the districts of Larut, Matang, Selama, Upper Perak, Kinta, Kuala Lumpur, Kuala Selangor and Kuala Pilah, no information at all on this subject is forthcoming; so far as the other districts of the Federation are concerned the returns supplied, which make no claim to be more than a rough approximation, indicate that the year's agricultural product included 14,000,000 gantangs of padi, of which Pahang contributed about 6,000,000 and Perak 5,500,000; 90,000 pikuls of tapioca, mostly from Negri Sembilan; 43,000 pikuls of coffee, of which nearly three-fourths came from Selangor and one-fourth from Negri Sembilan, and 20,000,000 coconuts of which Perak was the principal producer.
>
> The padi crop appears to have been a poor one in Perak and Selangor and over the greater part of Negri Sembilan; but throughout the small district of Jelebu it is described as exceedingly good, the best for several years. From Central Pahang also an excellent crop is reported, while in Ulu Pahang and Raub it was fairly good.

As to Sugar, the larger estates in Krian, the principal sugar-growing district, are reported to have had a fairly prosperous year; but the fall in the price of sugar and the increased price of firewood appear to have borne hardly on the smaller estates. The value of the export from Krian for the last three years is as follows:—

	1900.	1901.	1902.
White Sugar ..	$373,077	$341,346	$369,954
Brown ,, ...	942,897	1,138,322	1,218,836
Total	$1,315,974	$1,479,668	$1,588,790

Gutta Percha.—As regards the important subject of State gutta-percha producing forests, the exploitation of which will be a Government monopoly, the Conservator's report is very hopeful, and a handsome revenue may be expected in the future. The natural reproduction of the gutta-percha yielding trees is satisfactory, and "considering that absolutely nothing has been done in the past to "keep the regeneration of this species the abundance of young "growth is extremely fortunate and shows that gutta-percha trees "are better able to hold their own than any other forest tree."

Re-afforestation.—Steps are being taken to more systematically plant up deserted mining land with Ficus elastica, Casuarina and other trees.

—o—

REPORT ON THE SELANGOR EXPERIMENTAL PLANTATIONS FOR THE YEAR 1902.

1. * * * * * *

2 Owing to the prolonged delay which occurred in acquiring the site for the Experimental Plantations, I regret that more progress cannot be shown for the year under review. The land kindly offered by Mr. BAILEY, on behalf of the Selangor Rubber Planting Syndicate, as a site for the Experimental Plantations, and recommended by me on the 27th March, 1901, owing chiefly to legal technicalities which arose in reference to the transfer of the land, did not become available until 11th September, 1902, and the serious delay which occurred, although unavoidable, was nevertheless regrettable.

Delay in acquiring the site.

3. While negotiations for the transfer of this land to Government were proceeding, a small piece of Government land, $3\frac{3}{4}$ acres in extent, lying off the Damansara road, was cleared with the intention of starting nurseries and getting together a collection of plants ready for planting as soon as the land was ready to receive them. In June, permission was obtained to enlarge this nursery site, and an additional 7 acres of jungle was felled, burned, cleared and the land drained, and later an additional $6\frac{3}{4}$ acres was cleared. This will become part and parcel of the Experimental Plantations, from which it is divided by the Damansara river.

Nursery site.

This land is low lying, and during exceptionally wet weather is liable to be flooded, owing to the overflowing of the river; but I do not anticipate any damage from floods, which will only occur at long intervals and will be of short duration, and would probably be entirely avoided if the river was to be cleared of fallen trees, etc., a work which the Public Works Department have in hand. The soil is of a very heavy nature but will disintegrate on exposure to rain and sun. About 4 acres of this land was entirely cleared of stumps and dug over about a foot deep preparatory to laying out the nursery beds. This was a somewhat slow and expensive work, but was rendered necessary as a protection against crickets, which live at the base of the stumps and do a considerable amount of damage to young seedlings.

Nature of land.

The present site has a road frontage of about a quarter of a mile which will be extended from time to time and is fenced the entire length with a bamboo hedge, *bambusa nana*, having been used for the purpose.

Road frontage.

4. Six acres of the enlarged nursery site have been planted with Hevea brasiliensis, 24 feet apart, with the intention of growing and experimenting on suitable catch crops, while the rubber trees themselves will come in useful for experimental purposes later on. Among other things which it is intended to try as catch crops are ramie and other fibres, chilies ginger, Indian corn, arrowroot, ipecacuhana, earth nuts, cardamoms, linseed, etc. All these and many others give a quick return and would not be influenced by the small amount of shade formed by the rubber trees during the first two to three years of their existence.

Catch crops.

5. A small piece of land adjoining the Government road has been planted with Kickxia elastica, the Lagos silk rubber. The seeds were introduced direct from Lagos, this being the first introduction of this plant to these parts and distributed among the Botanical Gardens and planters of the Straits Settlements, as I had nowhere to plant them at the time. The plants referred to above were re-introduced from the Penang Botanical Gardens and had been growing in small bamboo pots for some time and their growth was consequently somewhat stunted. During the very dry season which followed they made a very free growth, but commenced to show signs of ill-health during the exceptionally wet weather of the last three months of the year, and were then attacked by caterpillars, which entirely defoliated them. The trees, however, survived this attack, and I am of opinion that they will suceeed here and probably become a valuable acquisition, but it is essential that they should be planted on well-drained ground.

Kickxia elastica.

6. About 35 plants of this coffee have been planted among the kickxia and an equal number are at present in the nursery and will be planted on hill land when the

Coffee—coffea robusta.

ground is ready. This is a new species introduced by M. LINDEN, of Brussels, from whom these plants were purchased, and it has not to my knowledge been yet cultivated. I can say nothing about it therefore, except that it appears to be a robust grower and is free from disease.

Maragogopie hybrid.

7. A block of land, roughly about an acre in extent, has been planted with this plant, 12′ × 12′. It appears to be a very free grower and in appearance very similar to Arabian coffee, which is no doubt one of the parent plants. This, too, is at present entirely free from leaf disease, notwithstanding that disease was present in the nurseries.

Coffee Liberica.

This is the only coffee grown in the Federated Malay States and owes its popularity to the fact that it is almost proof against leaf disease. One and a half acres have been planted 12′ × 12′ chiefly for the purpose of grafting and hybridising experiments.

Other coffee in the collection.

Other coffees in the nurseries are C. stenophylla, C. Arabica and Liberian-Arabian hybrid.

Locust tree.

Small plants raised from seed of Hymenœa Courbaril have been planted between the Liberian coffee at intervals of 36 feet. This yields a valuable resin. The growth is free and it promises to do well.

Mimusops balata.

8. The Maragogopie hybrid coffee has been inter-planted with Mimusops balata, which yields a gum known as balata and largely used for adulterating gutta-percha. This, I believe, is a new introduction to this part of the world. The plants, although apparently perfectly healthy, have so far made but a very slow growth.

Main border.

9. A border about one chain wide on each side of the main road has been planted with various economic plants and is intended to be representative of the collection.

A commencement made on the original site of the Experimental Plantations.

10. As soon as the originally selected site for the Experimental Plantations became available a start was made, and 22 acres of jungle were felled, the felling being completed on 16th October. This was not a recognised season for the work, but considering the delay which had already ensued, it was deemed advisable to commence operations without any further delay in the hopes of getting something like an ordinary season in which to burn off and clear up.

Abnormal weather experienced.

As things turned out it was a somewhat unfortunate move, for the rains started immediately the felling was finished and continued until the second week in December, there being only three days during the period without rain. The total rainfall for these three months was over 60 inches, constituting the wettest season on record for this State. It was of course quite impossible to burn off and the whole field had to be piled—a slow, tedious, and expensive work. All other works, such as cutting roads, weeding, clearing and levelling building sites, were also delayed by the abnormal weather experienced during the latter part of the year; while sickness among the coolies was rife, not only making it extremely difficult to obtain labour, but impossible to get anything like a fair day's work from the coolies employed. It might be worth while recording the fact that while levelling the site for the Superintendent's bungalow, which is situated on the top of a laterite hill in the centre of the gardens, that no less than four Javanese coolies out of the five so employed died from fever. The felling of a further $23\frac{1}{2}$ acres was commenced in December, but not completed within the year under review.

Sickness among coolies.

11. A set of Javanese coolie lines have been built at a total cost of \$213.50. These are $50' \times 30'$, consisting of two rooms, and provide accommodation for 30-40 coolies. They are raised about $4\frac{1}{2}$ feet from the ground, the floor and walls are meranti planks, the roof nipah ataps, the supports being chiefly petaling. A temporary set of Tamil lines, $36' \times 24'$, were erected on the abandoned tapioca estate close by the side of the nurseries on account of the sickness prevailing among the Javanese coolies on the newly opened land. These are built entirely of ataps, except the supports, sleeping benches and doors. They provide accommodation for 25 coolies, the total cost being \$100.

Buildings: coolie lines.

A small tool shed, $18' \times 12'$, was also erected at a cost of \$80.

Tool Shed.

Owing to the fact that there is only one man in the district who will undertake construction work, the prices of these works are probably somewhat higher than would otherwise be the case; while the prices of building materials have advanced considerably during the past few years.

A 60-feet span wooden bridge was constructed across the Damansara river, connecting the land previously opened as a nursery site with the site proper of the Experimental Plantations. The bridge is built entirely of merbau, the cost being \$1,700.

Construction of bridge.

12. A site was selected and levelled on a hill about 300 yards from the Plantations, during the month of May, for the erection of the Superintendent's quarters. This site, however, was disapproved of as it was not actually on the Plantations, with the result that the Superintendent was without quarters for the remainder of the year. During the first three months of the year the Superintendent lived at Kuala Lumpur, journeying to and from Batu Tiga by train each day. His quarters there being required for another officer, he was by the kindness of the late Mr. BARNWELL accommodated at the Bungalow on the Sungei Rengam Estate. This, however, necessitated a walk of $3\frac{1}{2}$ miles to and from work each day, so that in September he again moved to the halting bungalow at Batu Tiga, which had in the

Superintendent's Bungalow.

meantime been put in a better state of repair; but even here the Superintendent was a little over a mile from his work. It is needless to dilate upon the utter impossibility of working a gang of coolies when living away from the work and without the assistance of an overseer; or of the inconvenience and the extra work thrown upon the Superintendent. Another site was felled and cleared on the Plantation as soon as permission was received, and the bungalow—which was a Public Works Department work—was almost ready for occupation at the close of the year.

13. Overseer's quarters. A site was cleared and levelled for the erection of the overseer's quarters and a contract let for the same. The building was commenced in the early part of December.

14. Roads. A main road, 16 chains long, 20′ wide, with a drain on each side 4′ × 3′ × $2\frac{1}{2}$′, leading from the entrance to the Gardens to the foot of the hill land, was commenced, though not completed within the year. A deal of filling up has been necessary in the construction of this road, as the Government road lies considerably higher than the adjoining land. At the foot of the hill this road branches to the right and to the left and is extended towards the jungle in such a manner that it may be still further extended from time to time as more jungle is taken down and eventually run right round the estate. From the foot of the bungalow hill an approach road has been constructed to the bungalow and is 20 chains long by 18′ wide.

The gradient is steep, but the expenditure entailed in the construction of a road with an easy gradient would have been excessive. A 12′ path leading from this road to the overseer's bungalow was cleared and stumped at a cost of $2.75 per chain.

15. Drainage. The principal drains are 4′ × 3′ × $2\frac{1}{2}$′, of which 62 chains 25 links have been cut at a cost of $3.50 a chain. In addition to these there are 12 chains of drains $2\frac{1}{2}$′ × $2\frac{1}{2}$′ × 2′, and 93 chains $1\frac{1}{2}$′ × $1\frac{1}{2}$′ × 1′, the total length of drains being a little over 2 miles.

16. The Imperial Institute. During the year a memorandum was published by the authorities of the Imperial Institute calling attention to the advantages offered to merchants, planters and others who may wish to have samples submitted to scientific experts for opinion as to their commercial value.

Ngai camphor. Occasion was taken of the opportunities thus offered and a bundle of Blumea Balsamifera was despatched on 30th June and a further bundle consisting of flowers, stems, leaves and roots on 18th September. This plant furnishes the Ngai camphor, and is known to the Malays as "chapa," by whom it is largely used in native medicine, chiefly as a stomachic. It was suggested that it might be turned to good account either for the production of camphor or as a medicine. It is common in waste places in Selangor, and if of sufficient value could be easily cultivated as a catch crop on rubber estates. No news, however, has been heard of it nor has its receipt been acknowledged.*

A similar fate befell a consignment of 5,000 Para rubber seeds which were despatched on the 22nd September. This seed contain a large percentage of oil, which so far as I am aware, does not yet enter into commerce. If however the virtue of the oil expressed from the seeds was demonstrated a market might be found for it and probably a successful bye-product would be in the hands of the cultivators of the Para rubber tree.

Oil contained in Para rubber seed.

17. Several attempts have been made to induce Malay youths to enter the Plantations with the intention of teaching them to take a lively interest in agricultural matters, but although paid the wages of a working coolie and allotted the easiest tasks no boy has been persuaded to stay any length of time. In conversation with the late Mr. DRIVER, Federal Inspector of Schools, he gave it as his opinion that it would be impossible to obtain boys of any nationality from the English schools, owing to the demand at present existing for well-paid clerks. This, however, does not I think generally apply to the class of natives who might be expected to take up agriculture, and I am of opinion that the opportunity of instructing natives in agricultural pursuits based on sound principles is one that ought not to be lost sight of; though until the Plantations have reached a more advanced stage it may perhaps appear to be a little premature. Any scheme of this kind to be successful should be connected with a school, and lessons in agriculture should form part of the daily training, and each student allotted a piece of ground to be cultivated under the supervision of the officer in charge, and allowed to sell the produce. The students would then have an interest in their work, which would be stimulated by the possibility of profits which might accrue.

Teaching agriculture to natives.

18. It having been reported from India that applications of the Gondal fluid have proved very effective against the ravages of white ants, endeavours have been made to procure the ingredients locally. This, however, has not been possible, and I am now in correspondence with Sir G. WATT, Reporter on Economic Products to the Government of India, on the subject. Should the experiments in this direction prove successful probably some local tradesman will endeavour to procure the ingredients and stock them, or even stock the ready mixed fluid.

White ants.

19. In September I furnished you with a report on Para rubber in the Malay Peninsula, which although not so complete as it might have been, dealt with most of the points at issue in connection with the cultivation of this tree and the extraction and coagulation of the latex.

Rubber experiments.

* With respect to this Professor W. R. DUNSTAN of the Imperial Institute writes as follows to the Editor.

"A number of the products of the Straits Settlements are at present under in-"vestigation in the Laboratories and some of them, *Blumea Galsamifera,* for example, "seem likely to be important. I shall hope to hear of further problems from you."

Editor.

20. You were also furnished by the Secretary of State for the Colonies with a report on samples of Para rubber prepared by me and valued by Messrs. HECHT, Levis and Kahn, at the request of Sir W. T. THISLETON DYER, Director, Royal Botanic Gardens, Kew. This report should be very encouraging to planters of the Para rubber tree, the best samples being valued at 4*s*. 4*d*. per lb. against 3*s*. 8*d*. for "fine Para," and should settle the question once and for all as to whether the product of the cultivated tree can compete with the Para rubber of commerce of the present day.

Report on samples of Para rubber.

21. Other experiments on the extraction of the latex are being continued and when sufficient data are to hand a further report on the subject will be made.

Other experiments.

STANLEY ARDEN,

Superintendent, Experimental Plantations.

Batu Tiga, 31st March, 1903.

SANSEVIERA CULTIVATION IN SELANGOR.

The following correspondence from the Director of the Imperial Institute will be read with interest. The Sansevieras of which there are several kinds are well known ornamental plants of the order *Liliaceæ*. They possess an under ground creeping stem from which they send up stiff smooth leaves often ornamentally barred grey and green. The one referred to here has narrow lanceolate acute leaves 2 feet or more long and about $1\frac{3}{4}$ inch across, transversely barred with deep green and grey, and it is from these leaves that the fibre is prepared. The flower spike is tall and bears numerous white flowers resembling those of a Dracœna, and eventually orange juicy fruits.

The plant grows best here in rather rocky soil and is cultivated in India and also in Florida, and is often known as Bowstring Hemp. It is very commonly cultivated here as an ornamental plant.

It is propagated by root cuttings and also in Florida by leaf cuttings. Sections of leaves 4 inches long are made and inserted into boxes of earth to a depth of about 2 inches. The soil must be moderately dry or the plants will rot. The box is placed in a moderately shady place and in a few weeks time put out roots, and eventually suckers. It requires good rich soil and takes about two years to acquire its full growth.

Dr. HARRIS of Florida states that Sanseviera will after it is well established afford a crop of 5 tons of clean fibre per acre valued at 100 dollars (American) a ton, and selecting a few square feet where the growth was thickest in his estate, cut and cleaned the leaves and found it gave at the rate of $13\frac{1}{2}$ tons per acre. However as Prof. Dodge (Report on the Leaf fibres of the United States, U. S. Department of Agriculture 1893) points out this estimate is hardly conclusive as the experiments were made on so small an area. The machines for cleaning the fibre mentioned in the paper above quoted are Death and Elwood and the Van Buren. The attention of planters may well be called to this plant.

IMPERIAL INSTITUTE

OF THE

UNITED KINGDOM, THE COLONIES AND INDIA.

IMPERIAL INSTITUTE ROAD, LONDON, S. W.

15th May, 1903.

DEAR SIR,—Samples of Murva fibre (*Sanseviera zeylanica*) grown in the Straits Settlements have been sent by the Selangor Rubber Company to the Board of Trade for an opinion on their commercial value. The matter was referred to the Imperial Institute to deal with, and the fibres have been chemically examined in the Laboratories here, and also submitted for the opinion of brokers.

As the matter may be of interest I send you a copy of the Report which has been furnished to the Selangor Rubber Company. I shall be glad of any information you can give me on the subject of this fibre, especially in relation to the possibility of planting it as a catch crop while the rubber trees are growing. The fibre seems to be very satisfactory, and there would appear to be a good market for it in this country, if it could be grown and prepared at a comparatively small cost.

I am,

Yours sincerely,

WYNDHAM R. DUNSTAN,

Director.

H. N. RIDLEY, ESQ.,

Director, Botanic Gardens, Singapore,

Straits Settlements.

IMPERIAL INSTITUTE.

(SOUTH KENSINGTON, LONDON, S. W.)

Report on samples of Murva Fibre (*Sanseviera zeylanica*) from Selangor, Straits Settlements.

BY PROFESSOR WYNDHAM R. DUNSTAN, M.A., F.R.S. DIRECTOR

The enquiry relating to the value of samples of Murva fibre grown experimentally in the Straits Settlements by the Selangor Rubber Company was referred to the Imperial Institute by the Commercial Department of the Board of Trade.

The sample which was first forwarded only weighed 2.6 grams and is stated to have been extracted from a single leaf. It had a white lustrous appearance and a staple of about 50 cm. (20 inches).

A second sample was afterwards received which was very similar in character and appearance to the first except that it had a very slight yellowish tinge.

Owing to the small amount of fibre available, a complete chemical examination could not be carried out, but the following determinations were made by the usual methods. For comparison, the results furnished by the examination of other specimens of the fibre of *Sanseviera zeylanica*, by the Scientific and Technical Department of the Imperial Institute are also quoted:—

	Moisture per cent.	Ash per cent.	Cellulose per cent.	Length of Ultimate fibre.
Selangor ...	9.9	0.7	75.9	1-3 mm.
Grenada ...	9.5	1.4	72.7	1-5 mm.
Assam ...	9.4	0.7	75.6	1.5-3.5 mm.
Colonial and India Exhibition (Cross and Bevan)	9.7	...	73.1	1.5-3 mm.

From these results it appears that the fibre from Selangor is fully equal in quality to specimens obtained from other sources.

The fibre has also been submitted for commercial valuation to two leading firms of fibre brokers who were informed of the favourable results which it had furnished on chemical examination. One firm reports that the sample is a very strong, clear, hard fibre, of good colour but rather short and tapering; it is coarser and not quite so soft and pliable as is usual for the fibre of *Sanseviera zeylanica*. Owing to the want of regular supplies the fibre has not a recognised position on the London market, but consignments of long staple have been sold at very high prices. The value of the present specimen is given at about £35 per ton (Sisal hemp being now £37 per ton) but if long and of similar quality it would be worth £40 per ton and upwards.

The other brokers to whom the fibre was submitted value it at £33 per ton or £36 per ton if bright white, at which prices they state it would meet with ready sale.

It would appear from these reports that these samples of fibre of *Sanseviera zeylanica*, are of good quality and that consignments of similar character would probably meet with a ready sale on the London market.

WYNDHAM R. DUNSTAN,

15th May, 1903.

BORING BEETLES IN PARA RUBBER.

Mr. Tunnicliffe sends from Port Dickson some small beetles found boring into Para Rubber trees and writes, I am sending some specimens of what I take to be a small boring beetle, also bark of a para rubber tree which they had attacked. Hundreds of them are sticking on to the tree in their small holes, those that are dead having killed themselves by boring into the tree from which a very little latex formed and coagulated holding them in their self made holes. The bark of the tree where attacked is dried up and dead.

These beetles seem to be one of the genus *Platypus*, of the tribe *Bostrychidæ*. They are $\frac{3}{16}$ inch long dark brown and sprinkled all over with short stiff hairs. The head is very short and perfectly flat in front, antennœ very short with few joints, the terminal one oval and flat, jaws black conic curved and deeply grooved. Thorax cylindric punctate, slightly indented at the sides sparingly hairy. Elytra oblong deflexed at the tip and then rounded quite covering the abdomen, with golden hairs on the apex and two short conical processes. They have numerous well marked ridges, and are also dotted. The first joint of the abdomen is very long, longer than the rest of the abdomen, so that the last pair of legs appear to come from near the tail. The fore legs have a very thick round coxa, the femora short and thick, tibia narrowed at base dilate forwards with short processes on the outer edge, the tarsi long and slender ending in two rather large claws. The second and third pairs of legs are somewhat similar, but the coxæ are much smaller.

This animal or one closely allied I have found coming to light in the Botanic Gardens. It belongs to a group mainly at least feeders on dead wood and I have no doubt that in this case the Para tree was dead or partly so and the beetles attacked the dead portion laying their eggs in the dead wood, where the grubs could feed, the holes referred to are doubtless their exit holes, and where the beetles tried to burrow their way out through still living bark they got caught in the latex. The latex of plants like the para rubber tree is indeed its defence against the attacks of such insects which of course are unable to bore through laticiferous tissue.

But though this beetle has I think merely attacked the dead portion of the tree, it is not at all advisable to neglect it. There have been known more than one case of wood boring beetles, living normally, on dead wood, gradually adapted themselves to attack living trees, and effected vast damage. It is just this set of insects that I should expect to be the greatest enemies of Para rubber under cultivation, and just these that we must specially watch and guard against. Fortunately it is easy enough to destroy all rotten wood (*especially that of the trees themselves*), lying about the plantations, so as to leave boring beetles no breeding ground. To leave a dead Para tree lying about among living ones is nearly as bad as to leave a corpse to decay in a town.

Ed.

SARCOLOBUS GLOBOSUS.

This plant is a long climber with a slender brown stem rather thicker than a crowquill covered with a brown thin bark. The leaves rather thin and fleshy ovate to lanceolate, 3 inches long by one and a half wide with a broad rounded base, and a petiole half an inch long opposite. The flowers are in small clusters on short stalks ½ inch long. Each flower is ¼ inch across pale purple in colour with few rather broad lobes and a very short tube.

The fruit is large and oval in out line with a strong keel on one side. It is three inches long and as much through, brown and rough with very small warts. When cut through it is seen to have a thick rind ½ inch through white and pithy, and containing as does the rest of the plant a quantity of latex. This rind which when fresh is quite tasteless is the eatable part of the plant. The seeds are ovate flat thin discs an inch long and three quarters of an inch across and form a large mass overlapping each other. They are brown and possess a broad thin wing all round the seed itself.

The plant belongs to the order *Asclepiadaceæ,* and inhabits the shores of tidal rivers creeping over the bushes along the banks. It is called Akar Peler Kambing, or Kambing-kambing. It occurs in Singapore, Malacca, Pahang and as far north as the Merqui Archipelago and in the Sunderbunds in India.

Mrs. BLAND informs me that this fruit is used to make a conserve in Malacca, which is very palatable and I find it is also so used here. The following is the recipe, as used in Singapore.

The rind is taken and cut into pieces and dipped in salt and water for three days, then removed to fresh water for 2 days and then put into boiling syrup.

It is also used as a "sambal" for curry. For this the rind is put into salt and water for 3 or 4 hours, and then boiled.

The seeds are said to be poisonous killing a dog in about twenty four hours.

H. N. RIDLEY.

DATURA-POISONING.

Dr. J. D. GIMLETTE publishes in the British Medical Journal (May 16, 1903) an article on Datura poisoning in the Federated Malay States. These poisonous plants (*Datura gastuosa*, and *D. alba*), commonly to be found in gardens and waste grounds are known to the Malays as Kechubong, the black datura a dark coloured usually purplish flowered form or species being known as Kechubong Hitam, Kechubong Ulong, and in Kedah Trong Pungah, the white form is called Kechubong Putih. For criminal purposes the seeds are used in the Native States, but I have known of a decoction of the leaves being used in Singapore, and also dried flowers. Four cases of criminal use of the drug in Pahang and Selangor are described, the seeds being administered in tea or curry; but Dr. GIMLETTE also mentions cases of mixture of the seeds with opium and Indian hemp, and also burnt with incense so as to produce lethargy in the victims. The results of taking the seeds internally are, dryness of the throat, uncertainty of vision and delirium. It does not seem to be ordinarily fatal except in the case of young children and aged persons. In cases of datura-poisoning, emetics are usually the first remedies applied, but Dr. GIMLETTE states that too much reliance must not be put in these and the early administration of a purgative is often advisable.

Daturin is precipitated by tannic acid and the use of strong tea or coffee may be of value, but the author suggests the use of potassium permanganate, which has the property of oxidising vegetable alkaloids, washing out the stomach with a solution not stronger than 1 grain to the ounce, by means of a tube. Dr. GIMLETTE managed in the course of his experiments to extract an alkaloid from the seed, and it may be hoped that he may be able to continue his researches into this substance, and to settle the questions as to the amount and relative strength of the poison in the different forms of the plant, and the difference between the alkaloids of *Datura stramonium*. and of *Gastuosa* and *alba*.—EDITOR.

THE BLACK COBRA.

As many people have their dog's eyes injured by the spitting of the black cobra, some account of the method of treatment which I have found successful may be of service.

The black cobra when threatened by a dog erects its hood and spits its poison at the enemy, that is to say the poisonous saliva forced out of the glands, to the end of the teeth is blown with violence at the dog. I have been hit in the face by the poison at a distance of eight feet. As a rule, when spitting at a dog in the open the poison flies in the form of a fine spray and the chances of a dog getting seriously hurt thus are small, but when the cobra draws back into its hole, or into a bamboo hedge, and the dog charges it it is very likely to get the full discharge in one or both eyes. A careful cobra-killing dog always waits his time till he can get the animal by the throat, and shake the life out of it. A dog too excited follows the cobra as it draws back, and so gets hurt. I have never seen a cobra attempt to bite a dog.

The result of the poisons being injected into the eye, is almost immediately inflammation of the conjunctiva and cornea. The eyelids swell up in a few minutes and the eye is closed. If neglected the eye remains closed for some days and when the lids are opened the eye is seen to be blue, opaque and quite blind, and it looks very much as if the dog would never see again with it. In one case a fox terrier remained after some days with the eye open but perfectly blind, and died apparently from the effects of the accident a week afterwards. The following treatment I have found most effective. As soon as possible after the accident has happened, clean the eye with a soft handkerchief and plenty of cold water. Then drop into the eye opening the lids as far as may be, a few drops of a solution of zinc sulphate 8 grains to 8 ozs. of water. This should be done every few hours, the dog being kept chained up in a shady place. Even when the eye is perfectly opaque and blue it is marvellous how soon it will clear and the dog will see as well as ever. The sooner the treatment is begun, the sooner the eye will recover, but it may take a week or two if much of the poison has entered the eye or the damage has been neglected.

As the eye clears Alum water 1 drachm alum to 8 ozs. water can be used in place of sulphate of zinc, as it seems to be very beneficial.

As the cobra can spit even after its back has been broken by the blow of a stick, persons killing them should be careful not to put their faces too near the animal as long as it is not completely disabled. Some years ago a gentleman well acquainted with the Indian Cobra, who was examining one in a cage in the Botanic Gardens was hurt in this manner, the Cobra suddenly spitting at him. The Indian Cobra apparently does not defend itself in this way.

H. N. R.

:o:

GUTTA PERCHA NOTES.

In an account of the specimens of Gutta percha and allied substances shown at the Hanoi Exhibition, Dr. SPIRE (Bulletin Economique Ser. ii, No. 17) gives some account of the gutta produced by *Dichopsis krantziana*, a tree much resembling our *D. obovata*. It is a native of Cochin-China, and plants were received in the Botanic Gardens of Singapore some years ago through the kindness of Dr. HAFFNER of Saigon, and are growing steadily though not rapidly. Samples from Kampot, were shown at the Hanoi Exhibition, by M. CASSIER, but it does not appear to be very abundant. It is sold at the rate of a piastre a kilogram.

The most interesting exhibit of this was the series of exhibits of products obtained from the latex; by purification with hot water, extraction cold by sulphuric ether as made by M. LEFEVRE, a process producing a substance containing 81·9 per cent. of gutta, a gutta purified by petroleum ether which produces a material more suitable for industrial purposes than that obtained by sulphuric ether. At the suggestion of M. LOURME, Director of Posts and Telegraphs, experiments are being made with this gutta for cables.

Dr. SPIRE gives also in the same paper an account of the extraction of gutta from the leaves of *Dichopsis oblongifolia*. He points out that there are two methods of manufacture, one from fresh leaves mechanically on the spot, and one from dried leaves by chemical processes. The former process was used by M. BRANDT at Pontianak, and Dr. LEDEBOER in Singapore.

The gutta so produced was the best for cables, but the amount obtained was much less 1½ to 2 per cent. instead of 9 to 10.

As to chemical processes, Dr. VAN ROMBURGH and M. TROMP DE HAAS, have attempted to put the business on a practical footing. They treated the dry leaves by petroleum ether at Sourabaya. First treating them with boiling alcohol, then by petroleum ether and distilling between 60 and 80°, they obtained a gutta valued by European experts at 12 francs a kilogramme. No further exploitation of the cultivated plants has been carried on till experience has shown that this gutta can be used for cables.

In Sarawak the brothers HOURANT have attempted to manufacture the gutta by the Serullas method, the Rajah of Sarawak having granted them a monopoly of the leaves in the State. Unforfunately Serullas' process requires a great deal of machinery and a number of chemicals, and the expenses of purchase and transport were so large that the Society were alarmed and abandoned the whole business in spite of the fact that the gutta produced was quite successful. Other European syndicates have not been more fortunate.

At the Suresnes factory M. SERULLAS is continuing his series of experiments without attempting to start a commercial undertaking. A factory put up at Chézy near Orleans, treated the leaves with petroleum ether and precipitated the gutta by ice, using in fact Dr. OBACK'S method. This factory has however, ceased to exist. The factory of GRAVILLE ST. HONORINE, near Havre, had some difficulty in procuring material. M. KORTE, Traveller for the factory, has succeeded in forming a new export locality at Sambas to replace Pontianak. As to Padang which supplies at the present time nearly all the dry leaves sent to Europe, the exportation according to statistic amounts to 20,000 kilograms a year only.

The paper goes on to give some account of the attempts at cultivation in various parts of the world.

In Java, there are the Government plantations of Poerwokarto started in 1856, containing now only 58 trees of *Dichopsis oblongifolia*; the Experimental Gardens of Tjikemeuh, 150 plants of each of the following:—*D .gutta, borneense, Treubii oblongifolium* and *Payena Leerii*, planted in 1884 and the large plantation of Tjipetii, of 700 hectares, first commenced in 1885. There are also two private plantations in Java recently started. In Bintang Dr. LEDEBOER has a small plantation of *D. gutta.*

There are also the plantations of the Malay Peninsula. The Americans have tried to introduce the Gutta percha into the Philippines, the Germans into New Guinea, and the Belgians on the Congo. According to Dr. STUHLMANN, Director of Agriculture on the East Coast of Africa, the only attempt made there with four plants of *D. Treubii,* has failed. Dr. PREUSS, according to M. SCHLECHTER, has had better success in the Cameroons. France has made serious attempts to introduce it into her Colonies. The plants collected by Messrs. SERULLAS and PIAOUL have been scattered over her possessions. At Sibreville (French Congo) some plants given to a planter are dead, two only of those supplied to the Mission, have survived. To Guadeloupe 97 plants, to Martinique 106, and to French Guiana 87 were taken by Dr. LECOMTE. M. Jacquet succeeded in introducing 100 alive to French Indo-China.

RAINFALL STATISTICS FOR MAY, 1903.

Our annual dry season generally begins from about the middle of December and finishes in May; June ushering in our rains for the year; such being the case, May is always the most favourable month for weather statistics, therefore, I am forwarding Rainfall Returns from 23 registering stations this side of Singapore, in order to shew where the most and least rain are recorded; these comparative statements, if I may call them, have never before been published in this form, and will be of some important use to those interested in the Meteorology of the Straits:—

PENANG.

Balek Pulau	...	...	Ins. 8-47
Pulau Jerajak	...	...	,, 9-82
The Government. Hill	...		,, 8-84
The Fort	...	...	,, 4-33
The Prison	...	...	,, 7-82

PROVINCE WELLESLEY.

Sungei Bakap	...	...	Ins. 7-03
Bukit Mertajam		...	,, 4-65
Butterworth	...	...	,, 3-39

FEDERATED MALAY STATES.

Taiping	...	...	...	Ins. 14-89
Ipoh	...	...	...	,, 8-41
Parit Buntar		...	...	,, 5-09
Selama	...	...	...	,, 14-51
Tapah	...	...	...	,, 12-58
Seremban		...	...	,, 6-42
Kwala Lumpur			...	,, 10-82
Lenggong		...	...	,, 5-94
Bagan Serai		...	...	,, 7·60
The Cottage		...	...	,, 11-26
Mot Wells' Hill			...	,, 13-53
Batu Gajah		...	...	,, 7-47
Gopeng	...	...	...	,, 10-03
Kampar		...	...	,, 17-65
Teluk Anson		...	...	,, 5-68

METEOROLOGICAL OFFICE, PENANG,

M. E. SCRIVEN.

Officer-in-Charge.

VITALITY OF PARA SEEDS.

As Para rubber seeds have the reputation of very quickly losing their vitality, the following extracts from a letter received from Mr. J. C. HARVEY of Vera Cruz, Mexico, will, no doubt, be read with interest.

" You will perhaps be interested to know, that of the twenty " seeds of Hevea Brasiliensis you so kindly sent me, I have now " fourteen thrifty plants a foot high. I feel very proud of them. " The matter is worthy of record, as undoubtedly they are the first " plants ever raised in Mexico. "

These seeds were from the Para rubber trees growing in the ecomonic section of the Botanic Gardens. They left Singapore on the 12th February, 1903, and arrived in Mexico on the 3rd May, 1903.

Editor.

INSECTICIDES.

A mixture prepared as follows is recommended to prevent ants, Scale insects and other vermin attacking trees or plants:—

White Lime (slaked)		...	6 quarts.
Kerosene oil	...	...	½ pint.
Turpentine	...	...	1 wine-glass.
Soft soap	...	...	5 lbs.
Cow-dung	...	...	3 quarts.
Water ...	...	...	16 quarts.

Mix the whole thoroughly together, and apply freely with a paint brush or white-wash brush to the trunks of trees or stems of plants requiring protection. It is also a good remedy in case of trees already affected by pests, killing scale insects &c. immediately.

If signs of " gumming " are observed in Citrus trees, to the above mixture should be added ½lb. of Flowers of Sulphur. The mixture adheres to the trunks and branches of trees for a considerable time, but when it peels off, the bark beneath will be found to be perfectly clean and free from pests, both animal and vegetable.

It must be remembered that such remedies as the one here recommended cannot be expected to be permanently effectual, unless proper cultural method are adopted, so that the tree and plants are kept in a healthy growing state. Healthy trees are not often attacked by insect pests. *From the Bulletin of the Botanical Department, Jamaica.*

RUBBER TAPPING EXPERIMENTS IN PENANG.

It is interesting to record that the Para Rubber tree growing in the Penang Gardens—a figure of which was given at page 384 of the Bulletin—still continues to give good results. This year makes the 8th consecutive year of tapping. Operations began on 8th May, and the following Table shews the results. The tapping was made as previously, *i.e.*, by taking a fine shaving off the cuts on each occasion.

Date of tapping the Para Rubber tree.

Date of tapping.	Weight of wet rubber in oz.	Weight of Dry rubber on 6th July.	Remarks.
8th. May	No rubber		
11th. ,,	$1\frac{1}{2}$		
13th. ,,	$1\frac{3}{4}$		
15th. ,,	$2\frac{3}{4}$		
18th. ,,	$3\frac{1}{4}$		
20th. ,,	$4\frac{1}{4}$		
22nd. ,,	6		
24th. ,,	$7\frac{1}{2}$	54 oz. or 3 lbs. 6 oz.	
26th. ,,	$7\frac{1}{4}$		
28th. ,,	7		
30th. ,,	$6\frac{1}{2}$		
1st. June	10		
3rd. ,,	5		
5th. ,,	$9\frac{1}{4}$		
8th. ,,	$17\frac{1}{4}$		
	$75\frac{1}{4}$		

The net result shews 14 tapping giving 75 oz. of wet rubber or 54 oz. of dry. This with the previous seven tappings gives a total of 22.15 oz. from this tree. An average of 2 lbs. 15 oz. per year.

W. FOX.

PENANG, 16. 7. 03.

The following is the Rainfall for June, 1903 :—

PENANG.	
The Fort - - - -	Ins. 5·17
Pulo Jerejak - - - -	,, 7·00
The Prison - - - -	,, 8·31
The Government Hill - - -	,, 11·91
Balek Pulau - - - -	,, 12·71
PROVINCE WELLESLEY.	
Bukit Mertajam - - -	,, 3·14
Butterworth - - - -	,, 6·48
Sungei Bakap - - -	,, 1·68
Lumut - - - -	,, 4·70
Pangkor - - - -	,, 1·60
Bruas - - - -	,, 3·73

M. E. SCRIVEN,

Assistant Surgeon,

Prison Observatory,

PENANG.

NOTICE.

It is suggested that Subscribers who are not residents of Singapore should send Money Orders in preference to Cheques in order to avoid the loss due to Bank discount.

SINGAPORE MARKET REPORT.

June, 1903.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	27.00	25.00
Bali	102	19.25	18.50
Liberian	116	19.00	17.50
Copra	4,797	8.15	6.80
Gambier	5,736	1.480	12.75
Cube Gambier, Nos. 1 & 2	367	21.75	16.50
Gutta Percha, 1st quality	...	340.00	225.00
Medium	...	240.00	125.00
Lower	...	140.00	22.00
Borneo Rubber	...	150.00	120.00
Gutta Jelutong	...	8.00	6.75
Nutmegs, No. 110's	...	88.00	78.00
No. 80's	...	125.00	100.00
Mace, Banda	...	175.00	165.00
Amboyna	...	150.00	140.00
Pepper, Black	1,059	35.65	33.50
White	184	56.50	50.00
Pearl Sago, Small	157	6.75	5.25
Medium	20	7.50	7.00
Large	...	8.00	7.50
Sago Flour, No. 1	4,624	4.20	3.75
No. 2	525	1.25½	1.10
Flake Tapioca, Small	1,020	7.00	4.20
Medium	30	...	...
Pearl Tapioca, Small	635	5.50	4.20
Medium	757	5.50	4.20
Bullet	...	5.25	5.00
Tin	3,050	89.00	83.00

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th June, 1903.

Wired at 4 p. m. on 16th June, 1903.

To England.

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports.	1,075
Gambier	from Singapore	to London	10
,,	,, ,,	,, Liverpool	...
,,	,, ,,	to U. K. & / or Continent	140
,,	,, ,,	to Glasgow	...
Cube Gambier	,, ,,	,, England	10
White Pepper	,, ,,	,, ,,	50
Black ,,	,, ,,	,, ,,	170
White Pepper	,, Penang	,, ,,	10
Black ,,	,, ,,	,, ,,	40
Pearl Sago	,, Singapore	,, ,,	20
Sago Flour	,, ,,	,, London	430
,, ,,	,, ,,	,, Liverpool	...
,, ,,	,, ,,	,, Glasgow	20
Tapioca, Flake	,, Singapore & Penang	to England	220
,, Pearl & Bullets	,, ,, ,,	,, ,,	280
,, Flour	,, Penang	,, ,,	625
Gutta Percha	,, Singapore	,, ,,	50
Buff hides	,, ,,	,, ,,	20
Pineapples	,, ,,	,, ,, cases	15,000

To America.

Tin	from Singapore & Penang	580
Gambier	,, Singapore	1,050
Cube gambier	,, ,,	...
Black Pepper	,, ,,	160
,,	,, Penang	...
White Pepper	,, Singapore	...
,,	,, Penang	...
Nutmegs	,, Singapore & Penang	4
Tapioca, Flake & Pearl	,, ,, ,,	200
Pineapples	,, ,,	cases 6,250

To the Continent.

Gambier	from Singapore	to South Continental Ports	250
,,	,, ,,	,, North ,,	90
Black Pepper	,, ,,	,, South ,,	50
,,	,, ,,	,, North ,,	30
Black Pepper	,, Penang	,, South ,,	20
,,	,, ,,	,, North ,,	...

			Tons Steamer.
White Pepper	from Singapore	to South Continental Ports	...
,,	,, ,,	,, North ,, -	10
,,	,, Penang	to South Continental Ports-	...
,,	,, ,,	,, North ,, -	20
Copra	,, Singapore & Penang	to Marseilles -	260
,,	,, ,,	,, Odessa -	1,000
,,	,, ,,	,, South Continental Ports - other than Marseilles and Odessa	440
,,	,, ,,	,, North Continental Ports -	220
Tin	,, ,,	,, Continent -	310
Tapioca Flake	,, ,,	,, ,, -	80
Tapioca Pearl	,, ,,	,, ,, -	140
Cube gambier	,, Singapore	,, ,, -	70
Pineapples	,,	,, ,,	cases 2,000

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,150 tons Gambier
530 ,, Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E. C.

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 30th June, 1903.

Wired at 3.45 p.m. on 1st July, 1903.

To England:—

			Tons Steamer
Tin	from Singapore & Penang and U. K. optional any ports	to England -	1,550
Gambier	from Singapore	to London -	...
,,	,, ,,	to Liverpool-	...
,,	,, ,,	to U. K. & / or Continent -	250
,,	,, ,,	,, Glasgow -	...
Cube Gambier	,, ,,	,, England -	60
White Pepper	,, ,,	,, ,, -	...
Black ,,	,, ,,	,, ,, -	20
White ,,	,, Penang	,, ,, -	...
Black ,,	,, ,,	,, ,, -	...
Pearl Sago	,, Singapore	,, ,,	20
Sago Flour	,, ,,	,, London -	470
,,	,, ,,	,, Liverpool -	...
,,	,, ,,	,, Glasgow -	...
Tapioca, Flake	,, S'gapore & P'nang	to England -	330
,, Pearl & Bullets	,, ,,	,, ,, ,, -	280

			Tons Steamer.
Tapioca Flour	from Penang	to England -	725
Gutta Percha	,, Singapore	,, ,, -	30
Buff hides	,, ,,	,, ,, -	20
Pineapples	,, ,,	,, ,, cases	7,000

To America :—

Tin	from Singapore & Penang	-	600
Gambier	,, ,,	(sailing)	300/230
Cube Gambier	,, ,,	-	10
Black Pepper	,, ,,	-	170
,,	,, Penang	-	290
White Pepper	,, Singapore	-	30
,,	,, Penang	-	...
Nutmegs	,, Singapore & Penang	-	19
Tapioca, Flake & Pearl	,, ,, ,,	(sailing)	330/650
Pineapples	,, ,, ,,	cases	6,500

To the Continent :—

Gambier	from Singapore	to South Continental Ports	230
,,	,, ,,	,, North ,, -	130
Black Pepper	,, ,,	,, South ,, -	90
,,	,, ,,	,, North ,, -	50
,,	,, Penang	,, South ,, -	20
,,	,, ,,	,, North ,, -	30
White Pepper	,, Singapore	,, South ,, -	20
,,	,, ,,	,, North ,, -	10
,,	,, Penang	,, South ,, -	...
,,	,, ,,	,, North ,, -	40
Copra	,, Singapore & Penang	to Marseilles -	150
,,	,, ,,	,, Odessa -	500
,,	,, ,,	,, South Continental Ports other than Marseilles and Odessa.	540
,,	,, ,,	,, North Continental Ports	840
Tin	,, ,,	,, Continent -	230
Tapioca Flake	,, ,,	,, ,, -	40
Tapioca Pearl	from Singapore & Penang	to Continent -	330
Cube gambier	,, Singapore	,, ,, -	50
Pineapples	,, ,,	,, ,, cases	750

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

2,300 tons Gambier 430 ,, Black Pepper *(in Singapore)*	contracted for during fortnight ending as above.

