KEW

REPORTS





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REPORT

ON

THE PROGRESS AND CONDITION

OF

THE ROYAL GARDENS AT KEW,

During the Year 1880.

LONDON:
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REPORT

ON

THE PROGRESS AND CONDITION

OF

THE ROYAL GARDENS AT KEW,

During the Year 1880.

Royal Gardens, Kew, January 1, 1881.

SIR,

THE **Number of visitors** (723,681) to the Royal Gardens during the past year is very nearly the same as that of 1878 (the largest hitherto recorded) being only 1,741 less. It is 154,547 in excess of the number for 1879. The falling off in that year, attributable to the inclemency of the weather, has been therefore almost entirely retrieved.

The number of visitors on the Whit Monday, Bank Holiday (61,831) was the largest admitted on any single day in the year.

Bank Holidays.—The following figures give the total numbers admitted during each, and also the numbers of persons who on each occasion entered before 1 a.m.

	Total Number during day.	Number before 1 a.m.
March 29	32,753	2,893
May 17	61,831	4,703
August 2	32,412	1,679
December 27	864	348

It may be interesting to give in one instance (May 17) the figures showing the rate of arrival of the morning visitors:—

From 10–11	887
„ 11–12	1,475
„ 12–1	2,341
Total	4,703

The **Lessons** given **to the young gardeners** in the evening twice a week through about nine months of the year by members of the staff (with the exception mentioned below) have been well attended and continue to give satisfactory results. The demonstrations in elementary meteorology, physics, and chemistry have as before been given in the large room of the Jodrell Laboratory.

The attendance, however, last winter, was more than the size of the room was adequate to, and I hope before next winter to be able to provide more satisfactory accommodation. The lectures upon these subjects were kindly undertaken by Mr. J. F. Harris, B. Sc., F.C.S., to whom I am under obligation for the pains and trouble with which he devoted himself to the careful execution of the duty entrusted to him.

BOTANIC GARDENS.

Preparations are being made for remodelling the **flower-beds in front of the Palm House,** which owing to the wetness of the last three seasons, and to the position they occupy having been originally a swamp, have become water-logged, resulting in the destruction of the box-edging. It is proposed to raise the ground over the whole area, or a considerable portion of it, to do away with the winding narrow gravel paths that intersect the grass plots, and to construct new beds of a simpler and bolder pattern.

Many of the **Specimen conifers** on the mound behind the water-lily house have thriven very badly

and others have been killed by the severity of the winter. The most valuable of these was the oldest and only surviving large specimen of *Pinus insignis*, planted about 1849. These are being replaced by a selection of kinds less likely to be injured by severe frosts.

The cemented **Tank** for hardy **aquatics,** mentioned in the Report for 1879, has answered its purpose remarkably well, and presents a very interesting and attractive appearance in summer.

The **Plant Houses** in the Botanical Gardens are in an entirely satisfactory state, both as to repair and heating, and though tried severely by the unusually long continuance of cold weather with high winds, no accident of any kind occurred in the furnaces, boilers, pipes, or flues. The new apparatus supplied to the Palm House in 1877, continues to hold the first place in point of efficiency and economy of fuel; the whole of the gigantic structure being kept at a tropical heat in ordinary weather by two of the four boilers, together with the small accessory one now provided for the flow and return pipes round the gallery; the whole six were, however, required during several weeks of last winter and the beginning of this, so rapid was the abstraction of heat due to the cold, the wind, and iron work. I have no hesitation in saying that had the Palm House been constructed (like the Temperate House) mainly of wood, with stone or brick piers, an average tropical heat would be provided by two of three boilers, together with a small one to heat the gallery pipes.

The condition of the collection in all the sections of the **New-range** has greatly improved of late. That of economic plants, now a very valuable one, and, indeed, quite unique in point both of numbers and specimens, requires further accommodation, both in height and in space, to render it at all an adequate representation of the vegetable resources of India and our Colonies. The Victoria water-lily in the tank was a failure this year, which is attributed by the curator to the absence of sun-light, as it had flowered profusely every year under the same treatment and in the same tank ever since this was constructed.

In the **Palm House** the whole of the collections have been again re-arranged, an operation of great labour, and frequently needed, owing to the rapid and unequal growth of the plants, and to the fact that in the case of those in the transepts and wings one side of them alone is exposed to the light. Cross alleys have been made in the wings and various of the larger and more umbrageous plants destroyed, with the view of bringing more of the medium sized specimens to the light.

In the **Propagating department** more space is urgently needed for growing on in a better cultural style than has hitherto been possible specimen-plants of tropical species of all kinds. Such kinds as the Mangosteen, Durian, Gutta-percha and others of the Malayan Peninsula and islands require, especially when freshly imported, as well as in their youngest state, a maximum of heat and moisture, and a closeness of personal supervision, which it is impracticable to give them in the houses open to the public. The collections in the economic house and on the shelves of the Palm House must unavoidably become disfigured by the presence of overgrown and worn-out plants which need periodical renewing to keep the general appearance and average condition up to the level which is fitting in a public establishment. Hitherto there has been no accommodation for carrying on work of this kind, the need of which has not failed to strike the eye of every

practical horticulturist who has visited Kew. By a re-classification and structural improvement of some of the existing propagating houses and frames, for which provision has been made in the forthcoming estimates, I trust that at no great expense, at any rate a step will have been made in the direction of this much needed reform.

From time to time the smaller glass-houses at Kew have been rearranged, consolidated, and re-constructed. But no attempt has hitherto been made to re-number them upon a consecutive plan. The houses have in most cases retained their original numbers which had come to possess in many cases a purely arbitrary significance. The Clerk of the Works has accordingly carried out a systematic **Renumbering of the houses**, retaining, as far as possible, those to which long association had familiarized the staff. This will much facilitate the transaction with the Board of all business relating to repairs, as plans have been prepared in triplicate, copies of which have been deposited in the offices both at London and Kew, on which the position of all the houses is marked with the corresponding numbers, which are also conspicuously painted over their doors.

It will be convenient to record here the numbers which the houses containing the several collections now have, those under which they are described in the twenty-eighth edition of the authorised guide being given in brackets with the pages where mention is made of them.

No. 1. Tropical House (No. I., p. 12).

No. 2. Tropical Ferns (No. II., p. 87).

No. 3. Temperate Ferns (No. III., p. 84).

No. 4. Conservatory (No. IV., p. 83).

No. 5. Succulents (No. V., p. 75 [No. 6. Fern propagating pit.]

No. 7. Cape House (No. VI. B., p. 68).

No. 8. Begonia House (No. VI. B., p. 68).

No. 9. Stove (No. VI. B., p. 67.)

No. 10. Victoria House (No. VI. A., p. 45).

No. 11. Tropical Economics (No. VI. D., p. 49).

No. 12. Temperate Economics (No. VI. D., p. 49).

No. 13. Tropical Orchids (No. VI. C., p. 70).

No. 14. Temperate Orchids (No. VI. C. p. 70).

No. 15. Waterlily house (p. 21).

The following houses (as well as No. 6) are not open to the public:

No. 16. Orchid propagating pits.

No. 17. Tropical propagating pits.

No. 18 and No. 19. Conservatory reserves.

No. 20. Conservatory forcing house.

No. 21. Succulent reserves (formerly Cinchona house).

No. 22. Bulb house.

The following **Plants of special botanical interest**, amongst others of less importance, have **flowered** during the past year in the Royal Gardens:—

Acacia sphærocephala, Cham. and Schl.
Acrotrema lyrata, Thw.
Agave Hookeri, Jacobi.
„ *univittata*, Haw.
Albuca Wakefieldii, Baker.
Angræcum Scottianum, Rchb. f., sp. nov.
Anthrophyum cayennense.
Anthurium parvum, N. E. B.; sp. nov.
Aristolochia Goldieana, Hook, f.
Begonia socotrana, Hook f., sp. nov.
Bredia hirsuta, Bl.
Bryonia laciniosa, Linn.
Burbidgea nitida, Hook f.; Bot. Mag. 6403.
Calandrina nevadense, A. Gray.

Cereus Fendleri, Engelm ; Bot. Mag. 6533.
Chlorophytum macrophyllum, Asch.
Crinum Balfourii, Baker, sp. nov.
Curcuma leucorihiza, Roxb.
Cyphia, sp. nov.
Dipcadi Balfourii, Baker, sp. nov.
„ *hyacinthoides*, Baker.
Eichornia (*Pontederia*) *azurea*, Kunth. ; Bot. Mag. t. 6487.
Eria meirax, Rchb. f.
Erigeron multiradiatus, Benth. ; Bot. Mag. t. 6530.
Eriospermum brevipes, Baker.
Gentiana ornata, Wall. ; Bot. Mag. t. 6514.
Hæmanthus, sp. nov.
Hechtia, sp. nov.
Hibiscus schizopetalus, Hook. f., sp. nov. ; Bot. Mag. t. 6524.
Huernia, sp. nov.
Impatiens bicornuta, Wall.
Ipomæa Mulleri, Benth.
Lacæna spectabilis, Rchb. f. ; Bot. Mag. t. 6516.
Lansbergia caracasana, Vr.
Lysionotus serrata, Don.
Melianthus Trimenianus, Hook. f.
Milletia megasperma, Muell.
Monolophus (*Kæmpferia*) sp. nov.
Monolophus (*Kæmpferia*). sp. nov., aff. *K. angustifoliæ*.
Nerine filifolia, Baker, sp. nov.
Pellionia Daveauana, N. E. B., sp. nov.
Peucedanum, sp. nov.
Phœdranassa, sp. nov.
Pelea crassifolia, B. E.
Plagianthus pulchellus, A. Gray.
Ruellia Portellæ, Hook f., sp. nov. ; Bot. Mag. t. 6498.
Salvia hians, Royle ; Bot. Mag. t. 6517.
Satyrium nepalense, Don.
Schismatoglottis, sp. nov.
Scilla socialis, Baker.
Scilla tricolor, Baker, sp. nov.
Sedum retusum, Hemsl. sp. nov.
Sedum parvum, Hemsl, sp. nov.
Solanum, sp. nov.
Stapelia, sp. nov. (Barkly, No. 64.)
Stapelia, sp. nov. (McOwan).
Tillandsia angustifolia, Baker.
„ *distachya*, Baker, sp. nov.
Wormia Burbidgei, Hook f., sp. nov.
Zingiber Cassumunar, Roxb.

The Arboretum.

General works.—The plantations on the islands in the lake, which were suffering from overcrowding have been thinned, and more deciduous Cypresses planted round their margin.

The shrubberies, &c., along the path parallel to the Richmond Road have been extensively thinned, reduced and replaced by grass with a skirting of shrubs and evergreen oaks planted along the wall.

The western slope of the mound by the Ruined Arch has been cleared of its rugged growth of trees and shrubs ; one face of it has been planted with a clump of seven Araucarias, and another with a clump of Cryptomerias. Many loads of soil have been carted on to it to improve its appearance from the ground around. The dead cedar has been moved from opposite the lodge and replaced by a *C. atlantica*.

All the plantations and shrubberies round the Pagoda and from the Richmond Road entrance to the Cupress collection have been thinned ; but there is still a great deal that should be done in digging these plantations and improving the skirting of laurels and privets, and which are in a very bad condition.

A number of interesting flowering shrubs have been introduced at regular intervals along the skirts of the shrubbery bounding the deer park, and tickets are being prepared

for them. A line of Laburnums have been planted all along in the shrubbery.

A group of Araucarias has been planted in the mounds towards the southern end of the collection of Rosaceæ, where the old Cedars are breaking up and will have to be replaced by young ones.

The shrubberies in the Sunk Garden near the Museum Gate have been thinned.