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E. C.

(C)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th July, 1903.

Wired at 2.50 p. m. on 16th July, 1903.

			Tons Steamer.
To England.			
Tin	from Singapore & Penang	to England and U. K. optional any ports. -	1,940
Gambier	from Singapore	to London -	...
"	" "	to Liverpool -	70
"	" "	to U. K. &/ or Continent -	120
"	" " "	Glasgow -	...
Cube Gambier	" " "	England -	80
White Pepper	" " "	" -	10
Black "	" " "	" -	20
White Pepper	" Penang "	" -	...
Black "	" " "	" -	...
Pearl Sago	" Singapore "	" -	70
Sago Flour	" " "	London -	750
" "	" " "	Liverpool -	1,075
" "	" " "	Glasgow -	...
Tapioca, Flake	" Singapore & Penang	to England -	350
" Pearl & Bullets	" " "	" " -	240
" Flour	" Penang	" " -	430
Gutta Percha	" Singapore	" " -	90
Buff hides	" Singapore	to England -	100
Pineapples	" Singapore	" " cases	43,000
To America:			
Tin	from Singapore and Penang	-	240
Gambier	" Singapore	- - -	490
Cube Gambier	" "	- - -	20
Black Pepper	" "	- - -	180
"	" Penang	- - -	...
White Pepper	" Singapore	- - -	10
"	" Penang	- - -	...
Nutmegs	" Singapore and Penang	-	5
Tapioca, Flake and Pearl	" " "	- -	40
Pineapples	" " "	- cases	7,500
To the Continent:			
Gambier	from Singapore	to South Continental Ports	50
"	" "	" North "	650
Black Pepper	" "	" South "	20
"	" "	" North "	70
"	" Penang	" South "	...
"	" "	" North "	...
White Pepper	" Singapore	" South "	10
"	" "	" North	100

			Tons Steamer.
White Pepper,	from Penang	to South Continental Ports	...
"	" "	" North "	...
Copra	" Singapore & Penang	to Marseilles	460
"	" "	" Odessa	...
"	" "	" South Continental Ports other than Marseilles and Odessa.	460
"	" "	" North Continental Ports	2,900
Tin	" "	" Continent	230
Tapioca Flake	" "	" "	260
Tapioca Pearl	" "	" "	190
Cube Gambier	" Singapore	to Continent	110
Pineapples	" "	" "	cases 3,000

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

500 tons Gambier
130 " Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

Singapore.

Abstract of Meteorological Readings for the month of June, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·865	136·3	80·7	87·8	75·0	12·8	77·9	·897	75·9	80	S.S.E.	5·48	1·61

K. K. Hospital Observatory,
Singapore, 8th July, 1903.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S,

Penang.

Abstract of Meteorological Readings for June, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·874	149·1	82·0	90·5	74·4	16·1	75·4	·774	69·40	67	S.	8·31	2·28

Colonial Surgeon's Office,
Penang, 9th July, 1903.

M. E. SCRIVEN,
Asst. Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for June, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
Durian Daun Hospital.	29·805	152·4	79·5	89·7	70·2	19·7	81·4	1040	70·2	93	S.W.	8·75	3·88

Colonial Surgeon's Office,
Malacca, 12th July, 1903.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for June, 1903.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Humidity.	Total Rainfall	Greatest rainfall during 24 hours.
Taiping ...	151	83·20	93	72·50	20·50	77·70	876	77	5·66	1·42
Kuala Kangsar ...	...	81·09	93	71	22	76·47	851	80	3·47	1·00
Batu Gajah ...	158	81·62	93	72	21	77·87	900	84	3·61	·86
Gopeng ...	...	81·49	92	65	27	77·01	868	81	5·82	1·28
Ipoh ...	...	81·76	93	71	22	77·22	874	81	7·05	3·65
Kampar ...	...	...	93	69	24	...	...	...	7·79	2·06
Teluk Anson ...	...	82·13	92	71	21	77·77	887	82	8·29	2·63
Tapah ...	..	81·47	92	70	22	77·28	882	82	7·73	1·26
Parit Buntar ...	...	82·70	92	73	19	77·55	875	79	1·54	·86
Bagan Serai ...	...	82·07	91	71	20	77·24	880	80	1·35	·64
Selama ...	...	82.16	91	74	17	78·14	906	83	4·45	2·18

STATE SURGEON'S OFFICE,
Taiping, 13th July, 1903.

M. J. WRIGHT,
State Surgeon, Perak.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for April, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis, ...	...	...	88·8	96·0	71·0	21·9	...	...	...	...	...	1·51	·43
Raub, ...	...	...	81·18	92·0	71·0	16·50	...	...	...	...	...	4·09	1·56
Bentong ...	...	...	82·7	91·0	74·5	16·5	...	...	...	...	...	3·83	·90
Pekan ...	...	...	80·0	90·0	70·0	10·0	...	...	...	...	...	8·57	4·71
Kuantan, ...	...	...	...	87·0	72·0	15·0	...	...	...	...	...	6·01	3·15
Temerloh ...	...	...	...	96·0	73·0	23·0	...	...	...	...	...	5·78	1·62

Pekan, 25th June, 1903.

S. LUCY,
District Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for June, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	86·0	91.0	72·0	19·0	79·0	...	...	...	S. W.	4·99	·73

Muar, 1st July, 1903.

FRANCIS PEARS.

No. 8.] AUGUST, 1903. [VOL. II.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

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SINGAPORE:
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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F. L. S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN

OF THE

STRAITS

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FEDERATED MALAY STATES.

No. 8.] AUGUST, 1903. [VOL. II.

CULTIVATION OF RENANTHERAS.

There are few orchids more easy of cultivation and more floriferous than the Renantheras, commonly known as spider or scorpion orchids, and no tropical garden can be considered at all complete without them. There are eleven species known, all natives of the Malay and Chinese regions. The plants have terete woody stems usually about as thick as a pencil, emitting long grey terete roots from the joints, and attaining a length of 20 or 30 feet or even more. The leaves are leathery oblong distichous rather far apart and the flowers are produced in large panicles, of several branches usually spreading horizontally and covered with flowers, often of large size and brilliant colour.

The Renantheras are propagated by cuttings which grow readily when merely stuck in the ground. To grow them it is best to dig a round bed, in which is put leaf mould mixed with broken crocks and charcoal, and fairly stout poles, seven to ten feet tall are put in the beds up which the Renantheras will grow. The beds are made in full sun, and from time to time a little cut grass should be thrown on the base of the plants. Grown in this manner most of the Renantheras will thrive and flower several times a year.

The Vandas, *V. teres* and *V. Hookeriana,* and the hybrid *V. Miss Joaquim,* are best grown in the same way as Renantheras, and in good damp soil are very floriferous. Renantheras may also be grown on trees but as they do not flower till they get to the light this is rather a slow method. Light being what these plants require cultivation in Europe has not been very successful on the whole, though several species have flowered in hot houses. Renantheras are seldom attacked by any pests, but I have seen them injured by the small black orchid weevil in Penang.

The following species have been cultivated in Singapore:—
R. arachnites, Lindl. The scorpion orchid, native of Perak.
R. maingayi, Ridl. Native of the Malay Peninsula.
R. alba, Ridl. Native of the Peninsula and Borneo.
R. matutina, Lindl. Native of Borneo and Malay Peninsula.
R. micrantha, Lindl. Native of the Peninsula.
R. storiei, Rchb. fil. Native of the Philippines.

R. coccinea, Lour. Native of Cochin China and China.
R. imschootiana, Rolfe. Native of Assam.

The only others are *R. bilinguis*, Rchb. f. of Borneo, *R. sulingi*, of Java and *R. trichoglottis*, Ridl. of Borneo.

The plant commonly called *Renanthera Lowii*, does not really belong to this genus.

R. arachnites, Lind. is the largest and strongest grower and a very regular flowerer. The flower sprays are large and the flowers 3 inches across, the largest in the genus, the sepals and petals are green with blotches of brown, the lip white.

From its curved lateral sepals and straight upper one, it has obtained the name of scorpion orchid, as it vaguely re-calls the appearance of that creature. It has a strong scent of musk emitted from the tip of the upper sepal, which is curved back. It flowers twice or oftener a year, January and July, and occasionally fruits.

R. Maingayi, Hook. fil. is nearly as big a plant, but the leaves are more flaccid. The panicles are usually large and loose and the flowers distant, quite scentless of a similar shape to those of the previous species, and nearly as large, the ground colour white or pinkish white, with numerous blotches of shrimp-pink. In some forms the flowers are almost suffused entirely with dark pink. It is a very beautiful species, but a much shyer flowerer. Very fine sprays however are often to be seen in Singapore Gardens.

R. alba, Ridl. was first met with by myself climbing over bushes in hot open sandy country in Pahang. It occurs in many places in the Peninsula especially near the sea I have seen it in immense abundance climbing over low trees in an island near Singapore, and emitting so many of its long roots that they formed a curtain that had to be cut through before one could get through the bushes. It is rather shorter in the stem than the preceding species, and somewhat brittle. The leaves are more fleshy and rigid and often minutely toothed at the base, especially in plants grown in full sun. The flowers are smaller than those of *R. maingayi*, in a loose panicle, or a spike in small plants. They are white.

R. matutina, Lindl. is a plant of much lower habit one or two feet tall with speckled stems and narrow ligulate leaves, rather stiff. The sprays about 8 or 9 inches long, the flowers about 20 scattered rather narrow, red or orange spotted with darker colour, the lip white with a central red spot. It grows usually on rocks, and does not seem to be a very easy plant to cultivate. It appears to be rare in the Peninsula, but has been found by WRAY, in Perak, and by myself also on rocks in forest on Bujong Malacca. It seems to be commoner in Borneo.

R. micrantha, Lindl. is often to be found on rocks overhanging the sea, all over the Peninsula. The stems are tolerably stout about 10 or 12 feet long, the leaves short and broad usually blotched with red the flower sprays are about a foot or more long, with horizontal branches densely covered with very small deep red flowers all arranged on one side. Though the flowers are the smallest of any in the genus, only $\frac{1}{4}$ inch long their abundance makes this a very charming plant. It is easily grown and flowers often. The plant itself however appears to be comparatively short lived.

R. soccinea, Lour. is a stout plant, but appears here at least to be a much shorter and more compact plant than *R. moschifera* or *maingayi,* however it runs to 12 feet or even more in length. It is one of the most beautiful in the genus. The panicles are large and much branched and bear innumerable deep scarlet flowers mottled with darker colour, they are about 2 inches across with the lower sepals broader oblong spathulate. It does well in the Straits and very fine sprays may be often seen at our Flower shows.

R. storiei, Rchb. f. is the finest species in the genus. It has much the habit of *R coccinea,* a stout plant with rather broad dark green leaves. The panicle is often very large, one plant about 6 feet tall had an inflorescence of 700 flowers. It was flowered by Mr. St. V. B. Down, in Singapore in June 1903, and was certainly a magnificent sight. A plant in the Botanic Gardens though only about 4 feet tall flowered at every one of the upper joints. But I have seen plants grow for a long time before they showed any signs of flowering, although grown in full sun. It is better certainly that the plant should not be allowed to flower till it is robust, as the flower sprays are usually small and it is a considerable strain on the plant. It is a native of the Philippines and is said to be abundant there.

R. imschootiana, Rolfe. is a short plant with the habit rather of a Vanda, and flowers like those of *Storiei,* but smaller and fewer. It is rather too small to grow on posts like the other species, and pot culture seems to suit it best. Imported plants were flowered in the Botanic Gardens last year but this climate is probably too wet for it, as it does not seem to thrive.

FENCING OF MAIN TRUNK LINE FEDERATED MALAY STATES RAILWAYS.

The following correspondence is published at the request of the Resident General, Federated Malay States.

Resident General's Office,
Selangor Malay Peninsula,
11th June, 1903.

Sir,—The question of fencing the Government Railway Line from Prai to Seremban, some 290 miles, is engaging the attention of the Government of the Federated Malay States and is one involving large expenditure.

2. I shall be greatly obliged for any suggestions you can kindly offer in the direction of utilizing some suitable plant or shrub for

planting as a hedge along the line, to keep off trespassing cattle, goats and other animals.

3. The General Manager for Railways is of opinion that Bambu hedges are unsuitable, because cattle can push through the strongest bambu hedges, cost of maintenance, trimming &c., would be too high, bambu does not thrive in wet swampy ground.

4. You may happen to know of some cactus or other strong thorny plant which would serve the desired purpose.

I have, &c.,

W. H. TREACHER,
Resident General, F. M. S.

THE DIRECTOR OF GARDENS,
Straits Settlements, Singapore.

BOTANIC GARDENS, SINGAPORE,
Straits Settlements,
June 15th, 1903.

SIR,—I have the honour to acknowledge your letter of June 11th asking about fencing plants for the Railways in the Federated Malay States, I should recommend Inga dulcis (Madras thorn) it will grow almost anywhere and does not object to swamp. It grows dense and does not require much topping. Where cattle are a nuisance in breaking through we use also Mauritius hemp, green aloe, Fourcroya gigantea the long spiny leaves of which prevent any animal from passing.

Cactus is useless in swamp, and is only suitable for sandy spots. Sometimes we plant here both a row of green aloe outside the more permanent hedge of thorn, so as to prevent the animals crossing or eating the thorn till it has grown up as the aloes grow faster, though they are not so long lived.

I have, &c.,

HENRY RIDLEY.
Director.

THE RESIDENT GENERAL,
Federated Malay States.

THE GROWTH OF MURVA FIBRE.

BATU TIGA, *27th May, 1903.*

Sir,—I have the honour to acknowledge receipt of your letter No. R. G. 3531/03 of the 23rd instant on the subject of Murva fibre, or Sansevieria zeylanica, and to report as follows:

2. Murva or Moorva fibre is the product of Sansevieria roxburghiana—now recognised as distinct from S. zeylanica, which plant was formerly supposed to yield this

Source.

product—and is a member of the family of plants which yield the fibre known as bow-string hemp.

3. The Sansevierias belong to the natural order Hœmodoraceœ and are small perennial plants with short, thick rhizomes and fleshy or leathery radical leaves, mottled or spotted, and varying according to the species from two to seven feet in length.

Classification.

Most of the species are natives of tropical Africa, but are widely distributed throughout the tropics of both hemispheres. Probably the most common species in the Malay Peninsula is S. guineensis, which yields the Konje hemp. It is a somewhat similar plant to S. zeylanica, which also occurs here in a state of cultivation but has larger and flatter leaves and produces a more valuable fibre.

Habitat.

4. Sansevierias are easily propagated by division of the rhizome or from seed, or more readily still from the leaves, which may be cut into small pieces about three inches long and placed in a moist situation when they will readily take root.

Propagation.

5. With the exception of S. Ehrhenbergii, which is a native of Somaliland and would probably only thrive in an arid situation, these plants enjoy a good soil, moist climate and a moderate amount of shade, and for this reason would probably be valuable to Para rubber planters as an auxiliary crop.

Cultivation. Probably valuable as a "catch crop."

The young plants should be put out about two feet apart and the same distance between the rows, and when once established they may be regarded as a permanent crop, yielding regular cuttings of leaves several times a year.

6. The leaves of all the species contain an abundance of fibre noted for its fineness, elasticity and strength. Murva fibre is as yet hardly known to commerce, but is largely used by natives, who hold it in high esteem for making bow-strings, ropes, mats, etc. The fibre from S. guineensis (Konje fibre) and S. cylindrica (Ifé hemp) are much valued in Europe for the manufacture of ropes, especially those used for deep sea soundings.

Product.

7. The fibre is obtained from the fresh leaves, either by scraping away the cellular tissue by means of a blunt knife or by washing and beating. When the pulp is thoroughly removed the fibre should be washed in clean water and hung in the shade to dry, and when perfectly dry packed in bales and pressed and is then ready for export.

Preparation of the fibre.

It will be seen that the method of preparation in vogue is quite simple, although the fibre would doubtless be improved by the aid of a suitable decorticating machine.

8. I am not in possession of any data with regard to the yield of leaves or of prepared fibre in this country; but, judging from the plants I have seen scattered about

Yield.

in the Peninsula, I should imagine that these plants could be grown quite as well here as in Jamaica, for example, where the return of fibre from S. guineensis is estimated at $1\frac{1}{2}$ tons per acre per annum, valued in London at £30 per ton.

Both Sansevieria guineensis and S. zeylanica are represented in the collection of the Experimental Plantations, but so far have only been used for propagating purposes.

Further investigation necessary.

9. There appears to be need for further investigation with regard to the cultivation of these plants and the preparation of the fibre, as the soil, climate and age of the leaves when collected have much to do with the length and strength of the staple and the quantity of the fibre generally.

Sample.

10. I enclose a small sample of Murva fibre recently extracted from a young leaf. Had this leaf been fully developed the fibre would have been three or four feet long.

I have, &c.,

STANLEY ARDEN,

Superintendent Experimental Plantations.

The Secretary to Resident-General,
FEDERATED MALAY STATES.

KEEPING LAND CLEAN FROM WEEDS.

The following observations by an agricultural correspondent of the Melbourne Weekly Times are appended:—

The advantage of keeping the land clean will be admitted by every cultivator, whether farmer or gardener, though, strange to say, a great many allow it to get foul with weeds for lack of proper attention to its requirements. This is the case with tillers of the soil generally but more especially do many Australian farmers err in this respect. The too common practice in this part of the world is to get as many acres under crop as possible, and little, or even, in some instances, no further attention is given till the harvest time arrives. Though this may be the easiest way of farming, it is not the most economical in the long run. On the contrary, it is a most wasteful and thriftless practice.

Common sense should teach everyone that the cleaner the cultivation the better the crops may be expected to be.

Land cropped in a foul state is not only laid under contribution for the production of a crop of serviceable plants, but has also to support a number of others that are useless and troublesome to the cultivator. Now, it must be perfectly plain to the most ordinary mind that, when crops have to contend with large numbers of weeds, the growth must be interfered with more or less. When land is foul with weeds there is a much heavier tax upon its productive powers when cultivated for a crop than if it were clean. In order to obtain the best possible returns, not only are good land and favourable seasons necessary, but the crops must also be cultivated in a rational manner. The plants that form a crop require the whole of their space, if properly apportioned to them, for their free development, and they cannot be expected to thrive to the fullest degree when they have competitors struggling with them for a share of the soil.

Annual crops, the cereals, for instance, feel this competition very much, and frequently from this cause alone turn out complete or partial failures. When wheat or other cereals are sown in land that is foul with wheat germs, their growth often commences simultaneously, and the crop plants are either smothered by the useless vegetation or suffer seriously in their struggle for existence. Even if by chance the crops are enabled to make a fair amount of headway, they are often injured afterwards by an undergrowth of weeds, which absorb a large amount of nutriment and moisture. On the other hand, in thoroughly clean land, cereal and other crops are able to get a fair start and make good headway without the interference of alien plants.

Crops have not only a better chance of coming to perfection in clean land, but they will also come to maturity earlier, as a rule. This is an advantage that all farmers must appreciate, but especially so in this part of the world, where cereal crops often suffer from the effects of dry weather just before they reach maturity. In many cases crops would not suffer materially from the hot weather if their growth were a little more advanced before it set in. Besides, the earlier the crops are the less liable are they to the attacks of those fungoid and insect pests which are too often troublesome to our farmers.

To Eradicate Weeds.—Weeds may be divided into two classes, and they require somewhat different treatment to eradicate. The annual kinds, which are the most numerous, can generally be destroyed or kept under without much difficulty by allowing an occasional fallow and ploughing them in before they perfect their seeds. When the annual kinds of weeds have been plentiful in a grain or other crop, it will be advisable to take steps for their eradication as soon as the harvest is over. They will generally start with the advent of the first rain, and the operation of germination will be facilitated by a slight scarifying of the surface soil previously.

Weeds that are perennial in their habit are, however, somewhat more difficult to deal with; but labour and patience will generally keep them under. In order to free land from this kind of vegetation, it must be left uncropped for a time, and the surface frequently broken with the plough or scarifier. When land gets foul with these kind of weeds, it is better to throw it out of crop for a season or two than to persist in cultivation that will necessarily give but poor and unsatisfactory returns. The excuse with many for slovenliness in cultivation is the want of time to do things properly, and the difficulty of finding the necessary labour at the time it is wanted. But though some extra labour is undoubtedly required to keep land well cultivated it will, when tried, be found the most economical plan in the long run. It is useless for farmers to expect satisfactory crops if they make no efforts to keep their land free from weeds, and to obtain clean seeds, even if the other conditions of cultivation are favourable.

Clean During Growth.—But, in addition to the greatest care in the cleaning of the land before the crop is put in, and the selection of seed a system of cultivation cannot be deemed perfect unless efforts are made to destroy alien vegetation while growth is progressing. This is generally admitted in garden practice with our own cultivators, and by farmers in countries where agriculture is carried on systematically, but in growing grain crops in this part of the world it is quite ignored. The farmers of Great Britain find it pays them best to put in cereal or other corps in such a way that they may, without difficulty, be kept free from weeds during the early stages of growth. In that country, as also in others where agriculture is carried on systematically, grain crops, as a rule, are put in the ground with a seed-drill in regular rows. Under this system there is no difficulty in using cultivating implements during the early stages of growth, and consequently crops can be kept free to a great extent from alien plants. This is a great advantage, as it enables cultivators to place their crops under the most favourable conditions for a free and uninterrupted growth.

And not only are the conditions for growth more favourable when the drill is used, but it also effects a considerable saving in the quantity of seed required. In fact, not more than half as much required as in sowing broadcast, which is the plan generally followed in this part of the world. By the use of drilling machines the seed is sown regularly at a uniform depth, and nearly every grain that is put into the ground becomes a serviceable plant. On the other hand, when seed is scattered broadcast over the surface of the ground, the crops are apt to come up irregularly, and many of the grains do not germinate at all.

By keeping crops free from weeds that would interfere with their growth, and allowing sufficient space between the plants for free development, the cultivator must necessarily obtain much better returns than if these essentials are neglected. In garden practice these conditions are generally observed by cultivators, and the more closely they are observed by agriculturists the better.

———:o:———

WASHED SOILS: HOW TO PREVENT AND RECLAIM THEM.

FROM THE JAMAICA BULLETIN.

The Erosion, or Washing, of Agricultural Soils.

The denudation, or washing, of lands of the higher levels of the earth's surface is a process which no human precaution can wholly prevent. It has been one of the most important forces and factors in the geological changes which have so modified the surface of the earth. The present surface of the largest portion of the United States is made up of this "sedimentary" or "drift" material which has been moved from the place where it was formed through the disintegration and decay of the old crystalline rocks, by water, wind, or moving ice, and which has accumulated to a depth of hundreds or thousands of feet over nearly the entire surface of the country. It is estimated that the general surface of the land in the area of the crystalline rocks of the Piedmont Plateau has been lowered at least 2,000 feet by this continual washing. This vast amount of material has been slowly removed and deposited elsewhere by the very same agents which we are contending with to-day in our gullied fields; for this denudation, or erosion, is still going on, as it has been for ages past.

As a rule this denudation is exceedingly slow and the general level of large tracts of country is not lowered more than an inch or two in a hundred years. Where the change is as slow as this it is undoubtedly of benefit to the human race, as in the course of time it must carry off the soil which have been used over and over again for vegetation and expose fresh material to the roots of plants. With this slow change the natural forces are amply sufficient for the decay of the subsoil and for the conversion of this freshly exposed material into a good soil. When the rate of denudation is excessive, however, and more rapid than the natural decay of the subsoil material which is exposed, it may work serious injury to agricultural lands.

Along the banks of the Ohio River and in very many portions of the South hundreds of fields that were once covered with sturdy forests of oak, maple, walnut, and pine, and which bore under cultivation, being cleared of the natural growth, large crops of wheat, maize, tobacco and cotton, may now be seen furrowed with gullies as with the wrinkles of age, and abandoned to brush and briers.

A surface layer of good agricultural soil 6 inches deep resulting from the slow and gradual disintegration and decay of rocks and accumulation of humus may have required hundreds of years for its natural formation, and yet it is liable to be washed away in a single storm.

This excessive erosion, or washing, of lands may be prevented, and the already gullied fields may be recovered, and steep slopes of loose material may be held and prevented from washing:—

(1). By chemical means, in the application of manures and fertilizers and in the accumulation of organic matter, which change the texture of the soil and make it more porous and more absorbent of water, so that there is less to run off over the surface.

(2). By means of cultivation and under-drainage, which prevent erosion by distributing the surface flow over the ground and increase the amount carried off by under-drainage.

(3). By reforestation, or the planting of trees, which act mechanically to prevent washing.

(4). By grass and similar vegetation, which bind the soil grains and prevent their washing away.

The erosion of a soil is caused by the wearing of the rain and snow waters which cannot penetrate into the soil fast enough to be carried away by underdrainage, and which, by reason of the slope or contour of the land, run off over the surface carrying along particles of sand and clay. When this water accumulates in a depression in the fields the force of the torrent may be sufficient to cut out a great gully in a short space of time.

The extent of washing to which the soil is exposed depends upon the quantity of rainfall in a given time, the slope or contour of the surface, the texture of the soil, the vegetative covering of the surface, and the kind and condition of cultivation. A soil composed chiefly of moderately coarse grains of sand, and having good underdrainage, will absorb the heaviest rainfall without much danger of surface erosion. A clay soil, on the other hand, into which the water cannot percolate with anything like the rapidity of the precipitation will be washed and gullied by the torrent of water which must flow over the surface.

Chemical Relations of the Soil to Surface Washing.

It has been repeatedly shown by experiments and by the experience of farmers that a soil, as a rule absorbs water more readily as the content of organic matter and humus increases. Surface erosion can, therefore, be largely prevented by such a system of cultivation and cropping as will introduce as large a quantity of organic matter into the soil as possible. A very old method of recovering washed and gullied lands is to place straw in the furrows while ploughing, the straw not only acting mechanically to hold the soil in place and prevent surface erosion, but also in a very efficient way to increase the quantity of humus, thus making the soil hold large quantities of water which otherwise would have passed off over the surface. In this simple way fields which have been badly washed and gullied and entirely abandoned may be recovered and made highly productive.

The most important thing in the recovery of waste fields is the incorporation of organic matter of some kind in the soil, pea vines, stubble, briers, or leaves from the forest may be used as a source of the organic matter. The straw from one acre of land which has been recovered, as mentioned above, will be sufficient to start the recovery of another acre, even if this be deeply furrowed with gullies. Where enough organic matter can be used as a surface dressing, this layer helps greatly to retain water and to make the under lying soil more absorbent.

As soon as a sufficient supply of humus has been accumulated and the lands are brought up to an adequate condition of fertility, clover or grass should be seeded, if the land is at all suited to these crops, or rye, oats, or field peas should be sown to help hold the surface. Little by little, but more rapidly than would be expected from the forbidding aspect of the field, the land can be reclaimed again and made productive through the accumulation of humus and organic matter. A soil containing a fair quantity of humus will wash less readily than one nearly destitute of this matter.

A soil containing a fair supply of lime is much less liable to wash than one similarly situated and exposed which is deficient in lime. The reason of this is that clays which are deficient in lime, when once brought into suspension by moving waters, will remain in suspension and keep the water turbid for a long time. Clays which are heavily impregnated with lime salts, on the other hand, are in a flocculated state, the fine grains of clay being held together and in contact with the larger grains of sand. This flocculated mass quickly settles and is originally not so easily disturbed and carried off by moving water. A field treated with an abundance of lime is thus less easily washed by heavy rains. The results of investigations by Schulze, Schloesing, and Hilgard have shown in a most emphatic way the beneficial changes which take place, especially in stiff clay soils, by the application of lime.

The change in the physical condition of the soil which is produced by the lime, and which is likewise produced by a number of other chemicals ordinarily used in commercial fertilizers, is another important factor worthy of consideration. A stiff clay soil is practically impervious to the penetration of surface water when it is delivered in such torrents as we are liable to have in our summer storms. A well-limed soil, on the contrary, although it may contain as much clay but in which the particles are flocculated or drawn together, is much more pervious to water, and the amount of water which the soil will carry down through underdrainage is increased, and the excess which has to flow off over the surface is diminished. The surface washing of cultivated fields, especially those which are naturally deficient in lime, can be greatly diminished, therefore, by the free application of this substance to them.

A number of the ordinary fertilizing materials have an important effect upon the texture of soils and upon the permeability of soils to water, but few systematic investigations have been carried on in this line and not much, except of local importance, has been definitely settled by experiments or by the experiences of farmers.

Washing of Lands May Be Prevented by Methods of Cultivation and Underdrainage.

The depth and character of the tillage are very important factors, in the washing of lands. A field in a condition of fine tilth and ploughed to a depth of ten inches will hold two inches of rain fall and absorb it very readily, and a soil in such a condition will suffer no surface washing from any ordinary rainfall. Where it is possible, therefore, land which is liable to wash should have the soil gradually deepened and be kept in a fine state of tilth so as to increase the storage capacity for excessive precipitations. This will not only save the surface from being washed and gullied, but it will also increase the store of moisture held by the soil, which is of very great value in the time of drought.

It is important also for this, as for other reasons, that the soil be covered with vegetation as much as possible throughout the year, as the roots and organic matter serve to bind the grains of the soil together, in some parts of Holland the drifting sands of the coast, which shift the position with every storm, often cover up valuable farming lands. Vast areas of these sands have been reclaimed and made productive by being covered with vegetation, while the roots and remains of organic matter hold the soil grains in place and prevent them from drifting and covering up more valuable lands. Any crop which requires very clean culture, as for example, cotton, is exhausting to the land for the reason that constant exposure of the surface to the sun and storms uses up the organic matter, makes the soil less porous, and the soil particles themselves are more easily washed away; so that clean cultivation is in its effects very favourable to excessive erosion.

Another very effective method, when properly carried out, to prevent the washing of lands is to underdrain the soil with tile or other drains. These drains carry off quite rapidly an excess of moisture, so that much more of the rainfall is absorbed by the soil and carried off through the drains and less washes over the surface of the land. Not only this, but a well-underdrained field is usually dryer and more porous, and has a greater capacity for absorbing excessive rainfall and thus preventing surface washing. A field thoroughly underdrained with tile drains will carry off the water of any ordinary rainfall without any surface erosion. This method is very effective, but is likewise very expensive, and cannot be used economically in extensive farming solely for this purpose of protecting the land from washing.

While the land may thus be made more porous and more absorbent of water through the increase of the amount of organic matter or of humus through the use of lime and other fertilizing material, through the deepening of the soil by gradually increasing the depth of cultivation by so cropping it that it shall be covered with vegetation as much of the year as possible, and by underdraining the land-still, these methods may not be sufficient to so change the chemical and physical texture of the soil as to enable it to absorb the rain as it falls and to prevent an excess of water washing and eroding the surface where the contour of the land is such as to promote erosion from the surface flow of the excess of water.

It will be necessary in this case to provide for a more uniform distribution of the flow over the surface, and to prevent any accumulation of water which would have the effect of a torrential stream. This is secured in a great measure by laying off the rows according to the contour of the surface, so that each row will have a very slight incline of not more than from 1 to 7 inches in 100 feet, and in which the flow of water would be so slow that there would be little or no erosion. Theoretically, this is a fine idea, to let each row carry off its own proportion of the excess of rainfall so gently that there shall be no erosion, thus acting as a miniature drain. Practically, however, it is often impossible to keep these rows from breaking through, and when the bed is once broken and the water overflows into the next row the accumulation of water is sufficient to break down bed after bed until the rows from all the field are discharging into this narrow channel.

To overcome this difficulty sidehill ditches may be used in which larger and more substantial ditches are provided, following very nearly the contour of the field, so that there shall be a fall of from 1 to 6 inches in 100 feet. The distance apart of the ditches will depend upon the slope of the field; with a very steep slope they should be close together, often not over 6 to 10 feet apart; with a gentle slope they should be at intervals of 15 or 20 feet, or even further apart, depending upon the texture of the soil and the contour of the surface.

These sidehill ditches are very easily constructed, being made almost entirely with the plough. A bank is formed by running a number of furrows, throwing the dirt toward the middle. The last furrow on the upper side is cleaned out with a spade to form the bottom of the ditch. If the plough is well handled it takes very little work with the spade to make a very substantial ditch. It is well to get the bank forming the lower side of the ditch sodded with grass to help hold it and to lessen the danger of its giving way during a heavy rainfall. When the slope is thus protected with a number of ditches at the proper distance apart, the rows can be given a rather steeper fall so that they shall run out into the drains at frequent intervals and not have to carry the water so far. These ditches have to be constructed with care and have to be strengthened where they cross any depression or sudden curve by building up an embankment. Unless these ditches are thoroughly constructed they are worse than useless, for if they break they concentrate a volume of water upon one point in the field which would otherwise have been distributed over the surface, and this often forms a torrent which does great damage.

It is essential that these ditches and rows be run according to the contour of the surface of the land, and that there shall be no low places where the water would accumulate and gather force. They should always be run with a level, of which there are several forms on the market suitable for this work.

A more efficient, but at the same time much more expensive, method of preventing the washing of lands where there is considerable slope is to terrace the field so that there shall be level steps upon which the water can rest for a while and be absorbed. In terracing, the lines are run with a spirit level following the contour of the surface so as to give a perfect level line. A furrow is run along this line, and a similar furrow is run along a lower contour, the distance apart depending upon the nature of the land and the slope of the surface, as in case of sidehill ditches. Theoretically, it is intended to have the surface between these two furrows level so that there will be no chance for the water to run off over the surface. On a small scale this levelling can be done with a horse shovel, and the land thus put once into a condition to prevent washing. In this case the banks of the terrace are sodded or seeded with grass to prevent them from washing. In the field practice, however, the soil is moved gradually with a plough, the furrow being thrown always downhill and the soil gradually worked down to a level plain. There are several forms of reversible ploughs which are admirably adapted to this purpose, being turned readily from a right to a left handed plough, so that in going back and forth the furrow is always thrown downhill. If requires, of course, a number of years of such cultivation to get the surface into even approximately a level condition, but with patience and thorough cultivation the soil very quickly assumes a comparatively level aspect and erosion is reduced to a minimum. This is a more expensive method, but if intelligently done it is much more efficient and much more durable than depending upon sidehill ditches to prevent erosion. As was said in the case of the sidehill ditches, unless this work is well done it had much better be left undone, as it may seriously injure the field.

Where erosion has proceeded so far as to render the land at present unfit for cultivation, or where the land is not needed for cultivation and it is desired to prevent erosion, the land should be given up to trees, herbs, or grasses of some kind according to one or other of the following methods.

Recovering Gullied Hillsides by Reforestation.

Forest ground is not subject to this erosive action of the rainfall because in a forest a large part of the rainfall never reaches the soil, as 20 or 30 per cent. is intercepted by the foliage and evaporated before it reaches the ground. The rainfall which reaches the surface is rapidly absorbed, as the soil is kept granular and loose and much more of the water is carried off by underdrainage rather than by surface drainage.

The forest covering protects the soil in the following ways.

1. By preventing rain from falling directly upon the soil, the foliage of the tree crowns intercepting and breaking its force, the water reaching the soil more gently from the leaves and along the branches and trunks of the trees.

2. By interposing a loose cover or mulch of litter formed by the fallen leaves and branches, which breaks the direct force of the raindrops and keeps the soil from being compacted or puddled by their blow.

3. The deeply penetrating roots, and holes left from decayed stumps and roots of trees, assist in this underground drainage.

4. The litter with the stumps and projecting roots and trunks of trees prevent the water from rapidly running over the ground and from gaining the momentum and force which is necessary in order to erode and gully the soil.

If the forest floor is not disturbed by fire, nor the litter trampled and compacted by cattle, it always reduces rapid surface drainage and largely, if not entirely, prevents erosive action.

RECOVERY OF WASHED SOILS.

Just as deforestation of hillsides and hilltops is the first cause for inducing erosive action, so is reforestation the most effective means in curing the evil. This has been demonstrated in France, where the Government and the farmers together have spent, during the last thirty years, over £40,000,000 and expect to expend three or four times that amount to reforest 1,000,000 acres of denuded mountain sides, the soil and debris from which has been carried by the torrents of water into the plain, covering over 8,000,000 acres of fertile ground and making it useless for agriculture. Sodding for pasture has been found mostly less effective and on the steeper slopes entirely ineffective.

Whenever the ground in the hill country is not fit for agricultural use it should be set and kept in forest, not only to make it produce a timber crop, but also to prevent the erosion which finally becomes dangerous to the lower valley lands. Wherever agriculture is possible and profitable there should be such a distribution of forest, pasture, and field as will secure the greatest immunity from erosive and torrential action of the waters. The forest should occupy all hilltops which, as a rule, have too thin a soil to allow profitable agricultural use; it should be kept growing on the steeper slopes where the water acquires the greatest momentum and the loosening of the soil by the plough furnishes a most favourable condition for erosive action; it should be placed on all rocky, uneven, agriculturally useless spots, because it will produce useful material even on such unfavourable situations, and, finally, forest belts should be maintained on long slopes alternately with fields and pastures, running along the brow of the slope of widths and at distances proportionate to the character of the land and the angle of the slope on the steeper slopes closer together, on the gentler slopes further apart. These belts, acting as a barrier to break the force of the water, will prevent an undue accumulation of surface waters and will protect to a considerable degree the lower field from washing. Farmers, therefore, living in the eroded hill country should start upon the work of reforestation with a well conceived plan. They should determine beforehand which parts ought to be in forest, and which they may reasonably expect to adapt again to agricultural uses. They should understand that they must begin this work at the origin of the evil, at the very tops of the hills where the water begins to gather and acquire its force, and gradually proceed with their work down to the lower levels.

Preparation for Planting Forests.

Although cultivation of the soil for tree planting in the manner practised for field crops is advantageous to the young plants for the first few years of their life, it is by no means necessary, and rough, broken and stony ground, which could not be ploughed and prepared for ordinary field crops can be readily planted in trees. If the ground is in such a condition that it can be ploughed, this is decidedly the best method of preparing the land. The ploughing should in all cases follow the contour of the hill and be as deep as possible, in order to allow as much water as possible to soak into the soil and so diminish surface erosion and prevent the young trees being washed out. The occasional gullies must be filled with brush and soil, or stones, rubble and dirt.

In the deeply gullied hill lands, where ploughing has become impracticable, other ways must be provided against the further erosive action of the water, which would otherwise be apt to wash out and uproot the plants. For this purpose it is necessary to break the force of the water by constructing brush dams across the gullies and roughly fill in the latter with stone, gravel. earth, etc., in front and rear if they are shallow and at least in the rear if they are deeper. Where the ravines are especially deep and wide it may become necessary to supplement and strengthen the rough dam with a loose rubble embankment or dry wall of stone. A simple and efficient method has been practised in France, which consists in filling up the ravine with brush placed lengthwise and keeping this down by poles laid across and fastened in the sides of the ravine. The waters are thus allowed to drain off, while the soil carried by them is retained in and over the brush, and in a short time the gulley will fill up of its own accord. Then alders and willows are planted along the edge and soon finish the work of securing the ravine against washing. The means for thus breaking the force of the water in the gullies and changing it from a rushing torrent into a series of gentle falls, and in part from surface drainage into subterranean drainage, and of filling up the gullies themselves will have to be devised in every special case as circumstances permit and the ingenuity of the operator suggests. The brush dam is preferably made of readily sprouting material, which becomes alive and by striking root adds to the firmness of the dam.

It is especially needful, as in all kinds of dams, to fasten the ends scarcely. According to the steepness, depth, and width of the ravine more or less frequent dams are necessary. After the brush dams, walls and other breastworks have been established, the waters may be allowed to do the work of filling up the gullies themselves, which they will do sooner or later, or else, where it can be readily accomplished,.the filling may be done by hand.

It may be understood that unless the preliminary work is well done and systematically, beginning at the very tops of the hills where the waters start, it is not worth doing at all, since the water if allowed to get headway would soon wash away and destroy any imperfect work.

Planting.

To cover the soil as quickly as possible with a dense and permanent arborescent cover is the object to be attained. Where the soil has not been so far eroded that ploughing could be done, it might be best for the first reason to sow field peas, or other crops that will readily grow and make a cover. This may be cut for green fodder, leaving a high stubble, and tree seed can be sown broadcast with the fodder crop in the early summer, or over the stubble after the crop is cut in the late summer and fall. The cheapest and most readily germinating tree seed should be looked for and the quantity used per acre should be lavish to secure a dense stand from the first...............

Where the ground is too much cut up and too uneven to permit of ploughing, recourse must be had to sowing of seed in plats, or planting of seedlings or cuttings by hand. This is naturally much more expensive and therefore should be done with great care and foresight. Plats may be made by loosening the soil with a hoe or spade, and sowing the seed into these seed beds covering the seed only slightly. The plats should be 3 or 4 feet apart to make sufficiently rapid cover. The success of this method is, however, very questionable, as not only the germinating of the seed under the prevailing conditions is precarious, but rains are apt to wash out the seed or young seedlings. The surer method, however, will be found in planting seedlings or cuttings. Seedlings are not only expensive but also more precarious to handle, hence for the bulk of the plantation such kinds as can be readily obtained and propagated by cuttings are used, and if desired a sufficient number of seedlings of better kinds can be added to increase the timber value of the plantation.

The first and principal object being to break the force of the surface waters, the arrangement in setting out the plants should be as nearly as possible in horizontal and parallel rows along the brow of the hill, following the contours. To get a full cover as soon as possible the plants should be set not farther apart than 3 to 4 feet and even less, making from 5,000 to 7,000 per acre. If this is found too expensive, or for some reason impracticable to be done at once, the work may be reduced and divided into several seasons; the rows then may be made farther apart, say from 6 to 16 feet, according to the slope, and the plants in the row 2 feet, when the number will be one-half, or less.

Whatever is done in such a work of recovering lost ground, let this fact never be forgotten, that it is better to do a small part well than a large part indifferently which usually means lost labour.

Grasses and similar vegetation prevent erosion and washing of Agricultural Lands.

On gentle slopes a good turf of perennial pasture grasses, especially those with creeping rootstocks, prevents erosion, or washing, of lands, and short steep embankments may also be protected with this same covering. On longer and steeper slopes, however, this method is not so effective as that of reforestation.

In enumerating the effects to be obtained by the growth of grasses and other herbaceous vegetation on washing lands, or lands liable to be eroded, it should be stated that such growths are calculated to break the force of the rainfall and prevent its packing the soil; to render the ground more porous through the root penetration into the subsoil; to make the soil more absorbent and more retentive of moisture through the addition of humus to the soil from the decay of the plants to retard the rate with which the surface waters flow off, and lastly, to bind the particles of soil together, which is especially effective in the case of light sandy lands and of newly formed embankments, whether of sand or clay.

The turf which would answer the present purposes should be composed of perennial grasses of varieties which have creeping rootstocks and it is frequently essential that they be able to grow upon an impoverished and often hard soil. To secure a strong turf on lands of this character it is very important that the soil should be thoroughly ploughed or loosened, and some variety of field pea or clover be seeded down, such as the cowpea, well adapted to this purpose. There crops may either be cut off, leaving a high stubble to be turned under, or the whole may be ploughed under, thus furnishing a quantity of organic matter to the soil as a preparation for the grasses which are to be seeded.

With this preparation of the soil Bahama grass is one of the best grasses for the purpose of preventing erosion, or of reclaiming eroded land. This should be planted by cutting up a turf rather than by seeding, as the seeds do not germinate very readily, even where they have been gathered in a mature condition.

Where the soil will support other good turf grasses of higher value for hay or pasturage, or where the soil can be brought into a condition to support them, these more valuable grasses should be introduced.

AGRICULTURE IN THE CAMEROONS AND TOGOLAND.

In the Diplomatic and Consular Reports on the German Colonies occur the following:—

> Rubber, ivory and palm oil are the most important articles of native trade, though, in consequence of the falling-off of the supply of rubber and ivory in those parts of the country from which they have hitherto been obtained, it is only by the opening-up of fresh districts that the trade can be kept up to its present standard.
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> The progress made by the plantations, under European management, is satisfactory. Though the cultivation of

coffee is becoming more and more restricted on account of the ravages of insects, the cocoa plantations, which in 1898 were confined to the immediate neighbourhood of the coast, are now covering the South-eastern slopes of the Cameroon Mountains.

Tobacco is grown by a few planters, and large rubber plantations have been started near Victoria.

The labour question, on which so much of the development of the Colony depends, is less acute than formerly. A certain number of labourers have still to be imported, but cheap native labour is becoming more easily obtainable, though the native, as a rule, is neither a very intelligent nor reliable person.

The following appears under the head of Togoland adjoining on Gold Coast Colony:—

The standard of native agriculture is low, and though yams, tobacco, kola, cocoa, coffee and cotton are grown, the quantities produced are inconsiderable.

There was a more plentiful supply of rubber than in the preceding year, and efforts are being made to guard against a possible exhaustion of the old stock by fresh plantations.

The prospects of the coco-nut palm plantations are good, but the experiments made by Europeans with kola, cocoa, coffee, and tobacco have not as yet been attended with much success.

Considerable hopes, however, are founded on those that have recently been made in several districts with cotton growing. A cotton plantation, covering some 120 acres, was started in 1899 in the Agu Hills, and another one was commenced last year at Tove, near Misahöhe, under the direction of three American experts. Soon 105 acres have been sown chiefly with American seed, though Egyptian and native seeds were also partially employed. The samples of cotton which have been sent to Bremen have been classed as "above middling American" and the success or failure of the Togo cotton plantations is believed to depend solely on the question of transport.

INSECTS DESTROYED THROUGH LUMINOUS SNARES.

Read the following letter from the Manager, Comptoir de l' Acetylene, of Paris:—

"We call your esteemed attention to the new method of destroying insects, carried on with great success in Europe and Colonies. The laying time taking place early in May there is urgency to act, especially as many of these vermins have two generations a year. The acetylene light, unequalled in power, is not blown out by wind, though burning without chimney glass, and ensures great success to lamp traps, now largely used on the continent to exterminate the flying pests. The agriculturists and vine-growers annihilate butterflies from caterpillars devouring leaves, roots, grapes, turnips, fruits, flowers, and all harvests just before the laying time. The experiments carried on by professors give 2,000 moths (half females) killed in a night with a single lamp (Academy des Sciences Report). The lamp, strong, and simple to clean, gives 20 to 35 candle power during 6 hours, at an expense of 1½*d.* per night, being immersed in a basin of water covered by a film of petroleum oil, the visiting insects in their diving flight drown themselves. This efficient way superseding the old tedious methods of fumigation, or sprinkling of dangerous liquids, has proved the most rapid and cheapest means to protect the crops from thousands of insects. It is indeed a good investment. All the noxious insects being nocturnal this method can be applied to all flies and mosquitos found propagating contagious diseases, malaria pest, or troubling domestic animals. Moreover these lamps are used all the year for lighting yards, cellars, stables, cross-roads and night works."

Indian Gardening and Planting.

RUBBER PLANTING IN MEXICO.

(*A*)

This Company the "La Zacualpa" have issued in pamphlet form a report by E. S. VAN COURT, of Oakland, California, a stockholder who recently visited the plantation. He states that he saw three 7 year old trees yield 6½ lbs. of latex at one tapping: five 11 year old trees, said to have been tapped several times within twelve months, yielded in 20 minutes enough latex to make 2½ lbs. of rubber. Mr. VAN COURT considers the Castilloa elastica very tenacious of life where trees had been cut down, shoots at once sprang up from the stumps, and where a tree had blown down, leaving most of the roots exposed, a number of shoots had grown up from the trunk. Mr. O. H. HARRISON, manager of the estate, is mentioned as being at work upon a machine for tapping the trees, which will do less harm to the trees than tapping with the "machete," while the opening made in the bark will permit the latex to flow more freely than where trees are tapped by the old method.

(*B*)

A committee of bondholders who visited this plantation, the Mexican Mutual Planters' Co, recently reported on the progress of the various cultures there, the chief of which, to date, is coffee. There were planted in 1901, however, 10,000 rubber trees, for coffee shade, 16 × 16 feet apart, 330,000 trees, in the open, $7\frac{1}{2} \times 7\frac{1}{2}$ feet apart. The latter planting covered about 478 acres. The trees were one year old when transplanted, and the loss amounted to only about 5 per cent. There were also about 3,000,000 rubber plants, in six nurseries, covering 34 acres. The management planned to clear and plant more than 1,000 acres in rubber in 1902. The Company's horticulturist, JAMES MAUNDER, writes in the "Madras (India) Mail" that 340,000 rubber plants were set out in July last, within 28 days from the start. The men employed made 350 to 500 pits per day with posthole diggers, and one man could set 350 plants daily. Part of the area was then planted in corn, which kept down the weeds so that no weeding of the rubber was required until after the corn was harvested. The rubber was then weeded, and a second crop of corn planted—making two crops of the latter in one year. The second planting of corn was made within seven months from the first clearing of the ground. He expected to set out 1,000,000 rubber plants this year.

(*C*)

The President of the Chiapas Rubber Plantation and Investment Co., Mr. L. H. BONESTELL, wrote from San Francisco March 25, in answer to a communication from The India Rubber World office, about his not having stated the number of acres planted in rubber by his company: "I did not do this for the reason that this had previously been reported, and as very little planting has been done since last planting season, June and July, there was very little change in that respect. The number of acres actually planted is 4,000 and some hundred acres; cannot give you the exact number to date." Mr. BONESTELL, states that while visiting the plantation in February, he had a test made as follows: "An acre was laid off already stalked, and two men set to planting with old refuse seed left over. It took them just twenty minutes by the watch." Criticism has been made in these pages of the character of the Chiapas company's advertising—particularly to a page which appeared in the San Francisco News Letter. A letter to The India Rubber World from the proprietor of that journal says: "I beg to say that the page illustration of the Chiapas Rubber Co. published in the San Francisco News Letter September 15, 1900, was not paid advertising matter."

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LA ESPERANZA RUBBER CO.

This plantation embraces 500 acres bought by CARLETON HALE in 1898, being then virgin forest. There have been 270 acres cleared, and 130,000 rubber trees, of various ages, are now standing, together with 10,000 plants in nursery, which will be transplanted this summer on land now being cleared. Mr. HALE is in charge. The company is incorporated. EDGAR J. DOE is president and W. P. HALE, treasurer. The latter writes to The India Rubber

World: "Ours is not one of the million dollar companies that promise returns from by products the first year, but a legitimate enterprise for making money when the trees get large enough to tap."

The India Rubber World.

RUBBER TAPPING EXPERIMENTS IN THE BOTANIC GARDENS.

In Nos. 2 and 3 of Vol. II of this Bulletin, certain observations on the tapping experiments conducted in the economic section of the Botanic Gardens, were recorded. Owing to the absence for a time on a collecting tour in Pahang of the Officer deputed to conduct these experiments, they were for a short time, discontinued. On the resumption of these operations, all the hundred trees that were being bled, were found to be in bloom, and the quantity of rubber obtained, was, as will be noticed from table below, much diminished. This phenomenon is so well known in the Amazons, that there, a rubber tree is never tapped when it is in flower.

Date.	No. of trees tapped.	No. of incisions to each tree.	Pressed rubber produced.	Scrap produced.	Total for the day.	Remarks.
			oz.	oz.	oz.	
May 19	100	4	29	1	30	The last time these
„ 22	100	4	43	12	55	100 trees were tapped
„ 27	100	4	37¼	3	40¾	was on May, 1st.

It will be seen from above that the quantity of rubber produced during these three tappings was far below the amount obtained from previous tappings, when the trees were not then florescent. And in order to determine if this diminished production of rubber, has really any connexion with the blooming of the trees, one hundred virgin trees, growing under precisely the same conditions as the first hundred previously operated upon, likewise in bloom, were chosen for experiment. The result, giving their output of rubber for the period they were tapped, will be seen in table below.

Date.	No. of trees tapped.	No. of incisions to each tree.	Yield of pressed rubber.	Yield of scrap.	Total yield for the day.	Remarks.
			oz.	oz.	oz.	
May 29	100	4	12½	½	13	
June 1	100	4	16¼	4	20	
2	100	4	19¾	3	22¾	
5	100	4	27	3	30	
6	100	4	22¾	3	25¾	
9	100	4	26¾	4	30¾	
10	100	4	14½	3	17½	
11	100	4	17½	3	20½	
12	100	4	43	4	47	
13	100	4	42	4	46	
15	100	4	48	4	52	
16	100	4	53	5	58	
17	100	4	57	4	61	
18	100	4	30	3	33	
19	100	4	45	3	48	
20	100	4	49	4	53	
22	100	4	37	3	40	
23	100	4	41	3	44	
24	100	4	37	3	40	
25	100	4	37½	2	39½	
26	100	4	32½	3	35½	
27	100	4	32	3	35	
July 1	100	4	23½	3	26½	

It will be seen from this return that tapping went on for a sufficiently long period to enable one to determine if blooming had anything to do with the diminished output in the previous case. That it has, is proved beyond doubt by these returns. The greatest amount of pressed rubber produced in a day was, in the case of the first 100 trees, 112 oz. when the trees were then first about done fruiting. The greatest amount produced in a day, in the case of the second 100 trees, was 61 oz. a sufficiently small output to justify the belief that blooming plays a very important part indeed in the economy of these trees; therefore, the lesson is that on no account should a tree be tapped when it is in flower.

Experiments were continued for a time with the ten large trees previously reported upon, and for the reason that these trees were also in bloom, operations were brought to a close. Below is a return giving their output of rubber from May 20th, previous returns having appeared in No. 3, of this Bulletin.

Date 1903.	No. of trees tapped.	No. of incisions to each trees.	Yield of pressed rubber.	Yield of scrap.	Total yield.	Remarks.
			oz.	oz.	oz.	
May, 20	10	20	38	$9\frac{1}{2}$	$47\frac{1}{2}$	
21	10	10	...	...	...	Yield of latex handed over to Government Analyst for analysis.
23	10	20	42	$6\frac{3}{4}$	$48\frac{3}{4}$	
30	10	10	$27\frac{3}{4}$	2	$29\frac{3}{4}$	
June, 4	10	20	$17\frac{3}{4}$	4	$21\frac{3}{4}$	
8	10	20	$26\frac{3}{4}$	4	$30\frac{3}{4}$	

It was suggested that the herring bone system of tapping should be tried. Five trees of medium size, never before tapped were selected for experiment, but if these were also in flower, the results obtained cannot by any means be held to be conclusive. This system has been so often described that no further description is necessary, beyond the fact, that in this case, the instrument used was a half round chisel, very sharp, which enabled a thin piece of bark to be shaved off daily without touching the cambium. Two herring bones, 2 feet long, tri-ribbed on either side of the central channel, were made to each tree, tapping extending for 15 days. Practically, no scrap was produced, while the rubber obtained, was of a clear white translucent colour, easily soluble in benzine and leaving no residue, thus proving it to be a really fine quality rubber. Below is a return showing the results of these 15 tappings.

July, 8	$2\frac{1}{2}$	oz. of	pressed rubbers.
9	$5\frac{3}{4}$	,,	,,
10	$8\frac{3}{4}$	,,	,,
11	$7\frac{1}{2}$	,,	,,
13	$6\frac{3}{4}$	,,	,,
14	9	,,	,,
15	$11\frac{3}{4}$	,,	,,
16	11	,,	,,
17	$10\frac{1}{4}$	,,	,,
19	$11\frac{1}{2}$	,,	,,
20	12	,,	,,
21	14	,,	,,
22	$13\frac{1}{4}$	,,	,,
24	11	,,	,,
26	12	,,	,,

A. D. M.

he following return comprises some of the principal readings taken at the Prison Observatory from 6th to 19th July, 1903. They publish ed side by side for each week in order to shew the effect the late rains have had on the General State of the weather :—

Mean Dry Bulb.	Mean Wet Bulb.	Max. in Shade.	Min. in Shade.	Sun Maximum Vacuo.	Rain.		Remarks.	Date.	Mean Dry Bulb.	Mean Wet Bulb.	Max. in Shade.	Min. in Shade.	Sun Maximum Vacuo.	Rain.		Remarks.
					Ins.	cts.								Ins.	cts.	
85.3	75.3	91.0	74.0	153.0	Nil.	Nil.		13	82.0	74.3	86.0	74.0	142.0	...	48	
84.3	76.3	90.0	76.0	149.0	...	...		14	80.3	74.6	88.0	73.0	137.0	2	42	
82.3	75.0	91.0	74.0	159.0	...	...		15	80.3	74.6	86.0	72.0	122.0	1	85	
84.6	75.3	90.0	75.0	147.0	...	...		16	77.6	75.0	86.0	73.0	131.0	1	78	
82.0	75.0	89.0	74.0	139.0	...	...		17	84.0	77.0	88.0	75.0	149.0	...	...	
83.6	76.0	88.0	73.0	137.0	...	...		18	83.3	75.6	89.0	74.0	148.0	...	05	
83.3	76.3	87.0	75.0	146.0	...	...		19	83.6	76.0	86.0	73.0	151.0	...	...	
Total Rain				...	Nil.	Nil.		Total Rain					...	6	58	

Singapore.

Abstract of Meteorological Readings for the month of July, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·848	Mean 134·3 Highest 150·5	80·8	86·5	75·3	11·2	77·5	·875	75·2	78	S.S.E. S.E.	6·99	2·47

K. K, Hospital Observatory,
Singapore, 6th August, 1903.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S,

Penang.

Abstract of Meteorological Readings for July, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	°F	...	%		ins.	ins.
Criminal Prison Observatory	29·864	145·3	80·5	88·7	73·8	14·9	75·6	·792	70·1	·71	S.	10·27	2·42

Colonial Surgeon's Office,

Penang, 7th August, 1903.

M. E. SCRIVEN,

Asst. Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for June, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kuala Lipis, ...	...	...	81·6	94·0	70·0	18·5	...	...	...	...	...	11·41	1·40
Raub, ...		...	80·4	90·0	71·0	16·3	...	...	...	...	...	4·27	1·12
Bentong ...	...	...	81·0	92·0	70·0	15·1	...	...	...	...	...	4·28	1·00
Pekan ...	...	...	81·2	90·5	72·0	13·3	...	...	...	...	...	7·79	2·62
Kuantan, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Temerloh ...	...	...	...	...	...	...	...	...	...	...	...	...	...

S. LUCY,
State Surgeon, Pahang.

K. Lipis, 27th July, 1903.

Muar.

Abstract of Meteorological Readings for July, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	84·0	90.0	73·0	17·0	76·0	...	...	...	S. W.	5·39	1·96

Muar, 1st August, 1903.

FRANCIS PEARS.

No. 9.] SEPTEMBER, 1903. [VOL. II.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY
H. N. RIDLEY, M. A., F. L. S.,
Director of Botanic Gardens, S. S.

CONTENTS.

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AGRICULTURAL BULLETIN

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No. 9.] SEPTEMBER, 1903. [VOL. II

TURF AND FODDER GRASSES.

The question of turfing ground for lawns and tennis courts is one that is constantly recurring, and some notes upon the subject may be of use to gardeners and others in the Malay Peninsula. To prepare a lawn for tennis and other such games, the first requisite is of course to level the ground, and dig it well over, eradicating all unnecessary weeds and especially Lalang (*Imperata cylindrica*). In rolling the prepared soil it is not advisable to use too heavy a roller, especially if the soil is stiff clay with much iron in it. In one instance many years ago this was done with a cricket pitch, on new made ground, and after it had been used for many years, it was found that the turf peeled off in places. Investigation showed that the grass roots had been unable to penetrate sufficiently deeply into the stiff under soil which, by rolling, had been packed into what had become almost a rock from the depositing of iron oxide so that when the dry weather came, the turf had no hold on the soil at all ; it is much better to roll new made soil gradually rolling it down as each layer is thrown on the ground. On the top of the soil levelled and raised as high as required, should be thrown a top-dressing of a mixture of cowdung and earth in about equal proportions, which has been well mixed, allowed to dry in the sun, and then passed through a sieve.

The ground being prepared, suitable turf must be procured cut into pieces about 6 inches square, planted two or three feet apart, being well pressed into the soft soil. If the weather is excessively dry it may be advisable to water the lawn, but it is not usually necessary. In from 3 to 6 months the ground should be completely covered, and the turf carpet level. The turf should then be well rolled with a fairly light roller, and all objectionable weeds, such as Tutup Bumi, *Elephantopus scaber*, Sensitive plants, and Lalang should be weeded out.

This turf will consist of mixed grasses, together with a few other plants which are not grasses, but which occur in most of our turfs ; the most useful of these are the little clovers, *Desmodium heterophyllum* and *D. triflorum*. These play the part of the white clover in English lawns, binding it well together and making a soft carpet. Too much of these clovers however, makes the turf too soft, especially in damp spots.

Gardeners not rarely send to various horticultural establishments for grass-seed to plant on their lawns, but the attempt to raise turf from sown seed, here invariably results in the greatest disappointment. It would hardly seem necessary to inform gardeners that the best English grass seed supplied by seedsmen at home is utterly useless out here, but one hears so often of residents sending home for grass-seed that it is perhaps as well to call their attention to the fact that the grasses of temperate climates will grow no better in the Straits, than our palms will in England. The greatest difficulty in raising grass from seed, here lies in the fact that there are abundance of seed eating ants which on finding a quantity of grass seed as laid down by a gardener, come in swarms and carry off all the seed to their nests where they eat it. The grass finches (*Munia*) also destroy a quantity.

The most important grasses for turfing are those with a prostrate creeping stem; grasses which merely form tufts are of very little use, as it takes a long time for them to cover the ground. As far as I know we have no annual grasses here, unless it be *Dimeria ornithopodioides* a slender grass which at certain times of the year appears in considerable quantities in many places and then disappears again. But we have a good many tufted grasses and small sedges (*Fimbristylis* and *Scleria*) which fill up spaces in turf and are useful in that way, but do not make turf themselves.

The following grasses are the most useful we have for turfing:— *Ischæmum ciliare*—This is a good running grass with hairy lanceolate leaves about an inch or two long. The inflorescence is a pair of spikes rather thick about an inch long, purplish and hairy, borne on the end of a slender stem about 6 inches long: the seed is often destroyed by a bunt fungus giving the spikes a sooty appearance. It is a very common road-side grass, creeps fast, and quickly forms a good turf mat: under good circumstances it will even smother Lalang, and is very suitable for covering clayey ground rapidly. It makes very good fodder when grown in damp ground.

Ischæmum muticum—is a glabrous grass, with rather broad leaves one to 5 inches long, easily known by its pair of white spikes, so closely pressed together that they appear one: the white colour of the spikes is chiefly due to the large white plumed stigmas A very fast grower, covering ground rapidly with its very long creeping stems often 12 or 14 feet or more in length. Though the leaves are rather stiff and broad for the fine grass required for tennis lawns, this grass is perhaps the very best for covering clay banks or open clay spaces such as one often gets after cleaning a lalang field, like the last it can over grow lalang. For stiff steep clay banks such as railways banks, this is undoubtedly the best grass to employ: if planted at the top of the bank the long creeping stems will run down the bank holding the clay and eventually forming a compact strong turf which will prevent slipping of the clay to a very large extent: in damp soil among bushes and in hedges it becomes scandent climbing for some height, the leaves and flower spikes becoming much larger. It will grow any where except in very wet soil, and is common on the sea-shore. Where it grows rank it makes a good fodder.

There are several other *Ischæmums* in the Peninsula but they are mostly coarse tufted grasses of no value. *I. timorense* which resembles *I. ciliatum* but is more tall and slender and does not creep so much, though unsuitable for turfing forms a very good fodder. It is common on roadsides.

Paspalum conjugatum is a very far-creeping grass with bright green rather broad leaves, fairly long and wide. Its inflorescence is tall and slender, of two very slender widely spreading spikes with small round yellow spikelets all arranged on one side of the spike. It is almost certainly an introduction from Brazil, but is now very widely spread over the tropics. It is of very rapid growth, very quickly covering bare ground with its long creeping stems so that it is very suitable for covering steep banks, as well as ordinary flat clay land. The spikelets which adhere to animals fur, and to clothing are readily carried about so that the plant is very abundant everywhere. Like *Ischæmum ciliare,* it can defeat Lalang under good circumstances. The leaves are rather too broad to be recommended for tennis lawns but for ordinary turf it is very good.

Paspalum platycaule is a broad leaved grass of rapid growth, somewhat similar, but the bright green shining leaves are wavy and broader, the flower spikes more numerous. It is a native of the West Indies, and has lately established itself in Singapore. The leaves are too broad for a good turfing grass but it makes neat grass edges for beds, etc.

P. scrobiculatum is one of the most widely distributed and variable grasses of the tropics, and is very abundant in the Straits. Like the other species of the genus the rachis of the spikes, of which there are usually three or four, is flattened with the small round spikelets in rows on one side. It is very common in grass plots, roadsides, and in many wet or dry spots. The stem however, creeps but little or not at all so that it forms tufts with erect narrow leaves, and is therefore less suitable for turfing though it does very well for filling up spots in stiff clay soils where it is difficult to get anything to grow. It comes in very well also as fodder grass.

Paspalum sanguinale var debile is a slender creeping grass with very narrow grey leaves, very conspicuous from its colour. The flowering stem is slender, with three terminal spreading spikes, very slender, with minute spikelets. This is an excellent grass for tennis lawns, creeping well and forming a good mat with its very fine leaves. It is not so rapid a grower as *P. conjugatum* and seems to require rather better soil.

Zoysia pungens is rather a stiff little grass with short erect or creeping stems and very narrow almost needle-like leaves. It usually frequents sea-shores and sandy spots, and often in very sandy spots such as sand hills, becomes quite stiff, the leaves wiry and pungent (whence its name). It is not rarely met with inland, however, and I have seen lawns of it a good way from the sea. It has short, slender, simple and solitary spikes of small yellowish spikelets.

This makes excellent turf in sandy places by the sea, compact and smooth, and forms most of the turf in, and round, the town of Malacca; but in damper spots, especially inland, it cannot be recommended as it makes too woolly a carpet. That is to say the stems grow several inches tall, bearing the leaves at the top, and nearly bare below from the fall of the leaves, so that the foot sinks deeply into it, and when mown the grassy portion is apt to be cut off leaving unsightly brown patches of stems only, while for tennis it is equally unsatisfactory as the ball simply sinks into it.

Cynodon dactylon, the Doub grass, is a slender creeping grass with very narrow grey leaves, and two slender spikes of flowers on a short stem. In appearance it much resembles the grey *Paspalum sanguinale var debile*, but is more compact, and usually shorter. It is certainly the best grass for tennis lawns, but is rather more particular as to soil: naturally a sea-shore grass it seems to dislike wet clayey soils, and indeed one seldom finds it far away from the sea. It grows rather slowly, the creeping stems being short. It is used in India as fodder but does not come into use in that way here as it is too short and not abundant enough.

Andropogon or *Chrysopogon aciculatus* commonly known here as "love grass," is well enough known to all who keep lawns. It is perhaps our commonest grass and also attracts attention from its adhesive spikelets borne on a stiff panicle about a foot tall. It is objected to by many people on account of the way the spikelets adhere to and burrow into the clothing. It is, however, a good grass for turfing, as its creeping leafy stems form a strong soft mat, dense but not woolly, and suitable for tennis. It grows on very poor soils as well as on richer ones, but seems rather to dislike too damp spots. It is probably not a native of the Straits Settlements. but I have seen considerable tracts of it in Pahang, where it formed good grazing ground for buffaloes.

Fodder Grasses.

As a rule grass for fodder for cattle and horses, is not cultivated here; the supplies being derived from various pieces of swampy ground in the neighbourhood. The grass cutters take almost any grass that they can find long enough to cut, and usually the fodder consists of a mixture of grasses, sedges, and weeds which grow with them. What is preferred, however, is a grass taken from a swampy bit of ground too wet for any cultivation but that of rice or sago. The chief grasses therein are *Isachne australis* and *Leersia hexandra*, both excellent fodders.

Isachne australis is a slender narrow-leaved grass about a foot or more tall with a creeping base, and a panicle of small round spikelets. It is very abundant in damp spots, and being fairly tall is easily cut.

Leersia hexandra is a very slender grass with narrow leaves. It is about two feet tall, with a small panicle of spikelets resembling those of paddy but much smaller. In fact the plant belongs to the group *Oryzeæ*, and is nearly allied to the rice plants. This is really the best fodder grass we have, and is much liked by cattle and horses. It will not grow in dry spots, being a semiaquatic grass, but is abundant in all open wet ground, and forms with the last the thick long grass of the open swamps.

Ischæmum ciliare, mentioned above as a turf grass is another excellent fodder. Though as a turf grass it grows short and compact, in damper spots it gets taller and thicker and can be easily cut. Among the other mixed grasses growing in somewhat dryer spots than *Leersia* and *Isachne*, we have good plants in the form of *Paspalum sanguinale* one form of which I have already mentioned as a good turf grass. The common weedy form which grows in partly cleared ground becomes taller, some two or three feet high, and is a suitable fodder.

P. maximum, the Guinea grass, is often cultivated for horse fodder. It is very easily grown and attains a large size often over six feet, and can easily be propagated by breaking up the tufts. The leaves are rather broad, and it is stated, that, when given in large quantities in a wet state to horses it produces inflammation of the stomach and death, Mixed with other grass it is certainly very good for horses and is cultivated as a fodder all over the tropics. It is certain that many horses have been killed here by over eating of this grass, so that no horse or cow should be allowed to eat large quantities of it at a time; what the exact cause of death is in these cases is at present obscure, but it is known that in other cases of death from over-eating of certain fodders, the cause is due to the formation of prussic acid in the leaves at a certain period of their growth and it is quite possible that this may happen in the case of the Guinea grass. The subject however requires careful investigation.

Panicum muticum, Watergrass, is a smaller narrower-leaved grass than the Guinea grass. It has long been introduced into this country, being a native of South America, where it is also largely cultivated for horse fodder. In Brazil almost every house has a patch of this grass in the compound which is cut for the horses each day by the syces.

It grows in damper more low-lying spots than the Guinea grass, and is an equally good and apparently much safer fodder. I have no records of accident from it. It is usually about four feet tall but grows to as much as eight feet in some places, the bases creeping, the nodes and often the sheaths hairy, the inflorescence of numerous short spikes, with very crowded spikelets arranged in rows on one side of the flattened rachis.

I do not know why this grass is so little used here, unless it be that so many of the European compounds are too dry for it, and the swampier grass grounds more suitable for it are occupied with the more popular *Leersia & Isachne.* Certainly it is not as popular as it is in Ceylon and elsewhere and as it deserves to be.

Panicum oryzoides, a rather broad-leaved creeping grass with round green spikelets of fairly large size, grows in damp spots and edges of woods. It is apt to get woody however, when it gets large, but it is common and mixes well with the others.

The *Panicums* of the section *Hymenachne*, with moderately broad lanceolate leaves and catkin-like spikes of green flowers, are mostly good fodders. The smallest, *Panicum indicum*, is often to be seen in grass plots, but it attains a larger size in open ground, and with the allied *P. Myosuroides* and larger *P. auritum* which sometimes grows as much as six feet tall in wet spots, is good. *P. myurus* which is even bigger with a more open panicle is rather too coarse a grass, though cattle are said to be fond of it in Ceylon. All grow together in damp spots, often in water.

Panicum patens, "Rumput Telor Ikan" Fishes-eggs grass, so called from its minute black spikelets borne on the very slender hairlike branches of the panicle, often occurs abundantly in fairly dry spots, edges of woods, etc. It is seldom very tall but comes in very well with other grasses.

Panicum repens, known here as Victoria grass, is a tall, often stout grass with a woody base and a long creeping rootstock which perforates the ground and is very troublesome to eradicate. The leaves are usually narrow and rather glaucous. This grass is too well k nown to planters as a pestilential weed, nearly as bad to extirpateas Lalang. It chiefly grows in sandy places. FERGUSON says (Trimen Flora of Ceylon, v, 154), that it is highly valued as fodder for cattle, and large quantities are brought into and sold in Colombo.

P. colonum. A common weed cultivated in India for its grain, occurs in waste ground here, but in no great quantity. It is considered one of the best fodders in India, but is not abundant enough here.

Eragrostis is a genus of usually small weedy grasses, several of which occur mixed with other grasses. They do not creep to any extent so that they are really not much good for turfing, though *E. elongata* (*E. Brownei*) forms tufts in our grass plots, especially in bad soil, which often come in well to fill up bare spots.

E. unioloides, a very pretty grass with flat purple or pink spikelets, in damp soils adds a good deal to the grass. *E. plumosa*, a common pathway weed is occasionally also mixed with other grasses, and forms a good fodder.

E. Brownei is considered a very good fodder grass in Australia, and might come in very well in dry clayey or sandy pastures.

Many other plants besides grasses occur in our turf plots and pasturage:—*Cyperaceæ*, small sedges, especially the two *Kyllingas*, with round white (*K. monocephala*) or green heads (*K. brevifolia*). These have rather an aromatic flavour but are liked by some animals especially dogs. Small species of *Scleria* and *Fimbristylis* also fill up bare spaces. The Pegaga, *Hydrocotyle asiatica*, with round leaves borne on its slender creeping stem, is much sought by natives as a medicine. Slender white flowered *Hedyotis*, white and brown flowered *Torenia polygonoides* and many other little weeds occur and help to cover the ground.

Perhaps the most objectionable weeds for tennis grounds are the Tutup Bumi, *Elephantopus scaber*, which has a flat rosette of broad leaves and a stiff stem bearing a tuft of very small pink flowers. It is easily eradicated however, by spudding it up.

The sensitive plant (*Mimosa pudica*) is often very troublesome in lawns and is very objectionable in fodder. It is accused of killing cattle when mixed with their grass, by causing inflammation of the stomach and intestines by its small thorns, and also it is said that sheep suffer much from the spiny fruits getting between the toes and ulcerating them. It is a very persistent weed and grows with great rapidity.

Introduced Grasses.

We have had from time to time a number of fodder plants considered to be valuable in various parts of the world: most of these however, having come from dryer or colder climates have proved useless, either not growing at all or refusing to propagate sufficiently, and disappearing in a few years.

Tricholæna Tenerriffæ, a fairly good fodder grass was introduced some years ago and held its own against other weeds for some two or three years, but was then defeated and quite disappeared.

Andropogon (*Sorghum*) *halepen e* though not spreading at all rapidly, has remained where it was planted in spite of being occasionally weeded out, and seems to have quite established itself in one or two parts of the garden. Its value as a fodder is very much a matter of doubt, probably much depends on the locality in which it is grown. It is not, I think, a plant I should recommend, on account of its persistence, as it might in some places prove a pest among other crops.—H. N. Ridley.

PLANTING IN SELANGOR.

Coffee and Rubber.

The Anglo-Ceylon and General Estates Company held its seventeenth yearly meeting at London on the 16th July with Mr. H. K. Rutherford presiding. The working of the Company had been unprofitable in the Mauritius owing to the low price of sugar, and cattle disease, but tea and cocoa yielded a profit in Ceylon. After setting out these facts, the chairman thus referred to the Company's ventures in Selangor :—

With regard to Selangor, Mr. GRIEVE, one of your directors, when on a visit to the Straits Settlements took the opportunity of visiting your property out there, and I will leave it to him entirely to speak to you on the subject. Although I daresay I was the director who is personally responsible for bringing the company into Selangor, I am quite prepared to take the whole onus on my own shoulders, because, from what you will hear from Mr. GRIEVE, I think you will agree with me that we have a first-rate investment in that country. With these remarks, gentlemen, I now move the following resolution :—"That the directors' report and statement of accounts to March 31st, 1903, now submitted, be, and they are hereby, adopted, and that, in accordance with the recommendation of the directors, a dividend of 4 per cent. on the consolidated stock of the company be paid on and after July 17th, 1903, such dividend to be paid to the stockholders appearing on the register at this date."

Mr. NORMAN W. GRIEVE, upon this, said :—I beg to second the resolution, and in doing so I would like to take this opportunity of giving you a short description of what I saw on my recent visit to Selangor. I may say, at the outset, that I was very much impressed indeed with everything that I saw there. It is about five years and a half since I was out there before, at which time the whole place was practically swamp and jungle. There was nothing whatever to see excepting a certain amount of forest, which had recently been felled, and a lot of water all over the estate. Going back again, a little over five years afterwards, I found that what had formerly been swamp and jungle was now a smiling country under cultivation, with fine Government roads and drains, some of them 15 ft. square, cut to carry off the rainfall, which, as you are aware, is very excessive there at times. Now that these big works have been carried out you have a dry, rich, alluvial soil, sufficiently drained, and on which all sorts of products are growing in a way I have never seen equalled anywhere else. In order to bring myself up to date in regard to the state of the rubber industry, I visited a new country estate in Ceylon, belonging to another company with which I am connected, before I went to Selangor, and I was able to acquaint myself with the treatment and manufacture of rubber there carried on, and to obtain up-to-date information as to the method of tapping and treating the latex, in preparation of the rubber. I stayed there a day, and saw everything, with the result that I was able to instruct our own men in Selangor as to how to proceed with the manufacture and treatment of rubber. I was also able by that visit to form a comparison in regard to the growth of the Para rubber in Ceylon, and in Selangor in the Straits Settlements, and my experience, I may say, leads me to endorse the opinion, which is general among Ceylon planters who have seen the two countries, that in Selangor we are very much ahead, age for age, in the matter of growth; indeed, we are two years ahead. In fact, the rubber plant is a perfect weed in Selangor; the thing grows with extraordinary rapidity. Of course, I do not wish in this connection to be over sanguine. I never have been, as I think it is a great mistake to hold out too rosy prospects about anything. We who have been engaged in tropical agriculture know that these sanguine expectations have been so often falsified; so it is better to regard things in a calm way.

At the same time, there is one feature in connection with the rubber industry of Selangor which is very striking, and that is that all the men who are engaged in it, and who are putting capital into it, are men of some considerable shrewdness—men who are usually in the van when there is anything good going. A great many of the men—in fact, nearly all of them—are Ceylon planters, who have been going round quietly, picking up land, planting it, and floating companies. I may tell you that the £1 shares of one rubber company in Selangor, which is approaching the producing stage, are difficult to procure at the present moment at £3. This will give you some idea of what certain people think of the prospects. We hope on our property at Selangor to arrive at the producing stage somewhat earlier than they do in Ceylon. The trees at Kondesella are ten years old, and the results obtained are exceedingly satisfactory; but I hope that in Selangor we shall be able to get a considerable yield from our trees as soon as they are eight years old, if not sooner, owing to the very much more rapid growth of the trees. I hope that during this year we may be able to take a small amount of latex from the smaller trees, and that from thence onwards I trust that the rubber produced will be quite a substantial factor each year. In a very short time now we shall be able to show you a profit on your investment there. Meanwhile, the Liberian coffee, which is being planted amongst the rubber trees, and also the coconut trees, which latter will take longer before they come into considerable bearing, are doing very well. As to the Liberian coffee, we can only regard that as being in the nature of a temporary benefit, as when the rubber trees grow more densely the coffee plants will succumb. In the meantime, however, we are receiving a very substantial income from the yield of coffee, which goes a long way towards paying our current expenses. I therefore think, without being too sanguine, that the stockholders of this company have every reason to congratulate themselves upon having had a cut into this new industry. I think, also, that the price at which this property stands in the company's books is a very safe one, and, in conclusion, I may say that I do not think the stockholders will have any reason to do other than congratulate themselves on having embarked in this rubber industry in the Protected Malay States. I now have pleasure in seconding the adoption of the resolution moved by the chairman.

The resolution was carried.

Straits Times, August 11, 1903.

RUBBER IN MYSORE.

The following is taken from Mr. CAMERON'S lecture to the Planters association of Southern India.

So pressing is the demand for good rubber at the present time that, while experts are exploring the world for further supplies, the chemists are actually trying to manufacture an artificial caoutchouc. If they should succeed in the latter attempt, rubber-planting would, I suppose, become an unprofitable enterprise. But it is unlikely that they will succeed to copy nature exactly. I should here mention that an artificial product claiming to possess all the best properties of gutta-percha is now manufactured in Germany, and is used for insulating wires and cables. Then let us see how we stand in regard to a possible rubber industry in Southern India. Of several rubber-producing plants on trial, the American trees stand out prominently in the estimation of the public. These are *Hevea braziliensis*, producing Para-rubber, *Castilloa elastica*, the source of Central American or Panama rubber, and *Manihot glaziovii*, which yields Ceara rubber; here entered in the order of merit as regards the quality and value of their respective rubbers. But the prominence of these trees in due to their extensive use and productiveness in America, where they form part of the aborescent flora of the country, and we have still to learn, to a large extent how far they may prove remunerative to the State and planter when cultivated as exotics in this country.

This brings me to my own experience of the three trees, and as far as their utility to Mysore is concerned, I am going to reverse the order of things by putting Ceará first and Para last. Within the first decade the Ceará tree has thriven amazingly, and has certainly come to stay in the country. It will flourish from the seaside to an elevation of at least 4,000 feet. Matured trees shed their leaves so abundantly that thousands of seedlings can be picked up wherever a few trees abound. Nor is it an unproductive tree, as it has so long been considered in this country. Recent tapping experiments in the Lal Bagh have conclusively proved that trees ranging in age from 8 to 14 years are highly charged with latex, and that the latter flows freely when tapped at the correct season and in the proper place. During the dry season, when the tree is leafless, the large root limbs should be tapped: and after the rains the operation should be transferred to the trunk, which yields its milk sap freely throughout the cold season. These experiments have also proved that as regards the productiveness of latex, no two trees are exactly alike. Between the two extremes of a copious discharge and hardly any discharge at all, we seem to possess every degree of productiveness. This peculiarity does not appear to be due to situation, exposure, or even the quality of the soil, in whole, as two trees growing together under the same conditions of soil, etc., were found to be wholly different in the amount of latex they contained. It seems to be rather a constitutional feature that some trees contain more lateciferous vessels than others. In view to ascertaining what quantity of rubber a mature tree will yield without being injured, a specimen has been tapped twice a week for the past three months and the coagulated latex (it is not all pure rubber, as I shall explain later) now amounts to a trifle over three pounds The experiment is going on, as the tree shows no sign of exhaustion either constitutionally or in the flow of latex. Early dawn is much the best time for tapping, and the operation should cease about 8 a.m. The quantity collected from each of these tappings has varied from half an ounce to two and a quarter ounces.

What we have to do now is to raise nurseries of seedlings from the good trees and try to eliminate the bad ones. Being so hardy during long periods of drought, the Ceará tree would adopt itself readily to many of the scrub tracts at elevations ranging from 1,000 to 3,000 feet, with an annual rainfall of 25 to 40 inches. We know of course that it grows vigourously at higher elevations where the rainfall is heavy. But there seems to be a doubt (although nothing is proved) if the outturn of rubber would be as plentiful and good under the latter conditions of growth. Personally I am in favour of the *Maidan*, as the best location for a Ceárá rubber indusrty on an extensive scale. This you will naturally think cannot be of much advantage to the planter, who is confined to the hills. But in a large concern of this kind the planter, with his matured experience and larger capital, is bound to have a share sooner or later. It is now proved beyond a doubt that the Ceará tree is wholly adopted to the climate of Southern India. It is also being proved that as it approaches maturity some varieties of the tree are highly charged with latex, and I may here state that the dry climate of the plains is all in favour of a pure rubber being easily prepared from the latter. American imports of the rubber into the United Kingdom are valued at a somewhat lower rate than similar products of Pará and *Castilloa*. But with the improved methods of purifying the actual rubber by the extraction of hurtful ingredients such as phosphates, resin and albuminous matter, the best tree of the future will be the one producing the largest quantity of pure rubber or caoutchouc. The latter is suspended in the latex fluid in the form of minute globules and needs to be separated in much the same way that cream is separated from milk. An ideal preparation of pure rubber would be to drain the latex from the tree by means of a siphon into a kind of churn where the caoutchouc is separated by centrifugal force. It follows from this that any rubber at once depreciates in value when it is allowed to coagulate with all its impurities as it is taken from the tree. A ball of rubber, for instance, taken from a tree a few days ago, may be full of hurtful ingredients rendering the whole mass subject to the growth of fungoid disease and putrefaction, results which are greatly aggravated in a damp climate. The old American remedy to prevent disease was sun drying and smoking. But that is only partially effective and does not dry the rubber.

We now come to a brief review of *Castilloa elastica*, which has also attained the reproductive stage in the Lal Bagh. In its culturable requirements this important tree seems to be intermediate between the Pará and Ceará species, requiring neither the tropical humidity of the former nor the open and comparatively dry conditions of the latter. It is, in fact, a tree for the coffee zone.

Although I do not say positively that *Castilloa*, would fail on the *Maidan*, I certainly think it will have a better chance in comparatively open spaces throughout the coffee zone. Indeed it may become a good shade tree for coffee for all we know at present.

Now we come to the last of the three American trees *e.g. Hevea braziliensis*, or Pará rubber. When pure the latter is worth Rs. 4 a lb. and is admitted to hold the market at present. But under improved methods of preparation it will soon be closely run in quality, and perhaps greatly exceeded in quantity, by the rubber which I have just reviewed. Anyhow it is not likely to be of much practical use in the dryer parts of India: therefore, we are justified in turning our attention to more hopeful subjects. The Pará rubber tree is essentially tropical in its requirements, and needs a humid atmosphere such as is found in the Amazon Valley—its native habitat. Ceylon has started cultivation in a small way. But the only eastern country which is likely to compete on fairly equal terms with America in the Malay Peninsula and Archipelago. Along the West coast of India and in moist situations under the Ghauts there may be spots where the climatic conditions are tolerably favourable. But careful experiment should be conducted before a large investment is made. At Bangalore the tree languishes and dies during the long dry season. Irrigation gives only temporary relief and there is too little moisture during the first four months of the year.

The Assam rubber tree, (true rubber) *Ficus elastica*, I have all along said will grow well in the coffee districts, and the reason why it is not found there in quantity is possibly due to the difficulty of rapid propagation. But in any South Indian rubber plantation this useful tree should containly find a place. It is said to be doing well in the Straits Settlements.

Planting Opinion, 8th August, 1903, p. 542.

PARA RUBBER SEED.

Kepitigalla Estate, Matale.

DEAR SIR,—An important point to be decided, and of interest to Para Rubber growers, is whether the tapping of a tree injures the seed for planting. This question has been raised by a few planters when ordering seed, stipulating that the seed should be from untapped trees only. I have sold many thousand of seeds during the last four years, but only three planters have made this request. I have carefully tested seeds from tapped and untapped trees, of an equal number grown in beds side by side for the past three years and I have never found the slightest difference. I have now large nurseries and am perfectly satisfied there is no difference, if one can judge by general healthy appearance of plants in the nurseries. I referred the matter to Mr. WILLIS the Director of the Royal Botanical Gardens, Peradeniya, and he has very kindly allowed me to publish his opinion which is as follows:—"As to seed from trees which have been tapped (Para) our experience goes to show, that we get less seed when we tap, but the seed seems just as good on the whole. In some years our seed seems better than in others, but so far as I am aware this has no relation to tapping—weather has probably more to do with it. It is difficult without special observation on the subject to disentangle one effect from the other." *Re* tapping Para, from experience gained in tapping 6,500 trees, I find that they can easily give 1 lb. per tree per year, if tapped twice yearly as is being done at present on this estate.

I am, Sir, yours faithfully,

FRANCIS J. HOLLOWAY.

[We should certainly be inclined to recommend that seed should only be taken from Rubber trees set apart for that purpose just as Tea-bush-seed bearers are so treated.—Editor *Tropical Agriculturist.*]

FORMALIN IN TREATING CASTILLOA RUBBER.