It has been found necessary to enclose with a fence the **Great beech** tree that stands in the Arboretum near the end of the Cedar vista from the Palm House. The lower branches which sweep the lawn and form a circle of 108 yards in circumference, and which are now rooting into the ground, and thus tending to lengthen the duration of the parent, were being much injured by visitors running amongst them and breaking them. This is, perhaps, the finest beech within the same distance of London in respect of size and symmetry, though the girth of trunk is only $11\frac{1}{2}$ feet at 4 feet from the ground.

The Arboretum suffered very much through the **Frosts** and gales of **last winter** and the premature snow of the month of October, which falling on the old and brittle oaks, laden with foliage and with an unusually heavy crop of acorns, in many cases so broke them up that they will have to be removed. Of other trees damaged, some young Liquidambars were the most so. The great White Lime in the old Arboretum of the Botanic Gardens (to the left of the broad path leading from the main gates) had its top branches broken, and others being already quite dead, it is evident that it too is on the eve of breaking up.

The more important trees and shrubs in the Arboretum that suffered from the inclemency of the winter, are the *Pinus insignis*, of which few remain alive, *Abies bracteata*, of which one plant is uninjured and two severely hurt. Of *P. muricata* three fine plants were killed, as is *P. Elliottii*. Of *P. Sabiniana* most of the plants are browned more or less. Some of the more tender Hollies lost many of their leaves. The Hydrangeas, Escallonias, and Cistuses were for the most part killed, and Arbuti a good deal hurt. The actual damage done by the last cold winter is far less serious than what may be expected to result from its being followed by so cold and wet a summer as last was, during which the wood did not ripen well, consequently leaving very many plants quite unfitted to resist the effects of even an ordinary second winter.

Collections of trees and shrubs.—Great progress has been made in the arrangement of the classified collection of trees, especially the transplanting of the oaks from the beds near the mound at the end of the Sion vista is completed. The species and varieties of Spanish Chesnut, and Beech now also occupy both sides of an avenue 500 yards long, which runs parallel to the Sion vista and on the north of it. The collection of nuts has been planted in beds on each side of a short avenue 60 yards long, which branches off from the junction of the Spanish Chesnuts and Beeches, and runs to the large Magnolia in the centre of the old Azalea beds. Passing thence through the Azalea beds the collection of Hornbeams commences, and forms a curved avenue 190 yards long, leading northwards to the Poplar collection. The beds of Azalea, Vaccinium, and Heath which are very much worn out will be attended to next year.

The collection of Planes has been arranged (55 yards) along both sides of the walk leading from the Sion vista to the Rhododendron dell by the river. The Alders have been re-arranged round the east end of the lake.

The number of species and varieties in these collections is given below and there are several (and in most cases three or more) specimens of each. The positions which the majority occupy are permanent ones; but it is impossible to foretell that this will be so in the case of all; for the rate of growth being very different in different specimens of even the same variety of trees, some will no doubt require to be transplanted for their own full development, or that of their neighbours. Though all are forest trees, a small proportion only can be expected to obtain full dimensions as such; many, even of the most distinct and most desirable for the embellishment of parks, &c., or the most interesting in a scientific point of view, being sports that have originated under cultivation, or appeared as solitary specimens in a native state; such can be increased and perpetuated only by grafting, and of such grafted varieties few attain the dimensions of trees.

The collection of Birches has been added to and the area it occupies extended by the formation of a short avenue (105 yards long) which branches off from the right of the walk leading from the Brentford Gate to the Botanic Gardens, and, crossing the collection of Poplars leads into that planted with Hornbeams.

The Poplar collection is being similarly extended by a branch from the Hornbeam one which will lead to the entrance to the Botanic Gardens from the path to the Brentford Ferry.

The collection of Hickories, Walnuts, and Pterocaryas has been extended northwards along the walk by the Richmond Road; and specimens of the less common Privets have been planted between the large trees.

The collection of Vines has been removed to a long bed prepared for them facing the western slope of the mound over the ruined arch.

The *Celastrineæ*, *Rhamneæ*, and *Terebinthaceæ*, the specimens of which were overcrowded and injuring one another, have been all placed in new beds, and occupy four times the space they did. The positions the species now occupy are for the most part permanent, and future extension for new kinds can be provided for by forming beds behind.

The *Rhamneæ* are planted in two rows, occupying beds 44 yards long.

The *Celastrineæ* are planted in two rows occupying beds 60 yards long.

The *Terebinthaceæ* are planted in three rows, occupying beds 40 yards long.

The Vines are planted in one row, occupying beds 75 yards long.

In the Pinetum no change has been introduced beyond removing the specimens killed by the frost. The *Cupressineæ* will, however, immediately want attending to, their overcrowded condition being most detrimental to their health and appearance.

I have again to record the warm interest shown in the Arboretum collections by the principal nurserymen of the United Kingdom the Continent and the United States, and the liberality with which they continue to present plants and seeds of rare trees and shrubs.

Estimate of species and reputed **varieties** now in Arboretum:

Oak - - -	220
Chestnuts - -	24
Beech - - -	34
Hornbeam - -	17
Planes - - -	12
Alder - -	24

A **Catalogue** of the **arboretum** in is preparation which will give the names of the principal species and varieties with their native countries and synonyms.

Supply of trees for London parks. — During the past year 3,669 trees and shrubs of various kinds have been supplied for the London parks under the direction of H.M. Office of Works besides upwards of 300 clumps of herbaceous plants. Permission having been given by H.M. Office of Works to the residents to plant the Mortlake Road, the necessary trees have been supplied by the Royal Gardens.

Interchange of Plants and Seeds.

The receipts have been during the past year 3,513 living plants of all kinds, and 2,752 packets, bags, and boxes of seeds from 226 contributors. They are classified as follows:—

——	Ward's Cases.	Packets of Seeds.	Stove and Greenhouse Plants.	Herbaceous Plants.	Trees and Shrubs.	Number of Contributors.
Britain - -	—	210	840	448	226	139
Continent -	—	934	209	104	182	21
Asia - -	12	718	529	1	—	23
Africa - -	2	247	58	—	—	13
America - -	21	330	693	7	—	21
Australia and New Zealand.	3	313	81	135	—	9
Total -	38	2,752	2,410	695	408	226

Chinese varnish-tree. — In Dr. Bretschneider's notes on some botanical questions connected with the export trade of China (pp. 10 and 11) it is remarked that "it is "generally accepted by authors "writing on Chinese varnish that "it is produced by *Rhus verni-* "*cifera*, the Japanese varnish tree." The Chinese varnish tree is found in the provinces of Chê Kiang, Kiangsi and Sze-chuen. According to Bretschneider the figures of the tree in Chinese botanical books do not at all resemble *Rhus vernicifera*.

I learn from Mr. H. T. Murton that a Chinaman at Singapore has about forty acres planted with varnish trees. Specimens sent to Kew prove that it is *Aleurites vernicia* (=*A. cordata* and *Elæococca Vernicia*).

Seeds of this plant had been previously obtained through a correspondent from Sze-chuen, and have been distributed to Ceylon, Demerara, Dominica, Jamaica, Washington (Department of Agriculture) and Zanzibar. Dr. Kirk reports (September 9) from the last-mentioned place that the seeds "are "all a foot high, and I am planting "them out."

Cinchona Ledgeriana. — The extraordinary richness in alkaloids which has been evinced by selected strains of this *Cinchona* under the skilful management of the Dutch Government plantations in Java (see *infra*, p. 32) has naturally attracted the attention of planters to the importance of cultivating it, as other kinds of Cinchona would necessarily stand a poor chance with it in commercial competition. A very large number of applications has been addressed to Kew for a supply of seed. This has been

partially responded to, partly through the courtesy of the Dutch Government, and partly by a supply from the Indian Government plantations in Sikkim.

Ceylon.—In 1876 some seed was received at Kew from Java, and part of this was communicated to Mr. J. F. Howard, F.R.S., who raised seedlings. He carefully selected the most promising of these (an illustration is given of one in the Gardener's Chronicle for October 11, 1879, p. 457 which by the courtesy of the proprietors I am enabled to reproduce) and very kindly supplied Kew with cuttings both of the figured and of another selected plant in the course of last year. Three of the rooted cuttings were given to Mr. J. H. Campbell, of Lindoola, Ceylon, who was anxious to have a perfectly authentic strain. He writes (December 16) respecting them:—"You will "be glad to hear that I have "arrived safely in Ceylon with the "Ledgeriana plants, the large one "Mr. Howard gave me is not "looking very well, but will be all "right in a few weeks. Two of "the three cuttings you struck at "Kew are throwing out new leaves. "The other is dead at the top, but "looks as if it was going to burst "out below. So I hope before the "middle of January that they will "all be doing well.

"I am glad to be able to tell you "that the Ledgeriana plants here "on our estate "Conon" are doing "uncommonly well, and as far as I "can judge, they seem to be grow-"ing faster than officinalis, and "I'm not sure that they do not "grow faster and girth as fast as "succirubra. Unfortunately Mr. "Moens from Java, when in Cey-"lon, had not time to come and "see our clearing, but saw some "20 plants which my brother sold "to Mr. Downall and pronounced "them to be the right kind.

"I have not had time to go round "the country yet to see what "Ledgeriana's there are, but from "all I can hear, our clearing of 25 "acres, with about 25,000 plants, "is the largest in the Island, and "of the best sort. There are great "varieties in the leaves. These "25,000 were raised out of only "two ounces of seed which my "brother and I planted with our "own hands. There may be more "than 25,000 as I have not had "them counted yet, but I know "from the acreage, and the distance "planted and the few vacancies, that "there are at a very low estimate "indeed, 1,000 plants an acre."

Jamaica.—Three other plants propagated at Kew from the same authentic strain were sent to Jamaica. Mr. Morris reported (September 22) that he was "delighted "with their fine healthy condition." He further reported, "They measure "(December) respectively 12, 16, "and 18 inches in height." He remarks on the importance of the acquisition, seeing that Ledgeriana bark from Java has been sold at 17*s.* per lb.

Nilgiris.—Mr. Shubrick writes from Greenway, Ootacamund (December 21) a private letter in which there is much interesting information on the local Cinchona culture:—"The Ledgeriana seed from "Java reached me quite safely. I "sowed it very carefully in the "open air, and both beds, for I "kept the packets distinct, ger-"minated well, but very slowly. "Several of my neighbours got "packets from Mr. Moens, the "Government Gardens at Neddi-"vattum, and the Liddellsdale "Company large packets; both "had glass houses and their plants "did well, though my beds gave "infinitely more plants. In July "last year the largest was not an "inch high, as I have no glass "house to grow them in, and many

[*From* THE GARDENERS' CHRONICLE, 1879, *Vol.* XII., *p.* 457.]



CINCHONA LEDGERIANA.

[*From* THE GARDENERS' CHRONICLE, 1879, *Vol.* XII., *p.* 457.]



" rotted owing to the heavy mon-
" soon rain, so I parted with them
" to a friend in the Ouchterlony
" valley, who was a skilled gar-
" dener and has a forcing house.
" I heard to-day that he has done
" well and that from the weakly
" stunted seedlings he got from me,
" he has fine sturdy plants a foot
" high. The Government got some
" seed years ago, but all their
" experiments go to prove that the
" hills are too cold for the Calisaya.
" It is certainly too cold to raise
" them from seed in the open air,
" but I have several Calisaya
" growing well, two and three years
" old.

" I wrote to Mr. Moens, and
" asked him to send me, if he
" could not spare Ledgeriana, a
" packet of Calisaya seed, and this
" he very kindly did in January
" last, and now I have several
" thousand common Calisaya seed-
" lings not an inch high in pots.
" These I intend to stick to, as I
" hope to get a small glasshouse
" out from home in the spring, and
" propagate by cuttings in heat.
" Up to this time no one has grown
" Calisaya well. On the hills the
" Government trees died when
" barked. In Wynaad men are
" clamouring for Calisaya, Led-
" geriana if possible, but anyway
" Calisaya. There are so many
" applicants that I have little hope
" of getting Ledgeriana seed from
" Mr. Moens. I saw Mr. Cross
" here soon after he had brought
" out the Calisaya de Santa Fé.
" The plants looked strong and
" healthy. I believe, from what
" Mr. Cross said, the kind will do
" here, but not in Ootacamund.
" He said the habitat is the Canons,
" high up the Andes, where,
" though near the snow-line, there
" is always a hot wind from the
" plains. Ootacamund is the
" centre of the hills. Round the
" Ghauts might be found suitable
" spots for it. I have here at
" Greenway 80,000 odd trees of
" *C. Condaminea* in various stages
" of growth. I went to the
" Government gardens, and saw
" the eight or ten year old Led-
" geriana trees, some dead, others
" dying. Up here they will not
" renew their bark, and conse-
" quently die. The Calisaya,
" ordinary variety, too, in the
" gardens does not throw up a
" straight stem, but forms a bush
" rather than a tree. The Led-
" geriana forms a tree, certainly,
" and thrives till barked. My
" Condamineas are growing well.
" Many are 10 feet high now,
" planted in 1877. In four years
" time they ought to be ready for
" barking.

Coca.—Applications have been made to Kew from several colonial botanic gardens for plants of *Erythroxylon Coca*. During the past year it has been sent to Brisbane, Jamaica, Trinidad, and Zanzibar. Mr. Walter Hill, Botanic Gardens, Brisbane, writes to me (November 19) that the plants sent to him are doing well, and, at the date of writing, " now " in full flower." Mr. Morris reports from Jamaica that the " plant received from Kew during " the past year is doing well."

Cocoa plants for eastern colonies.—Mr. Horne, the Director of the Mauritius Botanic Garden, having visited Fiji, at the instance of the Governor Sir A. H. Gordon, reported to the Colonial Office that it was peculiarly desirable to introduce into the islands as well as the eastern Colonies " the twelve or thirteen superior " varieties of the Cocoa plant in " cultivation in Trinidad." Arrangements were accordingly made, and in the course of last autumn seven wardian cases of cocoa-plants

were received from Trinidad at Kew in excellent order, and, after examination and repacking, transmitted to Ceylon, whence it was arranged that portions of the collection should be sent on to Singapore and Fiji respectively. The transmission to Ceylon was fairly successful, and Dr. Trimen has since made the distribution. Individual planters in the East have already largely supplied themselves with Cocoa-seed from Trinidad. It was thought that it would be advantageous, however, to have in the Botanic Gardens of the Colonies above mentioned standard collections of varieties for future observation and experiment. In an official report on the subject, Mr. Prestoe, the Government botanist at Trinidad, remarks:—

"The best kinds are by no means "well known. Indeed, with the "majority of *growers* here they are "not known at all, and they never "notice a difference in the character "of the trees nor that of the sample "of produce, except in respect of "the Calabacillo or 'wild' cocoa, "and this they very rarely elimi-"nate. In the whole range of "varieties, however, there is a "difference in the value-yield of "at least one to five. Under these "circumstances, the value of the "cocoa plants now forwarded "should be regarded as of rather a "botanical or scientific nature than "as an agricultural or economic "one for immediate effect, for the "varieties being separated and "described as far as it is practical "to have them, there is a base for "experiments and tests as to what "are their real characters and what "may be done with them in the "way of improvement."

Cola nut. — Acting Administrator Berkeley reports from the Gambia (September) upon the West African trade in this singular product:—

"The import of cola nuts was "108,000 lbs. more than in 1878. "On the other hand, the export "was 58,000 in excess of the "export in 1878. The trade in "Cola nuts is an attractive feature "in the commerce of the Gambia. "The Cola nut is the product of "the Sierra Leone district, and the "trade in it, both at Sierra Leone "and the Gambia, is almost entirely "in the hands of women, to a large "number of whom it affords the "means of livelihood, and in many "instances the acquisition of con-"siderable wealth. The nut is "largely consumed by the natives "of the Gambia. It is of a bitter "taste, and produces no exhilarating "effect, but is said to possess the "power of satisfying for a consi-"derable time the cravings of "hunger. For this purpose, how-"ever, it is much less used than it "is as a luxury. The trade in "the article is rapidly increasing.

	lbs.
"In the year 1860 the "import was about -	150,000
"In the year 1870 the "import was about -	416,000
"In the year 1879 the "import was about -	743,000"

The trade in Cola nuts has also spread to Central Africa, and even to the African shores of the Mediterranean.

Cola nuts are the seeds of a tree *Cola acuminata* belonging to the natural order *Sterculiaceæ*; 6–12 are contained in woody pods, 3–6 in long, of which five or less are produced by each flower. Like olives they are said to enhance the flavour of whatever is eaten after them. But what is more important the nuts are said, as stated by Administrator Berkeley, to have the power of staying for even a prolonged period the cravings of

hunger, and of enabling those who eat them to endure prolonged labour without fatigue. *Cola acuminata*, in fact, plays the same part in tropical Africa that *Erythroxylon Coca* does in South America. The plant has been introduced into tht West Indies, and Mr. C. S. Salmon, late Chief Civil Commissioner in the Seychelles, suggested to us that the nuts would no doubt be valued in the Indian Ocean. The plant has, therefore, been propagated at Kew, and has so far been distributed to the Botanic Gardens of the following places: Calcutta, Cambridge (United States), Ceylon, Demerara, Dominica, Mauritius (for Seychelles), Sydney, and Zanzibar.

Columbian barks. — With regard to the plants of the Calisaya of Santa Fé, with which the late Mr. Biermann reached Ootacamund (*see* Kew Report, 1879, p. 13) I have received a copy of a report from Mr. Jamieson, the superintendent of the government botanical gardens at that place. It appears from this that the six plants have all died "notwithstanding that the utmost "care was bestowed upon them. . . "The four most sickly plants died "before Mr. Biermann left Ootacamund, and one of the two stronger "looking plants died shortly afterwards. The remaining plant "never made a start, but continued "in the same state in which it "arrived up to the end of February, "when it suddenly shrivelled at "the collar and died."

It was decided by the India Office on the receipt of this news that Mr. Cross should take out three of the plants remaining at Kew in his personal charge. He accordingly started September 8th with these and a case of plants of Carthagena bark. Mr. Cross accomplished his journey safely with the plants in his charge and reported (October 27th) from Ootacamund that they were "progressing very satisfactorily and "may now be regarded as perfectly "safe." Under the instructions of the Secretary of State a fourth plant was presented to Mr. Howard as some slight recognition of his services to quinology.

Jamaica.—Mr. Morris writes with regard to Carthagena bark:—"I am "glad to be able to report that the "plant so kindly presented to the "Government of Jamaica at the "request of Kew, has been the "means of thoroughly establishing "this species in the island. Early "in 1880, a number of good plants "were successfully raised by Mr. "Nock from cuttings, and five are "already planted out in their permanent places; some at 5,000 feet, "and others at 5,500 feet and all "are apparently doing well."

Sikkim.—Of the plants of Carthagena bark sent under Mr. Biermann's charge to Darjeeling, Dr. King reports (November 11):—"You will "be glad to hear that the four "plants of the Cinchona yielding "hard Carthagena bark, which Mr. "Biermann brought out from Kew "last January, have been increased "to 250. The species offers to be "very hardy and strong growing, "but Mr. Gammie says red spider "has taken a great fancy to it. "This may be a serious drawback."

Elephant sugar-cane.—Plants of this variety of the sugar cane originally obtained through the Botanic Gardens, Singapore, from Cochin China (*see* Kew Report, 1876, p. 25) were sent to the Botanical Department, Jamaica. Mr. Morris reports them as "growing "vigorously at the Castleton gardens." Plants were also sent to Sir Thos. Graham Briggs, for the Island of Nevis.

Fodder plants.—1. Caapim de Angola.—At the suggestion of Sir Ferdinand von Mueller steps were taken to obtain from Brazil a supply

of seed of this grass. Originally introduced by the Portuguese from Angola it is said to be much cultivated in Brazil where it yields the best and most copious produce of any fodder grass, the stems being from six to seven feet in height. Through the courtesy of Senor A. Glaziou, the director of the public gardens at Rio de Janeiro a copious supply of seed was obtained which has been widely distributed.

From the reports of several correspondents there is reason however to apprehend some error or confusion as to the identity of the grass sent. The Caapim de Angola is the *Panicum spectabile* of botanists, but is probably nothing more than a very luxuriant form of the well-known and widely dispersed *Panicum Crus-galli*. Dr. Trimen finds that what he raised from Senor Glaziou's seed was "merely our well-known and "long-cultivated 'Mauritius grass,' "(*P. sarmentosum*, Roxb. = *P. "barbinode*, Trin.)." He remarks:— "It is curious that this same grass "(professedly) was sent from Brazil "here many years ago to Gardner, "and he states in his report for "1845-6 that it turned out to be "'Guinea grass' (our other com- "monest fodder) by some mistake "of the sender." The Agri-horticultural Society of Madras state (November 3) that "the seed closely "resembles that of Guinea grass."

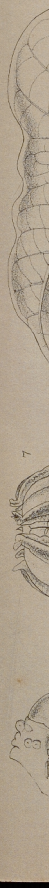
Mr. Morris reports from Jamaica that the grass sent "is found to be "indigenous to the Island and to "provide a good 'low-bite' in many "districts." The discrepancy which has also been noticed by Sir Ferdinand von Mueller has been pointed out to Senor Glaziou and the remarkable energy and courtesy of this valued correspondent leave no room for doubt that we shall eventually be in possession of and able to distribute the authentic kind.

2. TAGASASTE.—*Adelaide.*—Dr. Schomburgk reports:—"The seeds "have grown uncommonly well, "the plants reaching a height of "four to five feet. There is not "the slightest doubt that this plant "delights not alone in our climate, "but in any kind of soil and situa- "tion . . . . . I do not doubt "a moment that this shrub if sown "on the sheep runs, naturally well "covered with soil, will soon "become acclimatized, and will "stock the runs with a new fodder "plant."

Brisbane.—In these gardens the seed germinates freely in the open air, but makes but little progress in its subsequent growth.

3. TEOSINTE.—*Adelaide.*—Dr. Schomburgk reports:—"I have "now cultivated it for the last "three years, and no doubt it is "one of the most prolific fodder "plants. Notwithstanding the pre- "vailing dryness of the two last "summers, the hot winds did not "injure it, the plants not showing "the slightest effect on their leaves, "which preserved their healthy "green while the blades of the "other grasses suffered materially. "The habit of throwing out young "shoots is remarkable to the "number in some plants, especially "such as stand in a moist situation "of 50 to 60, with a height of five "to six feet. There is one draw- "back. The plant, as I have "already remarked, being essentially "tropical in its habits, the ripening "of the seed crops will be proble- "matical with us, as early frosts "will kill the plant."