A short article on this subject appears in the Trinidad Bulletin of Miscellaneous Information, for July, 1903, p. 528. Mr. HART refers to Dr. WEBER'S papers on this subject and reports on experiments made in the Botanic Gardens in Trinidad as follows:—

Latex from trees of mature age was treated with Formalin in varying quantities but our results did not confirm those reported by Dr. WEBER, in so far as the period required for the formation of the cake of rubber on the surface; on the contrary, it was found that the time required was four times that mentioned by him. Eventually however, the creamy portion did coalesce and form a cake of spongy rubber which parted with the liquid it contained readily on pressure. The quality of the rubber obtained was excellent, but was not observed to be much superior, if any, to that obtained by the ordinary creaming without Formalin. There is, however, every reason to believe that it may keep better than rubber so prepared on account of the intimate mixture of the rubber globules with the chemical preservative and specimens will be kept for the purpose of observing its effect. *Castilloa latex* treated to the creamy process will readily cake together and harden on the surface without the application of Formalin, if left for a sufficient length of time, and if left in the mother liquid without creaming or washing, the albuminoids will decompose and the rubber globules will form a cake of rubber on the surface, of good quality though somewhat darkened by oxidization.

Castilloa latex can be coagulated or agglutinized also by the sand filter, or when placed in a vessel having a fine copper wire gauze at its base. The watery fluid drips readily through this without allowing the rubber globules to pass, and when all are removed the rubber in paste can be turned upon a porous substance to dry. With the sand bath, the sand should be fine, clean and well wetted. The latex can then be poured upon it after placing wire gauze on the surface. These processes, however, do not compare in cleanliness, nor can so good rubber be made by them, as when the readily decomposing albuminoids are washed away by creaming process. The rubber produced is also inferior in quality. There is every reason to believe therefore that the treatment of *Castilloa latex* with Formalin is likely to become a highly successful method to adopt in the preparation of crude rubber.

NATURAL INDIGO.

The following particulars respecting indigo prospects are by the Calcutta correspondent of the *British Trade Journal*:—

A great deal has been written about indigo during the last few months, but the controversy can only tend to convey to the general public an erroneus idea. It has been contended that because the Maharajah of Darlangha turned his estates to the cultivation of *rhea*, that indigo growing has been abandoned in East India; and because many consumers have adopted artificial indigo as an experiment to see how far it can replace the natural product, it is assumed that chemical indigo is the more advantageous of the two, and therefore preferred. The argument that the high price of indigo during the last Calcutta season again alienated many regular partizans and consumers of the natural product, causing them to continue adopting synthetic indigo can be met in the following manner:—

In spite of the energetic and zealous work of the artificial indigo manufacturers, who have lost no opportunity of puffing their article, the worlds consumption has taken up all the natural indigo produced, and the very heavy stocks which have always existed have never been so low as of late. If the Maharajah of Darlangha, as many other planters before him, has seen that owing to the low prices prevailing the land can be turned into better account in many other ways, it shows nothing else but that in the comparatively small indigo district of lower Bengal the soil is not productive enough for this kind of culture, a fact which experts have known for years. Other districts continue to prosper satisfactorily, and will go on doing so if for the next few years better climatic conditions prevail than have existed with scarcely a break since 1898.

The rate of Indian exchange has an important influence on the indigo trade. The 1895 to 1896 harvest which was an exceptionally good one, producing 160,000 maunds—about 40,000 cases at an exchange of 1*s*. 1*d*. per rupee, yielded such high rupee prices that the planter was able to do a large business; in 1896 the exchange remained at 1*s.* 2*d.*; in 1897 it went up to 1*s.* 3½*d.* and even at this high rupee price, and without raising the European value, it was found profitable to plant every inch of even the very poorest soil with indigo. Since 1898 we have had an almost stable exchange of 1*s.* 4½*d.*, or as compared with that of 1895 or 1896, 20 per cent. more unfavourable from the European buyers point of view. It is therefore not to be wondered at if the estates less disposed to the production of indigo have been given over to other culture. It is quite clear to the producers in India that if they are to compete against artificial indigo they must supply a good quality of the natural product at a low price, and private individuals as well as the Indian Government are doing their utmost to introduce improvements in this direction, such as more careful tilling of the soil, a more rigorous choice in the selection of the seed employed, and specially a better supervision of the process of fermentation. These are all more or less coming into use. The weather naturally exerts a great influence on the crop, and under the unfavourable conditions which have prevailed during the last few years, especially in 1902, it has been difficult to produce indigo at a profit at the present prices. In this connection it should be noted that up to the late autumn of last year "indigo" influenced the market value of all fast blues. There followed the decrease in price of the competetive chemical product in order to meet the reduced price of natural indigo, and although artificial indigo was cheap, it was never so low as it had been before the summer of 1902 owing to the bad crops of the natural product. This shows that the enhanced price not only caused no holding back in buying circles, but that already in the autumn of 1902 many of the stocks in Europe and the new supplies in India were sold on a rising market. The deliveries to all parts of the world indicate that the universal consumption did not kick against the higher prices: numerous orders remained unexecuted in Calcutta, because the stock of about 43,000 maunds, or 10,800 cases, was not sufficient to satisfy the demand. Many American buyers, after trying both the artificial and the natural indigo, have gone back to the latter, and this shows that it is not always the true blue dye-stuff which renders the best analysis which is the best in actual practice.

In dyeing circles it has been usual to enquire the analysis of indigo, *i.e.*, how much per cent. of indigotine is shown by the chameleon or permanganate process, and whoever, for the sake of convenience, only buys according to such analysis can easily be deceived. Every practical dyer knows that different lots of Bengal indigo, for example, which on analysis show, let us say, 60 per cent. of indigotine, produce a much higher percentage than this in the vats. But it has been found convenient, although it may not be rational, to base purchases on the analysed percentages, and not on the one which practical knowledge shows to exist. Natural indigo therefore by skilful manipulation would render a percentage of indigotine in excess of the analysed 60 per cent., whereas the artificial or synthetic product will give exactly 60 per cent. and no more.

It is argued on the other hand, that by buying artificial indigo one knows exactly that strength one is getting but the reply to this argument is that by purchasing the natural product a bonus is obtained.

It is about eight years ago that alizarine blue (or chemical indigo) was first presented to the dyeing world as a superior substitute for natural indigo, and although it possesses good qualities of its own, it has not yet succeeded in rivalling it. Each of the two qualities holds its place in the textile industry, an industry which from year to year demands ever increasing qualities of dye-stuffs, and time will show for what peculiar use each is best adopted. Up to to the present cloths dyed with natural indigo have withstood the effects of sea journeys and of the sun's rays better than all others. It would not be in accordance with facts to assume that in the competition between chemical and natural indigo a decision has as yet been reached in favour of or against one or other of the products.

In Indian planting circles the opinion is held that, the question will only be solved when, under normal conditions, or at least more favourable weather, larger harvests with improved qualities are placed upon the market, but this time is yet to come and in the meantime it can safely be taken for granted that the natural as well as the chemical indigo will each find its field of usefulness in the world's markets.

NITROGENOUS PLANTS.

It is now well known that many plants belonging to the natural order Leguminosæ have the power of taking in varying amounts of atmospheric nitrogen and building this up into complex compounds within the plant.

The cultivation of these nitrogen collectors is carried on in many parts of Ceylon and different leguminous species have been tried for different products. *Crotalaria striata* and others have been tried for tea, *Erythrina* species (Dadap) and *Albizzia moluccana* for cacoa and tea, *Mimosa pudica*, L., the sensitive plant, for coconut land, together with several species obtained from Europe.

Nitrogen and Nematode Nodules.

The formation of conspicuous nodules on the roots and rootlets is the only indication to the practical man that the plant belongs to the Nitrogen collecting family, and as this is usually the only criterion it is necessary to clearly state the characters of those nodules which are nitrogenous and to distinguish them from those produced by nematodes or eel-worms. Both classes of nodules, nitrogenous and nematodes, are especially characteristic of the same group of plants, and it is quite possible that the same species may under different conditions exhibit both kinds of root growth. Certain it is that some varieties of the common cultivated bean, *Phaseolus vulgaris*, produce in Ceylon nitrogen nodules, and others though growing in the same soil, produce nematode swellings.

Mr. BARBER, the Government Botanist, Madras, states that *Cassia mimosoides* may possess nitrogenous nodules and eel-worm galls. This I have been able to confirm in plants at the Hakgala Garden. The best naked eye character to depend upon in judging between the two classes is the relative freedom of the swolen part; nitrogenous nodules are attached very feebly to one side of the small root or rootlets, and a slight pull will detach them with ease; whereas those produced by nematodes are more in the nature of swellings in the actual root or rootlet, and though they often occur on one side only, they are more frequently extended through a greater part of the circumference and cannot be detached separately from the root. In the young stages it is by no means easy to distinguish one class from another by the naked eye, a case in point being the eel-worm galls reported by Mr. BARBER on the Cinchona in Madras. In cases of doubt a transverse section of the swollen material seen under the microscope or with a good lens will settle the matter very speedily; in sections of true nitrogenous nodules every component cell is considerably swolen and the majority are packed with minute bacteria-like bodies, whereas in a nematode nodule the large cysts of the worm and frequently part of the body can be seen.

The nematodes are much more generally distributed throughout the plant kingdom than nitrogenous nodules, as may be judged from their occurrence on beetroot, sugarcane, cucumber, wheat, onions, cinchona, papaw, lettuce and tomato. Mr. GREEN, the Government Entomologist, has also found them on the roots of the common balsam and species of Coleus and Heliotrope. I have examined tea planter's nurseries and found that the leguminous species that the experimental planter was growing for green dressings for his tea had their roots packed with eel-worm galls only. These were being zealously attended to in the belief that they were nitrogenous nodules of exceptional size. The fact that the presence of these eel-worm galls has been determined on roots of tea both in Ceylon and India is sufficient to make one examine, very carefully, the nature of the nodules which may occur on the leguminous plants used for nitrogen collecting. The following list includes the more common plants on which nematode nodules or galls have been found:—Ageratum conyzoides ("Goat weed" or Pumpulla), Impatiens Sultani (Chitta maddi), Triumfetta rhomboidea (Epala), Cassia mimosoides (Binsiyambala), Mollugo pentaphylla, L., Impatiens kleinii, Impatiens balsamina, Sida rhombifolia, Tea, species of Coleus, Heliotrope, Cinchona, French bean, Phaseolus vulgaris. Desmodium sp., Saccharum officinalis, Acacia decurrens, Piper subpeltatum, and numerous garden cultivations such as those previously mentioned.

The nitrogenous nodules may be divided into two classes, one comprising those which are approximately globular in form, *e.g.* *Erythrina indica* and *Phaseolus vulgaris*; the other includes those that are flat and grooved and have the appearance of miniature finger-like projections from a common centre, the latter being the point of attachment of the nodule to the root, *e.g. Albizzia moluccana* and *Entada scandens.* Nodules of the former class are more easily confused with eel-worms than those of the latter group. Both kinds occur on the roots of *Acacia decurrens.*

With a view of obtaining some definite knowledge of the abundance or otherwise of the nitrogenous nodules on plants which are common in Ceylon the following classification has been commenced:—

PLANTS POSSESSING NITROGENOUS NODULES.

Climbers:—Entada scandens (Woody climber); Phaseolus vulgaris; Mucuna pruriens: Canavalia ensiformis; Abrus precatorius; Dolichos falcatus.

Herbaceous plants:—Annual or Perennial; Crotalaria striata; C. incana; C. verrucosa; C. semperflorens; C. laburnifolia. Mimosa pudica (introduced); Pseudarthria viscida; Vicia sativa; Desmodium triflorum; D. jucundum; D. heterophyllum. Cassia tora; C. mimisoides; C. hirsuta; C. absus; Alyssicarpus vaginalis; A. bupleurifolius; Indigofera trita; I. paucifolia; Tephrosia purpurea.

Trees:—Albizzia moluccana; A. stipulata; A. odoratissima; Pithecolobium saman; P. dulce; Acacia decurrens; A. arabica; Leucæna glauca; Erythrina lithosperma; E. ovalifolia; E. indica; E. umbrosa; Cassia grandis; Bauhinia triandra; Colvillia racemosa; Sesbania grandiflora; Ormosia dasycarpa; Dalbergia armata; Pterocarpus indicus; P. echinatus: Amherstia nobilis; Hardwickia pinnata; Lonchocarpus latifolius; Psophocarpus tetragonobolus; Pongamia glabra; Brya ebenus; Dimorphandra mora; Trachylobium verrucosum; Copaifera officinalis.

It will be noticed that no statement is made as to the percentage of nitrogen in the nodules. The work up to the present has consisted of collecting our best native and introduced species and determining the weight of the nodules per plant. A series of experiments in beds and tins has also been arranged to determine the increase in percentage of nitrogen in soil which has been occupied for a definite period with a particular species. The selected plants include our common species of *Albizzia*, *Crotolaria* and *Erythrina*, and several imported species.

Agricultural Journal of the Royal Botanic Gardens,
Ceylon, April, 1903.

BLUMEA BALSAMIFERA.

In the Bulletin Economique de l'Indo Chine No. 18 for June, 1903, is an analysis of the Camphor obtained from this plant by the natives of Laos and Tonkin. The sample came from the province of Chobo and was analyzed by M. AUFFRAY, of the Laboratory of Tonkin. It gave—

Liquid essential oil	...	...	2.25
Concrete crystalline essence		...	97.75
			100.00
Point of fusion	...	...	178°
Deviation	...	...	10,48

The chemical analysis giving the formula $C^{10} H^{18} O$. shows that it is composed of Camphol or Borneol. By oxydation it gives camphor and inversely the camphor by hydrating becomes Borneol.

Ed.

HORTICULTURAL NOTES.

THE FRUITING OF THE TRAVELLERS' TREE RAVENALA MADAGASCARIENSIS.

The Travellers' tree, often erroneously called the Travellers' palm, belongs to the same order as the Banana as may be easily guessed from the foliage. It is commonly cultivated in the Straits Settlements where it thrives very well, and is propagated from the side shoots, like a Banana. I have heard of no instance of its flowering or fruiting in the Straits Settlements. In Ceylon at Peradeniya I have seen it in flower, and recently I found it fruiting in July in the grounds of the Rajah's Bungalow at Matang in Borneo at an altitude of 1,000 feet elevation.

This is the only record I have of its fruiting in the East. The flowers are white with long pointed petals and stamens, a number of them borne in ivory white boat shaped bracts. The fruit a large woody capsule splitting into three valves each enclosing a number of seeds wrapped in a blue aril.

The only other species in the genus is *R. guianensis,* a native of Guiana which is almost stemless. Both species are in cultivation in the Botanic Gardens, Singapore.

ACANTHUS MONTANUS.

There are two or three species of the genus *Acanthus*, indigenous to the Malay peninsula. These are tidal mud plants with blue or white flowers and usually holly-like prickly by leaves. They are known to the Malays as "Jeruju," and the ground up seeds are considered by them as a specific for boils. The handsomest is *A. ilicifolius*, with large blue flowers, the other local species, are *A. ebracteatus*, Vahl. with light blue or white flowers and *A. volubilis*, a half climbing species with white flowers I have failed to cultivate these local kinds in the garden as they seem to require the salt mud of the tidal river.

A somewhat different type of *Acanthus*, *A. montanus*, a native of Tropical Africa was received from Kew about a year and a half ago, and readily took to the soil and climate of Singapore. It is a large herb with light green stems about five feet tall and runcinate leaves about 8 inches long and 2 inches across, armed with prickles at the tips of the lobes. In colour they are deep green mottled with lighter colour, with a pale greenish white midrib. The flower spikes attain a length of about 18 inches with numerous flowers sessile with a flat spiny green bract and the sepals are four, two opposite ones large flat green and spiny, and two side ones quite small.

The short corolla tube ends in a broad five lobed lip an inch and a half long and as wide, white tinted with rose colour, over which lie the four large stamens. The flowers open a few at a time on the spike so that the plant remains long in bloom.

As a foliage plant with its mottled thistle-like leaves it is worth cultivating, and the large pinkish white flowers make it still more attractive. Its general habit is so distinct from anything that we have in cultivation that it is well worth a place in shady borders of the garden.

It is easily propagated by layers, and is of rapid growth, when planted in good soil under partial shade.

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* Rainfall for August, 1903.

The Government Hall	...	Ins.	8.51
The Prison	...	,,	6.51
The Fort	...	,,	4.84
Balek Pulau	...	,,	7.88
Pulau Jerejak	...	,,	7.21
Lumut	...	,,	11.30
Pangkor	...	,,	9.77
Bruas	...	,,	9.34
Butterworth P. W.	...	,,	4.58
Bukit Mertajam	...	,,	8.18
Sungei Bakap	...	,,	8.47

M. E. SCRIVEN.

Prison Observatory, Penang.

* The Rainfall for August as compared with previous years is unusually low. In fact the amount recorded for the past 8 months, hardly casts up to 50 inches—

The Meteorological readings for Temerloh (Pahang) were received too late for the previous Bulletin. Mr. EMERIC gives them:—

Temperature maximum	...	93
Minimum	...	70
Range	...	23
Total Rainfall	...	2.48
Greatest rainfall in 24 hours	...	1.04

SINGAPORE MARKET REPORT.

July, 1903.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	20	25.00	23.00
Bali	314	18.00	16.50
Liberian	134	18.00	15.00
Copra	3,367	8.05	6.60
Gambier	1,015	14.15	13.25
Cube Gambier, Nos. 1 & 2.	130	19.25	16.50
Gutta Percha, 1st quality	...	325.00	225.00
Medium	...	225.00	125.00
Lower	...	125.00	22.00
Borneo Rubber	...	145.00	90.00
Gutta Jelutong	...	6.85	6.50
Nutmegs, No. 110's	...	76.00	70.00
No. 80's	...	120.00	115.00
Mace. Banda	...	180.00	165.00
Amboyna	...	1 50	
Pepper, Black	452	34.37½	33.00
White	366	51.00	48.50
Pearl Sago, Small	125	6.50	5.25
Medium	...	7.70	6.75
Large	...	8.50	7.50
Sago Flour, No. 1	2,360	4.00	3.75
No. 2	110	47.50	46.00
Flake Tapioca, Small	761	6.50	4.00
Medium	55	4.50	
Pearl Tapioca, Small	562	5.00	4.00
Medium	648	5.00	4.00
Bullet	110	5.25	4.15
Tin	2,677	82.50	76.50

SINGAPORE MARKET REPORT.

August, 1903.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	14	23.50	22.00
Bali	249	17.25	16.00
Liberian	303	16.00	15.00
Copra	4,688	7.90	6.30
Gambier	2,512	14.15	12.75
Cube Gambier, Nos. 1 & 2	90	18.50	16.00
Gutta Percha, 1st quality	...	280.00	210.00
Medium	...	200.00	110.00
Lower	...	120.00	19.00
Borneo Rubber	...	145.00	88.00
Gutta Jelutong	...	7.00	6.60
Nutmegs, No. 110's	...	75.00	73.00
No. 80's	...	125.00	120.00
Mace, Banda	...	200.00	175.00
Amboyna	...	150.00	140.00
Pepper, Black	855	34.12½	29.50
White	744	48.50	44.00
Pearl Sago, Small	125	5.60	5.10
Medium	...	...	...
Large	20	...	...
Sago Flour, No. 1	4,462	3.95	3.60
No. 2	620	1.65	1.50
Flake Tapioca, Small	887	6.25	3.90
Medium	76	4.65	4.50
Pearl Tapioca, Small	872	4.75	3.95
Medium	844	4.75	3.90
Bullet	...	4.25	4.15
Tin	2,990	79.50	71.00

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st July, 1903.

Wired at 3 p. m. on 1st August, 1903.

To England.

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports.	1,800
Gambier	from Singapore	to London	20
"	" "	" Liverpool	...
"	" "	to U. K. & / or Continent	330
"	" "	to Glasgow	...
Cube Gambier	" "	" England	40
White Pepper	" "	" "	50
Black "	" "	" "	20
White Pepper	" Penang	" "	...
Black "	" "	" "	10
Pearl Sago	" Singapore	" "	70
Sago Flour	" "	" London	725
" "	" "	" Liverpool	...
" "	" "	" Glasgow	20
Tapioca, Flake	" Singapore & Penang	to England	370
" Pearl & Bullets	" " "	" "	180
" Flour	" Penang	" "	1,025
Gutta Percha	" Singapore	" "	60
Buff hides	" "	" "	50
Pineapples	" "	" " cases	11,500

To America.

Tin	from Singapore & Penang		50
Gambier	" Singapore		...
Cube gambier	" "		40
Black Pepper	" "		20
"	" Penang		...
White Pepper	" Singapore		...
"	" Penang		...
Nutmegs	" Singapore & Penang		...
Tapioca, Flake & Pearl	" " "		120
Pineapples	" "	cases	1,250

To the Continent.

Gambier	from Singapore	to South Continental Ports	230
"	" "	" North "	140
Black Pepper	" "	" South "	120
"	" "	" North "	20
Black Pepper	" Penang	" South "	10
"	" "	" North "	...

			Tons Steamer.
White Pepper	from Singapore	to South Continental Ports	20
,,	,, ,,	.. North ,, -	70
,,	,, Penang	to South Continental Ports-	...
,,	,, ,,	,, North ,, -	10
Copra	,, Singapore & Penang	to Marseilles -	540
,,	,, ,,	,, Odessa -	320
,,	,, ,,	,, South Continental Ports - other than Marseilles and Odessa	700
,,	,, ,,	,, North Continental Ports -	2,200
Tin	,, ,,	,, Continent -	400
Tapioca Flake	,, ,,	,, ,, -	230
Tapioca Pearl	,, ,,	,, ,, -	290
Cube gambier	,, Singapore	,, ,, -	60
Pineapples	,,	,, ,,	cases 1,500

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

700 tons Gambier
370 ,, Black Pepper
(*in Singapore*)
contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th August, 1903.

Wired at 5 p.m. on 17th August, 1903.

To England:—

			Tons Steamer.
Tin	from Singapore & Penang	to England - and U. K. optional any ports	1,850
Gambier	from Singapore	to London -	20
,,	,, ,,	to Liverpool-	10
,,	,, ,,	to U. K. & / or Continent -	200
,,	,, ,,	,, Glasgow -	...
Cube Gambier	,, ,,	,, England -	70
White Pepper	,, ,,	,, ,, -	60
Black ,,	,, ,,	,, ,, -	200
White ,,	,, Penang	,, ,, -	30
Black ,,	,, ,,	,, ,, -	...
Pearl Sago	,, Singapore	,, ,,	90
Sago Flour	,, ,,	,, London -	580
,,	,, ,,	,, Liverpool -	1,700
,,	,, ,,	,, Glasgow -	430
Tapioca, Flake	,, S'gapore & P'nang	to England -	430
,, Pearl & Bullets	,, ,,	,, ,, ,, -	500

			Tons Steamer.
Tapioca Flour	from Penang	to England -	250
Gutta Percha	,, Singapore	,, ,, -	90
Buff hides	,, ,,	,, ,, -	150
Pineapples	,, ,,	,, ,, cases	18,500
To America:—			
Tin	from Singapore & Penang	-	600
Gambier	,, ,,	-	1,000
Cube Gambier	,, ,,	-	90
Black Pepper	,, ,,	-	750
,,	,, Penang	-	330
White Pepper	,, Singapore	-	80
,,	,, Penang	-	...
Nutmegs	,, Singapore & Penang	-	16
Tapioca, Flake & Pearl	,, ,, ,,	-	725
Pineapples	,, ,, ,,	cases	12,000
Sago Flour	,, ,, ,,	-	300
To the Continent:—			
Gambier	from Singapore	to South Continental Ports	260
,,	,, ,,	,, North ,, -	330
Black Pepper	,, ,,	,, South ,, -	100
,,	,, ,,	,, North ,, -	80
,,	,, Penang	,, South ,, -	...
,,	,, ,,	,, North ,, -	...
White Pepper	,, Singapore	,, South ,, -	10
,,	,, ,,	,, North ,, -	80
,,	,, Penang	,, South ,, -	...
,,	,, ,,	,, North ,, -	...
Copra	,, Singapore & Penang	to Marseilles -	360
,,	,, ,,	,, Odessa -	900
,,	,, ,,	,, South Continental Ports other than Marseilles and Odessa.	300
,,	,, ,,	,, North Continental Ports	2,650
Tin	,, ,,	,, Continent -	240
Tapioca Flake	,, ,,	,, ,, -	70
Tapioca Pearl	from Singapore & Penang	to Continent -	210
Cube gambier	,, Singapore	,, ,, -	60
Pineapples	,, ,,	,, ,, cases	2,500
Sago Flour	,, ,,	,, ,, -	110

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

500 tons Gambier
300 ,, Black Pepper
(in Singapore)
} contracted for during fortnight ending as above.

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E. C.

(C)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st August, 1903.

Wired at 5.30 p. m. on 1st September, 1903.

		Tons Steamer.
To England.		
Tin	from Singapore & Penang to England and U. K. optional any ports.	1,600
Gambier	from Singapore to London	...
,,	,, ,, to Liverpool	...
,,	,, ,, to U. K. &/ or Continent	280
,,	,, ,, ,, Glasgow	...
Cube Gambier	,, ,, ,, England	30
White Pepper	,, ,, ,, ,,	60
Black ,,	,, ,, ,, ,,	...
White Pepper	,, Penang ,, ,,	...
Black ,,	,, ,, ,, ,,	...
Pearl Sago	,, Singapore ,, ,,	140
Sago Flour	,, ,, ,, London	450
,, ,,	,, ,, ,, Liverpool	...
,, ,,	,, ,, ,, Glasgow	100
Tapioca, Flake	,, Singapore & Penang to England	260
,, Pearl & Bullets	,, ,, ,, ,, ,,	270
,, Flour	,, Penang ,, ,,	800
Gutta Percha	,, Singapore ,, ,,	100
Buff hides	,, Singapore to England	50
Pineapples	,, Singapore ,, ,,	cases 6,000
To America:		
Tin	from Singapore and Penang	510
Gambier	,, Singapore	875
Cube Gambier	,, ,,	10
Black Pepper	,, ,,	340
,,	,, Penang	...
White Pepper	,, Singapore	100
,,	,, Penang	...
Nutmegs	,, Singapore and Penang	2
Tapioca, Flake and Pearl	,, ,, ,,	140
Pineapples	,, ,, ,,	cases 3,500
Sago Flour	,, ,, ,,	400
To the Continent:		
Gambier	from Singapore to South Continental Ports	40
,,	,, ,, ,, North ,,	200
Black Pepper	,, ,, ,, South ,,	200
,,	,, ,, ,, North ,,	10
,,	,, Penang ,, South ,,	...
,,	,, ,, ,, North ,,	...

			Tons Steamer.
White Pepper	from Singapore	to South Continental Ports	70
"	" "	" North "	180
White Pepper,	" Penang	" South "	...
"	" "	" North "	...
Copra	" Singapore & Penang	to Marseilles	50
"	" "	" Odessa	480
"	" "	" South Continental Ports other than Marseilles and Odessa.	500
"	" "	" North Continental Ports	880
Tin	" "	" Continent	360
Tapioca Flake	" "	" "	200
Tapioca Pearl	" "	" "	250
Cube Gambier	" Singapore	to Continent	30
Pineapples	" "	" "	cases 2,000
Sago Flour	" "	" "	500

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,300 tons Gambier
500 " Black Pepper
(*in Singapore*) } contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London. E. C.

Singapore.

Abstract of Meteorological Readings for the month of August, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·877	131·9	79·3	85·2	73·9	11·3	76·7	·863	74·0	82	S.E. S.S.E.	12·79	3·26

K. K. Hospital Observatory,
Singapore, 10th September, 1903.

A. B. LEICESTER,
Meteorological Observer.

W. GILMORE ELLIS,
Principal Civil Medical Officer, S.S,

Penang.

Abstract of Meteorological Readings for August, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·898	143·7	79·9	88·5	73·9	14·6	75·0	·777	70·4	·71	S.	6.51	1·09

Colonial Surgeon's Office,
Penang, 10th September, 1903.

M. E. SCRIVEN,
Asst. Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for July, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
Durian Daun Hospital.	29·833	150·5	79·7	89·0	69·4	19·7	80·8	1032	69·4	93	S.W.	7·59	1·67

Colonial Surgeon's Office,
Malacca, 17th August, 1903.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for July, 1903.

Districts.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Humidity.	Total Rainfall	Greatest rainfall during 24 hours.
Taiping ...	150	83·05	93·50	70	23·50	77·32	861	76	4·54	·80
Kuala Kangsar ...	...	81·75	93	70	23	76·30	834	77	2·86	·60
Batu Gajah ...	159	82·13	93	71	22	76·94	857	78	1·76	1·02
Gopeng ...	...	81·89	92	64	28	76·64	847	78	2·29	·67
Ipoh ...	...	82.14	92	70	22	76·77	851	78	2·30	·44
Kampar ...	...	...	94	67	27	...	...	...	2·20	·57
Teluk Anson ...	...	82.07	91	70	21	77·08	864	79	2·84	1·16
Tapah ...	..	82·16	92	70	22	77·05	864	79	3·25	·89
Parit Buntar ...	...	82·28	93	70	23	76·78	848	77	4·90	1·65
Bagan Serai ...	...	81·91	91	71	20	76·76	854	78	3·26	·79
Selama ...	...	82·17	91	71	20	77·94	900	82	4·65	1·89

STATE SURGEON'S OFFICE,
Taiping, 12th August, 1903.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for July, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·889	150·1	80·4	89·9	70·7	19·2	76·8	04·89	73·2	80	S.W.	0·20	0·20
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	4·31	0.87
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	1·97	0·60
,, Klang	...	...	...	85·3	75·6	9·7	...	...	...	...	...	6.58	2·84
,, Kuala Langat	...	...	...	85·6	73·2	12·4	...	...	...	...	...	10·19	3·89
,, Kajang	...	...	...	86·3	76·4	9·8	...	...	...	...	...	2·82	0·79
,, Kuala Selangor	...	...	...	87·9	76·6	11·2	...	...	...	...	...	1·82	1·22
,, Kuala Kubu	...	...	...	92·0	71·8	20·2	...	...	...	...	...	4·65	0·79
,, Serendah	...	...	...	81·9	76·8	12·3	...	...	...	...	...	2·64	1.13
,, Rawang	...	...	...	87·2	77·1	10·1	...	...	...	...	...	3·34	1·25
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	3·51	1·70

State Surgeon's Office,
Kuala Lumpur, 25th August, 1903.

E. A. O. TRAVERS,
State Surgeon, Selangor

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for August, 1903.

Districts.	Max-imum in Sun.	Temperature.				Hygrometer.			Total Rainfall	Greatest rain-fall during 24 hours.
		Mean Dry Bulb.	Max-imum.	Min-imum.	Range.	Mean wet Bulb.	Vapour Tension.	Humi-dity.		
Taiping ...	149	80·67	93	69	24	76·01	835	79	16·11	4·30
Kuala Kangsar ...	...	79·36	93	70	23	75·38	828	82	16·19	2·95
Batu Gajah ...	162	80·09	95	70	25	75·92	839	81	16·03	2·26
Gopeng ...	...	79·92	92	63	29	76·12	851	83	22·17	5·71
Ipoh ...	...	79·53	93	70	23	75·42	827	82	16·35	3·05
Kampar ...	...	...	93	69	24	...	...	...	20·97	6·57
Teluk Anson ...	...	80·00	91	70	21	76·55	827	85	12·50	3·25
Tapah ...	..	80·68	91	69	22	76·46	857	81	18·23	3·78
Parit Buntar ...	...	81·11	93	70	23	76·38	847	79	4.23	1·47
Bagan Serai ...	...	80·42	90	70	20	76·21	848	81	7·85	1·80
Selama ...	...	80.81	91	71	20	76·95	878	84	14·44	2·82

State Surgeon's Office,
Taiping, 11th September, 1903.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for August, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29.891	148.2	80.1	89.9	69.3	20.6	76.7	.860	74.7	82	S.W.	9.58	1.86
Pudoh Gaol Hospital "	...	...	...	...	...	...	...	...	...	...	...	6.45	2.23
District Hospital "	...	...	...	...	...	...	...	...	...	...	...	6.70	2.09
" Klang	...	...	...	84.5	74.3	10.2	...	...	...	...	...	5.51	1.82
" Kuala Langat	...	...	...	85.5	72.4	13.1	...	...	...	...	...	5.16	1.13
" Kajang	...	...	...	85.3	75.9	9.4	...	...	...	...	...	5.41	1.11
" Kuala Selangor	...	...	...	81.7	71.0	10.7	...	...	...	...	...	6.38	2.20
" Kuala Kubu	...	...	...	91.2	71.9	19.3	...	...	...	...	...	13.48	1.90
" Serendah	...	...	...	87.7	74.2	13.5	...	...	...	...	...	9.99	3.10
" Rawang	...	...	...	86.3	77.3	9.0	...	...	...	...	...	10.46	2.22
" Jeram	...	...	...	...	...	...	...	...	...	...	...	7.48	2.70

State Surgeon's Office,
Kuala Lumpur, 16th September, 1903.

E. A. O. TRAVERS,
State Surgeon, Selangor

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for August, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raub, ...		...	...	...	...	...	...	...	...	...	...	...	...
Bentong ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pekan ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kuantan, ...	...	...	...	86	71	15. 0	...	...	...	...	...	5·57	1·30
Temerloh ...	...	...	...	92	70	22. 0	...	...	...	...	...	6·84	1·32

K. Lipis, 31st August, 1903.

S. LUCY,
State Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for August, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	81·0	89.0	71·0	18·0	73·0	...	...	...	...	6·79	·90

Muar, 1st September, 1903. FRANCIS PEARS.

No. 10.] OCTOBER, 1903. [VOL. II.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua- "tion regarding new or little known natural or manufactured pro- "ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F. L. S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN

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No. 10.] OCTOBER, 1903. [Vol. II.

COTTON.

As some interest has lately been shown in the Cultivation of Cotton in the Malay peninsula a few notes on the subject may not be out of place. Attempts have been made at intervals for many years to cultivate the different species and varieties of Cotton plants in many parts of this region, not only by Europeans but also by Malays, and in Sumatra by the Battaks. It has also been cultivated experimentally in the Botanic Gardens at Singapore and Malacca. In the latter gardens the first crop was fairly good, but the soil was too poor and the next attempt was a failure.

In 1889, a sample of Cotton received from Jelebu was forwarded to the Royal Gardens Kew, for examination and was submitted by the authorities there to Messrs. John Bradock & Co. 11 Commercial Sale rooms, Mincing Lane, who reported May 7, 1889:

"The sample of Cotton submitted to us shows a very good style, white, clear, free from seed with fair staple. It would find a ready market at from 6½ to 7d. per lb. It appears to be handpicked from the pod but to make the article profitable it would we think require proper machinery to extract the seed and otherwise to clean the Cotton ready for market to be able to compete with American and other Cotton growing Countries".

Mr. (now Sir) D. Morris of Kew Gardens notes on this: "This report is very satisfactory as far as it goes and if labour is cheap it might be well worth while growing it".

In 1900, Mr. H. C. Rendle of Petaling Estate wrote: "I have just sent home a few pods of Cotton which I believe is more or less indigenous to South America and have received a very good report on it. I first noticed it growing in a Malay garden at Klang. I planted the seed near my bungalow and in about 6 months got ripe pods. The Cotton was valued at 5d to 6d per lb. and the seed £5.10 per ton".

An interesting series of letters as to the cultivation of Cotton in Deli, Sumatra, was received from Mr. J. A. Taylor in 1892-1893. His first letter runs as follows:

Sir—As it may interest you, and as I have not heard of anyone making a trial of planting Cotton about the Straits, I send you a line thereon. In April last (1892) I picked a few seeds of what I was told was Sea Island Cotton from a garden: I sowed the seed in drills, when the plants were about six inches high, I pulled them up and transplanted them at six feet apart on tobacco-land planted in 1891. The ground was chankolled over before putting in the Cotton plants; the Cotton plants took root at once; I had only to replant about five or six plants and have had no further trouble except cleaning the grass twice. The amount planted is about an acre, the plants have now grown so that the spaces between are quite filled up and are from five to seven feet high. Flowering has been going on for some time and some of the larger bolls are as large as my thumb, so I will have a sample of Cotton before long. The only enemy the plants seemed to have was a small grub of rough reddish appearance which eat into the stem near the tip which withered, but other shoots came out strong and the plant did not seem to suffer from it. It may be that the grub will attack the bolls and destroy the cotton. Of course the planting was not in the right season, as I suppose the wet weather just coming on will spoil a lot of the cotton; and the plants should be planted much further apart, perhaps ten by six feet, which would leave room to get between the rows. I do not think it is the usual way to transplant the cotton plants but it seems to me the simplest way and the easiest".

In November 1892 Mr. TAYLOR sent some samples of Cotton grown by the Battaks in Sumatra to the Botanic Gardens, Singapore, and they were forwarded to the Incorporated Chamber of Commerce Liverpool for report, and Mr. H. BARNES the Secretary replied, February 18th, 1893:

Dear Sir,—"I received your letter dated 29th November, advising sample of Battak Cotton grown in Sumatra which came duly to hand. I have submitted a portion of the sample to the Liverpool Cotton Association who have furnished me with the annexed report upon the same which I trust may be of service and may stimulate production of cotton, * * *

I am, etc.,

Report: "The sample of cotton sent from the Botanic Garden, Singapore, has been carefully examined by our Committee and they report that in its present condition the cotton would be worth about $1\frac{1}{2}$d. per lb. but if ginned owing to its rough staple it would be worth $4\frac{3}{4}$ to 5d. per lb. valued on the present basis of prices".

The Liverpool Cotton association weekly circular shows that at that date the demand for cotton was limited and the market generally dull. Ordinary cottons being quoted at from $2\frac{1}{4}$ to $6\frac{15}{16}$.

On April 2nd, 1893, Mr. TAYLOR writes in reply to the letter containing the above report:—"It is a pity (the cotton) was not a sample of what I grew myself which was much better. During the rainy season, November and December, as I found the trees producing cotton which was only spoilt by the rain I cut off all the branches to about one or two feet from the main stem. They are now beginning to flower again so by the time the dry weather is on the Cotton will be getting ripe. I do not suppose that cotton cultivation will pay in Sumatra as labour is dear here, nor do I think the seasons will suit as the plants keep growing and flowering all the year.

I wrote to and received from America what they said was Sea-Island cotton seed. I planted the seed only about a month ago and it is now about 1½ feet high and has begun to flower and the plants look weedy, and I conclude that what I planted before was not Sea-Island though the leaf and general appearance is the same".

These reports are fairly satisfactory, but of course are only experimental plots, and it might be well worth while planting it on a larger scale in the richer soils of such places as Klang district, and the low lands about Taiping. The absence of a distinct dry season for the bolls to ripen is certainly against the cultivation; heavy rainstorms at the period of ripening injure if they do not quite destroy the cotton. The plant here in Singapore at least flowers and fruits throughout the year, so that the crop is practically continuous, and cannot be gathered all at once as is done in Brazil and elsewhere, and this must occasion a greater expenditure of labour.

The present expense of labour and its scarcity is against cultivation of cotton on a large scale for it it is distinctly a crop which requires cheap labour. As to local pests, termites were certainly troublesome in Malacca, chiefly by packing the soil with their nests, but it must be remarked that the soil was really too stiff anyway and not that which would have been selected had there been any choice. The red cotton bug, *Dysdercus cingulatus* is very common, feeding usually here on *Urena lobata*, the herbaceous *Hibisci* and other *Malvaceæ*. Damage has been done to cotton in India by the bug sucking the bolls. It is allied to another species which is known as the cotton stainer in America, which discolors the cotton also by destroying the seed and staining the cotton with its excrement. There is a short account of our species in the first series of the Bulletin p. 272. I certainly have not noticed that it does much harm to the plants which it feeds on, but it is a very objectionable animal, and might give a good deal of trouble.

These notes perhaps do not give a very encouraging view of the possibility of cultivation of cotton on a large scale in the Malay peninsula, even as a catch crop, but I should certainly like to see the cultivation tried again in better soil than we had at our disposal at the time that these experiments were made in the Straits Settlements and with other varieties of Cotton. The importance of Cotton cultivation throughout the Empire at the present time cannot be overrated, and if we cannot here produce it in very large quantities we can at least supply some, and that I think at a rate which will produce a fair return for the cost of cultivation.

Editor.

DUTCH GOVERNMENT PLANTATION OF GUTTA PERCHA AT TJEPETIR.

———o———

In the Bulletin for July the Government Gutta plantations at Tjepetir are referred to (page 227).

By the courtesy of HEER SPAKLER, the Consul-General for the Netherlands in Singapore and Dr. TROMP DE HAAS of Buitenzorg, I have recently been afforded an opportunity of visiting this plantation. I am also indebted to HEER A. F. DE NEVE who was good enough to go round with me.

The area reserved for this plantation is about 6000 acres situated in the hill country near the Salak and Gêdé volcanoes. The elevation is over 2,000 feet above the sea. It is about an hour's drive from Tjebadak, a station on the main line some two hours from Batavia.

The soil is excellent—a rich volcanic loam in which anything would grow. The surface is undulating—in some places the slopes are steep.

Roughly about 1,000 acres have so far been planted. The oldest trees are some 17 years old, and these appear to be over 30 feet in height. The planted area is now being increased at the rate of some 500 or 600 acres a year. Seed is obtained, I understand, from the Government plantations at Poer Wokarta and grown in nurseries. There were 90,000 plants in the nurseries at the time of my visit. These young plants are handed over to natives when 8 or 9 months old, and planted by them in fields of hill padi or Indian corn, 20 feet apart.

These people contract with Government to clear the land and to plant and maintain the *Dichopsis oblongifolium* plants for 3 years at 8 guilders a bauw (2 acres). They get what they can off the land by their padi crops as well.

After 3 years the plantations pass into the charge of Government.

About 1 cooly, I think, is employed for every 8 acres.

The trees in all stages look extremely healthy. They are not grown under shade at all—some were pointed out to me as having suffered from the effects of shade, which has now all been removed.

The chief enemy of the young trees is a moth, *Rhodeneura mytaca*, the caterpillars of which destroy the young shoots at the extremities of branches.

Great care is taken to prevent the planting out of hybrid plants. Seed is brought from known and isolated trees, and any plant showing signs of hybridization is removed from the nurseries before it is 2 months old. One cooly was in charge of the nurseries of 90,000 plants.

Some of the older trees have been experimentally tapped, but I am told that the results of tapping are not satisfactory, and the wounds heal very slowly.

More is hoped for from the process of extracting gutta from the leaves.

Only *Dichopsis oblongifolium* is planted.

R. N. BLAND.

THE MOSQUITO PLANT.

Report on the Basil Plant (*Ocimum viride*) in relation to its effect on mosquitoes.

This investigation, the results of which are given below, originated in a number of statements which were made in the medical and lay Press, to the effect that the basil plant (*Ocimum viride*) possesses the property of driving away mosquitoes, and that, to quote the words which appeared in the *British Medical Journal.* (31st January):— "Captain LARRYMORE found that the presence of one of these plants undoubtedly drove the mosquitoes out, and that by placing three or four round his bed at night he was able to sleep *unmolested*, without using a mosquito net." (The italics are mine). It was further claimed by Captain LARRYMORE, in a letter to the *Times,* that a mosquito placed in contact with a basil leaf died in a few seconds. While, on the one hand, a plant which could be shown to possess these properties, would be a most invaluable addition to our means of protection in malarious countries, on the other, if it did not possess them, the publication of such statements would be apt to do an immense amount of harm by producing a false feeling of security and by inducing people to do away with the complete protection of the mosquito-net, in favour of the imperfect protection of a few basil plants placed around the bed. His Excellency the Governor therefore requested me to experiment with the view of ascertaining whether the basil plant possessed these properties. And first as to the results of enquiries among the natives of Freetown. I was unable to ascertain that a knowledge of this property was universal, though a few people were to be found who said that they had heard that it would drive away mosquitoes. It certainly is not used to any extent for this purpose in Freetown. Dr. ROMER who was aware of this belief, informs me that he had tried it several times, hung round his bed. His impression was that while it appeared to drive mosquitoes away at first after a little they came back and he was bitten during the night. Others who have made the same experiment have also concluded that it does not offer a permanent protection during the night.