Jamaica.—Mr. Morris reports:— "Treated as a garden plant, the "*Euchlæna* has grown well at "the Castleton Gardens, but "sufficient experience has not yet "been obtained to express an "opinion whether it will prove "generally suitable as a fodder "plant. A good crop of seeds has

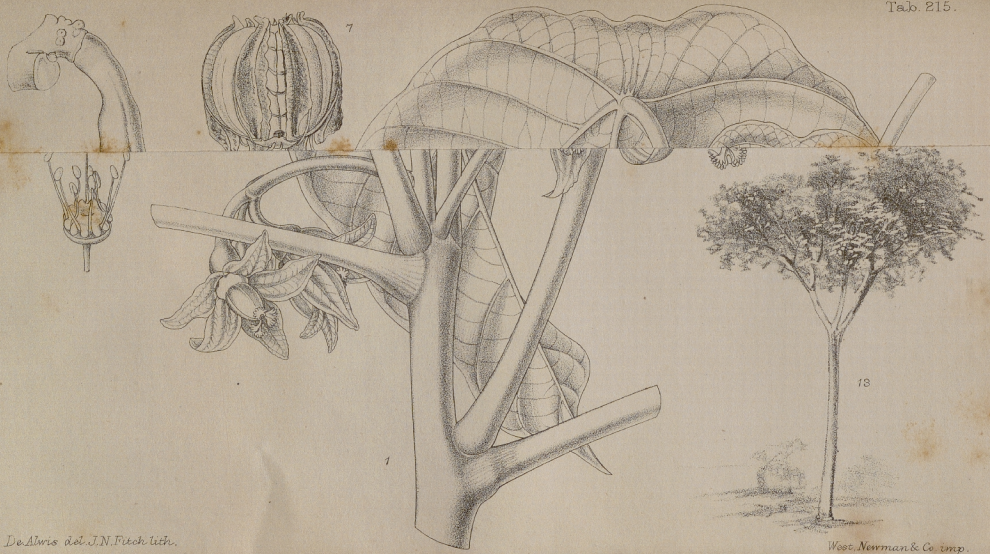




Manihot glaziovii, *Müll. Arg.*

De Alwis del. J.N. Pitch lith. West, Newman & Co. imp.

Tab. 215.



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West, Newman & Co. imp.

Manihot glaziovii, *Mull. Avg.*

" been harvested and widely dis-
" tributed for experimental purposes
" in different parts of the island."

Madras :— The Agri-Horticultural Society report :—" *Euchlæna* " (*Reana*) *luxurians* continue to " grow luxuriantly, seed, and re-" produce itself, with so little care " and watering as to confirm the " opinion expressed in last annual " report, that it may be considered " a success. It is particularly " worthy of growth in private " gardens, a few stalks of it giving " a green bite to horses in the long " dry weather when change of food " is so hard to get. . . . . As a " single crop, with a given quantity " of water and moderately good " soil, the *Reana* will produce in " the hot weather a much greater " bulk of green fodder than either " Lucern or Guinea grass which " are most commonly grown in " Madras for the purpose."

India-rubbers.—1. CASTILLOA. —*Ceylon.*—Dr. Trimen reports :— " Two plants have been sent to " Calcutta. Those in Burmah are " reported to be flourishing. Much " better success now attends the " propagation by cuttings of this " fine species. Our largest trees at " Heneratgoda have now a circum-" ference of nearly seventeen inches " at a yard from the ground, and " the trees are beginning to take " their true form."

Jamaica.—Mr. Morris having reported that this plant does not appear to have been successfully introduced into Jamaica a fresh supply has been sent to the Botanical Department and so far appears to be doing well.

2. CEARA.—*Ceylon.*—Dr. Trimen reports :—" Of the three species of " South American trees here in " cultivation [the successful intro-" duction of which was due to Kew. " See Kew Reports, 1876, pp. 8, 9 ; " 1877, pp. 15–17.] *Manihot* " *Glaziovii* is still the only one " which has flowered. Seed of this " has been supplied during the year " to the Government gardens in " India (Calcutta, Saharunpore, " Ootacamund) and distributed as " widely as possible among the " planters in the colony, 24,550 " seeds having been thus disposed " of as well as 1,879 rooted cuttings. " We have also sent small quantities " to the Botanic Gardens of Singa-" pore, Mauritius, Jamaica, British " Guiana, and Kew, the Acclimati-" zation Society of Queensland and " Mr. Low, Her Britannic Majesty's " Resident in Perak.

Dr. Trimen has given a botanical description of the species with an accurate figure in the Journal of Botany for November 1880. I am indebted to him for the opportunity of using this plate in the present report.

Dr. Trimen adds :—" This plant " is now flourishing in Ceylon in " suitable places and proves very " hardy; in the new estates in the " Trincomalee district it is reported " to be thriving, but to have shown " itself intolerant of wet."

In the Nilgiris I am informed it is doing well at 2,400 feet, and Major Seaton reports from British Burma that there are 500 and upwards set out and well established in the Mergui plantation.

Jamaica. Mr. Morris reports :— " This plant is evidently of a very " hardy character, and adapts itself " readily to the exigencies of " culture. Plants at Castleton " (600 feet) and at the Parade " Garden, Kingston (50 feet) are " doing well. At the former " gardens, young trees when about " 9 to 12 feet high were beginning " to flower, but the hurricane

" deprived us of the hope of pro-
" curing seed this year. . . . Judging
" by reports from South America
" it is possible that tracts of dry,
" stony, almost worthless lands, in
" the plains, may be turned to
" good account by means of this
" cultivation."

Natal.—Mr. Keit, the Curator of the Botanic Garden reports that the Ceara rubber plants raised from seed obtained from Ceylon in 1878 have grown luxuriantly, and had flowered, but had not had time at the date of his last report (December 31, 1880) to perfect their seeds.

3. HEVEA.—Dr. Trimen reports from Ceylon :—The cultivation of Para rubber " will be probably " found to be satisfactory only in " rich land not much above sea-" level, when the temperature is " high and equable, and the rain-" fall large. At Peradeniya the " trees are now making but slight " progress, and suffer from wind " especially in the dry north-east " monsoon. At Heneratgoda their " progress is all that could be " wished ; our largest trees are " now at three feet from the " ground, 16 inches in circum-" ference. During the year, 662 " cuttings were raised and distri-" buted. *Hevea* has proved com-" pletely unsuited to the climate of " Calcutta, but is doing well in " Burma and Perak. In the latter " place a tree has flowered sparingly " (at two-and-a-half years and 35 " feet high)."

4. LANDOLPHIA.—For a discussion of the specific identity of the plants yielding African rubber, see *infra*, pp. 38–43.

Plants of the most valuable kind (*Landolphia Kirkii*) as well as a few of the other species have already been distributed to the Botanic Gardens of the following places :—Adelaide, Ceylon, Demerara, Fiji (Colonial Secretary), Jamaica, Natal, Rio de Janeiro, Sydney, Trinidad. A further distribution will be made during the ensuing year.

Liberian coffee.—*Dominica.*—Dr. Nicholls writes (December 9) :—" You will be pleased to learn " that the Liberian coffee trees at " St. Aroment are in many in-" stances bearing a large crop. I " have already distributed over 16 " quarts of berries to planters " desirous of engaging in the " cultivation of this splendid new " coffee, and I have orders for the " seeds from many of the neighbour-" ing islands, both English and " French. The plant is now " established in most districts of " the island, and before many years " are past, coffee will doubtless " figure as a large export from " Dominica. The St. Aroment " Estate where the Liberian coffee " was planted by the late Dr. Imray " is between 300 and 400 feet " above the sea-level ; but a friend " of mine has a small plantation of " fine young trees, all raised from " seed ripened at St. Aroment, at " an elevation of 1,200 feet. I " observe, however, that the trees " do not grow so rapidly on high " lands. One great advantage in " the Liberian coffee is that the " fruit when ripe does not fall " from the tree, and thus it can be " gathered almost at any time. In " places where labour is scarce " this is of the utmost importance. " The aspect of the tree is very " different from that of the *C.* " *arabica.* In the latter plant there " is only one principal stem, and in " the Liberian there are several " usually from 4 to 5 or 6. This " may have a very important " bearing on the cultivation, for

" by removing one or more of the " stems every year or so, the tree " will be 'renovated' by allowing " space for the newer stems, and " this can be done without losing " the crops, as is the case when the " *C. arabica* is ' renovated ' by " cutting down the stem, and " training up a sucker. The leaves " still bid defiance to the ' white " fly blight,' for there is not a " speck of blight on any tree on the " estate."

Jamaica.—Mr. Morris reports:— " Nearly 1,000 plants and seeds " were distributed from the Castle- " ton Gardens during the year, and " a number were also raised and " distributed from seeds growing at " the Hope."

Mr. Syme reports from Castleton: —" Thirty plants growing on the " rather steep slope of the ravine " are now from 4 to 10 feet in " height, and bore this year a large " crop of berries. Over 7,000 " plants have been raised from " them.....I am of opinion that, " on suitable soils, with an annual " rainfall of not less than 90 inches, " this species may be successfully " cultivated without any special " shelter from cutting winds or " shade from the sun; and that it " will do equally well or perhaps " better, the soil being suitable, if " provided with shelter and partial " shade in localities with an annual " rainfall of not less than 90 inches. " Thus there are large tracts of " coast-land that are well suited for " the successful cultivation of this " tree-coffee."

Natal.—Mr. Keit, Superintendent of the Botanic Garden, Durban, reports (December 31):—" The " season having been favourable for " the growth of the Liberian coffee, " our plants have very much im- " proved in condition, and a few " berries produced from the flowers " of January and February last have " grown full size, but are still green, " and probably will ripen a few " weeks hence."

A copy of the Natal Mercury for December 10, has been communicated to me. I extract from it the following:—" On Mr. B. H. Wood's " Estate, Clairmont, may be seen, " coffee trees, flourishing and full " of berries, growing in the bush, " where the seed was dropped by " the monkies. These coffee-trees " have quite taken command, and " grow vigorously." General " Bissel also writes (October 29) from the Lower Unzimkulu:— " Coffee on this estate planted 20 " years ago by the father of a " native chief named Fynn is " bearing heavy crops after that " number of years, up to 15 cwt. " an acre, and some younger trees " bear up to a ton an acre."

It is clear, therefore, that the last word has not been yet said on coffee cultivation in Natal, and the desponding view which has been taken as to its success (*see* Kew Report 1876, p. 22) may be discountenanced.

Mahogany.— *Burma.*—Lieut.-Col. Hawkes reports (November 3). " The mahoganies are still growing " well under every variety of soil " and disadvantage of situation; " some planted in a swamp sur- " vived the whole monsoon, and do " not seem behind others more " favourably placed. At least 75 " per cent. of the plants were this " year attacked by a species of " borer, which drilled holes near " the points of the leading shoots, " and bored down through the " pith. This disfigured the plants " somewhat, but they rapidly threw " out side shoots, the strongest of " which being allowed to remain

" (the rest being rubbed off) soon " took the place of the original " leading shoot. In addition to " this, a large caterpillar, about " three inches long, of a light " green colour and covered with a " snow white powder, was very " destructive. The great vitality " of the plant enables it, however, " readily to overcome the damages " of these insect pests. Every " wound thus inflicted causes the " plant to throw out a fresh shoot, " thus disturbing the parallelism of " the fibres and producing the " mottled appearance of the grain " which is by dealers in cabinet " woods called the curl. As the " value of the best kinds of furni- " ture wood depends chiefly on the " amount of this curling of the " grain, it seems not unlikely " that to the liability of the " mahogany to the attacks of these " insect enemies, the wood owes " much of its value as an article of " commerce.

"Three young mahogany trees " measured on the 7th September " (when they were exactly two " years old), were found to have a " height of 16 feet 6 inches, 14 feet " 4 inches and 12 feet, with a girth of " 7, 5½, and 7 inches respectively."

2. *Ceylon.*—Dr. Trimen reports: —"Several applications have been " made from India for seed of the " mahogany, from an erroneous " idea that it is produced here " abundantly. It may, therefore, be " well to mention that the pro- " duction of a ripe capsule is rather " a rare event in Ceylon, though " the tree flowers freely. It is to " be regretted that the plan for the " formation of a plantation of this " valuable wood in the Southern " Province has fallen through for " want of funds."

3. *Jamaica.*—Mr. Morris reports: —"Several boxes of mahogany seed " collected from trees on the north " side of the island have been for- " warded to Kew, for transmission " to India and Ceylon. . . . . " For the purpose of encouraging " its extension in this island, where " it is rapidly becoming very scarce " as a timber tree, several thousand " plants are being raised at Castle- " ton and the Hope, and I would " commend the matter to the serious " attention of those possessing land " suitable for its cultivation."

Mesquit beans.—*Brisbane.*—Mr. Hill, Director of the Botanic Gardens, reports:—"The two Mes- quit beans "*Prosopis juliflora* (*P.* " *glandulosa*) and *Prosopis pubes-* " *cens*, both thrive here, and would " probably succeed well in districts " where the heat is greater and more " subject to drought. They will be " found valuable in the dry country " of the interior in seasons when " grass and most forage plants " are not to be had."

Saharunpore.—Mr. Duthie re- ports:—"The plants sown two " years ago under the name of " *P. glandulosa* produced pods " freely during the months of July, " August, and September. When " supplies of these pods can be " obtained in any large quantity, " it will no doubt prove a useful " fodder plant. Seeds have been " distributed widely through the " North-West Provinces during the " past year. Whatever may be its " value as a fodder plant, its " capability of standing any ex- " tremes of heat, cold, or dampness " to which it may be subjected in " the plains of this part of India is " clearly proved."

Sind.—Major McRae Conser- vator of Forests, reports that *Prosopis juliflora* (*P. glandulosa*) " promises to be the only exotic " which has hitherto been tried that

" can be naturalized in the Sind " Forests."

Pithecolobium Saman.—The useful qualities of this tree have now been so fairly tested that it will not be necessary to refer further to the trials that have been made of it in different parts of the empire. The following quotation from the report of Mr. Shuttleworth, the Conservator of Forests in the Northern Division of the Bombay Presidency, is a useful addition to our knowledge of its treatment. " Mr " Wroughton, the District Forest " Officer of Nasik, remarks :—I " have never seen it noticed that " *Pithecolobium Saman* will grow " from slips. In putting down " four plants, I removed about half " a dozen of the side branches " about the thickness of a lead " pencil, and, as an experiment, had " the cuttings planted in a small " nursery. About a month later " four of them were transplanted " into pits and the Forester reported " that these four plants on the " 31st of March 1880 were larger " and healthier than the original " ones."

Shade-tree for cocoa.—Seeds obtained from Trinidad were forwarded to Ceylon. Dr. Trimen writes (December 4) : — " Shade- " trees here are seldom used, but " if they take to planting in the " hot dry eastern districts it is " likely they may be required. The " seeds of *Erythrina umbrosa* duly " arrived on July 30th, and some " were sown at once. They all " germinated well and are now fine " healthy young plants, about 100. " We have sown more seed at later " dates with the same success, so " that I see no reason to agree " with Mr. Prestoe as to the seeds " quickly losing their vitality. " They were sent from Trinidad " on March 27th. The last were " sown 27th October, and these " are now sprouting well after just " seven months. The young plants " brought out by Mr. Clark, of " this species also are very flour- " ishing, so that we are well " supplied, if there should ever " be a demand for the tree in this " Colony."

Socotra aloes.—Aloes has been known as a production of the island of Socotra since the 10th century. According to Flückiger and Hanbury and other authorities its source is *Aloe socotrina*, Lam, a species cultivated in England for over a century. This is, however, only certainly known as a native of South Africa (*see* J. G. Baker in Journ. Linn. Soc., vol. xviii, p. 174). A specimen of the plant which really produces it was first brought to this country by Mr. Wykeham Perry in 1878 (although Wellsted in 1835 saw it in abundance). The plant reached Kew in a living state, but unfortunately did not survive. Professor Bayley Balfour, however, during his visit to the island secured an ample supply both of living plants as well as of dried specimens, and of aloes in all stages of preparation. The true source of the drug has accordingly been described by Mr. J. G. Baker as *Aloe Perryi* in honour of the energetic correspondent who in this as in so many other cases has shown so lively an interest in botanical investigation whenever his professional duties in the Royal Navy have afforded him opportunities. Of the stock of living plants at Kew a third, at Professor Bayley Balfour's request, was presented to the Royal Botanical Gardens, Edinburgh, and plants have also been sent to the Botanic Gardens of Calcutta, Ceylon, and Sydney.

The following is a statement of the **Plants**, &c. **sent out** during the past year, and included in 389 consignments :—

——	Ward's Cases.	Packets of Seeds.	Stove and Greenhouse Plants.	Herbaceous Plants.	Trees and Shrubs.	Number of Contributors.
Britain - -	—	677	3,860	1,066	5,012	109
Continent -	—	23	275	32	7	15
Asia - -	20	152	743	—	—	18
Africa - -	3	336	79	—	—	6
America - -	21	175	680	—	—	12
Australia and New Zealand.	6	35	233	—	—	5
Total -	50	1,398	5,870	1,098	5,019	165

I. Britain.

The usual exchanges have been made with the Botanic Gardens of Birmingham, Cambridge, Chelsea, Dublin, Edinburgh, and Oxford; with the Royal Horticultural Society, Chiswick; with the Royal Botanic Society, Regent's Park; also with the principal nurserymen, especially with Messrs. Backhouse of York, Bull of Chelsea, Carter of Holborn, Dickson and Co. of Edinburgh, Dickson and Sons of Chester, Dickson and Turnbull of Perth, Henderson of St. John's Wood, Jackson and Son of Kingston, Laing of Forest Hill, Lee of Hammersmith, Low and Co. of Clapton, Osborn of Fulham, Parker of Tooting, Thompson of Ipswich, Veitch of Chelsea, Ware of Tottenham, Williams of Holloway, and Wills (General Horticultural Company) South Kensington.

Contributions have been received from upwards of 150 different sources; of these the principal have been :—

Ball, J.; *Arpophyllum* sp. and *Pancratium maritimum*, tubers of Cyclamens and bulbs from Tunis.

Castobadie, Mrs.; *Phytolacca acinosa.*

Cattell, Surgeon Major; *Actiniopteris radiata*, seeds of *Leucadendron argenteum*, and collection of seeds from Afghanistan.

Christy, T.; seeds of *Euchlæna luxurians*, *Cytisus proliferus* and *Landolphia florida.*

Clarke, Col. T.; *Dyckia* sp. and hybrid *Ismene.*

Crewe, Rev. H.; *Ornithogalum* sp. and other plants.

Crotch, W. D.; bulbs from Algeria.

Davidson, Col.; large clump of *Hedychium acuminatum.*

Day, J.; orchids.

Deare, Major; *Monolophus sp. nov., Kæmpferia.*

Ducie, Earl; *Quercus sonomensis, Q. Wislizeni*, and other spp.

Duncan, Col.; *Caraguata linguata.*

Elwes, H. J.; bulbs from Central Africa, tubers of *Lissochilus* sp., &c.

Foreign Office; seeds of Cyprus Cedar (*Cedrus Libani* var. *brevifolia*).

Gilman ; *Adiantum farleyense.*

Godsal, F. W.; *Anæctochilus* sp.

Grabham, Dr.; *Ranunculus grandifolius*, &c.

Henry, I. Anderson; *Anoiganthus breviflorus*, &c.

Holmes, E. M.; rhizomes of *Curcuma* and *Zingiber Casumunar*, seeds of *Telfairia pedata*.

Howard, J.; several species of *Cinchona*, large plants of *Peristeria elata* and *Cyrtopodium Andersonii*.

Hunter, Capt. F.; seeds of *Balsamodendron Opobalsamum*.

Joad, G.; choice herbaceous plants.

Kayess, W. H. T.; seeds from Queensland including those of *Nelumbium Leichardtii*.

Lawrence, Sir. T., Bart.; *Catasetum tridentatum*, *C. sp.* and *Mormodes concolor*.

Lawson, Rev. W. L.; *Cheilanthes fragrans*, &c.

Loder, E. G.; new and choice succulents from Colorado, and rare British plants.

Lomb, Dr. T. R.; seeds of *Phormium tenax*, swamp variety.

MacLeay, Sir G.; choice stove plants including large plants of *Dicksonia fibrosa*, *Angiopteris evecta* var. *hypoleuca*, &c.; choice terrestrial orchids.

Marriott, Sir W.; *Catasetum sp.* and other orchids.

Maw, G.; *Crocus Gaillardotii* and *Fritillaria sp.*

Mayo, Countess of; seeds of *Amomum* and grass from Abyssinia.

Miles, F; *Andromeda japonica*.

Nelson, W.; set of plants from South Africa, including *Albuca Nelsoni*.

Parker, Lady; bulbs of hybrid *Amaryllis* × *Brunsvigia*.

Ringer, Professor Sydney; orchids and ferns from Japan.

Ross, H. J.; *Ærides crassifolium*, *Vanda Parishii*, &c.

Rothery, H. C.; seeds of *Pinus Gerardiana*.

Sonster, J.; seeds of *Anigosanthus Manglesii*.

Speed, T.; aquatic plants.

Waterfield, W; seeds *Arnebia echioides*.

White, R; large variegated *Aloe* from Cape.

Williamson, Mrs. A.; four species of *Cheilanthes*.

Woodbridge, J.; *Adiantum Farleyense*.

II. Continent.

Exchanges have been made with some of the principal nurserymen, especially with Messrs. Booth and Son of Hamburg, Haage and Schmidt of Erfurt, Godefroy-Lebeuf of Argenteuil, Hauschild of Copenhagen, Linden of Ghent, Van-Volxem of Brussels and Vilmorin Andrieux et Cie of Paris.

Contributions have been received from:—

Baillon, Professor, Paris; *Rheum Colinianum*.

Blodau, Herr von, Nordhaussen; collection of Begonias.

Engler, Dr. A., Kiel; choice herbaceous plants, willows.

Decaisne, Professor J., Paris; various shrubs including *Ostryopsis Davidiana*, &c.

Hanbury, T., Mentone: seeds of *Melianthus Trimenianus*, &c.

Leichtlin, Max, Baden-Baden; many choice bulbous plants including *Ixiolirion Kolpakowskianum*, new Fritillarias, Scillas, &c.; also *Gaudichaudia* sp. and *Incarvillea Olgæ*.

Monteiro, D. J. de N., Lisbon; seeds *Drosophyllum lusitanicum*, *Cistus crispus* and *C. salvæfolius*.

Regel, Dr., St. Petersburg; collections of choice bulbs, Irises, &c. many packets of seeds of herbaceous plants, seeds of *Nymphæa gigantea*; *Cypripedium macranthum*, *Eremurus Olgæ*, *E. sp.*; trees and shrubs, &c.

Reichenbach, Prof., Hamburgh *Tillandsia ionantha*.

Souza, I. A. de, Lisbon; seeds of *Welwitschia mirabilis*.

Todaro, Prof. A., Palermo; many packets of seeds.

III. Asia.

Aitchison, Dr.; seeds from Afghanistan, &c.

Balfour, Dr.; seeds from Aden.

Beck, J., collection of seeds from N.W. India.

Beddome, Lieut.-Col., Madras; seeds of *Beaumontia Jerdoniana*, choice palms, &c.

Bretschneider, Dr., Peking; seeds of trees and shrubs from China.

Bushell, Dr. S. W., Peking; seeds from China, including *Pinus Bungeana*, &c.