It is evident however that rough experiments of this kind are open to several objections and have very little scientific value, especially as the personal equation enters largely into them. First of all, the individual may not be susceptible to mosquito bites, and may not perceive when he is bitten. This is by no means uncommon, especially when people are asleep, and I have known cases where two people were sleeping close together, and one complained that he could not sleep on account of the mosquitoes, while the other said he did not notice them. Secondly mosquitoes may be absent or very few in number, and their absence may be attributed to the presence of the basil plants. It was necessary, therefore to devise some means of excluding the personal element, and it appeared to me that if two specially constructed cases were placed at some distance from each other, with free communication between them, these requirements would be met. Accordingly I had two cases made, three sides of which were covered with mosquito net, and the fourth was solid. In this side a large circular opening was made. The cases were placed with the solid sides facing each other, and the openings were connected with a short tube of mosquito netting. Along this tube it was found the mosquitoes would fly easily. I attach an account of the experiments in detail for reference, but here I content myself with epitomising the details.

The mosquitoes used were bred out from larvæ and consisted mainly of *Stegomyia,* the most common mosquito in Freetown but there were also a few *Anopheles* and *Culices.*

In one case (called No. 1) two large basil plants (about 18 inches high) were placed, along with some ripe bananas as food for the mosquitoes. In the other case (No. 2) only bananas were placed so as to equalise the conditions as regards food. On the 3rd June, eleven mosquitoes were liberated in case No. 1. They showed no discomfort and an hour afterwards were found perched on the roof and sides of the case. On the morning of the 4th seven were counted in case I, one was in the tube and none in case No. 2. Two free mosquitoes were found perched on the outside of the netting of case No. 1 (containing the plants). This is a very important observation as showing that, although there was a large room to perch in, the attraction of the food overcame the antipathy to the basil-plant. On the 5th one only was found in case No. 2, the rest in case No. 1. On the 6th the same condition was found and the experiment was concluded. It may be mentioned here that in all the experiments the number of mosquitoes gradually diminished owing to their dying. In some cases the dead bodies were found, in others they were eaten by small ants. Here, therefore, it was clearly shown that mosquitoes would remain in close proximity to basil plants although there was a free way of escape, and a supply of food accessible elsewhere. I repeated the experiments a second time with similar results. On this occasion one mosquito settled on a leaf and remained there for some minutes, and on the following day two were perched on the stem of the plant for over an hour. A free mosquito was found on the netting outside the case. Several mosquitoes were observed perched on the wall of rooms at distances varying from six to twelve feet from the basil plants.

In the third experiment the conditions were altered. Three pots containing 24 young growing basil plants from 4 to 12 inches high were placed in case No. 1 along with half a dozen ripe bananas. In case No. 2 no food was placed. On the 20th twelve mosquitoes were liberated in case 2. On the 21st no observations were made, but on the 22nd seven were found in case 1 perched over the top of the plants, three were found in empty case 2 while two had disappeared. On the 24th there were still seven in case No. 1 and only one in case 2. The experiment was then terminated.

This experiment shows conclusively that the presence of a number of basil plants is not sufficient to deter a hungry mosquito from seeking food, and it may safely be inferred that three or four plants round a bed would not be sufficient to protect a sleeping individual from the attacks of hungry mosquitoes.

The second series of experiments was directed to ascertaining whether close contact with basil leaves was fatal to mosquitoes. A quantity of fresh basil leaves was placed in a small stoppered bottle and in another as a control, a quantity of fresh rose leaves. On the 5th three mosquitoes were placed in each, and the stoppers firmly fixed down. On the 6th all the mosquitoes were lively and flew about when the bottles were shaken. The mosquitoes frequently rested on the basil leaves. 8th—The three in the basil bottle were alive but somewhat sluggish. Those in the rose bottle were dead. Three days close contact with basil leaves is therefore not sufficient to kill mosquitoes.

The experiment was repeated using hibiscus leaves as a control, with similar results. The mosquitoes lived four days without food in contact with basil leaves.

The object of the next experiments was to ascertain what effect, if any, the fumes of basil leaves when burnt had on mosquitoes. Cases containing mosquitoes were hung on the wall and in the middle of a small room containing a little over 1,000 cubic feet of air, and quantities of dried and powdered leaves varying from 4 oz. to a pound were burnt on a brazier filled with lived charcoal. It was found that when the atmosphere reached a degree of saturation which made the air extremely uncomfortable to breathe, prolonged exposure of an hour or an hour and a half undoubtedly had a stupifying effect on the mosquitoes and they were found lying in the bottom of the cages apparently dead. After exposure to fresh air, however, the majority recovered.

The conclusions may be briefly summarised as follows:—

1. Growing plants have little or no effect in driving away mosquitoes, and are not to be relied on as a substitute for the mosquito net.

2. Fresh basil leaves have no prejudicial effect on mosquitoes when placed in close contact with them.

3. The fumes of burnt basil leaves have a stupifying and eventually a destructive effect on mosquitoes, but to obtain this action a degree of saturation of the air is necessary which renders it im-

possible for the individual to remain in the room. It is probable, however, that cones made of powdered basil would, when burnt have the effect of driving mosquitoes away, and to this extent might be found useful.

In conclusion I wish to express my indebtedness to Dr. Hood, Senior Medical Officer, for his assistance in performing the experiments and verifying the results.

W. T. PROUT,

Principal Medical Officer,

Sierra Leone,

Times.

PARA RUBBER IN SELANGOR,

By S. Arden.

Experimental Plantation's Office,
BATU TIGA,
Federated Malay States,
17th August, 1903.

In a report on *Hevea brasiliensis* published some months ago, the question of extracting the latex, and the effect of wounding on the flow of latex was gone into, and I now intend to give the results of some further experiments made with the object of verifying the results which appeared in that report.

The aim of the planter is to produce the maximum of latex with as little injury to the tree as possible and at the least possible expense. It has previously been pointed out that this tree is, fortunately, very hardy and appears to be little effected by the wounding necessary to obtain the latex, so that if ordinary care is exercised little or no injury results; but a point which I think has not yet received the attention it calls for when deciding what style of incision should be practised, is that of the necessity of economising the available tapping surface. Previous experiments have shown conclusively that the first 3′ of the trunk from the base, contains the largest amount of latex, while if the tapping be extended beyond 6′ from the base, the quality of the latex decreases as well as the quantity, being much poorer in the percentage of caoutchouc and containing a larger proportion of resin, and the rubber is therefore not so elastic. It will be seen, then, how very essential it is to economise this somewhat limited tapping area, for no matter how skillfully the wounding is accomplished the result will be a rough and broken surface which will be found difficult to work, while the disconnected tissue will undoubtedly interrupt the flow of latex if tapping operations are repeated before cicatrization is complete.

The necessity of taking advantage of what is termed "wound effect" was shown in the report previously referred to, and I recommended that the wounds should be re-opened by taking off a thin slice from the cut surface for a number of occasions say 8–12 times although it has not been possible to lay down any definite number owing to the different behaviour of trees in responding to this wound-effect. I notice however, that in some experiments conducted by Mr. RIDLEY at the Singapore Botanical Gardens that better results were obtained by making a new incision a few inches away from the old one, than by renewing the old incision as described above; and as these results are opposed to those hitherto obtained by me I have been induced to repeat my experiments in this direction.

In the following experiment 10 trees were tapped with V shaped incisions. On one side of the tree a V incision was made at 6′ from the base, another at 3′ from the base and another close to the base of the trunk. The two lines forming the V were 6″ long in each case and the incisions were renewed on four alternate days. On the opposite side of the *same* tree a similar incision was made at 6′ from the ground, another at 5′ 6″ and so on every 6″ until the base of the tree was reached, there being 12 incisions in all. Three of these incisions were made each day, the base being reached on the fourth day. The results are given in Table 21 and show very clearly the advantage of renewing the old incision although the difference would probably not have been so great had only one incision been made on each side of the tree, as no doubt the flow from one wound interfered to some extent with the flow from the others close by. The reason for opening three incisions each day was so that the exposed surface would equal that of the incisions on the opposite side of the tree at the *same time* and therefore avoid any chance of the results being influenced by climatical conditions.

TABLE XXI.

New incisions opened each day.

Field number of tree ...	19	21	22	49	50	51	52	53	55	56	Total yield.
	Weight of dry rubber in ounces.										
Total yield per tree ...	·75	·75	1·25	1·00	·75	1·00	·75	·75	·75	1·00	=8·75 ounces.

Three incisions opened on four occasions.

Field number of tree ...	19	21	22	49	50	51	52	53	55	56	
	Weight of dry rubber in ounces.										
Total yield per tree ...	3·25	3·25	2·50	2·50	1·75	2·25	1·75	1·25	2·25	2·50	=23·25 ounces.

The result of a further experiment conducted on somewhat different lines are shown in Table 22. In this case only one V incision was made, this being at 3′ from the ground while on the opposite side of the same tree a similar incision was made at 6′ from the base. On the following day the incision at 3′ from the base was reopened while on the opposite side of the tree a new incision was made 6″ below the first incision. Tapping operations were continued daily in this manner until the base of the tree was reached when the incision at 3′ from the ground had been renewed on 12 occasions while on the opposite side of the tree there were 12 incisions each opened on only one occasion.

TABLE XXII.

New incisions opened each day.

Field number of tree ...	23	24	25	26	27	28	29	30	54	57	Total yield.
	Weight of dry rubber in ounces.										
Total yield per tree ...	4·25	5·00	4·00	5·50	10·00	5·50	5·00	9·25	4·25	4·00	56·75 = ounces.

One incision renewed daily.

Field number of tree...	23	24	25	26	27	28	29	30	54	57	
	Weight of dry rubber in ounces.										
Total yield per tree ...	7·00	5·75	4·25	9·25	8·00	9·00	5·75	8·00	7·00	4·75	68·25 = ounces.

The difference in yield between the new incisions and the renewed incisions is not so great as the former experiment but it seems apparent that if the maximum flow of latex is to be obtained, that either the original wound must be re-opened from time to time or the incisions made closer that 6 inches apart. Although a much larger number of trees were employed in the experiments conducted in the Singapore Botanical Gardens the method of renewing the incisions was only tried on a single day and it is I think, quite possible that the difference in yield in favour of the method of making fresh incisions each day, was due to some extent to climatical conditions. Personally, I have found that the yield is generally much above the average on dull or cloudy days, or if there has been rain the previous evening or during the night preceding the tapping. Even had the results been slightly in favour of making new incisions each day, I think, I should still advocate the renewal of the old incisions, for with a limited tapping area it is to the owners interest to interfere with this as little as possible or in other words to economise the available tapping surface.

This question of the renewal of incisions is an important one and one which I commend to the earnest attention of Planters, and it is to be hoped that they will be induced to try both methods over a considerable area for a definite period and to record the results. The behaviour of different trees in responding to the wound-effect is very remarkable but as it is impracticable on a large estate to study the idiosyncrasies of each individual tree, a general rule must be followed applicable to the majority, and it is only by making experiments on an extensive scale that the best method can be determined.

RUBBER PLANTING IN ASSAM.

Considerable interest is at present being shown in the planting of rubber on Estates in Assam, though it appears as if planters had not fully realised the enormous profitableness of the undertaking. To say that the venture is very much more paying than tea-growing or coffee-growing would perhaps be saying too much at once, but that it compares more than favourably with either of these two occupations cannot be doubted for a moment. For example in one particular only it will be realised how favourably is the comparison and that is that the rubber industry can never suffer from over-production when one comes to consider the enormous and still daily growing demand for this material. To every manufacture of the present day rubber in one form or another seems to be necessary. The commonest West African rubber fetches £200 per ton at home while the Para rubber of South America reaches the ruling price of £400 a ton. About two years ago the Government of India, obviously forseeing the advantages accruing from the plantation and production of rubber, started the cultivation of Para rubber in the Southern extremity of Lower Burma known as Mergui and also on the adjacent King Island. A year prior to the action of Government, however, private enterprise had also launched into the trade. In 1899 a Yorkshireman (Mr. W. S. TODD) living at Amherst, near Moulmein, started a plantation of Para rubber and has now fifty acres fully planted with 14,009 trees which even at this early stage have developed splendidly and give great promise of bringing Mr. TODD in another five years a very ample return. So that it is estimated when all the plants in Burma being to yield Europe will receive a good supply of nearly pure rubber which will only lose about one per cent. in the washing. This has been proved by samples recently sent home of cultivated rubber both from Ceylon and the Straits Settlements.

The *Hevea Brasiliensis*, is not, however, the only variety of rubber that has been introduced into Burma. The seeds of the *Castilloa elastica*, the variety now planted on a large scale in Mexico, have been successfully introduced into Burma by Mr. TODD, who imported the seed direct from San Salvador and Mexico. Some of these seeds were afterwards forwarded by this gentleman to Samoa in the South Seas and are reported to have arrived there in good condition. This latter fact is all the more important considering that this seed loses its vitality very quickly. Its transmission, therefore, from one place to another must be accomplished as rapidly as possible, though if carefully packed it is possible for it to travel in good condition for a period of three months. This year there is a considerable demand for this seed in Ceylon as it has been found that it thrives on a wider range of country than the Para plant. These latter considerations naturally make for the popularity of this seed in India where conditions and country are so varying. That there is money in rubber planting there can be no doubt and we are so far informed that the country in North Bengal appears to be specially adopted for rubber cultivation so that private enterprise, if not Government interest, should be aroused; and that the results will be satisfactory will be the hope of India's well wishers, since India as a country, and not merely private enterprise, will benefit by this industry.

ENGLISHMAN.

CHRISTMAS ISLAND PHOSPHATE.

From correspondence published in *Planting Opinion* of August 29, 1903, it would appear that Christmas Island Phosphates can be landed in India at a moderate price, and for the manufacture of Superphosphates are probably less costly than the indigenous material.

The Phosphate of Lime varies from 80 to 85 per cent. The product is shipped from Christmas Island as a raw material, and in an unground state. It is used principally by artificial fertilizer manufacturers, and is shipped largely to Japan, Australia, Germany and Great Britain. The price c. i. f. Calcutta would be £2. 10. 0 per ton on the basis of 80 per cent., and for Bombay £2. 12. 6. per ton, on the same basis. Phosphate of Lime Analysis shows:—

Moisture	0.74
Organic matter	2.80
Lime	. . .
Iron and Alumina ...	2.01
Alkalies &c.	. . .
Phosphoric Acid ...	38.89

Carbonic Acid ...	...	...	1.95
Silica ...	...	...	0.10
÷Calcium Phosphate		...	84.90
::Calcium Carbonate		...	4.43

A CASTILLOA BORER.

Among some young trees of *Castilloa elastica*, about 15 feet tall, in the Botanic Gardens Singapore, was one in which the top died and dried completely up. On breaking this dead portion up it was found to contain grubs and an adult beetle, belonging to the family of *Longicornia* which includes some of the most destructive borers in timber. The beetle, appears to be *Epepseotes luscus*, of wide distribution in the Eastern Archipelago. The grubs are when full grown about an inch and a half long, legless, white, with a hard horny brown head, quite similar to the larvæ of other longicorns. It burrows in the wood of the *Castilloa* near the pith cavity, going vertically up or down the stem, but I found traces of its work also in the central pith of the younger part of the tree. The perfect beetle is three quarters to an inch long and about $\frac{1}{4}$ inch wide across the back. The antennæ, $1\frac{1}{4}$ inch long and slender. The lowest joint globular, and sunk in a raised socket. The next joint dilated upwards, rather thick. The remaining nine joints are more slender, and all but the terminal one thickened at the tip. They are black with fine greyish fur. The head is broad and short, mottled grey, with patches of yellow fur round the eyes and on the cheeks and neck. The eyes are large semicircular surrounding the base of the antennæ, black, with a fiery red glint. The thorax is rounded and margined rather short, grey with a central vertical bar of yellow fur and a row of spots of yellow fur on each side. There is a short blunt process on each side. The elytra are oblong about $\frac{5}{8}$ inch long, blunt and slightly excavate at the tips, brown mottled with yellow, and punctate all over: on each shoulder is a round black velvety spot. The scutellum is semi-ovate, yellow. The under side of the body is covered with very fine fawn-coloured down. The legs are rather long and grey.

The beetle appears to fly by night as many of these longicornia do. I have taken it at rest in the day time on the leaves of the *Castilloa,* and in the morning have found it on the roads and walls. It is evidently a common insect here and does not confine its attacks to *Castilloas* but at present I have not traced it to any other tree.

One tree which had been attacked was saved by passing a wire down the hole made by the beetle grub, and pouring Jeye's fluid down it. This brought all the grubs out, and the tree recovered.

H. N. RIDLEY,

Extract from a monthly report (January) by the District Officer, Kwala Selangor, 1900.

AN ABNORMAL COCONUT.

At Assam Java, Kwala Selangor, there is a plantation of coconuts which contain two trees of great peculiarity. Instead of the bunches of flowers which appear on the ordinary coconut tree, in these two instances, in the place thereof, appear shoots which jut out from the tree not unlike the spike of a nipah-palm. As the so-called spike grows, the coconuts themselves, without any shew of flower whatsoever, appear in line along the whole length of the shoot somewhat like the fruit on a bunch of "rambai" but quite close together. As the nuts swell, the number, which at first might amount to fifty on one shoot, is gradually lessened as they fall off before maturity and in the end there probably remain some 7 or 8 nuts only on each shoot, of which there may be apparently about the same number as an ordinary coconut tree has branches of flowers.

The natives here have never heard of any similar trees except these two and they call them "nyor-nipah."

T. F. WELD.

EXTRACTS FROM

The Annual Report on Forest Administration in the Federated Malay States for the year 1902.

This table shows the proportion of forest reserve to the area of the whole State in square miles.

—	Area of State.	Area of reserves.	Area of unreserved forest.	Percentage of reserve of the whole area.
Perak	7,325	217.5	...	2.2
Pahang	14,000			
Selangor	3,200	93.7	...	2.9
Negri Sembilan ...	2,500	2.4	...	.096
	27,025	313.6	...	1.3

The percentage for the Federated Malay States is therefore only 1.3 of the whole area, a very small one.

Proposals and Settlements.

An area of 80,000 acres has been proposed during the year, of which 19,500 acres are mangrove forests near Port Weld, 2,550 acres near Tanjong Malim for getah taban (gutta percha), and 10,000 acres (Tanjong to Allang for timber, all in Perak). In Selangor, the Rantau Panjang reserve, 12,000 acres, and Kuang reserve, 15,000 acres, were proposed for getah taban, also three other areas for timber, aggregating 21,000 acres. In Negri Sembilan and Pahang no new proposals are yet made, but now that the department is bettter off in regard to staff, large areas will be added in 1904.

Sylviculture.

(a)—*Natural Reproduction.*

The Forest Officer, Perak, has nothing to say on this head in his report, but he has expressed the opinion that natural re-production of the more valuable timber trees is poor. As regards taban (gutta percha) it is good.

In Selangor taban seedlings are reported as plentiful at Rantau Panjang and Kuang. No trees were observed to fruit during the year, and $1 per 100 seeds was offered to Sakais without result. Merbau seeded well during the year and the Forest Officer reports large numbers of seedlings beneath the parent trees; but it is probable that the large majority of these will die in the next few years owing to overcrowding by other species. Meranti also seeded well and is abundant.

In Negri Sembilan taban flowered during the year and five trees were found bearing seed, four of which grew on private land. Seed was obtained from one tree on State land and although the Forest Officer offered to purchase seed from the other trees the owners did not produce any.

The seed was doubtless eaten by bats and flying foxes.

In Pahang the natural reproduction of taban is reported as good everywhere, both from seed and stumps, and its growth even in the densest forests as vigorous. Although but few large trees exist, the present state of affairs is very satisfactory, as in the future there will be a very regular crop of large trees. Considering that absolutely nothing has been done in the past to help the regeneration of this species, the abundance of young growth is extremely fortunate and shows that taban is better able to hold its own than almost any other forest tree.

With regard to Chengai (Balanocarpus maximus) the Forest Officer, Pahang, writes:—

"The forests of this species which have up to date been inspected (Kuantan), consist without exception of large-girthed, over-mature trees, the small-girthed classes being deplorably wanting." Under these circumstances and with the demand for chengai steadily increasing there is great fear of its ultimate extermination: I have personally searched in the Pahang forests all round large chengai trees and have not succeeded in finding a single large seedling or sapling of this species. The feeble natural regeneration of hardwood trees in evergreen forests is a danger that cannot be overestimated and, so far as I know, is one of the most difficult problems that the forester has to face. Experience in tropical evergreen forests is very limited, the bulk of the Indian forests being deciduous, much less crowded, and having conditions more suitable to natural regeneration of valuable species.

(b)—*Artificial Reproduction.*

In Perak, 15 acres of waste mining land were planted with Ficus elastica (rambong). The merbau plants in Pondok Tanjong show good growth, but chengai is slow. The total cost of maintaining the area of 441 acres was $6,935, or $15 per acre, but this includes cost of planting 15 acres.

In Selangor, blanks in the Circular road Plantation were planted up and a fire trace 10 feet wide made round block 5 and part of block 1. About 22 cart-loads of night soil were deposited per day throughout the year in this plantation, which is planted with casuarina, tambusu (Fagræa fragrans), glam (melaleuca leucodendron) and Eugenia grandis. The cost of maintaining this plantation was $938, total area 189 acres, or about $5 per acre 10,713 seedlings were planted out during the year.

(c)—*Cultural Operations.*

In Perak, 40 acres were cleared of undergrowth at the Waterfall, Taiping, to assist the young taban.

The cost of above and upkeep of original area, 30 acres, was $1,655. In Trollah (Batang Padang) 100 acres were cleared of undergrowth at a cost of $2,559 or $25 per acre. The result is most satisfactory, and the area cleared is found to be full of young getah taban trees of the best species (Palaquium gutta).

In Selangor, in the Rantau Panjang reserve, 200 acres were systematically gone over at a cost of $1,983, lines 4 feet wide being cut through the area 33 feet apart and young taban seedlings planted in these lines 30 feet apart—*i.e.*, 40 to the acre. These seedlings are taken out of the forest near at hand, planted in a nursery and put out as soon as they are strong enough.

Eight thousand seven hundred and eighty-one seedlings were planted out, and 3 119 dead seedlings replaced by new.

Transplanted from the forest into nurseries 2,646. Only 4 per cent. of plants removed from the forests to the nurseries and then planted out failed, whereas about 20 per cent. failed when planted direct into the lines, without being first kept in the nursery. This bears out Mr. CURTIS'S opinion on this subject.

(d)—*Experiments.*

Burchard's system of reproducing taban was successfully tried in Selangor—viz., by laying a seedling on the ground partially covered over, from which new shoots spring up vertically, and cutting the main stem between each shoot, then obtaining several plants from one. An account of this was given in the "Agricultural Bulletin," volume 1, No. 2, page 78.

The broad-leaved mahogany planted in Swettenham road plantation, Kuala Lumpur, is very badly attacked by larvæ, which eat into the new shoots.

Specimens of this insect have been collected.

EXPLOITATION.

(a)—Major Forest Produce.

The revenue received in Perak on timber was $90,142 as against $85,287 in 1901; in Selangor $23,030 as against $23,995; in Negri Sembilan $5,466 as against $4,301; and in Pahang, on timber and fuel, $14,834 as against $13,339.

On fuel in Perak $40,179, and in 1901 $41,998; in Selangor $18,571 as against $4,947; in Negri Sembilan $5,705 against $7,984 (decrease due to closing of some smelting works); and Pahang $775 against $684. The gross amount of timber and fuel extracted shows an increase.

Miners' Free Passes for Timber and Firewood.

The following table shows the number of one month passes issued to miners:—

State.	No. of passes.	Estimated revenue value.	Estimated No. of tons of 50 c. ft. solid.
		$	
Perak	39,458	78,916	52,610
Selangor	46,200	92,400	61,600
Negri Sembilan ..	9,015	18,030	12,020
Total ...	94,673	189 346	126,230

This quantity, 126,230 tons, is more than was extracted for all other purposes. This estimate is based on a valuation of the timber and firewood used, at $15 per ton, and is a very moderate one. For this the department has not been credited with any revenue, but has, on the contrary, suffered loss through the abuses consequent on such a system, both perpetrated by miners and other timber cutters At the time of writing this report I am glad to be able to say that the free pass system has come to an end and that the Forest Department are to be credited with an estimated equivalent of the royalty due them, while timber and firewood from State land will be cut free for miners and without pass.

An immense amount of timber and fuel is required in the mines and there is therefore the more need for careful use and control of existing supplies and prevention of waste. This means an efficient staff, which again means money to pay it with. So far the miner have had the free benefit of the forests and the Department had to control the cutting and collection of timber and firewood at great cost out of a curtailed revenue. The above privilege has been greatly abused by the miners.

The following table is interesting and shows that Selangor has had a far larger number of free passes than should proportionately have fallen to its share. This is partly accounted for by the fact that much of the firewood used in mines in Perak cannot be obtained near the mines and is bought in the open market.

	No. of coolies.	No. of engines.	Horse power.	
Perak	90,000	207	10 and under	276
		66	20 and under	
		3	40 and under	
Selangor	69,000	20	4	216
		31	6	
		40	8	
		78	10	
		30	12	
		5	14	
		2	16	
		4	20	
		6	25	
Negri Sembilan ...	19,300	37	8.5	37

In Pahang the bulk of timber was extracted by pass holders on a monthly payment of $1 per man. The export of timber is estimated at 6,500 tons, from Kuantan, mostly chengai (Balanocarpus maximus), balau (Parinarium) and giam. A considerable amount of timber and firewood is worked out for mining purposes free of royalty. The Pahang corporation, although owning an enormous concession, obtain their supplies free from State land also. One of the best timbers in Pahang appears to be "Shorea Ridleyi," known to the Malays as "selimbar" but wrongly called by the Chinese "balau."

(*b*)—*Minor Forest Produce.*

But little idea can be given as to quantity extracted, as it is impossible at present to obtain figures. In Perak bamboos and canes realised $7,986, and ataps and other produce $24,900, including $314 for getah (India rubber) and export duty, an increase of $2,266 on 1901.

In Selangor $4,368 and $3,545, respectively, including export, a decrease of $1,478.

In Negri Sembilan $2,312 and $16,869, respectively, an increase of $10,537, largely due to the crediting of export duty on jungle produce to the department.

In Pahang the following table will show the results:—

Year.	Bamboos and Canes.	Other min. or produce.	Rubber.	Export rubber.	Total.
1901	...	13,047	11,985	11,561	36,593
1902	4,872	17,596	2,927	2,998	28,393
Decrease ...	...	...	...	...	8,200

Rubber was collected by the inhabitants from getah grip (urceola) and purchased by Government. It was then sold in Singapore at about $100 per pikul, realising a nett profit of $2,894, and $33 was obtained from passes. The decrease is due to the abolition of the monopoly for rubber in force in 1901.

In Perak $314 was realised by the sale of rubber, also extracted from getah grip (urceola).

THE GROWTH OF RUBBER TREES.

The following details, as showing the growth of trees of various species of rubber, are of interest. They are the record of observations taken on trees growing in the Ootacamund Botanic Gardens by Mr. R. L. PROUDLOCK, Curator of Government Gardens and Parks, the Nilgiris:—

Name of species.	Dates on which measurements were taken.	Height.		Girth at one foot from the ground.		Girth at four feet from the ground.	
		Ft.	Ins.	Ft.	Ins.	Ft.	Ins.
Central American Rubber—*Castilloa elastica*—Planted in September, 1898.	Mar. 22nd, 1901	12	0	1	2	...	
	,, 6th, 1902	18	10	1	8	1	$5\frac{1}{8}$
	,, 21st, 1903	26	10	2	$1\frac{3}{4}$	1	11

Raised from seed collected in April, 1897, and planted in September, 1898. The young trees in this block are growing vigorously. They flowered in March, 1902, for the first time and produced ripe seeds in April and May, 1902. Thus at Burliar the life cycle or generation of this species is five years.

In last year's report it was stated that these young trees yielded a somewhat gummy substance destitute of the properties of true rubber. The trial tappings have been continued with the result that the rubber yielded by these trees in March, 1903, is intermediate in character and quality between the gummy substance referred to and rubber of good quality. This clearly shows in the case of *Castilloa* that the period of transition or change in the quality of the rubber yielded by the trees, namely, from a gummy substance to true rubber, coincides with, or closely follows, the period when the species first begins to produce ripe seeds.

The rubber recently obtained possesses a fair amount of resiliency with very little gumminess. It is anticipated that the trees will yield rubber of good quality in the course of the ensuing year.

Name of species.	Dates on which measurements were taken.	Height.		Girth one foot from the ground.		Girth four feet from the ground.	
		Ft.	Ins.	Ft.	Ins.	Ft.	Ins.
Lagos silk rubber *Funtumia africana.*	Mar. 22nd, 1901	8	10	...		...	
	,, 6th, 1902	17	10	0	10	0	$7\frac{1}{2}$
	,, 21st, 1903	23	4	1	$1\frac{1}{2}$	1	$0\frac{1}{4}$

Planted in December, 1899. Plants flowered for the first time in June, 1902, and the first three fruits (follicles) were observed on the trees on the 5th March, 1903. The seeds will probably be ripe in April, 1903.

The leaves of the trees were badly attacked by caterpillars in November and December.

Kallar variety of Ceara rubber—*Manihot Glaziovii.*	June 14th, 1901	22	6	...		0	$9\frac{3}{4}$
	Mar. 6th, 1902	23	5	1	$6\frac{3}{4}$	1	4
	,, 21st, 1903	28	0	2	$3\frac{1}{2}$	1	$9\frac{1}{4}$

Grown from a cutting put in on 17th January, 1900. This young tree was properly tapped.

For the 1st time on 23rd Augt., 1902, yield of dry rubber $1\frac{11}{16}$ ozs.
,, 2nd time on 5th Feb., 1903, ,, ,, $1\frac{12}{16}$,,
,, 3rd time on 5th Mar., 1903, ,, ,, $0\frac{12}{16}$,,

Annual Administration Report,
Government Botanic Gardens,
The Nilgiris, 1902–1903

CEARA RUBBER.

At the request of the Inspector-General of Agriculture in India 1 lb. of moulded Ceara rubber (in 17 pieces) and 1 lb. of Ceara

"Scrap" rubber were sent to the Agricultural Chemist to the Government of India for analysis and the result is given as follows:—

Report on the composition of two samples of Ceara rubber 'Scrap' and 'Prepared', sent by R. L. PROUDLOCK, Esq., Government Botanic Gardens and Parks, the Nilgiris, Ootacamund, 16th September, 1902.

Water ...	... 4.92	3.64
Pure caoutchouc	... 87.67	90.09
Resins ...	... 2.86	4.09
Ash ...	... 4.55	2.18
Total	... 100.00	100.00

"The rubbers are of excellent quality as regards colour and texture, and the analysis shows a high amount of pure caoutchouc.

(Signed DAVID HOOPER.
Offg. Agricultural Chemist.

Annual Administration Report,
Government Botanic Gardens,
The Nilgiris, 1902–1903.

New Tool for Tapping Rubber trees.

A device for grooving or tapping India-rubber trees in the subject of a United States Patent (No. 730,299) granted to FAYETTE S. ROBINSON, of Boston. It has been designed for use particularly on plantation of *Castilloa elastica.* Briefly described, the device comprises a tongue-like structure having jaws to embrace or partially embrace a tree, and an adjustably supported knife adapted to cut the groove in the tree. When the device is in position, the movement thereof up or down the tree, or around it, causes the knife to cut the proper channel in the bark. The construction of the tool permits the jaws to widen as they are drawn downward, to allow for the increasing diameter of the trunk. A vertical groove may be cut, or a horizontal groove, or a spiral groove around the tree, as desired. While it is supposed that a single grooving knife will be used preferably, the plan of the invention permits additional knives to be inserted. The Patent has been assigned to FERDINAND E. BORGES, Secretary of the Consolidated Ubero Plantations Co. (Boston).

The India Rubber World,
August 1, 1903.

CORRESPONDENCE.

Singapore, 7th August, 1903.

H. N. RIDLEY, Esq.,
Director, Botanical Gardens.
Present.

Dear Sir,

We have pleasure in handing you a copy of a letter received by last mail from our London people reporting on the Rubber Samples we sent home for you from which you will see that their brokers speak very favourably of them.

We instructed them to sell same after the samples had been reported on and when we receive a credit note for the amount will send you a cheque.

Yours faithfully,

BOUSTEAD & CO.

London, 10th July, 1903.

Messrs. BOUSTEAD & CO.,
Singapore.

Dear Sirs,

The small samples of India Rubber produced from the experimental trees in your Botanical Gardens duly came to hand and we have now the pleasure in waiting upon you with the Brokers report and valuation on same.

We are glad to see that Messrs. FIGGIS & CO. speak favourably of the preparation and the only thing they suggest is that it would probably be more advantageous if the pieces were made $\frac{1}{4}''$ to $\frac{1}{2}''$ thick. We are pleased to note that they put the value *3d.* to *4d.* over the price of fine Para and in the interest of the Straits it is to be hoped that the production may before long assume considerable proportions. With regard to the ball you will observe that some part of it was rather mixed with bark, but it is a good Rubber and would to-day readily sell.

Of course such small parcels as these are not at all attractive to buyers and we have sold them at 4/- for the biscuit and 3/- for the ball. In quantity there would be buyers at say 4/3*d.* to 4/4*d.* for the biscuit and 3/3*d.* to 3/4*d.* for the ball.

In addition to submitting the lots to our Brokers we have also asked one of the principal men in the Rubber trade to give us his report on them and we shall have pleasure in forwarding it as soon as received.

We are, &c.,

6 MINCING LANE, LONDON, E.C.
26th June, 1903.

FRANCIS PEARS ESQ.
Lanadron Estate,
Muar—via Singapore.

Dear Sir,—We thought it would interest you to hear that some Straits grown Para rubber was sold in our auctions to-day.

It was only a sample box of 38 lbs. good biscuits but rather mouldy outside, 6 lbs. thin biscuits mouldy outside and 9 lbs. Ball scrappy inside.

The good biscuits only fetched 3/6*d.*, the thin 3/3*d.* and the ball 2/6*d.* per lb.

If the quantity had been larger and more care taken in the drying, it should have fetched 6*d.* per lb. more all round; As Ceylon grown sold up to 4/4*d.* per lb. and the Straits grown seemed almost as good barring the condition.

We hope your trees will soon be fit for tapping and that you will prepare it and thoroughly sun dry it (not artificially) like the Ceylon people do—who allow it to hang in a dry airy place for months—and produce a tip top article that we are selling at 4/4*d.* per lb.

Yours very truly,

LEWIS AND PEAT.

TO THE EDITOR AGRICULTURAL BULLETIN,
Singapore, 21st August, 1903.

In view of the fact that planters of the Para rubber tree will soon be looking out for those markets where they can dispose of their produce to the best advantage, the enclosed letter will no doubt be of sufficient importance to be included in the pages of the bulletin where it may be referred to in the future.

STANLEY ARDEN,
Supt. Experimental Plantations.
BATU TIGA, SELANGOR,
Federated Malay States.

Yokohama, August 6th, 1903.

STANLEY ARDEN, ESQ.,
Superintendent, Experimental Plantations,
Federated Malay States.

Dear Sir,—In a recent issue of the Journal of the Society of Arts we read a report from your goodself upon the subject of Rubber. We are general merchants and have some friends who are very anxious to purchase Asiatic Rubber.

We shall be obliged if you can give us the name of some reliable firm in your district with whom we may correspond upon the subject.

We remain, Dear Sir,
Yours faithfully,
SALE & CO. Limited,

LANADRON ESTATE,
MUAR, *viâ* SINGAPORE,
Straits Settlements,
September 3rd, 1903.

DEAR SIR,

I have just received an analysis of some of the Garden's rubber prepared with acetic acid, viz.,

India Rubber	90.76%
Resinous matter	3.42%
Albuminous matter	4.01%
Mineral matter (ash)	0.11%
Mixture	1.80%

You, I believe, have already received the valuation of this and will perceive that although it is much superior to any Para rubber coming from South America, it is not as good as it is possible to get it.

The analysis offers plenty of matter for reflection to those interested in the rubber industry here as to the possibility of improving the quality by the eradication of the organic impurities.

I remain, etc.,
FRANCIS PEARS.

The Editor,
"Straits Agricultural Bulletin,"
Singapore.

GOVERNMENT NOTICE TO PLANTERS.

THE INTRODUCTION OF NEW AND VALUABLE AGRICULTURAL PRODUCTS.

Notice is hereby given that, with a view to encouraging the introduction of agricultural products not under general cultivation in the Federated Malay States and neighbouring countries, the Government is prepared to grant to any *bonâ fide* planter who can satisfy the Government that he is the pioneer in the introduction, as a business operation, of a new and commercially valuable pro duct, freedom from payment of export duty in respect to such product for a period of five years from a date to be fixed by Government in each case.

The period of freedom from payment of export duty may be increased to ten years in the case of such new product in regard to which the planter can prove, to the satisfaction of Government, that he has introduced or been instrumental in introducing into the Federated Malay States the use of special machinery, necessary for the preparation of such product for the market, and the practical utility of which machinery shall be demonstrated to the satisfaction of Government.

Each application under the notification will be dealt with on its merits and the Government reserves to itself the right of granting or refusing any application without assigning reasons for its action.

By command,

OLIVER MARKS,

Acting Secretary to Resident-General, F.M.S.

RESIDENT-GENERAL'S OFFICE,

Selangor, 27th June, 1903.

The Agricultural Show.

Planters and others interested are reminded that the Agricultural Show will be held next year in July, at Kwala Lumpur.

Erratum.

No. 7 vol. ii, Page 224, Line 29, and Page 225, Line 11, for *gastuosa*, read *fastuosa*.

Rainfall for September, 1903.

The Government Hill	...	Ins.	15-32
Balek Pulau	...	,,	13-13
The Prison	...	,,	13-63
Pulau Jerejak	...	,,	12-62
The Fort	...	,,	11-80
Bruas	...	,,	3-13
Pangkore	...	,,	6-66
Lumut	...	,,	6-66
Butterworth, P. W.	...	,,	11-94
Sungei Bakap	...	,,	2-91
Bukit Mertajam	...	,,	4-97

M. E. SCRIVEN,

Assistant Surgeon,

Penang, 12th October, 1903. *Prison Observatory,* On 24th September, 1903, there was a heavy and continuous down-pour of rain in Penang, the following is the amount recorded on that day at each of the registering stations:—

The Government Hill	...	Ins. 5-13
Balek Pulau	..	„ 5-90
The Prison	...	„ 5-76
Pulau Jerejak	...	„ 8-20
The Fort	...	„ 3-74

M. E. SCRIVEN,
Assistant Surgeon,
Prison Observatory,
PENANG.

Notices to Subscribers.

I.—Subscribers whose subscriptions are still unpaid are requested to send in their subscriptions for the present year as soon as possible. Members of the United Planters Association are requested to send in their subscriptions in future directly to the Editor, and not to the Secretary of the Association.

II.—Subscribers outside the peninsula will in future be charged $3.50 per annum instead of $3 in order to cover postage.

SINGAPORE MARKET REPORT.

September, 1903.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	24.00	22.50
Bali	286	18.25	16.50
Liberian	198	16.00	15.00
Copra	3,632	7.95	6.30
Gambier	3,245	13.00	11.75
Cube Gambier, Nos. 1 & 2	290	18.00	15.50
Gutta Percha, 1st quality	...	280.00	200.00
Medium	...	200.00	100.00
Lower	...	120.00	19.00
Borneo Rubber	...	135.00	90.00
Gutta Jelutong	...	7.50	6.75
Nutmegs, No. 110's	...	68.00	65.00
No. 80's	...	108.00	105.00
Mace, Banda	...	170.00	150.00
Amboyna	...	130.00	125.00
Pepper, Black	335	32.50	30.50
White	373	46.00	44.00
Pearl Sago, Small	35	5.50	5.20
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	2,440	4.05	3.87½
No. 2	360	1.80	1.70
Flake Tapioca, Small	720	4.20	3.95
Medium	35	4.60	4.25
Pearl Tapioca, Small	812	4.05	3.95
Medium	479	3.97½	3.85
Bullet	...	4.25	4.10
Tin	2,310	73.00	67.75

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th September, 1903.

Wired at 1.40 p. m. on 16th September, 1903.

To England.

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports.	1,200
Gambier	from Singapore	to London	...
,,	,, ,,	,, Liverpool	280
,,	,, ,,	to U. K. & / or Continent	240
,,	,, ,,	to Glasgow	20
Cube Gambier	,, ,,	,, England	...
White Pepper	,, ,,	,, ,,	80
Black ,,	,, ,,	,, ,,	...
White Pepper	,, Penang	,, ,,	10
Black ,,	,, ,,	,, ,,	...
Pearl Sago	,, Singapore	,, ,,	50
Sago Flour	,, ,,	,, London	110
,, ,,	,, ,,	,, Liverpool	1,500
,, ,,	,, ,,	,, Glasgow	20
Tapioca, Flake	,, Singapore & Penang	to England	220
,, Pearl & Bullets	,, ,, ,,	,, ,,	230
,, Flour	,, Penang	,, ,,	625
Gutta Percha	,, Singapore	,, ,,	30
Buff hides	,, ,,	,, ,,	90
Pineapples	,, ,,	,, ,, cases	11,250

To America.

Tin	from Singapore & Penang		675
Gambier	,, Singapore		410
Cube gambier	,, ,,		...
Black Pepper	,, ,,		100
,,	,, Penang		280
White Pepper	,, Singapore		150
,,	,, Penang		30
Nutmegs	,, Singapore & Penang		8
Tapioca, Flake & Pearl	,, ,, ,,		520
Pineapples	,, ,,	cases	5,750
Sago Flour	,, ,,		50

To the Continent.

Gambier	from Singapore	to South Continental Ports	110
,,	,, ,,	,, North ,,	100
Black Pepper	,, ,,	,, South ,,	160
,,	,, ,,	,, North ,,	70
Black Pepper	,, Penang	,, South ,,	170
,,	,, ,,	,, North ,,	...

			Tons Steamer.
White Pepper	from Singapore	to South Continental Ports	20
,,	,, ,,	.. North ,, -	50
,,	,, Penang	to South Continental Ports-	...
,,	,, ,,	,, North ,, -	30
Copra	,, Singapore & Penang	to Marseilles -	260
,,	,, ,,	,, Odessa -	1,650
,,	,, ,,	,, South Continental Ports - other than Marseilles and Odessa	840
,,	,, ,,	,, North Continental Ports -	360
Tin	,, ,,	,, Continent -	330
Tapioca Flake	,, ,,	,, ,, -	60
Tapioca Pearl	,, ,,	,, ,, -	210
Cube gambier	,, Singapore	,, ,, -	70
Pineapples	,,	,, ,,	cases 2,200
Sago Flour	,,	,, ,, -	700

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,250 tons Gambier
240 ,, Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E. C.

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 30th September, 1903.

Wired at 1.30 p.m. on 1st October, 1903.

To England:—

			Tons Steamer.
Tin	from Singapore & Penang	to England - and U. K. optional any ports	1,650
Gambier	from Singapore	to London -	40
,,	,, ,,	to Liverpool-	...
,,	,, ,,	to U. K. & / or Continent -	580
,,	,, ,,	,, Glasgow -	50
Cube Gambier	,, ,,	,, England -	30
White Pepper	,, ,,	,, ,, -	20
Black ,,	,, ,,	,, ,, -	50
White ,,	,, Penang	,, ,, -	...
Black ,,	,, ,,	,, ,, -	50
Pearl Sago	,, Singapore	,, ,, -	30
Sago Flour	,, ,,	,, London -	420
,,	,, ,,	,, Liverpool -	...
,,	,, ,,	,, Glasgow -	50
Tapioca, Flake	,, S'gapore & P'nang	to England -	330
,, Pearl & Bullets	,, ,,	,, ,, ,, -	90

			Tons Steamer.
Tapioca Flour	from Penang	to England -	550
Gutta Percha	„ Singapore	„ „ -	30
Buff hides	„ „	„ „ -	60
Pineapples	„ „	„ „ cases	7,500
To America:—			
Tin	from Singapore & Penang	-	280
Gambier	„ „	-	130
Cube Gambier	„ „	-	...
Black Pepper	„ „	-	100
„	„ Penang	-	...
White Pepper	„ Singapore	-	70
„	„ Penang	-	...
Nutmegs	„ Singapore & Penang	-	3
Tapioca, Flake & Pearl	„ „ „	-	190
Pineapples	„ „ „	cases	5,000
To the Continent:—			
Gambier	from Singapore	to South Continental Ports	70
„	„ „	„ North „ -	150
Black Pepper	„ „	„ South „ -	80
„	„ „	„ North „ -	30
„	„ Penang	„ South „ -	...
„	„ „	„ North „ -	...
White Pepper	„ Singapore	„ South „ -	20
„	„ „	„ North „ -	140
„	„ Penang	„ South „ -	...
„	„ „	„ North „ -	...
Copra	„ Singapore & Penang	to Marseilles -	340
„	„ „	„ Odessa -	100
„	„ „	„ South Continental Ports (other than Marseilles and Odessa.)	420
„	„ „	„ North Continental Ports	960
Tin	„ „	„ Continent -	330
Tapioca Flake	„ „	„ „ -	380
Tapioca Pearl	from Singapore & Penang	to Continent -	190
Cube gambier	„ Singapore	„ „ -	30
Pineapples	„ „	„ „ cases	1,250
Sago Flour	„ „	„ „ -	750

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

2,500 tons Gambier
100 „ Black Pepper
(in Singapore)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

Singapore.