Cameron, J., Bangalore; Ward's case of *Averrhoa Carambola*, various seeds, &c.

Crocker, W. M., Borneo; *Cypripedium* sp. nov.; tubers of *Curcuma sp.*, *Sphærostema sp.*

Duthie, J. F., Saharunpore; many packets of seeds.

Ellis, R., Punjab; seeds of trees, shrubs, &c.

Ford, C., Hong Kong; Ward's case containing *Rhododendron Championæ*, *Otanthera Fordii*, *Caryota ochlandra*, *Renanthera coccinea* and other orchids, ferns &c.; seeds of *Glyptostrobus heterophyllus*, and of "Pepitas de Tunquin" used for mosquito bites.

Gamble, J. S., Darjeeling; seeds of Himalayan trees and shrubs.

Gammie, J., Darjeeling; *Lysionotus serrata*, *Porana grandiflora*, *Lilium Wallichianum*, &c.

Gilbert, J. H., Moulmein; *Anæctochilus sp. nov.*, *Kæmpferia sp. nov.*, rhizomes of *Zingiberaceæ*.

Hance, Dr. H. F., Hong Kong; seeds of *Caryota ochlandra*, *Delphinium anthriscifolium*, &c.

Hardinge, J. J. C., Rangoon; tubers of terrestrial orchids.

Kinch, Prof. E., Japan; tubers of *Amomum mioga* and of *Conophallus Konjac* (*Amorphophallus Rivieri*).

King, Dr., Calcutta; six Ward's cases containing *Shorea robusta*, *Santalum album*, *Gynocardia odorata*, *Averrhoa Carambola*, *Ægle marmelos*, *Tacca aspera*, *Pteris ludens* and other ferns, Liliums, &c. also seeds of *Borassus flabelliformis* and other palms, of *Buddleia Colvillei*, &c.

McNair, Major, Singapore: "seeds of The Devil's Cotton Tree" (*Mimosa sp.*)

Sampson, T., Canton; seeds of *Liquidambar formosana*.

Scheffer, Dr., Buitenzorg; seeds of new and rare palms; Wards case containing *Dischidia Rafflesiana*, *Hopea fagina*, *Laurinea* (Massoi), *Wallichia porphyracea*, *Orania regalis*, *Nepenthes melamphora*, *Anœctochilus Reinwardtii*, *Schismatoglottis sp. nov.*, &c.

Trimen, Dr., Ceylon; Ward's case containing *Piper methysticum*, *Beesha Rheedii*, *B. striduta*, *Didymocarpus Humboldtianus*, *Apostasia Wallichii*, *Acrotrema spp.*, *Oreodoxa acuminata*, &c.; also seeds of *Pterocarpus indicus*, *P. Marsupium*, palms, &c.

Thurston, J. B., Fiji; palm seeds.

Woodrow, G. M., Poonah; Ward's cases containing *Garcinia indica*, *Boswellia thurifera*, *Ærides affine*, &c.

Zohrab, J., Arabia; seeds of *Cassia Absus*, and *Curcuma* sp.

IV. Africa.

Balfour, Prof.; collections of plants from Socotra consisting of Pancratiums, *Nerine Balfourii* Baker, sp. nov., and other bulbous plants, Stapelias, Euphorbias, Kalanchoes, *Aloe Perryi*, Baker, sp. nov., *Dracæna Ombet*, *Adenium sp.*, *Begonia Socotrana*, Hk. f., sp. nov.; various seeds, &c.

Bolus, H., Cape Town; miscellaneous seeds, tubers of *Disa atropurpurea*.

Bey, Dr. E., Central Africa; collection of seeds.

Bowker, Colonel J. H.; collection of aloes and bulbs from Zululand.

Calvert, H. H., Alexandria; seeds of *Euchlæna luxurians*.

Horne, J., Mauritius; two Ward's cases of *Vahea madagascariensis*, *Nephelium litchi*.

Hutton, H., Fort Beaumont; various seeds, *Euphorbia sp.*

Kirk, Dr., Zanzibar; seeds of *Musa Livingstonii*, *Pelargonium sp. nov.*, bulbs of Iridaceous plants, &c.

McOwan, Prof., Somerset East; miscellaneous seeds.

Nelson, J. C., Kingwilliam's Town; seeds from South Africa.

Perez, G. V.; collection of plants and seeds from Canary Islands.

Rehmann, Dr.; collection of seeds from Tropical South Africa.

Shepstone, Sir T.; seeds from Central Africa.

Taylor, Miss, Madeira; *Ranunculus grandifolius*, ferns, &c.

V. New World.

Austin, Mrs. R. M.; California; various seeds and plants.

Birchall, H., Bogota; seeds of *Arracacha esculenta*.

Briggs, Sir T. G.; several cases of plants from Bermuda.

Capanema, Dr., Rio Janeiro; *Spondias tuberosa*, *Manihot Glaziovi*, *Astrocaryum Murumuru*.

Department of Agriculture, Washington; *Zamia integrifolia*, Sarracenias, &c.; many packets of seeds.

Ernst, Dr., Caraccas; seeds of *Martinezia*, *Aiphanes*, &c.

Espeut, W. B., Jamaica; box of orchids.

Gastrell, J. P. H., Rio Janeiro; box of orchids.

Glaziou, A.; Rio Janeiro; two Ward's cases of Aroids, seeds of "*Panicum spectabile*," *Desmoncus sp. nov.*, &c.

Goodale, Prof. G. L., Harvard University; collection of herbaceous plants, seeds of *Tagetes Parryi*, Salvias, &c.

Imray, Dr., Dominica; Bromeliads, *Blakea trinervis*, &c., palm seeds.

Jenman, S., Demerara; choice orchids including *Cattleya superba*, &c., many seeds of palms, *Mora excelsa*, *Nectandra Rodiæi*, &c.

McCrea, Capt. J., Bermuda; Ward's case of palms.

Morris, D., Jamaica; Ward's case containing *Gymnogramma schizophylla*, *Cyathea Nockii*, *Adiantum Wilsoni*, and other choice ferns, *Amherstia nobilis*, various orchids, &c.; seeds of Palms, Brownias, Mahogany, &c.

Nation, Prof., Lima; seeds of *Jacaranda acutifolia*.

Nicholls, Dr. H. A., Dominica; Ward's case of palms, ferns, *Monstera Imrayi*, &c.

Prestoe, H., Trinidad; seven Ward's cases of best varieties of *Theobroma Cacao*, also cases containing *Artocarpus incisa*, *Hevea Spruceana*, *Simaba Cedron*, *Caryocar nuciferum*, &c., many choice and new ferns, including *Elaphoglossum Herminieri*, &c.; seeds of *Erythrina umbrosa*, and choice orchids.

Sargent, Prof. C. S., Harvard; seeds of trees and shrubs.

Sturtevant, E. D., New Jersey; *Nymphæa flava*.

Thurn, E. F. im., British Guiana; tubers of *Dracontium sp.*, *Hymenocallis guianensis*, palm seeds, &c.

White, R. B., Medellin: seeds of *Mikania Guaco*.

Wright, W. G., California; seeds of *Pritchardia filifera*, &c.

VI. Australia and New Zealand.

Abbot, F., Tasmania; various seeds.

Bernays, L., Brisbane; seeds of Cycads, Musas, &c.

Forest's Expedition, seeds from N.W. Australia.

Godfrey, J. R., Melbourne; miscellaneous seeds from Australia.

Hector, Dr., New Zealand; palm seeds, &c.

Hill, W., Brisbane; Ward's case containing *Antidesma Dallachiana*, *Milletia megasperma*, &c., large stems of Cycads, tubers of *Nymphæa gigantea*, seeds of *Areca Aliciæ*, *Ptychosperma Drudei*, *Nelumbium Leichardtii*, &c.

Kirk, T., Wellington; seeds from New Zealand.

Moore, C., Sydney; Ward's case containing seedling Pritchardias, *Heliconia aureo-striata*, *Alpinia sp.*, Ferns and other plants from New Britain, *Dracæna sp.* beautifully variegated, palms, &c.

Mueller, Baron F. von, Melbourne; many packets of seeds including those of new Eucalypti, *Grevillea annulifera*, *Duboisia myoporoides*, &c. large trunk of *Livistona australis*, *Dendrobium monophyllum*.

Schomburghk, Dr. R., Adelaide; collection of seeds.

Waller, G.; seeds of "Pitcherie" the tobacco of natives of the interior of Australia.

Supply of Specimens for Science and Art Department, &c.

A supply of cut plants for the Art schools and of specimens for the examinations in botany of the Science and Art Department, have been regularly furnished. A large number of specimens of flowering plants, as well as other botanical materials, have been supplied for the various examinations of the University of London as well as for some of those of the Civil Service Commission.

Indian and Colonial Botanic Gardens.

The remarks made in the Kew Report for 1878 (p. 24) on the relations of this establishment with the botanic garden of our various dependencies have to a considerable extent anticipated the actual course of events. A great increase of activity, arising from a variety of causes, has characterised almost all these institutions with which we are in regular correspondence, entailing a very great extension of the official work transacted at Kew independent of the purely administrative work of the establishment itself. I may refer to a paper read by the Assistant Director at the Colonial Institute on May 11, of last year, on the Botanical Enterprise of the Empire, as giving some idea of the extent to which the ramifications of the foreign relations of Kew have extended, and of the growth of the demands of all kinds which are now made upon its resources. Two of our most important botanical departments, those of Ceylon and Jamaica have been to a large extent re-organized under new directors within the last two years. I trust that in the future these will become more and more the head-quarters of botanical enterprise for our eastern and western tropical colonies respectively, and will not be content with the limited scope of departments strictly confined in their operations to their own local spheres.

Capetown.—It is with great satisfaction that I mention the appointment of Prof. P. MacOwan of Gill College, Somerset East, to the Directorship of the Botanic Garden, Capetown. The deservedly

high reputation of this gentleman as a South African botanist is fittingly recognised by the Cape Government in offering him the post, and his acceptance is of happy augury for the usefulness and scientific reputation of the institution.

Ceylon.—Dr. Trimen has submitted to the Government of Ceylon a report which appears to me a model of what such documents should be. It is, I venture to think, the more remarkable, as the occupations which Dr. Trimen has pursued with distinction in this country would not necessarily have implied (though I anticipated they would) the warm and intelligent interest which he has exhibited in the somewhat different direction of the duties of his new post. With regard to the state of the Peradeniya Garden (one of three under his charge). I quote the following description in Dr. Trimen's words:—

"The principles of management "consistently carried out in these "gardens for many years past aimed "at the preservation to as great an "extent as possible, of their natural "character. The result has been "all that could be desired in that "respect, and their luxuriant and "tropical wild beauty has been a "characteristic feature of the gar-"dens. Trees were rarely felled, "but allowed to decay; new ones "were planted without regard to "their surroundings, crowded to-"gether and never pruned, and the "struggle for existence allowed to "go on almost unchecked. . . . . "in short, many portions presented "more the appearance of a beautiful "wild jungle, where plants from "the tropics of all latitudes strove "for the mastery, than of a scien-"tific garden for public utility."

Demerara.—The fundamental works in draining, road-making, &c. which are the necessary precursors to turning an undrained "open flat" (*see* Kew Report, 1878, p. 25) into anything like the semblance of a garden, have been steadily proceeded with, and the residents have already the satisfaction of seeing something of the results which such an undertaking is capable of affording in the tropics.

A large and varied consignment of tropical plants of every description (filling thirteen Wardian cases) has been forwarded as a contribution from Kew.