Abstract of Meteorological Readings for the month of September, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·880	138·1	80·8	87·1	74·7	12·4	77·3	·868	74·9	77	S.E. & S.S.E.	4·87	1·46

K. K. Hospital Observatory,
Singapore, 8th October, 1903.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S,

Penang.

Abstract of Meteorological Readings for September, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·891	143·5	79·8	88·5	73·6	14·9	75·1	·686	70·5	·71	S.	13·43	5·76

Colonial Surgeon's Office,

Penang, 9th October, 1903.

M. E. SCRIVEN,

Asst. Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for September, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
Durian Daun Hospital.	29·832	154·0	79·6	89·3	69·7	19·6	81·6	1·067	54·7	95	S. E.	14·88	3·13

Colonial Surgeon's Office,
Malacca, 29th September, 1903.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for September, 1903.

District.		Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
				Mean.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis,	...	...	...	...	94.0	70.0	19.6	...	...	...	...	...	5.96	1.70
Raub,	...		...	...	89.0	69.0	16.4	...	...	...	...	...	4.74	2.30
Bentong	...	...	...	...	92.0	70.0	13.9	...	...	...	...	...	6.33	1.43
Pekan	...	...	...	...	95.0	70.0	16.5	...	...	...	...	...	5.28	1.64
Kuantan,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Temerloh	...	...	...	...	93	70	23	...	...	...	...	...	2.96	1·04

S. LUCY,
State Surgeon, Pahang.

Kuala Lipis, 30th September, 1903.

Muar.

Abstract of Meteorological Readings for September, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	82·3	90.7	71·1	18·6	74·6	...	...	...	...	3·84	1·04

Muar, 1st October, 1903. FRANCIS PEARS.

No. 11.] NOVEMBER, 1903. [Vol. II.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

PLATES 13 & 14—RUBBER TAPPING IN THE BOTANIC GARDENS.

Annual Subscription—Three Dollars.
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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

Photo by A. D. M.

Latex collecting cups on a Para Rubber Tree, Botanic Gardens, Singapore.

Photo by A. D. M.

Collecting Latex from Para Rubber Trees, Botanic Gardens, Singapore.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 11.] NOVEMBER, 1903. [Vol. II.

THE CULTIVATION OF COTTON IN THE FEDERATED MALAY STATES.

Kuala Lumpur, *24th September, 1903.*

Sir,—I have the honour to address you on the subject of the Cultivation of Cotton in the Federated Malay States.

2. There are probably in these States ten million acres suitable for agriculture, and, under correction, I would suggest that not more than half a million are under cultivation. The present would therefore seem to be a suitable time for Government to indicate to planters—European and native—its intention to encourage more particularly the growth of such products as are unlikely to undergo alarming fluctuations in price.

3. Consideration of the nature of the agricultural produce now exported from these States will show that, independent of these reasons, the planting industry is likely to be in the future, as it has been in the past, subject to the losses caused by collapse of market prices.

4. As an example of a crop that has been cultivated not without commercial success but never with any well-grounded assurance of continued success, I would instance pepper. It is, I believe, no exaggeration to say that an increase for two years of 10 per cent. in the world's supply of pepper generally leads, other things being equal, to a decrease of 50 per cent. in its price. Consumers are not induced by a fall in price to increase their consumption. Thus if the supply exceeds ordinary requirements merchants naturally fear that the surplus which must be given away, destroyed, or sold at any price, will render purchases at any figure approximating ordinary prices, a very hazardous transaction.

5. The factors that obviously render market prices reasonably free from fluctuation are: (*a*) enormous and insistent demands met by a huge supply, and (*b*) demands that increase inversely with the price. As regards (*a*) the imports of raw cotton into the United Kingdom alone have, roughly speaking, an average value of £40,000,000—about six times the total value of all the tin exported

from the Federated Malay States. The exports of cotton from the United States of America amount to not less than an annual average of £35,000,000, while Egypt and India annually export on an average £12,000,000 and £7,000,000 worth of cotton. The importance of the cotton trade to the United Kingdom can be guaged by the fact that while their imports of raw cotton amount, as I have said, to not more than £40,000,000 worth, the annual exports of manufactured cotton goods are valued at £75,000,000; (*b*) in regard to the steadiness of prices, in spite of varying supplies, it may be mentioned that except in the case of temporary enhancement of prices (owing to purchases made in order to meet speculative sales) the price per pound of cotton classed as Sea Island can be taken year by year for the past twenty years at similar seasons as varying less than 20 per cent.

6. The improbability of cotton being ousted from its present position as the staple fibre of the spinning industry is instanced by the difficulty of finding a market for ramie—which is stated to surpass cotton in nearly every essential respect, as a fibre.

Seeing, however, that ramie cannot be woven by cotton machinery, it is a drug in the market at a third of the price given for ordinary cotton.

7. To describe tersely the comparative merits of cotton and any other staple product which can be generally cultivated throughout the Federated Malay States, it may be said that the yield of an additional 1,000,000 acres of cotton would not very appreciably affect the cotton market, whereas the successful cultivation of the same acreage of any other product with which we need be concerned, would cause a collapse in its price.

8. Though I have been at some pains to collect data regarding the experimental cultivation of cotton in the Malay Archipelago, I regret to say I can quote no authentic figures, but I am in possession of a few facts that appear to me to dispose of the statement that the soil and climate of the Federated Malay States are not suitable to this cultivation.

9. I would refer particularly to what is known by Javanese as the "Kala-kala." (I understand from the Director of the Singapore Botanical Gardens that this shrub is a variety of the *Gossypium herbaceum*.)

10. I have seen this plant carefully cultivated and have seen it practically untended producing what appeared to me to be fairly large crops. In no case of which I have heard, has an unsuccessful attempt been made on this Peninsula to grow it. The question of whether its cultivation would result in success from a commercial point of view has, I believe, never yet been tested in the Federated Malay States; planters having seemingly accepted without question the statement that "cotton requires a dry climate."

11. In addition to the fact that plants may be seen in many parts of these States apparently thriving in a moist climate, I would

draw attention to the following figures representing the exports of the raw cotton from Java:—

97/98	 4,274,941	kilogrammes
98/99	 5,083,094	,,
99/00	 13,952,646	,,
00/01	 3,316,900	,,
02/03	 6,576,667	,,

[These figures do not include Kapok (*Eriodendron anfractuosum*) of which form of cotton the average annual exports amount to about 3,000,000 kilogs.] The great fall in the exports of raw cotton after 1900 will probably be found to have its origin in an increased local demand. The Consul General for the Netherlands in Singapore—who was so kind as to supply me with these figures—informed me he was not able to offer any information as to this sudden decrease n the exports.

12. The declaration that "cotton requires a dry climate" is made, I believe, almost solely by those who have no experience of its cultivation. The following quotation from a letter addressed to me by Mr. C. E. S. BAXENDALE discloses the views held by practical native cultivators with previous experience of this form of cultivation, as to the possibility of growing cotton at a profit in these States. "About three and a half years ago a deputation claiming to represent 65 Javanese landholders in this district came to see me. They asked me to guarantee them a price (15 cents a catty for the clean cotton they suggested) and one of them would go to Java and bring over seeds of the best variety, which they called 'Kapas Blanda.' This kind is an annual. The only kind I know here is the perennial Kala-kala, but there are two other kinds known to my Javanese friends—'Kala-kala Palembang,' and 'Fardeh.' Their expressed intention was to plant cotton solely, *not* as a catch-crop (I do not see any reason why it should not do well with either rubber or coconuts) and the fact that many of them had been cotton growers in Java and know the soils and conditions of both countries was noteworthy. The 'Blanda' is said to yield one heavy crop, while our trees are perpetually yielding a few pods at a time."

13. Mr. CYRIL BAXENDALE did not accept this offer, seeing that his brokers were unable to *guarantee* him a future price. They expressed their willingness, however, to buy Kala-kala of the same quality as that he sent to Liverpool at prices varying (from different brokers) from 5½*d.* to 7*d.* per lb., while ordinary prices at Liverpool were averaging about 6*d.* a lb. (Prices at present average about 7*d.* a lb.) The Kala-kala seed was valued at £7 a ton—a very high figure for cotton seed. The brokers reported that the cotton was "a very valuable variety owing to its 'harsh' fibre, this makes it approach wool in consistency and it is greatly sought after by woollen manufacturers to mix with wool."

14. I presume that the "Kapas Blanda" referred to by the Javanese was an imported variety of the Sea Island cotton-producing plant (*G. Barbadense*). This plant, though not deciduous, is

I believe, treated as if it was so and crops in the method described by the Javanese. In spite of the favour with which the "Kapas Blanda" is viewed by these men, I should not be inclined to abandon "Kala-kala" in favour of the imported variety unless a series of experiments proved the latter had the better commercial prospects. It must be remembered that there is a very great advantage as regards labour in having to deal with crops that do not suddenly necessitate a large temporary addition to the labour force on an estate. The cost of engaging one man for 1,000 days is ordinarily much less than the cost of engaging 1,000 men for one day. And if throughout the Federated Malay States all the planters wanted this sudden increase in their labour force simultaneously, the possible result would be that the planters in their attempts to attract the available "floating" labour would have to pay such prices as would seriously affect the prospects of their enterprise. In cotton-growing countries it would seem that during the "picking season" men, women and children, who at other times are unable to obtain a wage, are eagerly engaged at task-work rates which make their earnings, during the time they are employed, considerably higher than the normal wages of a first class labourer for the same length of time. Even disregarding the question of cost, the nature of our population would seem to offer an overwhelming obstacle to the general introduction of a form of cultivation the success of which must to a great extent depend on the possibility of planters being able to engage simultaneously a large supply of "casual" labour.

15. In regard to the general question of the desirability of a dry climate for growing cotton, it would appear that in the United States a very wet season is almost as much feared by the cotton growers as is a drought. Exceptionally wet weather is stated to produce weeds and tends to make the plant run to wood rather than crop. It seems to me to be possible to believe that even in the wettest years there is generally sufficient sunshine here to mature a crop of cotton. I know nothing of the climate of the cotton-growing districts of the United States, but would suggest that there is possibly an unusual lack of sunshine during the wet summers and that every hour of sunshine is of great importance when a plant has to bear fruit either on a certain date or not at all. After the opening of the boll there is undoubtedly some danger of rain discolouring the cotton if left exposed to the weather. Yet I have now in my possession some beautifully clean white cotton that was purposely allowed to remain on the shrub during three days of heavy rain while the boll was open. When considering these sources of possible disappointment it is only reasonable to bear in mind that neither droughts nor gales (gales strip the shrubs of blossoms), which frequently cause immense losses to cotton growers in the United States, are likely ever to cause serious loss to planters in the Federated Malay States.

16. It is not my intention to endeavour to prove that cotton growing would necessarily prove a highly remunerative form of

cultivation. As an example of troubles that might threaten its success, I would mention that from personal observation I am inclined to believe that Kala-kala is particularly liable to damage from weevils. The separation of the cotton from the seed cannot in such cases be done by gins and the cost of manual separation would add enormously to the cost of production. There may also be—and in fact there probably are—other difficulties which cannot now be foreseen. As an example of difficulties that are practically impossible to foretell, I would mention that the one, so far, unsurmountable obstacle to the success of the ramie trade is the fact that the fibre is too long. To say of a fibre that it is too long is tantamount to saying it is too good.

17. If, however, I have made out a case for supposing it would be worth the while of Government to consider this matter seriously I would urge that with a view to its doing so, a small Committee, chiefly composed of planters, should be requested to visit Java and observe and record such practical results in regard to cotton cultivation as they consider noteworthy. If the report of such a Committee was favourable, the cultivation of cotton as a "catch-crop," or otherwise, should, I think, be encouraged by Government.

18. Such a Committee should, I would suggest, also try to arrive at some arrangement by which Javanese emigration to the Federated Malay States might be encouraged. The over-population of Java is yearly causing greater concern to the Government of that Island and for many years every encouragement has been offered to labourers to leave Java for Dutch possessions, which are much in want of coolies. But there is, I understand, a strong feeling among the Javanese against emigrating to Sumatra and Borneo. It would seem that the same objection does not exist to coming to the Federated Malay States, and if it is demonstrated to the Government of Java—as I believe it would be possible to do—that Javanese emigrants do not generally become permanent settlers here, it might be possible for us to come to some agreement with with the Dutch Colonial Government that would be mutually advantageous.

I have the honour to be,
Sir,
Your obedient Servant,
A. S. BAXENDALE.

The Federal Secretary,
Federated Malay States.

COFFEE.

It is sometimes suggested that Indian coffee planters might follow to their own advantage the example of tea-planters by endeavouring to push their coffee as a specialty on the market here. While it may be doubted if the result would have justified the considerable outlay necessary to do this on a large scale, there is a middle course and that is to form some Indian Coffee Association in London with a view to the watching of the interests to the grower and pushing the sale of Indian coffee with the trade and the consumer. Discussing the coffee position generally we notice that the *London Commercial Record* refers to the necessity of finding new outlets for Indian Coffee. It says: If there is one trade more than another which baffles those connected with it, it is the Coffee trade. The enormous supplies of Brazil sorts have been the surprise of bears and the alarm of bulls for a long time, and although the planter vowed some years ago the production of his coffee was carried on at a great loss, yet the shipments from Brazil have been larger year after year. No frost, storm or vermin have been able to insure a diminution of those gigantic supplies. Most extraordinary resolutions have at times been passed calculated to establish a falling off in receipts, or even in the total yield of the crops, but all to no purpose. It would seem that the planters of Rio and Santos descriptions are anxious to make up in quantity what they cannot in quality. Ruinous as the decline in the value of Brazils must be to their producers, the sorry part is that coffees of less magnitude and importance have to suffer in sympathy. They are unable to make up their losses by doubling or trebling their output, and they will have to go to the wall unless some means can be devised to save them from such a calamity. We have all followed with regret the low value which East Indian sorts —which, perhaps, more than other coffees, suffer from the overproduction of Brazils—have fetched this season, feeling, as we must do, that to many planters such prices as London paid, or rather had to pay, could not possibly compensate the Indian planter for his trouble and expense. We all saw that a crisis in India would undoubtedly be the outcome of the depression in the Coffee trade, and we are seriously afraid that such a crisis is near at hand, for according to reports just received from the coffee growing districts, the monsoon has so far been very unfavourable to the new crop, and small yields are likely to ensue at a time when big ones are most urgently wanted. No wonder that great depression prevails among the planters generally, and that the coming season is looked forward to with considerable misgiving, and even alarm. We hear that European managers and superintendents are dismissed from many plantations, manure is sparsely used, or not at all, and some estates are allowed to grow wild, as their owners no longer possess the means of maintaining them. This must be regarded as a very serious matter, not to India alone, but to London as well, and support should be given to the struggling planter where consistent with fair competition. We understand some planters are desirous of sending a delegation to London to study the Coffee question here, and to find, if possible, some way or other of pushing their products or find new outlets for them. There is no doubt that some wholesale Coffee dealers are responsible for the little appreciation in which the fine East Indian Coffees are held in some parts of our country. As a matter of fact they are not known to the average man, to the ordinary consumer, and hence they are not asked for at the grocers by those fond of a good cup of coffee. The preparation of a really good cup of coffee is almost an unknown art in England. The introduction of East Indian sorts to the public would perhaps insure the saving of the East Indian Coffee culture, and the obtaining of a really good cup of coffee in England.—*H. & C. Mail.*

MANURING PARA RUBBER.

Early in this year some experiments in the value of different kinds of manure on Para rubber seedlings were made in the Botanic Gardens. Six beds were dug in good low lying soil, and planted with seedlings, all approximately of the same age and size. One bed was not manured in any way, but it should be mentioned that later it was found that an old building of some kind had been on the ground and that there was a certain amount of mortar broken up in the soil.

The other beds were manured respectively with Poudrette, from the night soil works; Lime; a mixture of burnt earth and decayed leaves; burnt earth only and cow-dung. The young trees were measured on October 20th, and the following table shows the result in growth.

It will be seen that in the bed manured with cowdung the plants made by far the most rapid growth and this was found also to be the case in previous experiments with plants in pots. Burnt earth alone was a little better than when mixed with leaf mould. Lime appears to be far from beneficial, the plants not only made but little growth but have a somewhat sickly appearance. Poudrette which suits certain plants very well, especially roses, seems to have been of no use to the Para-rubber trees. It would probably not be within the bounds of practical agriculture for planters to manure all their trees with cowdung, but it might be very beneficial to supply it, where possible, to the nursery beds with a view of increasing the growth and strength of the young plants before planting out.

THE EFFECT OF FERTILISERS ON PARA RUBBER TREES IN THE NURSERY.

	No. of trees.	Maximum height.		Minimum height.		Average height.	
		ft.	in.	ft.	in.	ft.	in.
Ordinary soil	31	3	1	1	0	2	0½
Poudrette	32	4	4	1	0	2	5½
Lime	33	4	7	1	7	2	9½
Burnt earth and leaves	24	6	0	2	3	3	8½
Burnt earth	24	5	5	2	0	3	10
Cowdung	30	8	0	3	2	4	9

Editor

THE EFFECT OF LIGHT ON THE GROWTH OF TREES.

BY S. ARDEN.

In connection with the cultivation of the Para rubber tree and —though to a less extent—coconuts and other tropical products, there is perhaps no question upon which opinions are divided to such an extent as on that of the correct distance to allow between the trees; for while some prefer to plant the Para rubber tree for instance, 36′ × 36′ (about 33 trees to the acre), others maintain that planted 10′ × 10′ (435 trees to the acre) or even 8′ × 8′ which gives 680 to the acre will give a larger yield per acre, although prepared to admit that the yield per tree will be considerably less when planted so closely.

I have recently had the opportunity of seeing some 20 acres of 3 year old trees planted 6′ × 6′ but it seems impossible to believe, that a practical planter who plants his coffee shrubs 12′ × 12′—the recognized distance on soil of ordinary fertility—would attempt to argue that a Para rubber tree, which, when fully developed has a spread of about 36 feet, would under such conditions have anything like a fair chance to develop.

There appears in the current number of the "Indian Forester" a review of a valuable book entitled "Economics of Forestry" written recently by Professor FERNOW, L. L. D., Director of New York State College of Forestry, and I have made a few notes having a direct bearing on the subject, trusting that they will prove interesting to those readers of the 'Agricultural Bulletin' who are interested in this important question, and who may not have an opportunity of studying Dr. FERNOW'S book.

In chapter VI Dr. FERNOW deals with the Natural History of the forest, and after observing the influence of temperature, moisture, and soil conditions, together with the methods adopted by nature for the transportation of the seed, on the natural distribution of the various species which form the particular type of forest met with in passing from the Tropics to the Northern Latitudes, and from sea level to the highest altitudes, proceeds to show that "not only is the composition of the forest largely a result of changes in light conditions, but the actual amount of production is a function of the light, *for the annual production of wood is in direct relation with the amount of foliage which the tree can exhibit to the influence of light.*

This is a very definite statement, emphasizing a well known scientific fact as to the important part played by sunlight, in the elaboration of the sap which is destined to form not only the wood but the leaves, fruit, latices and other parts of the tree.

The whole art of forestry and of agriculture also, is based on the laws of accretion.

An attempt is being made in the United States after the manner of the German Foresters to determine the volume development of crops by studying the height and diameter and volume of growth of the various size classes, together with the gradual diminution in numbers which takes place in a fully stocked crop.

"These measurements show that the same acre always produces annually the same weight of dry wood, with practically whatever species it may be grown, namely, from 4,000 to 8,000 pounds per acre, according to the quality of the ground. The volume may vary according to the specific gravity of the wood of different species, and according to the water contents. The annual production of available dry wood substance above ground varies, according to the quality of the climate and soil from 3,500 pounds on good sites to 1,200 pounds on the poorest. The number of trees to the acre is of no consequence, provided that a full crown cover is always kept."

I have on previous occasions given expression to the fact that overcrowding should be avoided and most practical men are agreed on this point, but the question that arises is—what constitutes overcrowding? Let us take a hint from nature.

Dr. FERNOW tells us that in a pure forest of one species (and a rubber plantation may be regarded as such) the individual trees of different sizes develop side by side according to available light, each crowding the other, until the laggards are killed by the withdrawal of light.

As an example of this he instances a stocked acre of American white pine, containing 50,000 or more seedlings in a dense thicket, excluding all light from the soil. "After a few years the lower branches owing to the absence of light die and fall off—in the case of tropical products where the rate of growth is much more rapid this would occur after a few months. At 30 years old the trees are slender poles of about 4 inches diameter and 20 to 25 feet in height; but different degrees of vigour of development, according to individual constitution and accidental opportunity, can now be recognized, and three classes may be differentiated: the predominant, with their crowns 5 to 10 feet above the general level, which are the trees of the future; the sub-dominant, ready to occupy the air-space of any of the superior class should accident remove any of them; and lastly, the suppressed ones, doomed to die."

"Out of the tens of thousands which started, only 2,000 or 3,000 survive, and as each tree is striving with its neighbours for as much air-space and root-space as possible, the result is a continued diminution of the number of trees occupying the acre."

"This decimation is in exact mathematical relation, barring accidents, with the development of the dominant class in height-growth."

"At the age of 80, not more than 400 to 500 trees are left. After this age the diminution proceeds more slowly until at last only 200 or 300 stems occupy the ground, the number varying with species, soil and climate."

We see then that out of 50,000 seedlings no less than 49,800 have 'gone under' in the struggle for existance, and the 200 which remain, is, I take it, the maximum number that can be grown per acre to maturity.

Those figures however refer to the pine tree, (*Pinus strobus*) a lofty tree with very narrow leaves, which do not form nearly so dense a canopy as the para-rubber tree, in which case I fancy still fewer of the original seedlings would survive the struggle.

"The important factor in production is therefore the intensity of utilization of the light, and not the number of trees."

There remains to be considered the system of growing up to a certain age more trees to the acre than can possibly come to maturity, afterwards thinning out one tree so as to stimulate the growth of its neighbour as is practised by the forester; but in the case of such a quick growing species as the Para rubber tree, this thinning out must be done at an early date, the age being dependent upon the number of trees planted to the acre, and it is a matter of doubt whether the small returns available at this stage, will compensate the planter for the expenses incurred.

A last but by no means the least consideration is, what effect will the trees cut down and left in the plantation to rot have on the 'white ant'?

We know only too well what suitable breeding places decaying vegetable matter provides for the coco-nut beetle.

RUBBER TAPPING IN THE BOTANIC GARDENS

PLATE 13 & 14.

With this number we give two plates illustrating the method of fixing the cups for the latex of Para rubber in the Botanic Gardens, Singapore. In Plate 13, the cups are arranged in two rows down the trunk of one of the larger trees. The tree itself was one of those planted in 1884. In Plate 14 the men are seen removing the cups from the base of a younger tree and transferring the latex to the coffee pot used for collecting in Higher up on the trunk are seen the tapping marks made on the previous day. The account of the method adopted which these photographs illustrate is described in Bulletin No. 2, p. 44. The photographs were taken by Mr. MACHADO & C. DE ALWIS.—*Editor*.

Para Rubber Tapping at Bukit Sebukor, Malacca.

The Para Rubber trees growing at Bukit Sebukor were recently tapped by Mr. F. B. GAGLIARDI on sixteen different occasions. The experiments took place between June 16th and July 2nd last. Nine trees, varying in girth between 27″ and 55″ (average $38\frac{8}{9}$″(. were tapped, with the result that 15 lbs. of clean rubber and 3 lbs, of "scrap" were obtained, thus showing an average yield from each tree of $2\frac{1}{9}$ ℔. The style of tapping used was the "Herring-bone" and two incisions were used each day.

The process of coagulation was carried on without the use of any chemicals, the rubber taking about three months to dry.

The trees were by no means exhausted and tapping could have been carried on for much longer.

In the "Bulletin" for June last an account was given of earlier tapping experiments at Bukit Sebukor by which twelve pounds of rubber were obtained. This rubber was sent by Messrs. HUTTENBACH BROTHERS to London and sold there by Messrs. LEVIS & KAHN.

The rubber fetched 4/5*d.* per ℔ and the scrap 3/7*d.*

Para Rubber Sales.

In the "Bulletin" for March, 1903, an account of Rubber Tapping Experiments in the Botanic Gardens was given. The rubber resulting from this series of tappings weighed 56 ℔s. and was consigned by Messrs. PATERSON SIMONS to their London Brokers Messrs. H. W. JEWESBURY & Co., 2, Mincing Lane. The price realised per pound was 4/.

Mr. W. LARKEN, Castlewood, Johore, writes that samples of rubber sent home by him two months ago were valued at 4/8*d.* and 4/9*d.* and were said to be as good as the best Ceylon on offer.

A FUNTUMIA PEST.

Caprinia Conchylalis.

From Klang, Selangor, Mr. CAREY sent in October a mass of leaves of *Funtumia elastica* spun together by caterpillars. The caterpillars which were fullgrown were an inch long, with a dark brown head, the body shining, the belly yellowish with a brownish band running the whole length of the back with a central yellowish stripe; on each segment are six black shining warts, three on each side arranged in a triangle, each wart bears a single hair and at the base of each of the outer ones is a white patch. Some of the older caterpillars were paler having no dark colouring but being altogether yellowish except for the white spots. The caterpillars pupated in the mass of spun together leaves and frass, forming a pale whitish pupa, three quarters of an inch long, attached to the leaf by the tail but with no coccoon. The moth came out two or three days later. It measured $1\frac{1}{2}$ inch across the wings. The antennæ long and very slender $\frac{5}{8}$th inch long tawny. Head and legs which are very long pale brown. The wings white and semi-transparent so that print can be read through them, with a bluish iridescence on them, and the upper margin of the upper wings smoky brown, the body is rather long tapering to the tip, white with a black tuft on the tail in the male, pointed without a tuft in the female.

The insect appears to be *Caprinia conchylalis*, Guen., and is recorded from India and Burma, but I can find no account of its life history.

H. N. RIDLEY.

RAMIE.

A NASCENT INDUSTRY FOR INDIA.

The London correspondent of the *Pioneer*, writes:—

The oft debated question whether planters in India in search of profitable forms of cultivation can grow rhea fibre for manufacturing purposes of a quality enabling them to compete with the China grass grown in the Far East has, you recently informed your readers, been put to practical test by the Bengal Rhea Syndicate, who already have some 5,000 acres under cultivation and have been exhibiting in Calcutta sample underclothing, velvets, tray cloths, incandescent gas mantles and other articles made therefrom, These goods were manufactured I believe, on the continent, but at a time when the problem of developing inter-Imperial trade is uppermost in the public mind it is a matter for congratulation that the pioneers of what is, I believe, destined to be a great industry are to be found in this country as well as on the Continent. The Ramie Fibre Spinning Syndicate Limited of 50 Lime Street, E. C., have for the past two or three years been quietly, but steadily, feeling their way, patenting processes, learning trade secrets and gaining experience by experiments on a comparatively small scale, and therefore at much smaller cost than would have been the case had great things been attempted too soon. I have no sort or kind of personal interest in the concern, and it was from the stand point of a detached observer, desirous of obtaining information for your readers, that I paid a visit to the factory of the Syndicate the other day. The works are situated on the outskirts of the developing town of Romford which is within very easy reach of London and is well served by the Great Eastern Railway.

I was conducted over the factory by Mr. FRANK BIRDWOOD, who as Secretary to the concern has given a great deal of time and thought to its interests, and has made himself as much at home in discussing the intricacies of textile manufactures and the relative advantages of this or that machine as he is amongst his law books and briefs. The Syndicate have hitherto mainly relied on the China market for raw material, but the directors, not only from a business point of view, but also because they have had in most cases long connection with India, official or mercantile, are very desirous of bringing the Indian planter into the benefits of cooperation in their enterprise. As Mr. BIRDWOOD pointed out recently in the *Anglo-Indian Review*, the cultivation of ramie is not a task on which the planter can enter haphazard and without due enquiry. Inadequate preliminary investigation has been the cause of failure of various experimental efforts in the past and these have resulted in widespread scepticism as to possibility of profitable cultivation. The planter should master the facts as to the climatic conditions and soil best suited to ramie-growing, and as to the best methods of cultivation, given in the *Agricultural Ledger*, No. 15 by Sir GEORGE WATT. He should make sure, by sending home samples, that the fibre he can produce is of the right class; and in preparing the raw material for export to the mills he must be abreast of the times.

Many planters are fully aware of the needs of careful study and well thought-out methods on the lines indicated, but they are doubtful of the capacity of the market to take large additional supplies of the fibre. The sceptic should visit the Romford factory where he would see the beginnings of a great industry, steadily feeling its way to the expansion that lies before it. In any case rapid advance in the first instance would have been impossible owing to the uncertainly of supply of raw material and the great fluctuations in price consequent on manufacturers being mainly dependent upon the Chinese grower. Last year the price of the fibre was about £24 per ton; this year, owing to drought and the increasing demand in Europe £40 per ton has been paid. In some respects this dependence upon a country so politically unstable as China, whose cultivators and dealers are not the most trustworthy of men, has not been disadvantageous, for it has deterred the Syndicate from experimenting on a large scale. While output has been restricted for want of raw material, the concern has felt its way, and, under the skilled ádvice of a most capable and experienced manager, a cool-headed Yorkshire man, it has now arrived at a stage where the expansion all along kept in view can safely be undertaken. Its manufactures have gained a footing in the English markets from which wealthy spinning combinations have tried in vain to dislodge them. This attempt has been especially pronounced in respect to the large trade in boot thread that has been built up by the Syndicate. A well-known combine tried the cutting game until it was selling below cost but the Ramie Company was able to go one better right through without loss. For it is to be remembered that, although the supply of raw material is so scant and fluctuating that prices are comparatively high, ramie threads are not only much stronger than linen, but can also be produced much more cheaply even on the present comparatively limited scale of manufacture. When larger quantities of the fibre are available and the outturn is correspondingly increased the ratio of the cost of production will be lessened. The boot and saddlery thread were, in the first instance, only introduced into the London market, but a demand is now growing up in Leicestershire and Northamptonshire, the centres of the boot trade, and there can be no doubt that the combination of strength and cheapness will ensure the growth and stability of this trade against the competition of the most powerful combines manufacturing linen thread.

In pursuance of this wise policy, in the initial stages of a new industry, of *festina lente,* the Syndicate have not as yet undertaken their own spinning. The processes I saw at the mills were those of degumming, cleaning, drying, separating, equalising lengths, weaving and dyeing and thread manufacture. The machinery is of the most modern type, and so far as a casual visitor could judge, the methods of working no less than the general supervision, most efficient. I had previously been shown at the offices of the Syndicate, samples of the spun goods manufactured from the woven fibre turned out at Romford by the Bunbeg Mills Company. There can be no doubt that ramie-made cloths and other goods are not only far superior to linen but will, ere long compete with silk, by reason of their being very much cheaper, and with cotton by reason of their greater strength and durability. There are very few articles, if any, among manufactured textiles with which ramie-made goods cannot and will not enter into competition, from khaki and sail cloth to dainty dresses and tapestries and curtains. The principal demand thus far has been for vestings and underclothing, but other departments of manufacture are opening out as merchants come to recognise that among the advantages of ramie goods are that they are rot-proof, that they bleach a pure lustrous white and that they are unshrinkable. If the claim that ramie "even survives the attention of the Oriental *dhoby,* no matter how much it is beaten on stone" can be substantiated (and it can soon be put to the test) we may anticipate that this, with other advantages mentioned, will, in course of time lead to great demand in India. Already there has been some manufacture of white washing poplins for the Tropics. Sportsmen in the East should note that the manufacturer include "extremely durable unions for riding and hard wear" while the general public may bear in mind the claim, and put it to the test, that ramie goods are "lustrous as silk, more durable than linen, inexpensive and handsome". My tour of the Romford factory convinced me that there is a great future for this industry, and that Mr. BIRDWOOD had solid grounds to rest upon in expressing the conviction that the Indian planter need not be apprehensive of flooding the market with raw material, inasmuch as the demand is bound to keep alreast with the supply. "When they know that they may look beyond China for their supplies" wrote Mr. BIRDWOOD in the February *Anglo-Indian Review,* "manufacturers will be prepared to increase their out-turn very considerably. It would therefore appear that the Indian planter, if he will attack the problem soberly and with sufficient capital, could not only capture the market hitherto dominated by China, but could find fresh outlets for his production. One thing however he must clearly bear in mind: the manufacturer knows what be wants and can get what he wants from existing sources. . . . He will run no risks in his raw material. Indian planters must not imagine that knowledge will leap fully armed from their heads or that fortune will stop with them at the holding up of a little finger."

The question whether India is or is not to participate as a producer of the raw material in this nascent industry has a wider bearing on her industrial future than that which relates to the initiation of new avenues for the employment of planting capital, at a time when, in some directions it had been hard hit by currency changes and excess of production. There can be no doubt whatever that is the raw material is extensively grown in India for utilisation by the English and Continental manufacturers, ramie spinning and weaving mills will in course of time spring up in the great commercial centres of the country, and thus India will participate in ramie manufacture, as she participated to-day in the production of cotton goods made from her own raw material. Thus a great step forward will be taken in the industrial development so essential to adequately relieving the pressure on the soil, which though temporarily retarded of late by an unusual succession of famines, must become more and more acute with the growth of population and the rise in the standard of comfort now being witnessed. Even in the early years of ramie cultivation we may expect to see some of the preliminary processes of manufacture, particularly that of degumming carried out on the plantations prior to shipment to Western factories, in order to reduce the cost of freight. On economic grounds therefore every encouragement should be given to Indian planters to grow ramie of the right kind and in the right way. There is reason to believe that the plant can be cultivated successfully in other countries beside China and India and it behoves the captains of the planting industry in the latter Empire to establish her share in the promising industry before the ground is occupied elsewhere and India is put out of the running. At the very least, to quote the formula in such general use just now in connection with inter-Imperial fiscal relations, the case is one for full and careful enquiry, for the policy of the open eye and the open mind.

(We reproduce this sanguine letter in apposition to the important correspondence from Mr. BAXENDALE, in order to show the view taken by people at home on the subject. It is quite clear it seems that the reasons why ramie culture is only a nascent industry in the East at present lie with the buyers and not with the planter. The perseverance and energy of Mr. BAXENDALE deserves a much higher reward than has been accorded to him by the Home Syndicates.— Ed.)

25, Birchington Road,
WEST HAMPSTEAD, N. W.

To the Agent-General,

I would call your attention to the possibilities of Ramie (Rhea), which undoubtedly is the *Textile of the future.* If you can grow this fibre, which is easily cultivated, there is a vast trade with Europe possible. It would be specially welcome in England as a rival to cotton, and would do much to prevent the corner in cotton so easily worked by American capitalists, as experience teahces us to our cost. A Lancashire Cotton Famine would not be possible if supplies of Ramie were forthcoming. It would also help to make a *self-contained Empire—we should produce all we want independently of other countries.* The fibre is as easily worked as it is grown, and I see no reason why the industry should not be fostered in your Colony, from cultivation to spinning, or even weaving (from the field to the loom).

I would suggest the Government provides seeds or plants. It is easily grown from seed. In every District where the plant is freely grown, set up decortication and degumming stations, such as mills grind the corn here or the central stations crush the sugar-cane in Queensland. If the Government does not put up these stations, then they should encourage the capitalists to form Syndicates by giving a bonus on the amount produced.

The degumming stations would be highly profitable:

1st.—The fibre would be extracted in the form of filasse, easily packed, and a great saving in freight effected as compared with ribbons.

2nd.—A profit would be made on the enhanced price the filasse could command as compared with ribbons over-burdened with freight.

3rd.—The waste products would be source of income, and would shew a profit on the cost of working the fibre to filasse.

The by-products are—

(*a*) the gum, which is very valuable.

(*b*) the fibre in the leaves and lateral shoots could be worked into proper pulp—this would command a high price, as it makes the finest paper.

All these products—the filasse, the gum and the pulp, would command good prices in England, and if your manufacturers will treat the fibre in the Colony there is no reason why the yarns should not be sent over here after retaining sufficient for your home supplies.

If the Government will fall in with my suggestions I shall be pleased to offer my services on the principle 'no cure no pay'—*i.e.* I am content to take my remuneration in share of profit.

If the Government is of opinion the trade would be best conducted by private enterprise, I think the initial stages could be fostered by Government making the preliminary experiments as to growing &c., offering planters the seed or plants, either free or at very low rates, and by offering assistance in the shape of loans for planters to get large tracts under cultivation, and to the District Councils to enable them to put up decorticating and degumming stations, and by recommending capitalists to take up the planting, filassing, spinning, weaving, &c.

I think the Government would do wisely to advertise the possibilities of the fibre and the reason the *Textile of the future* will have such a prominent place in our industries:

1st.—It is many times stronger than cotton, flax, hemp and the like.

2nd.—It has a very long staple from 3 to 9 inches.

3rd.—It is easily grown, as it acclimatises itself in almost any zone where agriculture is possible—of course with varying results, as it crops in some latitudes as many as four times per annum.

4th.—It is beautifully lustrous, more after the nature of silk in appearance.

5th.—It does not rot, giving it, for many purposes, such as fishing lines, nets, sail cloths, ropes, boot and saddlery thread, tarpaulins, rick cloths, tents, hose, shop blinds, boot lining and other requirements necessitating exposure to damp, great advantages.

6th.—It is non-elastic—herein it is invaluable for machinery belting and ropes, measuring tapes, mixed with wool it imparts non-shrinking possibilities to that article, and many other purposes where rigidity is an advantage.

7th.—I could further expatiate on its merits, but space forbids, I will curtail my remarks by stating there is nothing, wool, cotton, flax, hemp, jute, and even silk produces, this fibre cannot imitate and in most cases excel. It makes splendid cloth for uniforms, and almost indestructible table linen, sheeting, dress goods, velvets, curtains, lace, tapestry and upholstery purposes, lamp wicks, waist-coatings, trousers duck, riding breeches, &c. It is an ideal hygienic clothing, invaluable for underwear.

It is pronounced by the Medical profession as the most advantageous surgical dressing and for body wear. I will wind up by pointing out its durability and toughness alone commend it as a material that is invaluable for its indestructible qualities.

There are many purposes for which its peculiar properties make it extremely valuable—for instance incandescent gas mantles. It excels all other fibres, and in this alone an ever increasing demand will consume enormous quantities. I could instance many other purposes but I think the foregoing quite sufficient to extol the merits of

RAMIE THE TEXTILE OF THE FUTURE.

Small farmers wishing to start Ramie growing can do so without any great outlay, and they can prepare the fibre for export without costly machinery. I do not recommend degumming stations except on large scale. Small parcels of fibre can be shipped and the degumming can he done here.

Stamps of Colony should accompany all requests for particulars as a proof it is not an idle enquiry.

If further information is required how to procure seed, plants and cultivate and prepare the fibre for the market, and how to dispose of the produce, also advice as to the installation of degumming and filassing stations, manufactories, &c., in short, any assistance I can give to encourage the world-wide cultivation of this fine fibre, you have but to apply to

D. EDWARDS-RADCLIFFE,
23. Birchington Road,
West Hampstead,
LONDON.

——o——

JUGRA ESTATE, SELANGOR,
September 30th, 1903.

Ramie Cultivation.

Sir,—I have the honour to acknowledge the receipt, through the Chairman of the United Planters Association, of your letter of Sept. 8th, No. 6489/03, covering a letter from Mr. D. EDWARDS-RADCLIFFE. The Chairman requests me to reply direct to you.

1. *Land.*—In 1898 we took up 1,000 acres under grant now known as Jugra Estate, and 2,000 acres as a reserve, on special terms, for the cultivation of Ramie.

2. *Varieties.*—Although very different in appearance, I cannot learn of any Botanical distinction between the two varieties of plant we cultivated. I took plants of each kind to Kew and Sir THISELTON DYER simply classified them both as *Boehmeria nivea.*

M. BLUNTSCHLI of Sumatra sent us several plants which showed some slight variations and some seed was sent from India. With the stock raised from this seed I planted up about half an acre. This differed slightly from the smaller of the two kinds we have here, and which we have found unsatisfactory. It grows readily from seed and crops fairly well once or twice then rapidly deteriorates. The most satisfactory way of cultivating the other is from stem or root cuttings. This plant surpasses in luxuriance of growth every form of cultivated product with which I am acquainted. It yields six crops yearly, arriving at maturity regularly every two months. Dry weather reduces the length of the stem and consequently the *output* of the fibre, but it makes little or no difference to the *maturing* of the fibre.

3. *Area cultivated*—Early in 1900, we had planted up eighteen blocks of 2½ acres each, testing different distances and systems of cultivation, the result of each block being separately recorded.

We then had 30 acres of the large and 15 acres of the small variety, in all about 400,000 plants.

4. *Retting.*—We tried several retting experiments carefully following the systems of treating flax as worked in Ireland and

Belgium, but without success. The stem is so full of sap that it causes a putrid fermentation which attacks the fibre as well as the gum. My results were merely a repetition of the experiences in Coutrai, 30 years ago, when the specialists in the treatment of flax utterly failed to do anything with ramie.

5. *Faure Decorticator.*—The Faure was the first machine we tried. It was sent out at the end of 1898. Our produce from this was valued at from £17 to £20 a ton. It was somewhat difficult to manipulate. The variation of one-eighth of an inch in the adjustment, made the difference between an over cleaned fibre (and consequently heavy loss in output) and a fibre, which through the presence of epidermis and an excess of gum, compared badly with the best quality of "China Grass"—as the hand prepared article is called in Europe. Our Malay coolies with experience became more adapt in adjusting the machine and in handling the fibre but the daily result was too small to admit of profit at £20 a ton. I returned to Europe and visited M. FAURE at Limoges. I saw his machine worked by skilled French artisans and I realised that it would take some time before I could bring my Malays up to the same degree of efficiency and even then the output compared very poorly with that shewn in the prospectus. M. FAURE was at that time constructing a machine which he estimated would double the output. This invention, I learn from Mr. A. S. BAXENDALE, who was present on the occasion, was worked at the last Paris Exhibition and was awarded the highest honours. Mr. A. S. BAXENDALE informs me that each machine required two men to feed it, and that it then only dealt with two stems simultaneously. The treatment was very effective but costly. In justice to M. FAURE, I must say that the prospectus referred to above, was not issued by him but by his English Agent and I do not think he was acquainted with its misleading contents.

6 *Eke Decorticator.*—While in England I received the loan of an Eke Decorticator from a gentleman who had taken over several moribund concerns, which included not only this decorticating patent but a degumming process and a large silk and ramie mill. He was anxious to round off his interest by erecting a degumming factory on this estate, and we discussed the details. His bankruptcy intervened before we come to terms but not however before we had shipped to him several bales of produce from the Eke machine.

This decorticator turned out a considerably greater percentage of filasse than the former but it included all the epidermis and a sufficient amount of pith to make the combing difficult. There was no loss of fibre. As the lender of the machine had no use for our produce, we sent a trial bale of it to another mill, where it was turned into yarn and sold to one of the largest saddlery manufacturers in London. The Secretary of the spinning Company showed me a letter from the manufacturer in which he referred in enthusiastic terms to a recent purchase of yarn from them and the Secretary said that the particular order has been entirely fulfilled out of our bale. The Company's expert adviser, the Mill Foreman and the Secretary all expressed satisfaction at the result and in my presence the expert advised the Managing Director to make a contract with us.

The Managing Director after telling me that he was confident that he could buy a fibre equal to the finest "China Grass" in the market for £15 a ton (the price I asked him for our Eke produce) agreed to take the latter for a year and he would send us out a decorticator which they were then constructing.

We sent them a further consignment and after a lengthy delay we asked them if they would take a few more bales then stored at Liverpool, as a present. To this they replied "We are sorry to say that the ramie ribbons are useless to us." We have heard no more of their decorticator. These are only examples of the numerous difficulties I have encountered in trying to find a market for our produce.

7. *Mr. D. Edwards-Radcliffe.*—This gentleman called on me in London. I had the pleasure of meeting him again and we discussed every branch of the ramie industry. He was interested in the Spinning Company just referred to, but was, I believe in no way responsible for its extraordinary management.

Without pretending to be an authority on the manufacturing side of the question, I have seen sufficient of its treatment and the numerous uses to which it can be put, to have, like Mr. RADCLIFFE, a strong belief in the future of ramie but I think that Mr. RADCLIFFE has set to work at the wrong end of the line. It is the spinning industry which seems to need conviction, not so much the planting.

It would seem to me that there is reason for supposing that in Mr. EDWARDS-RADCLIFFE'S letter a fair example occurs of how even the smallest demand for ramie is believed by many of those who wish to encourage its increased cultivation, to be an indication of the existence of an unlimited market for this product. It is stated by Mr. EDWARDS-RADCLIFFE that "enormous quantities" of ramie fibre will be required for making incandescent gas mantles. I may be mistaken, but I would suggest that not more than one ton of fibre is consumed in the manufacture of 100,000 mantles.

Sufficient China Grass reaches Europe for experimental purposes. For several decades the Spinner has had opportunities for thoroughly testing the possibilities of the fibre. Although we are the only people who have shipped ramie in bulk from the Federated Malay States, trial shipments have been made from many other parts of the Empire with apparently similar results. Sir GEORGE WATTS, Adviser on Economic Products to the Government of India, published a whole volume concerning similar failures. We are told that spinners are eagerly demanding our produce but when we have any produce to sell we find that there are only a few small ramie factories in the United Kingdom and those to which I have gone are only willing to buy fibre produced by a decorticating process of their own and that the first essential of the deal is that we purchase one or more of their machines and then no satisfactory guarantee is offered that large purchases will be made in the future. The position must have altered remarkably during the last three years, if small farmers can make money by shipping small parcels of the fibre to Europe. I was assured by leading brokers three years ago, that the only ramie then being sold in Europe was the hand product of China and the producers did not and could not afford to pay any wages, with their primitive methods of production.

8. *Freight.*—Under conference rates, this would be a heavy item particularly for the small grower who could not afford an hydraulic press.

The Ocean Steamship Co. were good enough to allow us special rates for experimental shipments. At current rates our hand-pressed bales would have cost at least £7 per ton weight to deliver in Europe.

9. *Experiments.*—I cannot recommend to Government to incur any expense in further agricultural experiments or urge private individuals to do so.

After two years hard work, and the expenditure of a considerable amount of capital, we have nothing to shew but agricultural results. These have hitherto been reserved for the information of our shareholders, but I now give the figures for the information of the Government and my fellow planters. All other figures I have seen quoted, appear to have been based upon garden-plot experiments.

It is true that we have never worked a decorticator steadily for a year, but these results are based on the produce of several acres treated in different seasons, careful records having been kept.

10. *Results.*—An acre of ramie will yield 20 tons of green stems without leaves.

Twenty tons of green stems yield 25 cwt. of dry ribbons *i.e.*, the fibre with all the epidermis and gum attached.

Twenty-five cwt. of dry ribbons yield 10 cwt. of filasse.

Ten cwt. of filasse at four pence a pound is worth £18 13*s*. 4*d*.

11. *Expenditure*—Our average expenditure on cutting, stripping, decorticating, drying and baling amounted to about £10 for 25 cwt. of ribbons. We worked only one decorticator, whereas the engine might have worked several for the same amount of fuel. Drying and baling would be unnecessary, with a degummer close at hand and I think the cost of production might be reduced.

But at £10 as the cost of treating the produce of an acre, there would be a balance of £8 13*s*. 4*d*. out of which field upkeep and supervision would have to be paid.

12. *Proposed Decortication*—If degummers were erected locally there would be no necessity for any epidermis-cleaning system of decortication. Our produce would be treated green, before the gum

hardened and our only mechanical requirement would be a machine capable of getting rid of the pith in the most expeditious way.

A mechanical engineer whose reputation in the Straits is deservedly of the highest and who assisted us in erecting and working both decorticators, is of the opinion that his firm could construct such machinery in Singapore.

13. *As a catchcrop*—Ramie is a suitable catchcrop for either Para rubber or coconunts. We have both products planted amongst our ramie and at the price given above, the profits from ramie might cover the whole expense of opening an estate within four years from planting. Planted a few feet from the trees, ramie does not affect the growth of either product. Within five years from seed our rubber is giving small but useful returns and some of our coconuts are bearing crop at four years old.

The first few weedings are expensive but the upkeep rapidly declines and no special cultivation would be necessary if the planting was done properly.

14. *State Aid*—I suggest that the question as to what assistance Government might give to encourage the erection of degummers in the Straits or Malay States might be left in abeyance pending evidence that practical spinners are interested in the subject.

If you will be so good as to forward a copy of this letter to Mr. EDWARDS-RADCLIFFE he will no doubt lay it before his Spinning friends, and they will be able to decide if they can afford to guarantee four pence a pound for filasse on the plantation, they to bear all expenses after decortication.

Assuming that it costs them a further sum of four pence a pound to convert the ribbons into filasse and ship the latter to their spinning mills in Europe, it will only equal the quotations I have had for the best quality of cotton produced on the estate *i.e.*, eight pence a pound.

All the ramie spinners I have met maintain the superiority of ramie to cotton, and if they are disposed to show that they have the courage of their opinion, I will recommend our shareholders to raise sufficient funds to open a large area with ramie.

The question of Spinning and Weaving in the Straits might I think be left open until the degumming has proved a success.

At the request of the Chairman of the Planters Association, I am sending a copy of this, together with Mr. EDWARDS-RADCLIFFE'S letter, to the Hon: Secretary for discussion at our next meeting.

I have the honour to be,

Sir,

Your most obedient servant,

CYRIL E. S. BAXENDALE.

GUTTA PERCHA IN THE PHILIPPINES.

The report of gutta-percha in the Philippines by Dr. PENOYER, L. SHERMAN, Jr., of the Philippine forestry bureau, summarized in THE INDIA RUBBER WORLD of February 1st, 1902, (page 137), is supplemented by some details of interest supplied by him in a later report of the bureau, for the fiscal year 1901-2. He records an expedition in search of Gutta-percha trees, with the result of confirming the belief already entertained that a considerable supply of gutta existed in the Philippines, though as yet the most valuable species (*Dichopsis gutta*) has not been recognised. Dr. SHERMAN explored portions of the large island of Mindanao and the islands and towns of the Sulu archipelago, finding not only Gutta-percha trees, but that the Chinese had already built up a much larger trade in the product than is indicated by the customs returns. So well are the natives controlled by these traders that the existence of Gutta-percha was denied in many places where Dr. SHERMAN afterwards found it, and the secrecy of the methods employed is carried to such an extent that when the gutta reaches the Singapore market its source is not known there. The amount of Gutta-percha which paid an export duty to the Philippine authorities during the twelve months ending June 30, 1902, was 373,331 lbs.: of the imports at Singapore in 1901 only 14,000 lbs. were credited to the Philippines.

In Mindanao Dr. SHERMAN was surprised at the extent of country over which Gutta-percha exists. The natives say that all of the mountain region of Southern Mindanao contains Gutta-percha. Much of the country has not, of course, been explored by Americans, or even by gutta collecting natives, but so far as any one has gone, the trees have been found, and in none of the towns visited by Dr. SHERMAN on the south coast did he find Chinese or Moros who were not engaged in the Gutta-percha business, shipping the product through Cottabaco. Going inland Dr. SHERMAN found large Gutta-percha trees some of which were felled for him by the natives and the latex extracted by the usual methods. One tree 160 feet in height and 8 feet in circumference yielded 8½ lbs. of dry Gutta-percha. Had the tree fallen so that it could have been "ringed" entirely around and had precautions been taken to catch all the milk which was lost on the ground, Dr. SHERMAN thinks there would have 20 lbs. while if all the gutta contained in the bark and leaves could have been secured there would have been 150 to 200 lbs. This is typical of the wasteful native methods in all Gutta percha district. In much of this region the trade is controlled by a Moro datto named PIANG, with the aid of a Chinese agent at Cottobaco. PIANG claims to observe the Government regulation against the felling of Gutta-percha trees, but Dr. SHERMAN found this method practised by his men nevertheless. Similar conditions were also found on some of the smaller islands visited, particularly on Tawi-tawi.

Having made a study of the material Dr. SHERMAN declared that a good quality was found by him, but the customs officials not being judges of Gutta-percha, were forced to accept the valuations made by the Chinese, with the result that the exports yield less than the proper amount of revenue. The natives, it is asserted are also cheated by the traders, both in regard to the quality of their produce and in the weights.

As a result of Dr. SHERMANS' report, the secretary of the interior of the Philippines, Dr. DEAN C. WORCESTER, in whose department the forestry bureau is placed asserts that "at the present rate of destruction there will be no Gutta-percha trees standing four years h nce." He is inclined therefore in view of the evident uselessness of the ordinary methods for protection of the trees, to recommend the establishment of a Government monopoly of Gutta-percha. Exportation, except by the Governmet, could be prohibited, and such prohibition could be made fairly effective. Government buyers could be located at suitable points. The Government could well afford to pay a price considerably higher than that now prevailing for the Philippine product, thereby avoiding ill feeling on the part of the gatherers, and by limiting the amount which it purchased could greatly retard the present rapid destruction of the trees. The Government buyers would necessarily come into closer contact with the collectors, and something might eventually be done in the way of introducing proper methods of extraction in place of the present destructive processes. At all events the establishment of suitable extraction plants would make it possible to utilise the large amount of Gutta-percha which is now left in the bark of trees that have been felled and ringed. By the way, Dr. WORCESTER says that a method has been worked out in the Government chemical laboratory for the extraction from the Philippine product of a chemically pure gutta equal in every way to the best heretofore put upon the Singapore market, the purifying process involving the loss of about 50 per cent. of the mass.

Dr. SHERMAN also investigated the number of rubber resources. No rubber was found in Mindanao, but in the Sulu islands he saw an abundance of large rubber vines, or creepers, from which rubber was extracting by cutting them so freely that they soon died. Samples which he secured he was told at Jolo, would bring at Singapore a price equal from 32 to 40 cents., gold, a pound. It appears that during 1901-2, in addition to Gutta-percha, there were exports of India-rubber from the Philippines on which duties were paid, amounting to 282,996 lbs.

The India Rubber World, August, 1903.

HORTICULTURAL NOTES.

Dendrobium taurinum var album.

A very pretty form of this plant was presented to the Botanic Gardens by Mr. PEREIRA. The stem bore three spikes of which however two were destroyed while in bud by some insect. The third bore six flowers in a rather compact raceme each measuring $2\frac{1}{2}$ inches across. The sepals were pure white the narrow twisted petals $\frac{1}{8}$ inch across and $1\frac{1}{2}$ inch long white at the base and pale olive yellow above, margined with mauve, the broad lip white with mauve at the mouth of the spur and gradually paling into white on the keels, the tip of the lip pale mauve with a yellowish spot on the edge, the three ridges on the keel, are well marked, the central one ending in a flat subtriangular tooth. The broad thick column is white stained at the base with mauve and the anther cap orange.

The flowers remained fresh for three weeks. The plant is a native of the Philippines. (Ed.)

THE IMPERIAL INSTITUTE.

STRAITS AND BORNEO EXHIBITS.

The latest supplement to the *Board of Trade Journal* dealing with matters connected with the Imperial Institute, contains some interesting notes on recent additions to the Indian and Colonial Sections. The following is an extract :—

Straits Settlements and Federated Malay States :—Considerable progress has been made in the re-organisation of this court, on a plan prepared last year by Professor Dunstan, which was approved by the Government of the Straits Settlements, by whom the work of collecting and preparing in the Colony the new exhibits required was entrusted to Mr. H. N. RIDLEY, M. A., Director of Botanic Garden and Forests at Singapore Much assistance has kindly been given by Mr. LEONARD WRAY, F.Z.S., Curator of the Government Museum at Perak, whilst on leave. The Straits Court is being re-modelled in accordance with the general scheme for the improvement of the collections, the object in view being to render the exhibits of greater value to commercial men, for educational progress, and as a means of bringing to public notice recent developments in economic research. To this end the specimens have been thoroughly overhauled and a representative series selected for exhibition. Temporary labels have been added giving information describing the collection and manufacture of important products, and the local uses of other products, many of which do not appear as exports. These temporary labels are being replaced as rapidly as possible by fuller specially prepared, printed labels, and when this work is completed it will be possible for the visitor to learn, as completely as the specimens allow, the method of cultivation, collection, and manufacture of the products, and the uses to which they are put. The tin industry has received special treatment in view of its paramount importance, and a complete series of specimens and photographs, illustrating the modes of occurrence of the tin ores, the methods of mining and smelting, have been placed on exhibition with full descriptive labels. The geology of the peninsula is illustrated by a set of specimens with notes on the occurrence, geological age, and economic importance of the several formations. Rice, sago, sugar, rattan, canes, gutta-percha, rubber, dammar resins, fibres, gambier and other tanning materials, dye stuffs, spices, &c., are similarly represented by selected specimens and descriptions of their collection, manufacture, and uses. Statistical tables showing the area, population, revenue, expenditure, trade and exports, prepared by the Local Government have been placed in the Court. An important addition is a large map specially prepared for the Court, showing the several Settlements and States under British administration, the railways, and other features of interest. When the new exhibits arrive and have been incorporated in the present collection the Court will give a full and accurate representation of the economic resources of the Straits Settlements and Federated Malay States, and prove an important factor in extending public knowledge of the country and furthering its commercial interests.

British North Borneo :—A collection of the commercial products of British North Borneo, including timbers, coal, rice, sago, sugar, coffee, cacao, pepper, tobacco and cigars, camphor, gutta-percha, dammars, cutch, and gambier, is on view in the North Gallery.

Strait Times,
12th November, 1903.

PERSONAL.

Many planters and others in the Peninsula will be sorry to hear that Mr. C. CURTIS, the Superintendent of the Penang Gardens, has been compelled to retire from the service on account of ill-health. Mr. CURTIS, who was for many years plant-collector to Messrs. VEITCH during which time he travelled in Madagascar, Sumatra and Borneo, joined the Straits Government Service in July, 1884, and was appointed in charge of the Penang Gardens and Forests, where he remained till his retirement. As a skilful and energetic horticulturist and an excellent plant-collector and botanist, he has done very good service to the Colony, and his compulsory retirement is much to be regretted.

It is understood that Mr. FOX will fill the vacancy in the Penang Gardens and Forest Department and that Mr. R. DERRY, will become Assistant Superintendent in the Singapore Botanic Gardens.

MISCELLANEOUS.

Notices to Subscribers.

I. For the information of subscribers and others who have been unable to complete their series of the Agricultural Bulletin of the Straits and Federated Malay States notice is here given that Nos, I, 7, 8, 9, of the Old Series (1891-1900) and Nos. 1, 8, 9, 10, of the New Series Vol. I (1901-1902), the first issues of which have long been exhausted, are now being reprinted, with plates, and will shortly be ready.

II. Subscribers whose subscriptions are still unpaid are requested to send in their subscriptions for the present year as soon as possible. Members of the United Planters Association are requested to send in their subscriptions in future directly to the Editor and not to the Secretary of the Association.

III. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 in order to cover postage.

Meteorological Observers are asked to send in their returns to the Editor, to arrive before the tenth day of the following month if possible, so as to be in time for going to press.

Wanted Nos. 8 & 9 of Vol. 1 (N. S.) of the Bulletin to complete the volume. Address F. B. Manson, Park View, Fytche Road, Rangoon.

An unprecedented large fall of rain was recorded at six registering stations in Penang and Province Wellesley :—

Stations.	6th Oct.		9th Oct.		30th Oct.	
	I	*cts*	*I*	*cts*	*I*	*cts*
Government Hill	4	00	4	10	5	07
The Prison ...	4	76	3	08	4	35
The Fort ...	2	91	2	65	3	02
Balek Pulau ...	4	00	6	90	4	10
Pulau Jerejak ...	3	78	3	60	3	91
Butterworth ...	2	71	2	33	1	40

M. E. SCRIVEN,
Assistant Surgeon,
Prison Observatory.

Penang, 13th November, 1903.

The following is the Rainfall for October, 1903 :—

Government Hill	...	Ins.	26-44
The Prison	...	,,	24-21
The Fort	...	,,	19-52
Balek Pulau	...	,,	27-23
Pulau Jerajak	...	,,	21-10
Lumut	...	,,	17-53
Pangkor	...	,,	16-89
Bruas	...	,,	16-62
Butterworth, P. W.	...	,,	17-86
Bukit Mertajam	...	,,	16-55
Sungei Bakap	...	,,	11-63

M. E. SCRIVEN,
Assistant Surgeon,
Penang, 13th November, 1903. *Prison Observatory.*

SINGAPORE MARKET REPORT.

October, 1903.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang - -	10	24.00	23.50
Bali - - -	377	18.75	18.00
Liberian - -	170	17.50	15.00
Copra - - -	2,436	7.90	6.70
Gambier - - -	2,445	12.47½	12.00
Cube Gambier, Nos. 1 & 2 - -	265	17.50	15.50
Gutta Percha, 1st quality - -	...	270.00	200.00
Medium - -	...	190.00	100.00
Lower - -	...	120.00	19.00
Borneo Rubber - - -	...	140.00	98.00
Gutta Jelutong - - -	...	7.50	6.85
Nutmegs, No. 110's - -	...	75.00	68.00
No. 80's - -	...	125.00	110.00
Mace, Banda - - -	...	190.00	150.00
Amboyna - - -	...	125.00	120.00
Pepper, Black - - -	528	31.85	30.40
White - - -	626	51.00	45.00
Pearl Sago, Small - -	90	5.65	4.95
Medium - -	15	...	...
Large - -	10	...	...
Sago Flour, No. 1 - -	4,165	4.30	3.80
No. 2 - -	188	1.90	1.85
Flake Tapioca, Small - -	815	5.40	4.40
Medium - -	65	4.50	4.30
Pearl Tapioca, Small - -	559	4.90	4.15
Medium - -	507	4.80	4.00
Bullet - -	...	4.25	
Tin - - - -	2,420	72.50	68.25

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th October, 1903.

Wired at 12 noon on 16th October, 1903.

To England.			Tons Steamer.
Tin	from Singapore & Penang	to England - and U. K. optional any ports.	900
Gambier	from Singapore	to London -	...
,,	,, ,,	,, Liverpool-	330
,,	,, ,,	to U. K. & / or Continent -	380
,,	,, ,,	to Glasgow -	50
Cube Gambier	,, ,,	,, England -	110
White Pepper	,, ,,	,, ,, -	100
Black ,,	,, ,,	,, ,, -	30
White Pepper	,, Penang	,, ,, -	20
Black ,,	,, ,,	,, ,, -	...
Pearl Sago	,, Singapore	,, ,, -	50
Sago Flour	,, ,,	,, London -	150
,, ,,	,, ,,	,, Liverpool-	2,000
,, ,,	,, ,,	,, Glasgow -	70
Tapioca, Flake	,, Singapore & Penang	to England	320
,, Pearl & Bullets	,, ,, ,,	,, ,, -	320
,, Flour	,, Penang	,, ,, -	400
Gutta Percha	,, Singapore	,, ,, -	20
Buff hides	,, ,,	,, ,, -	110
Pineapples	,, ,,	,, ,, cases	9,750
To America.			
Tin	from Singapore & Penang	-	...
Gambier	,, Singapore	- -	40
Cube gambier	,, ,,	- - -	...
Black Pepper	,, ,,	- - -	10
,,	,, Penang	- - -	...
White Pepper	,, Singapore	- - -	...
,,	,, Penang	- - -	...
Nutmegs	,, Singapore & Penang	- -	1
Tapioca, Flake & Pearl	,, ,, ,,	- (sailing) 50	60
Pineapples	,, ,,	- - cases	250
To the Continent.			
Gambier	from Singapore	to South Continental Ports-	50
,,	,, ,,	,, North ,, -	120
Black Pepper	,, ,,	,, South ,, -	80
,,	,, ,,	,, North ,, -	10
Black Pepper	,, Penang	,, South ,, -	80
,,	,, ,,	,, North ,, -	...

			Tons Steamer.
White Pepper	from Singapore	to South Continental Ports	40
,,	,, ,,	,, North ,, -	100
,,	,, Penang	to South Continental Ports-	...
,,	,, ,,	,, North ,, -	...
Copra	,, Singapore & Penang	to Marseilles -	360
,,	,, ,,	,, Odessa -	600
,,	,, ,,	,, South Continental Ports - other than Marseilles and Odessa	560
,,	,, ,,	,, North Continental Ports -	440
Tin	,, ,,	,, Continent -	190
Tapioca Flake	,, ,,	,, ,, -	130
Tapioca Pearl	,, ,,	,, ,, -	10
Cube gambier	,, Singapore	,, ,, -	40
Pineapples	,,	,, ,, cases	750
Sago Flour	,,	,, ,, -	700

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,400 tons Gambier
340 ,, Black Pepper (*in Singapore*) } contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st October, 1903.

Wired at 4.30 p.m. on 2nd November, 1903.

To England:—

			Tons Steamer,
Tin	from Singapore & Penang	to England - and U. K. optional any ports	2,000
Gambier	from Singapore	to London -	...
,,	,, ,,	to Liverpool-	150
,,	,, ,,	to U. K. & / or Continent -	500
,,	,, ,,	,, Glasgow -	20
Cube Gambier	,, ,,	,, England -	50
White Pepper	,, ,,	,, ,, -	90
Black ,,	,, ,,	,, ,, -	10
White ,,	,, Penang	,, ,, -	20
Black ,,	,, ,,	,, ,, -	...
Pearl Sago	,, Singapore	,, ,,	120
Sago Flour	,, ,,	,, London -	230
,,	,, ,,	,, Liverpool -	440
,,	,, ,,	,, Glasgow -	220
Tapioca, Flake	,, S'gapore & P'nang	to England -	500
,, Pearl & Bullets	,, ,,	,, ,, ,, -	200

			Tons Steamer.
Tapioca Flour	from Penang	to England -	500
Gutta Percha	,, Singapore	,, ,, -	60
Buff hides	,, ,,	,, ,, -	150
Pineapples	,, ,,	,, ,, cases	3,000

To America:—

Tin	from Singapore & Penang	-	650
Gambier	,, ,,	-	900
Cube Gambier	,, ,,	-	20
Black Pepper	,, ,,	-	70
,,	,, Penang	-	60
White Pepper	,, Singapore	-	60
,,	,, Penang	-	...
Nutmegs	,, Singapore & Penang	-	9
Tapioca, Flake & Pearl	,, ,, ,,	-	360
Pineapples	,, ,, ,,	cases	1,250

To the Continent:—

Gambier	from Singapore	to South Continental Ports		20
,,	,, ,,	,, North ,,	-	220
Black Pepper	,, ,,	,, South ,,	-	30
,,	,, ,,	,, North ,,	-	40
,,	,, Penang	,, South ,,	-	...
,,	,, ,,	,, North ,,	-	...
White Pepper	,, Singapore	,, South ,,	-	40
,,	,, ,,	,, North ,,	-	180
,,	,, Penang	,, South ,,	-	...
,,	,, ,,	,, North ,,	-	20
Copra	,, Singapore & Penang	to Marseilles	-	200
,,	,, ,,	,, Odessa	-	400
,,	,, ,,	,, South Continental Ports other than Marseilles and Odessa.		500
,,	,, ,,	,, North Continental Ports		760
Tin	,, ,,	,, Continent	-	400
Tapioca Flake	,, ,,	,, ,,	-	70
Tapioca Pearl	from Singapore & Penang	to Continent	-	260
Cube gambier	,, Singapore	,, ,,	-	70
Pineapples	,, ,,	,, ,,	cases	1,250
Sago Flour	,, ,,	,, ,,	-	1,500

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,350 tons Gambier
210 ,, Black Pepper
(in Singapore)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

Singapore.

Abstract of Meteorological Readings for the month of October, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·872	138·2	80·1	86·6	74·4	12·2	76·9	·857	74·7	79	N.W. & S.E.	4·46	1·77

K. K. Hospital Observatory,
Singapore, 16th November, 1903.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S,

Penang.

Abstract of Meteorological Readings for October, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·893	138·4	79·5	87·7	73·5	14·2	75·1	·787	70·75	·73	N.W.	24.21	4·76

Colonial Surgeon's Office,

Penang, 10th November, 1903.

M. E. SCRIVEN,

Asst. Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for September, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
Durian Daun Hospital.	29·930	154·2	78·5	89·5	69·2	19·7	80·9	1·045	59·1	93	S.S.W.	4·71	1·68

Colonial Surgeon's Office,
Malacca, 17th October, 1903.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Malacca.

Abstract of Meteorological Readings for October, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Durian Daun Hospital.	29·828	156·2	79·6	90·0	70·3	19·6	81·4	1·062	70·3	95	N.W.	13·68	2·58

Colonial Surgeon's Office,
Malacca, 13th November, 1903.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for October, 1903.

Districts.	Max-imum in Sun.	Temperature.				Hygrometer.			Total Rainfall	Greatest rain-fall during 24 hours.
		Mean Dry Bulb.	Max-imum.	Min-imum.	Range.	Mean wet Bulb.	Vapour Tension.	Humi-dity.		
Taiping ...	151	81·59	95	70	25	76·33	837	78	18·74	5·53
Kuala Kangsar ...	...	79·62	94	71	23	75·79	842	82	4·13	1·06
Batu Gajah ...	160	80·89	92	71	21	76·37	844	80	5·16	1·03
Gopeng ...	...	80·20	92	63	29	76·36	860	83	5·82	1·01
Ipoh ...	...	80·82	91	75	16	76·37	850	80	5·46	1·13
Kampar ...	...	...	93	68	23	...	...	...	6·88	1·00
Teluk Anson ...	...	78·01	92	71	21	76·63	898	94	9·45	2·20
Tapah ...	..	81·27	93	69	24	76·53	850	81	7·65	1·48
Parit Buntar ...	...	81·27	92	71	21	77·02	872	82	13.01	2·43
Bagan Serai ...	...	80·58	94	71	23	76·42	855	82	17·13	3·16
Selama ...	...	81.46	92	72	20	77·09	873	81	13·80	1·56

STATE SURGEON'S OFFICE,
Taiping, 11th November, 1903.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for September, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·891	147·9	80·4	89·8	70·6	19·2	76·5	·840	73·9	80	Calm.	5·54	2·45
Pudoh Gaol Hospital „	...	...	...	...	...	...	...	...	...	...	...	4·46	1.65
District Hospital „	...	...	...	...	...	...	...	...	...	...	...	4·51	1·50
„ Klang	...	...	...	85·6	75·2	10·4	...	...	...	...	...	4·97	1·37
„ Kuala Langat	...	...	...	87·2	73·0	14·2	...	...	...	...	...	3·10	1·14
„ Kajang	...	...	...	86·2	75·9	10·3	...	...	...	...	...	4·36	1·18
„ Kuala Selangor	...	...	...	87·6	76·1	11·5	...	...	...	...	...	3·38	1·98
„ Kuala Kubu	...	...	...	91·8	72·2	19·6	...	...	...	...	...	12·28	3·60
„ Serendah	...	...	...	88·8	75·7	13·1	...	...	...	...	...	3·98	1.81
„ Rawang	...	...	...	86·8	74·8	12·0	...	...	...	...	...	4·81	1·45
„ Jeram	...	...	...	...	...	...	...	...	...	...	...	7·59	4·76

State Surgeon's Office,
Kuala Lumpur, 15th October, 1903.

D. J. McCLOSKY,
Acting State Surgeon, Selangor

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for October, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Dry Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·887	141·6	79·6	89·4	69·7	19·7	76·1	·834	73·8	82	S.W.	9·79	2·47
Pudoh Goal Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	9·89	2·51
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	11·58	2·00
,, Klang	...	...	...	84·4	74·6	9·8	...	...	...	...	...	10.32	1·72
,, Kuala Langat	...	...	...	85·3	71·3	14·0	...	...	...	...	...	13·06	2·29
,, Kajang	...	...	...	87·7	73·8	13·9	...	...	...	...	...	11·28	2·11
,, Kuala Selangor	...	...	...	86·7	75·5	11·2	...	...	...	...	...	7·54	2.09
,, Kuala Kubu	...	...	...	89·9	72·1	17·8	...	...	...	...	...	12·69	2·33
,, Serendah	...	...	...	88·8	75·5	13·3	...	...	...	...	...	9·11	1·68
,, Rawang	...	...	...	85·3	73·0	12·3	...	...	...	...	...	8·68	1·10
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	6·85	1·76

State Surgeon's Office,
Kuala Lumpur, 16th November, 1903.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for October, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raub, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bentong ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pekan ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kuantan, ...	...	...	...	86	71	15	...	...	...	...	...	14.95	2.10
Temerloh ...	...	...	...	93	71	22	...	...	...	...	S. E.	5.04	1·22

S. LUCY,
State Surgeon, Pahang.

Kuala Lipis, 31st October, 1903.

Muar.

Abstract of Meteorological Readings for October, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	82	90	71	19	74	...	...	...	...	8·86	1·58

Muar, 1st November, 1903.

ROGER PEARS.

No. 12.] DECEMBER, 1903. [VOL. II.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

PLATES VIII & IX—RUBBER PREPARATION IN THE BOTANIC GARDENS, SINGAPORE.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 12.] DECEMBER, 1903. [Vol. II.

THE CHEMISTRY OF RUBBER,

By P. J. Burgess.

During the last ten years the cultivation of rubber in plantations has become well established in the Malay Peninsula, and the cultivation now bids fair to be of great profit to all interested in it and of indirectly being a distinct step in the development of the resources of the Peninsula.

At the present time many of the trees in the earlier planted areas are of sufficient age for yielding rubber, and I believe that an account of the chemistry of the latex of the rubber, and of the extraction of the rubber from the latex, will prove of interest and use. I shall at first confine myself to an account of the latex and rubber from *Hevea braziliensis* or Para rubber, and then afterwards point out the differences shewn by other kinds of rubber.

The latex when freshly collected is a white or faintly yellow milky liquid with a distinct and pleasing aromatic odour. In reaction it is alkaline and in this it differs from the latices from *Ficus elastica, Castilloa* and others, which are acidic. Under the microscope it is seen to consist of globules floating in a clear liquid. The globules are exceedingly minute being from one to two thousandths of a millimetre in diameter. They are regular in size and are in constant and rapid movement. If the latex be filtered through a sufficiently fine filter—such as, for instance, a Pasteur-Chamberlain filter tube—these globules, which are globules of rubber, can be separated, and the liquid that passes through is clear, pale yellow, alkaline in reaction, slightly sweet in taste, and has an odour very similar to that of the original latex.

I wish at the outset to emphasize this separation of the latex into two parts—the solid or pseudo-solid portion shewn as globules under the microscope, and the liquid menstruum in which the globules are suspended; and the fact may be at once stated that the problem to be solved in the preparation of rubber is to separate this liquid from the solid as perfectly as possible—the liquid carries in solution all those impurities which can possibly be removed in the manufacture of rubber from latex.

The chemical composition of a latex has been stated by LASCELLES SCOTT to be as follows:—

India Rubber	...	...	37·13 per cent.
Albumen	...	...	2·71 ,,
Resins	...	...	3·44 ,,
Essential oils	...	...	Traces.
Sugar ...	...	...	4·17 ,,
Mineral matter	...	...	·23 ,,
Water ...	...	...	52·32 ,,

In the main this may be accepted as not far from the truth, but different latices shew variations in the amounts of the various constituents and the same tree will produce a latex of different proportional composition at different times and the proportios of the constituents will vary with the depth and nature of the incisions made in the tree. This is only what would be expected when it is remembered that tissues other than the laticiferous are cut through during the process of tapping and the cells of each contribute their contents to make up the sum total of the mixture collected. Analyses shewing these variations are being made and will be published as soon as completed.

The constituents of the latex may be arranged into two groups as follows:—

(1) Rubber, Resins, Albuminous matter, Mineral matter. This group makes up the globules which can be microscopically observed in the latex and separated on filtration.

(2) Water with Albumenous matter, Sugar, and Mineral matter, in solution.

This group constitutes the liquid separated in a pure state from the latex by filtration. To separate, in group 1, the rubber from the other constituents appears at present to be a practical impossibility on a commercial scale: the task therefore left for the rubber grower is to separate group 1 from group 2 as perfectly as may be.

If this were done the resulting substance would represent the purest and best possible rubber that could be prepared on the large scale from the latex, and as such it ought to command the best price. As long however, as rubber is bought and sold by the appearance, smell, and strength, as they appeal to the rubber brokers, there is no guarantee that the best price will be given for the chemically pure product.

I propose now to consider briefly the chemical characteristics of each of the constituents of the latex in turn, and then to discuss the processes that now are adopted for the coagulation and preparation of the rubber.

INDIA RUBBER.

Dealing first with the India Rubber itself. This substance in elementary composition is a compound of carbon and hydrogen and belongs to the class of bodies known as terpenes. It may be obtained approximately pure by the solution of crude rubber in benzine, allowing the insoluble matter to settle out, and subsequently precipitating the rubber from the clear solution by the addition of alcohol.

When pure it is practically colourless and is considerably lighter than water.

It is quite insoluble in water and alcohol, which however are absorbed to some extent by the rubber which swells up in consequence. In turpentine, petroleum spirit, carbon bisulphide, benzole, and chloroform, rubber can be dissolved: the ease with which the solution is effected depending largely upon the physical condition and history of the sample. Strictly speaking these solutions of rubber are solutions of the solvents in the rubber rather than solutions of the rubber in the liquids. This property of forming solutions with certain liquids may be of practical use as a rough test for the purity of rubber when ready for the market and may be used to detect any mechanical impurities such as dirt and fragments of bark. It is however, seldom, if ever, that Para rubber can be prepared which will give a clear solution in these solvents, and this is owing to an impurity which is associated with the rubber from the first and which is quite insoluble in the rubber solvent although swelling up and becoming quite conspicuous. This substance, which formerly was regarded as an insoluble form of India rubber itself, has been shewn by WEBER to be quite distinct in character but never to be present in more than a comparatively insignificant amount. If the rubber be masticated, that is, mechanically kneaded and worked, before attempting to bring it into solution, this impurity ceases to appear in the solution owing to the state of minute division into which it has been brought by the mechanical treatment, but though not apparent, it is actually present just as before. If a dilute solution of crude rubber in benzole, one part of rubber to forty of benzole, be allowed to stand for several weeks all this gelatinous bulky insoluble residue subsides into a thin film at the bottom of the vessel and the quantity is then clearly seen to be quite insignificant. To effect this solution of crude dried rubber in benzole or other solvent, is a simple experiment which should be made by all interested in the preparation of rubber—the rubber strips should be put in a bottle with about forty times its weight of benzole, tightly stoppered and shaken at intervals. The rubber will be apparently in complete solution in two days and the nature of the insoluble residue can be conveniently studied. The action of heat upon crude India rubber is well marked; the heating results in a decrease of the elasticity with marked increase of the stickiness of the rubber, as long as the heat is quite moderate and not much above 100° C.: this result is largely to be attributed to the presence of resin and gums which exist as impurity in the rubber. The resins are, in the case of Para rubber, of low melting point, and though the percentage is small, not usually more than 3·5 %, yet the effect of this small amount is most marked. This has an important bearing on the treatment of freshly coagulated and pressed "biscuits" of rubber. Anything in the way of heating to accelerate the drying of the biscuits is to be avoided and increased rapidity must be obtained by the employment of currents of dry air passing over the biscuits which must also be kept as thin as possible if rapid drying is desired. On heating India rubber to a greater extent, it melts and then begin to decompose, breaking down into various liquid products which can be distilled off.

On heating with free exposure to air the rubber takes fire and burns freely. It is not commonly realised how inflammable India rubber is, and to obtain real conviction of this property a small strip of dry rubber should be burnt.

With the majority of chemical re-agents India rubber shews no action, this being a property which it holds in common with many other hydro-carbons. It does, however, re-act with the strong mineral acids, and with chlorine and bromine. Its re-action with sulphur is the most important, if heated with this substance (or if a solution of rubber be treated with sulphur monochloride) the rubber combines with the sulphur and becomes both chemically and physically more inert than before. This process of combination with sulphur is called vulcanisation and after vulcanisation the rubber is no longer soluble in the solvents mentioned, nor, which is more important, does it become sticky on gentle heating, nor brittle when exposed to cold. In fact if it were not for this capacity India rubber possesses for absorption of, and combination with sulphur and consequent change of properties, the India rubber industry could scarcely have developed at all.

The amount of sulphur which can be combined with the rubber in the process of vulcanisation varies from a lower limit of about 3 per cent. to an upper limit of 32 per cent., and the product becomes harder and darker as the amount of sulphur is increased until hard rubber, that is vulcanite and ebonite, results when 20 per cent. of sulphur has been combined with the rubber. Between these limits there is every gradation of product possible.

Towards oxygen and oxidising agents generally, rubber is comparatively inert, but with the oxygen of atmospheric air there is some slight action resulting in the formation of a resinous oxidation product. As might be expected this action in its rapidity depends upon the porosity and condition of the rubber with respect to the amount of surface exposed: with crude rubber, as prepared from the latex, this action in a period of six months appears to be quite negligable, and little fear of deterioration of the rubber during its transport to Europe need be apprehended.

The foregoing account of the properties of rubber is extremely brief, fuller details and a further account of many points not even touched upon, can be found in Weber's Chemistry of India Rubber.

In my next letter I propose to consider the other constituents of the latex and then shall deal with practical methods of preparation of rubber from the latex and the difficulties that are encountered therein.

(To be continued.)

THE CANKER FUNGUS IN RUBBER.

A lecture by Mr. J. B. CARRUTHERS, Government Mycologist, to the Kalutara Planters Association, Tebuwana, Ceylon.

MR. CARRUTHERS' ADDRESS.

Mr. J. B. CARRUTHERS, who, on rising was received with applause, said: Gentlemen, to begin with the history of the disease, I may mention that it was first noticed two years ago by the Assistant Conservator of Forests of the Province of Sabaragamuwa; but it was not till some five months ago that my attention was called to it. Following this various diseased speciments of rubber were sent to me from a number of districts, and, in some of these specimens, I found the nectria or canker fungus. The specimens sent contained mycelium, and, on investigating this by means of cultures, I found spores, which, on scrutiny, showed that they belonged to a species of nectria. I then made inoculations on trees, and that is the only way to prove the guilt of an individual parasitic fungus as the cause of any disease. Nectria grow on apple trees, plum, cacao, tea, etc., etc., and affect and eventually fill many kinds of trees.

After these preliminary investigations had been to some extent finished in the laboratory at Peradeniya, I visited Kalutara and went over some fifteen or more estates, and have seen practically all the rubber estates of any size. The result of this inspection is that the estimated proportion of diseased trees in the Kalutara district is about one in two-hundred or $\frac{1}{2}$ per cent. Yatiporua and Edengoda estates on the other side of the river are not included in this record. If they are included it would about double the percentage and make it over 1 per cent. Yatiporua has about 40 per cent. trees affected by canker and Edengoda 20 per cent. The canker has been there for some years, possibly five or even more. Details of the effects and structure of the fungus will be given in a circular of the Royal Botanic Gardens, so that there is no need for me to take up your time with these. Coming now to observe the aspect of the disease on trees, as a general rule the external appearances on the rubber tree are roughened and swollen places in the stem and branches. These, on cutting off the outer bark, show discoloured tissue, at first a neutral tint colour, and afterwards brownish and claret colour. When shaved the whole of the diseased parts are shown up like an outlined coloured map in the lighter-coloured healthy tissue. When the canker fungus has been growing in such a spot for some time—I cannot definitely say how long, as this depends on physiological conditions—the fruits are produced, at first pink or whitish spores, and later round red fruits like cayenne pepper, which look, on examination under a magnifying lens, like crystallized straw-berries. The structure of these red fruits is the means of identifying the fungus as a nectria. The canker spreads through the agency of the wind in dry weather, by water, and by insects such as red ants which carry the spores on their legs and bodies in their travels over the trees. The only conditions necessary for spores to grow are damp and moisture, both of which Kalutara always has. As regards the general health of rubber in the district it is good, very good, notwithstanding the dropping of leaves, drying back of young branches and irregular deciduity in certain rubber trees. The preventive methods I would recommend are inspection by gangs of coolies, cutting out the canker and the entire excision of affected portions and the burning of all bark cut off and dead branches. The burning of dead branches is a most important matter. Personally speaking I believe—though I am perhaps rather rash to speak on this matter to planters who have practical experience of these things—the best way to tackle a disease like this is not only to look out for this nectria canker disease, but to observe any and all diseases that may arise. With regard to the cultivation of rubber—as also in the case of other products—a regular inspection should be made during a considerable time of the year, so that the moment anything unusual is noticed in the way of disease it can be treated by simple means at the initial stage. As regards the time of the year for observing the disease I think dry weather is the best. You can see it better and also observe the effect of the same. The disease is better seen in dry weather; it is much more easy to spot then than in wet weather. If you cut out a portion of your tree when the weather is damp and moist and leave a small portion of the disease in the area cut out the fungus will struggle on and regain a foothold, but if you did that in dry weather it would completely drive out the fungus. So that there are two reasons to show that dry weather is the best for observing and for dealing with the disease. With regard to the applying of mixtures on diseased parts, there is no doubt that theoretically and practically it is sound, but I have reasons for not recommending this. In my experience the farmers in England and planters out here very often, if any wash is recommended, show a tendency not to carefully cut out any portion of the diseased bark, but to simply smear the bark with the mixture in a general sort of way, and the natural result is that the fungus goes on in its fell work under the wash, so that the treatment is of no avail. If you cut out the diseased portion of the bark and smear the wound with blue stone, the result would be advantageous, that is, if there is no slovenly work done with regard to rubber disease—as in the case of cocoa cultivation—the Tamil cooly can be shown in a very short space of time how to spot the diseased trees. When it comes to cutting off portions of the bark in the trunk or branches there should be no hesitation. The whole of the affected portion is full of the mycelium of the fungus and will not produce latex, so that you are not damaging your tree to any extent by cutting off such portion as is affected. After operation on the affected portion the tree will go on as usual. The rubber tree, gentlemen, has a wonderful power of growing and producing new tissues. Too much importance cannot be attached to this gang inspection. Whenever the bark of the tree is rough, and has a larger corky layer than the average bark I find that where you scrape the bark there is no disadvantage to the living tissues of the tree and it seems probable that they are even stimulated by this treatment and the amount of latex increased. With regard to the production of an abnormal or corky bark it would be well to groom it and see whether there is any unhealthy tissue right behind. There is one thing that I ought to have touched on, viz., with regard to the scare raised by people which your Chairman has referred to; and in this connection some people seemed to be scared on observing rubber trees in some places dropping their leaves.

This dropping of leaves and even branches I think is due to climatic or unforeseen reasons. During the short time I was in this district I saw trees which had previously dropped their leaves and had dead branches on them recovering, producing buds, and pushing on. I am quite certain that this nectria fungus was not responsible for the abnormal dropping of leaf and drying of certain branches. This is a question which I should wish to have gone into rather more fully, but you will understand that, when one has something in hand to deal with, it is better to devote one's attention solely to the point in question. Therefore I have not very closely studied this question to ascertain the exact cause for this dropping of the leaves. I have not found that any typically-diseased trees had dropped their leaves nor had they dead branches. So we may take it that there is no connection between nectria in rubber and any abnormal dropping of leaves, or dying back of branches, which are probably due to an abnormal season or to a tree being in an unsuitable place, or, through some accidental reason, not being able to do so well as its neighbours.