Jamaica.—Mr. Morris, the Director of Public Gardens and Plantations, has submitted to the Government of Jamaica a remarkably elaborate report, to which frequent reference is made in these pages, and which is well worth the attention of all persons interested in the planting industries of the West Indies. He points out that "as the "aims and objects of the Public "Gardens and Plantations are, in "addition to their purely scientific "character, to promote the agri-"cultural interests of the Colony, "to introduce and distribute plants "of great economic value, and sup-"ply practical hints respecting new "and promising industries, it is "hoped that their usefulness in "these respects will be extended "year by year, and that every "interest having for its object the "utilization of the valuable re-"sources of the Island, will meet "with sympathy and support."

The following extract from a letter from Mr. Morris (November 24) entirely corroborates the almost daily experience of Kew, that residents in the colonies from a blind faith in the resources of home institutions and an unaccountable incredulity as to the usefulness of local ones, constantly prefer writing to England for what, if they but knew it, in nine cases out of ten they either have at hand or could

get by making use of local machinery.

" In spite of charging for plants, " I find our distributions for last " year were nearly 10,000 in excess " of those for the previous year. I " find residents are continually " writing to you or to other places " for seeds or plants when they " know very well they can be sup- " plied locally at much cheaper " rates and with far less trouble to " themselves. I am now adver- " tising our sales quarterly, and I " find it has a most stimulating " effect; and, moreover, it shows " what the gardens are doing. " Many who have written to me " lately from the west end of the " Island are only just aware of the " existence of the gardens and their " resources."

On the 18th of August Jamaica was visited by a hurricane which was a rather severe trial to the Botanical Department. Mr. Morris writes:—" We are, I am happy to " say, recovering very fast from the " effects of the hurricane, and " though several very ominous gaps " are apparent everywhere, the " general appearance of things at " all the gardens is much more " normal. When the trees were " simply blown down without " serious damage to the roots, by " carefully lopping and trimming, " putting them up, and covering " the roots with good soil, and " giving them an occasional water- " ing, a large number of trees have " been saved. I gave this advice " to the pimento growers, and those " who followed it have been very " successful in re-establishing their " trees. From what I read in one " of the local papers, I was led to " experiment upon the cocoa-nut " trees at the Palisadoes, and I find " that if carefully done it is quite " possible to save these palms if " they are cut say 10 feet from the " crown, the lower end carefully " cut round so as to promote the " emission of rootlets, and then " placed in the ground to a depth " of two feet and well watered. " When very large there is con- " siderable difficulty in managing " them, but as our trees were rather " young and we had a good supply " of labour, we put up all the best " of our trees."

Mauritius.—The botanical establishment of this island is in an active and progressing state. This is due to the unflagging energy of the Director, Mr. John Horne, F.L.S., who has received much encouragement and support from His Excellency Sir George Bowen, G.C.M.G., the Governor. Buildings have been assigned to the gardens through his influence, suitable for the reception of a local museum of Economic Botany (to which contributions have been made from Kew) and of a Herbarium. The latter is peculiarly important for the preservation of types of the peculiar endemic flora which is fast being exterminated by the conversion of forest lands to planting purposes. The labelling of the collections in the gardens on the basis of the Flora of Mauritius and the Seychelles (prepared at Kew for the Colonial Government by Mr. J. G. Baker, F.R.S.) is being actively proceeded with. The Botanical Gardens contain a probably unique collection of varieties of the sugar-cane brought together by the late Director, Dr. Meller and Mr. Horne. At my suggestion Mr. Horne has received the authority of the Colonial Government to prepare a descriptive catalogue of this collection, which I trust when published will be found of much use in our various sugar-growing colonies. Many thousand trees of Australian species have been planted out throughout the island by the late Acting Director

Mr. Cantley, which were raised from seed brought from Australia by Sir George Bowen.

Natal.—The reports of the superintendent have been for some years no longer printed as official documents. I have, however, been furnished by the courtesy of the Colonial Government with manuscript copies through the Colonial Office. The state of decay and entire lack of local encouragement which these documents reveal is quite distressing. The Natal Botanic Garden has done useful work in the past and should still be one of the most valuable local institutions to the residents. These for the most part prefer to write home to England for what they should be able to get on the spot, if the botanic garden were healthily organised. The superintendent, judging from his report for 1878 seems to carry on his work under great disadvantages. The rainfall was only half the annual amount. The upper parts of the grounds suffered from drought and a large number of valuable plants were lost in consequence. In dry weather the entire labour of the staff is absorbed in carrying water from the ponds. The construction of an inexpensive windmill might obviate this. The picture of general dilapidation conveyed by the superintendent's report is very melancholy. The conservatory is so ruinous that the plants have been removed; the summer-houses have been either taken down or are unfit for use; the seats are dangerous to sit on.

Notwithstanding a condition of things which must be most depressing to a superintendent a good deal of work has been done. Considerable exchanges have been made and most planting effected. Liberian coffee has flowered for the first time (see *supra*, p. 19). The Ceara rubber raised from Ceylon seed is "promising well" (*supra*, p. 18). Seeds of *Pithecolobium Saman* have germinated and the plants were ready for distribution. The East African copal tree (*Trachylobium Hornemannianum*) has also been raised from seed sent by Dr. Kirk, Her Majesty's Consul-General at Zanzibar. It came into flower in 1880, at the age of five years.

The following **botanical appointments** have been made by the Colonial Office on the recommendation of the Director :—

N. Cantley, Acting Director Royal Botanical Gardens, Mauritius, to be Superintendent, Botanical Gardens, Singapore.

D. G. Clark, in the employ of the Royal Gardens, to be Gardener, Royal Botanical Gardens, Peradeniya, Ceylon.

The following appointments were also made by the India Office on the recommendation of the Director :—

W. Kennedy, in the employ of the Royal Gardens, to be Gardener, Government Cinchona Plantations, Bengal.

Joseph Parkes, in the employ of the Royal Gardens, to be Gardener, Royal Botanical Gardens, Calcutta.

Official Correspondence.

Apart from the purely administrative work of the Royal Gardens the correspondence with Government offices at home and in the colonies and India, together with the private communications and personal applications which it is the privilege of the public to address to a national establishment, largely absorb the time of the staff and must shortly make some further clerical assistance peremptorily necessary.

In matters relating to the ravages of insects on cultivated plants I have again to express my obligations to Mr. R. M'Lachlan, F.R.S., who has most kindly reported on a variety of matters which have been from time to time referred to Kew, and which are beyond the scope of our technical

ability to deal with. I regret that an application supported by the Board of Trade for a small retaining fee to be paid by the Government to a **consulting entomologist** has been refused by the Treasury.

With regard to plant-injuries due to the attacks of fungi we have had the advantage of the assistance as **mycologist** of Dr. Cooke formerly attached to the India Museum (see *infra*, p. 62). Some instances of the useful assistance which he has been able to give us are discussed in succeeding pages.

The following selection of notes drawn from the files of correspondence which have passed through the Director's Office during the past year will, I trust, be no less useful to our colonial and foreign correspondents than those given in preceding reports. The convenience of putting these notes on record is discussed in the Kew Report for 1878 (p. 26.) Further experience has shown that everything urged there in its favour is continually justified. So much in request are the past issues of the Kew Report that nearly all are out of print and I have recently received an indignant complaint from a correspondent personally unknown to me to the effect that the file in the library of the British museum is exceedingly incomplete.

Anisoplia austriaca. — Vice-consul Lowe reports from Berdiansk with regard to this serious scourge (*see* Kew Report, 1878, p. 26.) "The "*Anisoplia austriaca* pest calls for "the most serious consideration, but "even with all the attention that "is being given to the subject by "the Government and local autho- "rities, the general opinion amongst "farmers is that the pest is far too "colossal to be effectually grappled "with, and the only hope of gradual "extinction is by each farmer using "his utmost endeavours to destroy "the insect when visible. Vast "quantities were collected and des- "troyed, and the authorities insisted "upon every able-bodied person "assisting in the general destruc- "tion."

Bahamas flora. — H. E. W. Robinson, now Governor of Barbadoes, while acting in a similar capacity in Bahamas, lost no opportunity of promoting the industrial welfare of his government by encouraging every kind of new culture suitable to the islands (*see* Kew Reports, 1877, p. 25, and 1878, p. 29.) He did not overlook, however, the scientific interest of its peculiar flora, but having ascertained that Mr. L. J. K. Brace (in civil employ in the New Providence asylum) possessed a capacity for botanical work he encouraged him to prepare for Kew a collection as complete as possible of Bahamas plants and eventually obtained him a grant of 100*l.* in aid of his expenses which received the sanction of the Secretary of State. Mr. Brace's collections have been received and named at Kew, and they will form a useful basis for an exact knowledge of the vegetation of the group.

Carnauba palm.—(*Copernicia cerifera*).—I extract the following from Consul Bonham's report on the trade of Pernambuco for 1879:—

"This wonderfully useful tree is "indigenous to this province, and is "to be found in immense numbers; "every part of it can be utilised, the "wood is used for roofing, both as "rafters and also as lathes for "supporting the tiles; the fruit is "available for feeding cattle; the "stones of the fruit can, it is said, "be roasted and used as coffee; "the leaves can be utilised for "making hats and mats; a valuable "medicine is obtained from the "roots, and the shoots or young "leaves before they unfold are cut, "dried in the sun, powdered, and "when boiled produce a kind of "wax; this is not produced in

" anything like the quantity it might " be, however the export of this wax " during the last four years is given " as follows :—

	1875-76.		1876-77.		1877-78.		1878-79.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	kilos.	£	kilos.	£	kilos.	£	kilos.	£
Great Britain - -	9,138	312	116,872	4,622	83,530	2,958	—	—
Germany - -	9,530	446	55,108	2,335	5,952	210	1,542	61
Total - -	18,668	758	171,980	6,957	89,482	3,168	1,542	61

" The decrease during the last " year is of course owing to the " famine and drought, which so " severely crippled all industry in " the province."

Chinese hemp-palm.—(*Chamærops Fortunei*)—In the Journal of Botany for June 1879, Dr. Hance states that he is "assured that the " fibrous leaf-sheaths" of *Caryota Ochlandra*, Hance "supply all the " coir so extensively used in this " part of China for covering trunks, " making brooms, mats, and sandals, " and for other purposes." He has lately sent to the museum of the Royal Gardens an interesting collection of objects manufactured from this material and though they are for the most part different to anything we possessed before the material itself is apparently identical with that derived from the fibrous leaf bases of *Chamærops Fortunei*. We are indebted to Mr. Robert Fortune for a rain-cloak and hat (such as are figured in his Residence among the Chinese, p. 145) made from this material. He calls the palm producing it " the hemp-palm " (Chamærops, sp.)—a tree of great " importance to the Chinese in a " commercial point of view, on " account of the sheets of fibre " which it produces yearly on its " stem" (page 189). He describes it as occupying "a prominent place" on the sides of the mountains in Che Kiang.

While Mr. Fortune was at Shanghae an earthquake took place. On the following day "groups of " Chinese were seen in the gardens, " roadsides, and fields engaged in " gathering hairs which are said to " make their appearance on the " surface of the ground after an " earthquake takes place." *Some* " of the Chinese did not hesitate to " affirm that they belonged to some " huge subterraneous animal, whose " slightest shake was sufficient to " move the world." Many of the fibres of the hemp-palm were shown to Mr. Fortune as the hairs in question (l.c., pp. 4, 5).