At the conclusion of the address Mr. CARRUTHERS, in reply to questions from the meeting, stated that he did not consider there was anything very serious in canker disease, and although there was no reason to suppose the fungus would not attack nursery plants it was very possible that the smooth bark of the young plant would not induce the spores to settle on it, whereas with a wound on a tree it was possible that the disease would get hold by the spores settling on the wound. Canker in nursery plants would soon show itself by killing the plants: he himself however had only seen the fungus on trees about two years old. He considered that seed from very young trees was quite as capable of producing healthy plants that would resist pest attacks as seed from mature trees.

Canker in a tree did not affect the seeds. The fruit produced on the living portions of a cankered tree would be absolutely good for planting purposes. It was the same with the root, nectria on the bark did not affect it. Even when the bark low down was diseased the root was quite healthy: experiments had been made to induce the canker to grow on the root, without success. Nectria affects the tissues of the bark but not the root. The same applies in the case of seed in which there is absolutely no fungus.

The disease was more likely to make itself apparent in low-lying damp places than on ridges and well-drained land. Swampy land would tend to encourage disease when once it had got hold. Rubber trees were not more liable to pest attacks than other trees, in fact the proportion of diseased trees in the case of rubber is very much less than that of most other cultivated products. The disease could be eradicated by cutting out: a margin of two inches round the diseased portion would be on the safe side.

Overland Times of Ceylon, November 2nd, 1903.

———o———

RAMBONG RUBBER FROM KLANG.

8th October, 1903.

DEAR SIR,—I have to acknowledge the receipt of your letter of the 3rd instant, together with the sample of Rambong rubber referred to therein.

The rubber arrived in excellent condition, showing no signs of deterioration, and it is of very good quality. Its botanical source is presumed to be that of ordinary Rambong, viz., *Ficus elastica*.

A chemical examination of the sample gave the following results:—

Moisture	...	5.9 per cent.
Resin	...	3.9 ,, ,,
Caoutchouc	...	89.7 ,, ,,
Dirt	...	1.2 ,, ,,
Ash (included in dirt)		0.5 per cent.

The amount of resin present is very low for this class of rubber, whilst the percentage of caoutchouc is proportionally high. The specimen is much superior to previous samples of the rubber of *Ficus elastica* examined here, and there is no doubt that consignments of similar quality would be readily sold on the London market at good prices.

The deterioration which this rubber is liable to undergo during transit might be prevented or very much reduced if it were made up into small flat cakes about three-eights of an inch in thickness, and these *thoroughly* dried before shipment. It would probably be found advantageous to pack the cakes in small cases each containing about ½ cwt. of rubber.

I am add that the Imperial Institute does not as a rule undertake investigations unless these are forwarded through official channels, and I would suggest therefore that any further samples which you may desire to send for examination should be forwarded through Mr. RIDLEY, the Director of the Botanic Gardens at Singapore.

I am,
Yours faithfully,
WYNDHAM R. DUNSTAN,
Director.

F. A. GALLOWAY, ESQ.,
Klang, Selangor, Federated Malay States.

PARA RUBBER FROM JOHORE.

The following letter to a well-known Johore planter will be of interest.

"I enclose you a copy of the brokers report on your 8 cases India-rubber ex "Glengarry". The valuations given, will, I am sure be very satisfactory to you. The Rubber is being sold to-day, and probably in a postscript to this letter, I may be able to give you the result.*

"I went down this morning to see the samples put out for buyers' inspection, preparatory to the sale, and I saw the broker's man specially entrusted with this business. He pronounces your Rubber as splendid stuff, nothing could be better, but he is not sure that it is worth while (if it cost more) producing these very thin biscuits, such as a large part of your shipment consists of, and more especially such as you sent home packed in cigar box, by post.

"I enclose a biscuit selected from your own parcel which gives you an idea of what is necessary in the way of thinness; you need not go to the trouble of producing anything thinner than the enclosed. Looking at the sample put out, which fairly represents the whole shipment, I was disappointed to find so much of it "blocked" as we say in the case of Gambier; in other words, there were several lots of some half dozen sheets which had stuck together so firmly that they could not be separated, this of course detracts from the value; of course it is merely sentimental, but still it has the effect of lowering the price, and it occurs to the people here that the biscuits were packed before they were thoroughly dried and that pressure was put on in order to reduce the bulk of the shipment for purposes of freight; thus, being packed in this moist condition, the sheets of rubber have stuck in this objectionable manner. In the same parcel I found a lot of biscuits only partially adhering together, which were entirely separated by a gentle pull.

"It occurs to me therefore that you should give great attention to the *packing* of this stuff, see that the biscuits are thoroughly dried

* For note *vide* page 8.

before being put in the case, and that they are put into the case quite loosely, no weight whatever being placed upon them. The dampness of the rubber in my opinion was evident by the sort of Mould on it, this of course does not affect the quality, being merely external, still, if excessive, it might perhaps do so.

"To show you the want of care in the matter of packing, I enclose you 2 biscuits exactly as they were taken out of the case, you will see that they have lost all appearance of biscuits; one is just a little lump, and the other is nearly as bad. No doubt you will be able to judge how such an appearance could have been produced, were the "biscuits" packed in this form, or were they put into the case in the usual form? I should think that, if they were packed like this, it would have been much wiser to have kept such in a separate case, quite apart from the true biscuits. I am writing you fully on this matter, because, as you know, I am much interested in the success of your operations and because I am fully aware how intensely anxious you are to send us home the best article.

"The price of course, as you know, is extremely high. This is a legitimate rise, due to consumption getting ahead of supply, stocks are down to an extremely low point, never have they been lower. But Para Rubber will be coming in at the beginning of the year, and this must reduce values, during February, March and April more especially later on again, unless the very high prices stimulate production, we should see a return of the present high levels. There is however this danger in these high prices, they will stimulate the search for chemical substitutes to replace India-rubber.

† P. S.—Since writing the above, I am able to advise that the 8 cases of Rubber have fetched 4/9¼, and the Pickings 3/3 per lb."

* Brokers report and valuation on 8 Cases India-rubber.

29th September, 1903.

Per "S. S. Glengarry."

M A

J

8 Cases India Rubber

Grown from Para Seed.

No. 1/8.

8 Cases Fine thin sheet and biscuits, rather dark colour, very slightly sticky: good rubber value per lb. 4/8*d.* abt.

9. I bag (ex case No. 5) Scrap from do., fairly clean and dry, in quantity per lb. 3/7½ abt.

9 pkgs.

Auctions Friday

Good demand.

Figgis & Co.

Photo by A. D. M.

Prepared Rubber from a Para Tree, Botanic Gardens, Singapore.

Photo by A. D. M.

Rubber-preparing Shed, Botanic Gardens, Singapore.

Rubber Preparation in the Botanic Gardens, Singapore.

PLATES VIII & IX.

We give with this number two photographs showing the method of preparation of Para rubber in the Botanic Gardens. Plate VIII shows the shed with table on which are the enamel plates for holding the latex, a muslin strainer on a rattan frame and acetic acid bottle. In front of Mr. MACHADO standing up, is the mangle through which the rubber cakes are passed when set to press them and on the back of the seat is the rubber drying and ready for smoking. Plate IX shows a Javanese holding the rubber collected from 100 trees in the morning. The tree behind him is one of the biggest Para rubber trees in the gardens, planted in 1884.

By an accident the two last plates were numbered 13 & 14 instead of 6 & 7.

PARA RUBBER FROM THE BOTANIC GARDENS.

NEW YORK,

September 30th, 1903.

H. N. RIDLEY, ESQ,.

Director, Botanic Gardens,

Singapore, Straits Settlements.

MY DEAR SIR:—Yours of July 29th, was duly received, enclosing samples of rubber from the latex of the *Hevea Braziliensis.* I would say, that I have not had the product analysed because as far as manufacturers go the analysis means nothing to them. I have, however, had it subjected to physical tests and have secured expert opinion regarding it. I would say, that the rubber is, as far as I can see, equal to washed and dried fine Para of the best quality. It is exceedingly tough and as it has a very small percentage of moisture and no foreign matter in it, it would bring a higher price than the best crude Para now on the market. Were the rubber to be shipped in quantity I would suggest, that instead of sending it in thin sheets, these sheets be pressed into blocks, and thus avoid the rapid oxidation which would otherwise set in.

I want to thank you for sending me these samples as the matter is one in which I am very much interested.

Yours faithfully,

HENRY C. PEARSON,

Editor "India Rubber World."

SALE OF PARA RUBBER.

A small case of Para Rubber obtained from the Botanic Gardens trees was recently sold in London by Messrs. BOUSTEAD & Co. 19 lbs. of Sheet Rubber fetched 4/- per lb. and 2 lbs of scrap realised 3/- per lb.

THE CULTIVATION OF COTTON IN THE FEDERATED MALAY STATES.

EXPERIMENTAL PLANTATIONS,

Batu Tiga, 30th October, 1903.

SIR,—I have the honour to acknowledge receipt of your letter No. Misc. 7402/03 of the 27th instant, enclosing three copies of a paper by Mr. A. S. BAXENDALE, on the Cultivation of Cotton in the Federated Malay States.

2. It is not my intention to criticise this letter, as, like Mr. BAXENDALE, I have not had the opportunity of personally experiencing the conditions prevailing in those countries where the cultivation of cotton is carried out on an extensive scale; but, nevertheless, it is a subject in which I have for some time taken a keen interest, and I trust, therefore, that I may be permitted to venture a few remarks upon the report—which, under the circumstances, will not, I hope, be taken too seriously—and to indicate on what lines the experimental cultivation of this crop should proceed.

3. The first seven paragraphs of the letter under consideration deal with the disposal of the produce, and there can, of course, be no question as to the possibility of finding a ready market, provided that we in the Federated Malay States can compete successfully with other cotton-producing countries as regards the quality of our produce—*i.e.*, colour, length of staple, etc.—while, if selling in a European market, the extra cost of freight as compared with that from the United States and the West Indies must not be overlooked.

4. I gather from Mr. BAXENDALE'S letter that, in his opinion, practically the whole question as to whether the cultivation of cotton in the Federated Malay States would prove a profitable undertaking or not, turns upon the question as to the suitability or otherwise of the climate, with reference to which there are practically no statistics upon which to base an opinion. But assuming that the climatical conditions here could be considered suitable, which personally I very much doubt, remembering that the monsoons are scarcely discernible and that the driest month of one year may be the wettest of the next.* There are several other points having an important bearing upon the question, which the writer has entirely overlooked—*e.g.*, fungoid diseases, insect pests, soils, etc.

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* *N.B.*—The rainfall at Batu Tiga for October, 1902, was over 23 inches, rain falling on 29 days; the rainfall for October current (1st to 28th) is 5.10 inches, 3.30 of which fell on one day.

5. Unfortunately for the cultivation of the plant producing this particular crop, it is very susceptible to disease, and the very humid atmosphere prevailing in this country is peculiarly adapted to the growth of fungi, and I don't think I am overstating the case when I say that I do not remember having examined a single specimen of any species of Gossypium that was entirely free from fungus. Now this is an extremely important question and one that must be constantly fought in countries with a much drier climate than this and where, therefore, the atmospherical conditions are not so conducive to the growth of fungi.

6. The damage done by weevils is touched upon in the letter, and from what I have seen of this and other insects I am convinced that they will prove a most formidable barrier to the successful cultivation of cotton in these States. The risk of danger from both these pests may be considerably minimised by cultivating quick-growing varieties.

7. The character of the soil is another factor of the greatest importance—the cotton plant being somewhat particular in this respect, while the cultivation should be thorough, the fields being prepared much in the same way as for the cultivation of sugar. The land must be kept in a high state of cultivation and it is recommended that cattle be kept and fed on the residue of the cotton seed from which the oil has been extracted, in which case the resultant manure would prove an ideal fertilizer. Mr. HERBERT J. WEBBER, physiologist, in charge of the plant-breeding laboratory in the Department of Agriculture, U. S. A., recently gave it as his opinion that even in the United States it is impossible to greatly increase the acreage devoted to cotton, though much could be done to increase the yield.

8. The available labour supply is also a question that must be seriously considered, and I don't think that Mr. BAXENDALE'S suggestion of growing a variety of cotton that will "be perpetually bearing a few pods at a time" quite meets the situation. Firstly, there would be a large increase in the cost of picking, ginning, baling etc.; secondly, a very large increase in the cost of upkeep; and, thirdly, the liability of loss from disease would be enormously enhanced. In the case of Sea Island Cotton a return may be expected in six to eight months, but if by cultivating a slow-growing variety, the planter must wait, say, two years before getting a return equal to that from Sea Island Cotton in the first year, I think we may safely estimate the increased cost under the heading of upkeep alone at about 25%.

9. It will no doubt be readily conceded, that there is a vast field open for investigation in the cultivation of this product in the Federated Malay States, where hitherto any systematic attempts at cultivation are, I believe, entirely unknown. It does not follow, of course, that the most highly prized variety of cotton in one country will be the most successful in another, even when the conditions are to all appearances identical. Assistance might be ren-

dered by Government by introducing seeds of all the best known varieties of Sea Island, Egyptian, American, Indian and West Indian cottons and distributing them to planters and others who are willing to give the cultivation a trial at a nominal price: also by the introduction of ginning machines and baling presses of the most approved types.

If the natives showed any inclination to take to this cultivation, Government might assist on the lines laid down in my letter on Page 12.

Attention might also be directed to the local varieties of *Gossypium barbadense* and *G. herbaceum* also to *Eriodendron anfractuosum*, an arborescent species which might be planted as a shade tree, and which produces a fibre said to be specially valued for the manufacture of life-buoys.

Much however might be done by planters themselves, who by means of improved cultivation and seed selection should aim at procuring a good staple, an increased quantity of lint, an early cropping variety and a variety immune to disease. The extent to which it is possible to increase the yield by the adoption of scientfiic methods, is shown by the fact that in the United States, although the average yield is only about 190 lbs. of lint per acre, yields, varying from 500 to 800 lbs. per acre, have been frequently obtained on many large, carefully cultivated tracts (*vide* year book of Department of Agriculture).

I am of opinion that Government should take up the experimental cultivation of this product—on a limited scale at first—by starting small experimental plots in different localities, and, by means of selection and hybridization, attempt to raise disease-resisting varieties and improve the quality of the lint and yield per acre; and, if the results were promising, afterwards on a scale sufficiently extensive, to demonstrate conclusively the suitability or otherwise of this crop as an agricultural undertaking to the conditions obtaining here. Then, and not till then, will capitalists be prepared to invest money in its cultivation.

I have, etc.,

STANLEY ARDEN,

Superintendent, Experimental Plantations.

THE FEDERAL SECRETARY,

Kuala Lumpur.

COTTON IN THE STRAITS SETTLEMENTS FORTY YEARS AGO.

Mr. BALESTIER writes in Logan's Journal II p. 149 "Sanguine expectations were at one time entertained of raising Cotton on the island and considerable expense was incurred in giving it a fair trial, but the magnificent reports of coming crops sent to the

Agricultural Society of Bengal and the cheering reports of the London brokers to whom trifling samples had been sent were doomed to a short life for although the cotton plants of almost every known species were tried and grew well still they yielded but few pods and these were for the most part mildewed and consequently not merchantable."

Administration Report 1862-1863 records that "The cultivation of cotton has been carried on on a small scale in the Convict Garden and neighbourhood of the Brick Kiln, the plants appeared to grow most readily and to be perfectly healthy : in many instances however the cotton was destroyed by a small worm by which the pod was pierced before it was sufficiently ripe to be plucked.

"In Province Wellesley several interesting experiments have been made with respect to the cultivation of cotton and though in many instances the trial proved unsuccessful the general result has in some respects been favourable and the idea of introducing the cultivation on a considerable scale has not been finally abandoned. One batch of cotton produced is described by London brokers as being very superior to any samples received from the East Indies and if furnished in parcels of two or three hundred bales likely to sell at high prices, the colour however not white enough the ends of the different flacks having a yellow tinge

In Malacca the attempts to cultivate cotton were only partly successful."

ENCOURAGEMENT OF AGRICULTURE AMONG THE NATIVES.

EXPERIMENTAL PLANTATIONS OFFICE,
Batu Tiga, *19th September, 1903.*

SIR,—With a view to stimulating the interest in agricultural matters among the natives of these States, I have the honour to bring to your notice a suggestion which I would ask you to be so good as to consider.

2. It will, I think, be readily conceded, that agriculture—so far as it concerns the natives—is at the present time in a lamentable condition, and, so far as I can judge, shows little promise of improvement. Having regard to the future prosperity of the country on the one hand, and the favourable conditions in the matter of climate and soil on the other, the present situation is, I submit, worthy of the most earnest consideration of the Government.

3. The question which naturally arises, is, why is agriculture in such a backward state, and to this the general answer is that it is due to the indolence of the natives themselves. Personally I am not altogether in agreement with this view, and after considering the matter as carefully as circumstances would permit during my term of service in this country, I have arrived at the conclusion, that the real cause of the present state of affairs is due, at least to some extent, to :—

(*a*) The inability of the small settler to prepare his product in such a manner as to command remunerative prices,

(*b*) The difficulty experienced in disposing of his produce in the best markets.

The second of these two factors is to some extent dependent upon the first, but the extra cost entailed in making small shipments, the want of accredited agents at the terminable markets—such as exist among European firms, the absence of combination and the ignorance of the native in commercial matters generally, must also be taken into consideration. I may mention that quite recently a case came under my notice where a Malay, after preparing some eight to ten pikuls of sago flour, had to take it personally to Singapore in order to obtain a fair price for it. He might, of course, have disposed of it on the spot to a Chinaman, but at a ridiculously low figure.

4. In support of my contention that indolence alone does not account for the present state of affairs, I would instance the fact—well known to you—that some five years ago, when the cultivation of coffee was considered a remunerative employment, there were many thousands of acres under this cultivation in the Klang district alone; practically the whole of which has been abandoned since the decline in the price of this commodity, and I therefore incline to the belief that if there was a good prospect of a ready market at fair prices, the native would be ready and willing to cultivate his land.

5. This brings me to my proposal, which is roughly as follows:—

(1) Government should, by the aid of a grant, assist in the erection of modern machinery for the preparation on the most approved principles of the particular product or products it is decided to foster;

(2) The person or persons in consideration of such financial assistance would enter into agreement with the Government—furnishing securities—to take the whole of the crop grown on a definite area for a specified term;

(3) The area from which the crop is produced and the number of years for which the agreement holds good—which should not be less than five—would depend on the amount of the bonus;

(4) The cultivator should deliver his crop at the mill and be paid cash for the same *on delivery*;

(5) The market price for the raw product should be fixed weekly by Government and accepted by all concerned.

The above are the salient features of a scheme which I do not for a moment claim to be complete or original, but it is unnecessary here to go into the numerous details.

6. The grant made by Government, whether in the form of a lump sum towards the erection of the machinery or a fixed sum per annum so as to enable the Manager to pay cash for the raw product,

would be an insurance against total failure; and, if the venture proved successful, would be recovered wholly or in part in the form of export duty; although, having regard to the financial conditions of the country and the importance of this subject, I should not regard it as a fatal objection to the proposal if it was attended by the sacrifice of material wealth on the part of Government.

7. Among other crops, the cultivation of which might be encouraged in this manner, I would mention bananas (for the production of flour and fibre) cassava, sago, arrowroot and other starch-yielding plants; ground nuts as a source of oil and oil-cake, castor oil and croton oil, also citronella, cinnamon, lemon grass and other essential oils; the various plants producing the dye and tanning materials of commerce, and, if suitable machinery is forthcoming, ramie, sisal-hemp, bowstring-hemp, and many other valuable fibres.

8. The advantages that would accrue from such a scheme as I have outlined above are: firstly, that the small producer would be assured of a ready market, and knowing it to be under Government control would be induced to avail himself of the opportunities thus afforded for disposing of his produce at fair market rates. I am of opinion that had a central factory under Government control existed in Klang some five or six years ago, when a deal of attention was being paid by small owners to the cultivation of coffee, that not one of those estates would have been abandoned, as the cultivator would have been able to deliver his crop at such a factory and procure cash for the same, for even with the present low price of coffee the Manager, after allowing for a small margin of profit on curing and shipping the coffee, would be in a position to buy the "cherry" at a price which would enable the native to upkeep his estate.

Another advantage to the planting community and to Government indirectly, would arise from the fact that we should be able to place a superior product on the home market when prepared by the aid of modern machinery, which would earn a reputation for the country. In this connection I would remind you of the wonderful strides which are being made in the preparation of tropical products in the hotter parts of America, methods which will no doubt be extended to the Philippines at no distant date, and which will undoubtedly leave the native agriculturist in the lurch.

9. It may be argued that such a scheme as the one suggested would enter into unfair competition with private enterprise, but the fact should not be overlooked that the scheme itself would be to a great extent, the result of private enterprise, tenders being called for in the customary manner.

10. The importance of educating small settlers in the underlying principles of tropical agriculture cannot be over-estimated, though I have very little faith in such procedure at the present juncture, for it is of little avail, I considered, teaching a man how by extra care and trouble he may secure a large crop than his neighbour, if he cannot rely upon finding a market for his produce

when he has obtained it. Such education might, however, go hand in hand advantageously to all concerned with the scheme I have proposed, and the Experimental Plantations Department should be prepared to supply the best varieties of a particular product at nominal prices and give all information respecting its cultivation. Compulsory measures have been suggested to me by one or two prominent Malays and others, but I am of opinion that this would simply result in driving the natives from the soil.

11. Such then is briefly the scheme I have the honour to submit, in the hope that you will give it your kind consideration and take such action as you may deem advisable.

I have, etc.,

STANLEY ARDEN,

Superintendent, Experimental Plantations.

THE FEDERAL SECRETARY,

Kuala Lumpur.

NOTES ON THE ABOVE.

There can be no doubt that in the matter of cultivation by natives, a good deal more could be done than is at present effected.

It is useless to try to induce a Malay to cultivate a crop for which he cannot readily find a market where he can get a good price for his produce. As a rule Malays will cultivate crops at least to some extent where they have a chance of disposing of the produce, and it is not their natural indolence alone that prevents them from doing so. There are many cultivations where little and simple apparatus for preparing the product are required which would be very suitable for Malay cultivation, and which would be certainly taken up by them if they had a chance of a market.

Mr. ARDEN gives a case in which a Malay had a difficulty in disposing of his sago in any way but bringing it down personally to Singapore, and Mr. BAXENDALE, in the last number of the Bulletin gave an instance of a somewhat similar nature in the matter of cotton. I may mention another instance to show the great difficulty there is at present in getting a valuable trade product taken up, and put on the markets in England.

Some years ago an enquiry was made concerning a brush-fibre to replace the Piassava of Brazil, then becoming scarce. The matter was brought to my notice by Mr. BULKELEY (see Bulletin, Old Series, p. 58) who was interested in the business, and was then visiting Singapore. After showing him all likely fibres which could be obtained here, he selected those of the sugar palm *Arenga saccharifera*, known here as Kabong, and Tali hijau, as being well suited in every respect, and was prepared to take large quantities if the fibres were sorted according to size. I therefore induced a Malay to enter into the business, and to procure the necessary quantity. As the man had to travel about to collect the fibre and had no money to start a cleaning and sorting factory, it occurred to me that this work might well be done at the Lunatic Asylum or gaol, so that the Malays could collect and deliver the raw material to one of these establishments which could prepare it for the market at home. Accordingly a quantity was obtained and an apparatus of a simple nature designed for the work, but on the material and apparatus being sent to the lunatic asylum, it was pronounced that the work was too difficult for the lunatics, while the Superintendent of the Gaol on the other hand decided it was too easy for the prisoners. Eventually the Malay lost money in advances to people to collect the fibre for him, and as he had no friends to clean the fibre himself and ship it to Liverpool, the business dropped, nor could I induce any other Malays to take it up. So that the Kabong fibre has not yet found its way into the hands of the brush-makers, as I had hoped it would. In a case like this in which there was a regular demand in England, and a plentiful supply of the product in the Straits Settlements had it been possible for the Government to act as an intermediary between the producer and the buyer a trade of considerable importance to the country on the one hand and the brush-makers on the other might have been established, and when fairly started would doubtlessly have gone on of itself.

Another instance of a somewhat similar kind was afforded by the fibre of the common plant *curculigo* known as Lumbah. This plant has a broad leaf which contains a fibre used by the Dyaks for fishing-nets, and a firm of fibre dealers in England were much struck by the fibre and desirous of obtaining it in quantity, but it was found impossible to get any natives to collect and prepare the fibre, an easy process, because there was no means of their getting the product to the home firms, except at a large preliminary expense which they were unable to undergo.

In such cases of the introduction of a new or almost new product we may hope to be assisted by the Imperial Institute, but it would be necessary for the Government to give assistance to the native in the first instance, to get the trade well started at least.

In respect of minor cultivations too, much could be done by judicious aid, it seems really absurd that we should annually import large quantities of dried chilis for native consumption, when the plant not only grows here with great readiness, but has even run wild in some places.

The position of rice cultivation has been commented on in Rajah BOT'S letter published in Bulletin Vol. I Page 582 and has indeed been the subject of discussion at the Federal conference in July of this year.

The importance of the native population being independent of other countries in the production of their own food-stuffs where possible cannot be over-rated.

In the matter of major products such as Coffee, Tapioca, Sago, Ramie, &c., the native agriculturist should he be in the neighbourhood of a good trade centre or of large estates of European or Chinese planters can often manage to dispose of his produce at a reasonable price, and this will be easier as the Peninsula becomes more opened up by rail and road and more thickly populated, but even in this case there are often difficulties in disposing of the produce.

The energy of the Javanese in Agriculture in the Dutch East Indies contrasts strongly with the indolence of the Malays of the Peninsula, and perhaps this is due in some measure to the overcrowding and consequent competition for the food supply in Java, but it must be remembered that the Dutch factory system has been long in work there, and that the Javanese were practically compelled to become agriculturists, and had a purchaser at hand for their produce so that although the system led to a great deal of hardship at times it certainly produced a nation of agriculturists. It would have been impossible to do this without making it a certainty that the grower could dispose of his produce.

I have so far dealt with the question of the market only, which is the second part of Mr. ARDEN'S scheme, because it will be most important first to get the Malays to cultivate and sell their produce. In many of the minor products especially, but little machinery or expensive apparatus is required, but with some crops it is very different. For the heavy oils, such as those of Ground-nuts, Castor and Sesamum, the machinery may be very simple, unless the manufacture is done on a large scale, and it would be best then for the mills to be erected in one central place, where the cultivators could easily send their produce. Essential oils on the other hand usually require apparatus on the spot, and the cultivation of these by Malay agriculturists would certainly be encouraged by a scheme such as is proposed. But before any grant was voted for special machinery, it would be necessary (1) to make sure that the crop proposed to be grown was one for which there was a good demand, and one likely to continue, and (2) that there were enough cultivators in the district willing to take up the cultivation, and able to supply the mill when it starts work.

If enough agriculturists could be got to take up any such cultivation then the Government might with advantage to itself, and still more to the community erect the machinery and so develop the cultivation. When once this plan proved successful, more cultivators would doubtless join in the cultivation. This system would I think, go a long way towards evolving a nation of agriculturists. There will come a time sooner or later, when the Peninsula will have to depend on agriculture for its main support, and it would be strongly desirable that we should by then have our plant resources sufficiently well exploited to form a means of subsistence for our large population. I may say that I cannot recall at present any country that has attempted to develop its agriculture in exactly the way suggested, though to a certain extent one might compare with the proposed system, the Government Cinchona Plantation in India which have proved so successful, and the Dutch compulsory system alluded to previously. It would be very satisfactory to hear from the various District Officers what amount of cultivation the Malays in the different districts were doing and how far some such scheme as the proposed one would be likely to increase the agriculture.

EDITOR.

FRUITING OF TRAVELLERS TREE.

In the Bulletin for September, I notice that you have heard of no case of the travellers tree (*Ravenala Madagascariensis*) flowering or fruiting in the Straits. It may interest you to know that it did both in the Waterfall Garden, Penang, last year. The seeds were sown, but up to the time I left had not germinated. I thought at the time, and still think, that the seeds were not quite ripe at the time of gathering. In Madagascar this is a most common plant in places near the coast. I have seen it growing in great abundance within a short distance of Tamatave, and in other places. Almost anything from the coast of Madagascar does well in the Straits. Flame of the Forest, is another of the Madagascar things that is largely planted in Penang, as well as in other Malayan countries. Few residents, except those interested in botany, realises how many of the showy plants in their gardens, and by the roadside, are introduced plants, and how few properly belong to the Malayan region

C. CURTIS.

The Editor
AGRICULTURAL BULLETIN.

RAINFALL IN LONDON AND PENANG.

A Comparison.

From every district in the British Isles come reports of excessive rainfall in the present year; but in the metropolis and the Thames Valley the excess has been apparently greater than elsewhere. The following is a comparative statement of the rainfall in London as against that for Penang from 1880 to October, 1903.

The yearly fall is given from 1880 to 1882 and from 1895 to 1902, the average from 1883 to 1902 and the total from 1st January to 31st October, 1903. From the statement it will be seen that Penang is far ahead of London, and the damage caused by our rains is simply nil as compared to London and its suburbs as gathered from the English papers.

But while Londoners and many others have been bewailing rainy skies and frequent down-pours (as we Penangites have written the past 3 months) they, the Londoners, have only to turn their attention, says the British Medical Journal, to another spot in England, Borrowdale, at the head of the Derwent water, below Scaffell, to find a rainfall which many times exceeds that of South Eastern England (and is also in excess of that for Penang). In Borrowdale the amount average rainfall for forty years has been 132½ inches on 216 days) and its "record" is 180½ inches on 256 days. It is quite probable that Borrowdale may this year beat even that "record":—

London.			Penang,	
Years.	ins. cts.		Years.	ins. cts.
1880 ...	30.28	...	1880 ...	75.14
1881 ...	27.92	...	1881 ...	101.60
1882 ...	27.14	...	1882 ...	128.80
1883-1902	28.00	...	1883-1902	112,60*
1895 ...	21.47	...	1895 ...	100.10
1896 ...	23.52	...	1896 ...	133.32
1897 ...	22.86	...	1897 ...	145.62
1898 ...	17.69	...	1898 ...	123.37
1899 ...	22.54	...	1899 ...	125.78
1900 ...	23.28	...	1900 ...	96.75
1901 ...	22.17	...	1901 ...	119.69
1902 ...	20.84	...	1902 ...	85.93
1903 ...	34.55	...	1903 ...	86.75 †

* Average fall. † 1st January, to 31st October.

ERRATUM.

In a letter received November 30th Mr. Norman Grieve points out some errors that have occurred in the report of his speech at the meeting of the Anglo-Ceylon and General Estate Company, as given in the September Bulletin. Page 280 line 36, "new" should be "low" and page 281, line 20, for "Kondesella" read "Arapolakande."

Mr. Grieve further writes, "I may add that the flotation of companies continues briskly, and from what I hear, public confidence in the future of the Rubber Industry is shown by the way in which any reasonable proposition is being subscribed for."

RAINFALL FOR NOVEMBER, 1903 :—

The Government Hill	...	Ins. 16-91
The Prison	...	„ 14-70
Balek Pulau	...	„ 14-09
Pulau Jerejak	...	„ 11-83
The Fort	...	„ 9-68
Lumut	...	„ 10-32
Pangkor	...	„ 15-01
Bruas	...	„ 8-03
Butterworth	...	„ 7-63
Bukit Mertajam	...	„ 7-81
Sungei Bakap	...	„ 6-94

M. E. SCRIVEN,

Assistant Surgeon,
Prison Observatory.

Penang, 12th December, 1903.

MISCELLANEOUS.

Notices to Subscribers.

I. For the information of subscribers and others who have been unable to complete their series of the Agricultural Bulletin of the Straits and Federated Malay States notice is here given that Nos. 1, 7, 8, 9, of the Old Series (1891–1900) and Nos. 1, 8, 9, 10, of the New Series Vol. 1 (1901–1902), the first issues of which have long been exhausted, are now being reprinted, with plates, and will shortly be ready.

II. Subscribers whose subscriptions are still unpaid are requested to send in their subscriptions for the present year as soon as possible. Members of the United Planters Association are requested to send in their subscriptions in future directly to the Editor and not to the Secretary of the Association.

II. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 in order to cover postage.

Meteorological Observers are asked to send in their returns to the Editor, to arrive before the 10th day of the following month if possible, so as to be in time for going to press.

Wanted Nos. 8 & 9 of Vol. 1 (N. S.) of the Bulletin to complete the volume. Address F. B. Manson, Park View, Fytche Road, Rangoon.

SINGAPORE MARKET REPORT.

November, 1903.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	45	25.00	23.00
Bali	410	19.50	18.50
Liberian	215	19.50	16.50
Copra	2,606	8.15	6.75
Gambier	3,174	12.75	11.90
Cube Gambier, Nos. 1 & 2.	185	18.00	15.00
Gutta Percha, 1st quality	...	270.00	200.00
Medium	...	190.00	100.00
Lower	...	120.00	19.00
Borneo Rubber	...	140.00	80.00
Gutta Jelutong	...	7.25	6.75
Nutmegs, No. 110's	...	75.00	72.00
No. 80's	...	128.00	125.00
Mace, Banda	...	190.00	180.00
Amboyna	...	160.00	120.00
Pepper, Black	449	34.00	31.75
White	859	54.00	49.00
Pearl Sago, Small	105	5.65	5.20
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	4,230	4.30	4.25
No. 2	356	1.85	1.60
Flake Tapioca, Small	733	5.25	4.50
Medium	70	4.90	
Pearl Tapioca, Small	505	4.80	4.35
Medium	538	4.80	4.45
Bullet	...	4.25	
Tin	2,510	76.50	71.75

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th November, 1903.

Wired at 2 p.m. on 16th November, 1903.

		Tons Steamer.
To England.		
Tin	from Singapore & Penang to England - and U. K. optional any ports.	1,300
Gambier	from Singapore to London -	30
,,	,, ,, ,, Liverpool-	...
,,	,, ,, to U. K. & / or Continent -	280
,,	,, ,, to Glasgow -	...
Cube Gambier	,, ,, ,, England -	30
White Pepper	,, ,, ,, ,, -	220
Black ,,	,, ,, ,, ,, -	10
White Pepper	,, Penang ,, ,, -	20
Black ,,	,, ,, ,, ,, -	...
Pearl Sago	,, Singapore ,, ,, -	50
Sago Flour	,, ,, ,, London -	140
,, ,,	,, ,, ,, Liverpool-	...
,, ,,	,, ,, ,, Glasgow -	...
Tapioca, Flake	,, Singapore & Penang to England	380
,, Pearl & Bullets	,, ,, ,, ,, ,, -	190
,, Flour	,, Penang ,, ,, -	700
Gutta Percha	,, Singapore ,, ,, -	...
Buff hides	,, ,, ,, ,, -	30
Pineapples	,, ,, ,, ,, cases	1,000
To America.		
Tin	from Singapore & Penang -	120
Gambier	,, Singapore - -	220
Cube gambier	,, ,, - - -	40
Black Pepper	,, ,, - - -	170
,,	,, Penang - - -	...
White Pepper	,, Singapore - - -	20
,,	,, Penang - - -	...
Nutmegs	,, Singapore & Penang - -	1
Tapioca, Flake & Pearl	,, ,, ,, - -	50
Pineapples	,, ,, - - cases	350
To the Continent.		
Gambier	from Singapore to South Continental Ports-	250
,,	,, ,, ,, North ,, -	100
Black Pepper	,, ,, ,, South ,, -	180
,,	,, ,, ,, North ,, -	...
Black Pepper	,, Penang ,, South ,, -	30
,,	,, ,, ,, North ,, -	...

			Tons. Steamer.
White Pepper	from Singapore	to South Continental Ports	10
,,	,, ,,	,, North ,, -	...
,,	,, Penang	to South Continental Ports-	...
,,	,, ,,	,, North ,, -	...
Copra	,, Singapore & Penang	to Marseilles -	150
,,	,, ,,	,, Odessa -	540
,,	,, ,,	,, South Continental Ports - other than Marseilles and Odessa	480
,,	,, ,,	,, North Continental Ports -	600
Tin	,, ,,	,, Continent -	240
Tapioca Flake	,, ,,	,, ,, -	80
Tapioca Pearl	,, ,,	,, ,, -	...
Cube gambier	,, Singapore	,, ,, -	30
Pineapples	,,	,, ,, cases	350
Sago Flour	,,	,, ,, -	380

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,850 tons Gambier
180 ,, Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E. C.

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 30th November, 1903.

Wired at 1.30 p.m. on 1st December, 1903.

To England:—

			Tons Steamer
Tin	from Singapore & Penang	to England - and U. K. optional any ports	900
Gambier	from Singapore	to London -	20
,,	,, ,,	to Liverpool-	30
,,	,, ,,	to U. K. & / or Continent -	180
,,	,, ,,	,, Glasgow -	...
Cube Gambier	,, ,,	,, England -	30
White Pepper	,, ,,	,, ,, -	150
Black ,,	,, ,,	,, ,, -	10
White ,,	,, Penang	,, ,, -	10
Black ,,	,, ,,	,, ,, -	...
Pearl Sago	,, Singapore	,, ,,	20
Sago Flour	,, ,,	,, London -	130
,,	,, ,,	,, Liverpool -	...
,,	,, ,,	,, Glasgow -	...
Tapioca, Flake	,, S'gapore & P'nang	to England -	440
,, Pearl & Bullets	,, ,,	,, ,, ,, -	60

				Tons Steamer.
Tapioca Flour	from Penang	to England	-	1,150
Gutta Percha	,, Singapore	,, ,,	-	40
Buff hides	,, ,,	,, ,,	-	20
Pineapples	,, ,,	,, ,,	cases	1,000

To America:—

Tin	from Singapore & Penang		-	750
Gambier	,, ,,		-	1,500
Cube Gambier	,, ,,		-	70
Black Pepper	,, ,,		-	180
,,	,, Penang		-	20
White Pepper	,, Singapore		-	20
,,	,, Penang		-	...
Nutmegs	,, Singapore & Penang		-	26
Tapioca, Flake & Pearl	,, ,,	,,	-	1,150
Pineapples	,, ,,	,,	cases	350
Sago Flour	,, ,,	,,	-	50

To the Continent:—

Gambier	from Singapore	to South Continental Ports			140
,,	,, ,,	,, North	,,	-	230
Black Pepper	,, ,,	,, South	,,	-	70
,,	,, ,,	,, North	,,	-	70
,,	,, Penang	,, South	,,	-	...
,,	,, ,,	,, North	,,	-	...
White Pepper	,, Singapore	,, South	,,	-	...
,,	,, ,,	,, North	,,	-	120
,,	,, Penang	,, South	,,	-	...
,,	,, ,,	,, North	,,	-	...
Copra	,, Singapore & Penang	to Marseilles		-	420
,,	,, ,,	,, Odessa		-	300
,,	,, ,,	,, South Continental Ports other than Marseilles and Odessa.			240
,,	,, ,,	,, North Continental Ports			1,500
Tin	,, ,,	,, Continent		-	450
Tapioca Flake	,, ,,	,, ,,		-	110
Tapioca Pearl	from Singapore & Penang	to Continent		-	330
Cube gambier	,, Singapore	,, ,,		-	50
Pineapples	,, ,,	,, ,,		cases	1,000
Sago Flour	,, ,,	,, ,,		-	725

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

800 tons Gambier
260 ,, Black Pepper
(in Singapore)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for October, 1903.

District.		Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
				Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis,	...	...	...	...	94	70	18.3	...	...	...	...	...	11·91	2·85
Raub,	...	.	...	...	88	70	14·8	...	...	...	...	...	11·17	2·05
Bentong	...	...	...	...	92	70	18·1	...	...	...	...	...	3·99	1·22
Pekan	...	...	...	...	92	70	15·8	...	...	...	...	...	18·37	2·64
						For November, 1903								
Kuantan,	...	...	...	...	84	71	13	...	...	...	...	...	13·88	5·06
Temerloh	...	...	...	...	93	70	23	...	...	...	...	S. E.	10·82	1·64

S. LUCY,
State Surgeon, Pahang.

Kuala Lipis, 25th November, 1903.

Negri Sembilan.

Abstract of Meteorological Readings for October, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
Seramban, ...	...	...	..	...	...	...	...	...	...	...	...	8·70	2·39
Kwala Pilah, ...	...	...	...	...	...	...	...	...	...	...	...	6·35	3·77
Tampin, ...	...	...	...	...	...	...	...	...	...	...	...	5·90	1·30
Jelebu, ...	...	...	...	...	...	...	...	...	...	...	...	4·82	1·60
Port Dickson, ...		...	...	...	...	...	...	...	...	...	...	7·76	1·50

Colonial Surgeon's Office,
Negri Sembilan, 17th October, 1903.

J. SHEPLEY PART,
Surgeon.

Singapore.

Abstract of Meteorological Readings for the month of November, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·880	130·9	78·8	85·8	73·4	12·4	76·3	·858	74·5	82	N.N.W. & N.E.	10·13	2·12

K. K. Hospital Observatory,
Singapore, 5th December, 1903.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S.

Penang.

Abstract of Meteorological Readings for November, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·901	130·2	79·0	87·1	73·5	13·6	74·6	·776	70·39	74	N.W.	14·70	3·97

Colonial Surgeon's Office,

Penang, 7th December, 1903.

M. E. SCRIVEN,

Asst. Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for November, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Durian Daun Hospital.	29·834	156·7	79·3	89·6	70·2	19·3	81·1	10·35	70·2	94	N.N.W.	8·23	1·77

Colonial Surgeon's Office,
Malacca, 15th December, 1903.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for November, 1903.

Districts.	Mean Barometrical Pressure at 32° Fah.	Temperature.				Hygrometer.			Total Rainfall	Greatest rain-fall during 24 hours.
		Mean Dry Bulb.	Max-imum.	Min-imum.	Range.	Mean wet Bulb.	Vapour Tension.	Humi-dity.		
Taiping ...	149	79·96	91	70·5	20·5	75·77	·838	81	10·38	1·40
Kuala Kangsar ...	...	78·72	91	71	20	75·19	·828	84	9·28	1·45
Batu Gajah ...	159	79·42	93	71	22	75·60	·837	83	5·97	·81
Gopeng ...	...	78·52	91	63	28	75·37	·839	85	10·19	1·44
Ipoh ...	...	78·68	91	72	19	75·73	·850	86	9·71	1·10
Kampar ...	...	...	92	69	23	...	...	...	10·10	1·55
Teluk Anson ...	...	80·20	91	72	19	76·72	·873	85	13·03	3·75
Tapah ...	..	79·78	92	69	23	76·18	·857	85	14·76	1·84
Parit Buntar ...	...	79·80	90	70	20	76·12	·855	84	6.01	1·47
Bagan Serai ...	...	79·36	90	70	20	75·67	·841	83	5·86	2·35
Selama ...	...	80.65	90	72	18	76·81	·870	84	10·94	1·43

STATE SURGEON'S OFFICE,
Taiping, 14th December, 1903.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for November, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Dry Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·886	147·0	79·0	88·6	68·9	19·7	75·7	·827	73·6	83	S.E.	5·91	1·10
Pudoh Goal Hospital "	...	...	...	...	...	...	...	...	...	...	...	5·63	2·23
Ulu Gombah "	...	...	...	...	...	...	...	...	...	...	...	10·11	2·00
District Hospital Klang	...	...	...	83·6	74·3	9·3	...	...	...	...	...	11.24	1·60
" Kuala Langat	...	...	...	84·1	71·1	13·0	...	...	...	...	...	10·54	1·81
" Kajang	...	...	...	87·0	74·0	13·9	...	...	...	...	...	6·13	1·30
" Kuala Selangor	...	...	...	85·7	75·1	10·6	...	...	...	...	...	8·87	3.07
" Kuala Kubu	...	...	...	88·7	72·5	16·2	...	...	...	...	...	11·16	2·02
" Serendah	...	...	...	88·8	75·3	13·5	...	...	...	...	...	12·02	1·44
" Rawang	...	...	...	84·3	73·2	11·1	...	...	...	...	...	0·66	1·66
" Jeram	...	...	...	...	...	...	...	...	...	...	...	7·66	1·60

STATE SURGEON'S OFFICE,
Kuala Lumpur, 15th December, 1903.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Muar.

Abstract of Meteorological Readings for November, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	80	90	71	19	73	...	...	...	...	6·22	1·45

Muar, 1st December, 1903.

ROGER PEARS.