Cinchona.—1. *China cuprea.*—A new Cinchona bark has made its appearance in English commerce. A large quantity imported in the course of last year is said to have proved unsaleable, and even to have been thrown down to mend the surface of roads at the London docks. It has since, however, been better appreciated. The following information is quoted from a letter (December 8) from Mr. R. Thomson, formerly Superintendent of the Cinchona Plantations, Jamaica, and now resident at Bogota :

" Have you heard of the im- " portant discovery here of a new " species of *Cinchona*? It was " found a few months ago in the " State of Santander. It exists in " great abundance over several " hundred miles of hills, and con-

" siderable quantities have been " already exported. The bark is " peculiar. It is hard like cinna- " mon, and contains essential oil in " considerable proportion. The " quantity of sulphate of quinine " averages from 2 to 3 per cent. " 1,900 men have been collecting " this bark, and making roads " through the forests in which it " abounds. But this will now be " checked, inasmuch as the govern- " ment has just enforced a tax of " 20 dollars on every 'cargo' to " be exported. A cargo weighs " about 250 lbs., a mule load. This " species is further remarkable from " the fact that it grows at the low " elevation of from 2,000 to 3,000 " feet above the sea, it will, there- " fore become amenable to cultiva- " tion in most tropical countries, " *i.e.*, those having hills of a mode- " rate elevation. It seems strange " that this species should have been " left so long undiscovered, perhaps " it is owing to its peculiar character, " or perhaps to the fact that the " district in which it grows is sur- " rounded and possessed by wild " Cannibal Indians."

Steps have already been taken to obtain materials for the identification of this plant as well as seed, as the species may be found useful in many of our colonies where sufficient elevation is not found for the successful cultivation of the ordinary kinds.

2. *Cinchona Ledgeriana.* — As this species has been the subject of much correspondence during the past year it will be convenient to give a summary of its history. The seed was collected in June 1865 by a trusted native servant (Manuel Mamani) of Mr. C. Ledger from 50 trees growing in the almost inaccessible banks of the River Mamore in Bolivia, a place to which no botanist has ever approached more nearly than 100 miles. It was sent to London to the care of Mr. Ledger's brother, who sold half to the Dutch government for Java and half to Mr. Money, a Cinchona planter on the Nilgiri Hills.

The following further particulars are derived from a report made by Dr. Trimen to the Colonial Secretary, Ceylon (August 20).

The seed purchased by the Netherlands Government was " sent " to Java, and 20,000 plants were " raised from it, a number after- " wards reduced to some 6,300. " These were carefully cultivated " by Mr. Van Gorkom, the Director " of Cinchona cultivation, and it " soon became evident that the " plant, though presenting consider- " able variation, formed a fairly " marked variety of *Cinchona* " *Calisaya*. The name '*Ledger-* " *iana*' appears to have been a " plantation name (first printed " about 1873) used to distinguish " the progeny of Mr. Ledger's " seed; it has, however, since re- " ceived official scientific sanction, " the plant having been described " in 1876 by the late Dr. Weddell " as *C. Calisaya* var. *Ledgeriana*.

" This purchase proved a very " fortunate one for the Dutch, and " may be said to have infused new " life into the flagging Cinchona " cultivation of Java. Up to the " year 1872 the bark sent thence " had been almost wholly of inferior " quality, but in 1873 it was found " that that of the new kind afforded " eight per cent. of alkaloids, of " which from $5\frac{1}{2}$ to $6\frac{1}{2}$ was quinine. " In 1874 this was greatly ex- " ceeded, one sample even reaching " a total of 12·97 alkaloids, 11·01 " being quinine.* Though this

* Dr. King states in the Report of his visit to Java that some of the Dutch samples have yielded on analysis the extraordinary amount of 13·7 per cent. of quinine.

" great richness has been by no " means attained by all the trees, " yet the marked superiority of the " new kind was quickly established. " Some of the trees had seeded " before 1873, and a careful selec- " tion, based upon analysis, was at " once initiated by Mr. Van Gor- " kom, assisted by Mr. Moens, an " excellent chemist, who has since " succeeded to the Directorship. " In 1875 there were 23,000 trees " planted out, besides the original " stock trees; and at the present " time (June 1880), the plantations " contain no less than 443,270 " trees, and the nurseries 283,650 " of this valuable variety. The soil " and climate of Java seem to be " very suitable for this kind of " Cinchona, which has not as yet " been found to prosper in India. " From Mr. Ledger's seed sent to " the Nilgiris it is reported that " 60,000 seedlings were raised. It " would appear that most of these " died out though probably some " still exist in Wynaad. A 'pinch' " of seed from Southern India was " sown in the Sikkim Plantations, " and Dr. King considers the trees " which have resulted there to be " 'precisely the same' as some of " the forms of *Ledgeriana* which " he saw in Java, the much smaller " yield of alkaloid being he believes " due to climatic and local causes.

" With regard to Ceylon there " had been up to 1876 no attempt " on the part of the government to " introduce *C. Ledgeriana* from " Java, though in 1875 a private " gentleman had received a supply " of seed from Mr. Moens."

In 1880 Mr. Moens visited Dr. Trimen in Ceylon, and the following further remarks were communicated by Dr. Trimen in a letter (September 24), " Mr. Moens thinks *Cin-* " *chona Ledgeriana* a species, and it " is certainly remarkable that it has " never originated amongst the " crowd of allied forms which result " from every sowing of *Calisaya* " seed. The flowers too are very " well marked, and when present, " absolutely distinguish it; very " small, drooping, crowded, white, " strong-scented, with the corolla- " tube very wide, so that the usual " knob of the limb in the bud does " not exist, the bud being nearly of " the same size all the way down. " We found unexpected trees in " flower of this plant on two estates, " both having come from Daijeeling " seed (some of Ledger's seed " went there from the Nilgiris)."

Dr. King reports to the Bengal Government, " after seeing the Java " Ledgerianas I have no doubt that " our three or four best kinds of " Calisaya are precisely the same " as some of the forms of Ledgeriana " cultivated by the Dutch. It is " true that none of the Calisaya " banks grown in Sikkim contain " so much quinine as the best forms " of Ledgeriana grown in Java, but " this I believe to be an affair of " climate and soil. All the Java " Cinchonas are richer in alkaloid " than those of Sikkim, and this " will, I believe, always be the case, " the physical conditions being so " much more favourable."

3. *Possible synthesis of Cinchona alkaloids.*—The great extension which has been given to Cinchona cultivation as a Government undertaken in Sikkim, the Nilgiris, and Jamaica, and by private enterprise in Ceylon and Southern India has made it a matter of great importance to planters to ascertain what possibility exists of the same success attending the attempts of chemists to effect the artificial manufacture of the Cinchona alkaloids, especially quinine, as in the case of alizarin, vanillin, and indigo. As enquiries have been addressed to Kew on the subject, it was thought that it might be useful to Kew correspondents to

obtain some authoritative information and Dr. Hugo Muller, F.R.S., Foreign Secretary of the Chemical Society, has kindly prepared the following memorandum :—

"The synthesis of the Cinchona "alkaloids will probably be effected "sooner or later. It must, however, be borne in mind that up to "the present at all events, there is, as "far as can be judged from what is "known about this class of bodies, "no indication that this feat will "be accomplished in the immediate "future.

"The chemical history of the "substances [mentioned above] "which are now artificially produced, teaches us, that before the "synthesis of a body can be prognosticated, its chemical constitution must be thoroughly made "out and this can only be attained "by extended investigation of its "products of decomposition in a "variety of ways. Without going "into detail, it may be safely stated, "that although some advance in "this respect has been made with "regard to the study of the "Cinchona alkaloids, we are still "far from having obtained a clear "insight into their molecular "structure, which, so far as we can "judge at present, seems to be of a "much more complicated nature "than, for instance, that of any of "the above-named substances. The "more complicated the chemical "structure of a body, the more "difficult in all probability will be "its synthesis, and even after this "has been acomplished, there still "remains the task of finding out "means and ways to make the processes involved in it practicable "for artificial production. If it "should be found that there are no "special difficulties in growing "bark which like that of *Cinchona* "*Ledgeriana* contains 10 per cent. "of quinine, it seems almost doubtful whether we ever may expect "to find a synthetic process capable "of competing with the natural "production.

"It appears, therefore, premature "to anticipate already what may "require many years to elaborate, "and however sanguine we may be "in our expectation of the achievements of chemical research in this "direction, it seems more than "probable, that we shall be "dependent for some time to come "on the Cinchona plantations for "our supply of this valuable commodity."

Coffee-disease.—*Ceylon.*—The coffee disease in Ceylon still continues to cause great loss and anxiety to the planters. It has had, however, the effect of directing their attention to other staples especially cacao and Cinchona.

Mr. Morris, before leaving the island to take up his appointment as Director of the Botanical Department, Jamaica, devoted himself assiduously to the investigation of the life-history and course of development of the fungus (*Hemileia vastatrix*) to which the disease is due. A summary of his results has been given in the Quarterly Journal of Microscopical Science for April 1880 by the assistant-director. Mr. Morris's method of treatment by a mixture of sulphur and coral-lime is detailed in the Kew Report for 1878 (p. 34). It was based on the supposition that the mycelial filaments found on coffee-leaves belonged to the *Hemileia*. The sulphur-lime method was undoubtedly efficacious in destroying these.

Mr. Marshall Ward, whose appointment as cryptogamist for two years to continue the work of investigating the coffee-disease in Ceylon was recorded in the Kew Report for 1879 (p. 30) has submitted two reports to the Ceylon Government. With regard to the

mycelial filaments he finds that :—
"They all arise from spores which
"in shape, size, colour, and other
"peculiarities present no re-
"semblance to the spores now
"known to belong to *Hemileia*
vastatrix. They are easily grown
"in artificial solutions, and in their
"modes of reproduction and
"general growth, present nothing
"indicative of relation to *Hemileia*."

Mr. Marshall Ward does not, however, pronounce against the usefulness of the "sulphur-lime system." But he points out that the filaments emitted by the spores of the *Hemileia* on germination have a much shorter external duration than had been supposed, plunging almost immediately into the leaf tissues, and are, therefore, accessible to the destructive influence of the sulphur-lime mixture for a very brief interval. The full results of his completed investigations will appear in his final reports.

2. *Fiji.*—The rising coffee industry of Fiji has received a severe blow by the appearance of the *Hemileia* in the plantations on the Rewa river, apparently introduced from Ceylon. Specimens of diseased leaves sent to Kew unfortunately left no doubt as to its identity. An account of the measures taken to combat it has been given by the Assistant Director in the paper in the Quarterly Journal of Microscopical Science already referred to (pp. 127-129).

3. *Venezuela.*—Two distinct diseases affect the coffee-plant in this part of the world. One is the "Candelillo" which has already been referred to in previous reports (1876, p. 21, 1877, p. 29, 1879, p. 30). This appears to be the same as the "leaf-rot" or "Koleroga" of Mysore. The other which appears to be on the increase is apparently the "iron-stain" or "mancha de hierro" referred to in the Kew Report for 1876 (p. 21). It is characterised by the appearance of discoloured blotches on the surface of the leaves somewhat resembling those produced by the excavations of the "white fly" (*Cemiostoma coffeellum*). The cause is somewhat obscure. Professor Ernst of Caracas has sent ample specimens of both as well as a memoir on the subject by himself. Dr. Cooke lately attached to Kew as Cryptogamist (see *infra*, p. 62) has drawn up the following reports upon these materials :—

Candelillo. — "Careful exa-
"mination of the coffee leaves has
"resulted in the conviction that the
"fungus which is prevalent upon
"them is identical with the
"'Koleroga' of Mysore. (*Pellicu-*
"*laria Koleroga*, Cke.) The whole
"history of this fungus was never
"believed to have been discovered
"from the original specimens, and
"hence any additional illustration
"of an obscure fungus would be
"accepted with satisfaction. From
"Dr. Ernst's drawing it would be
"concluded that he has obtained
"such further information, and he
"regards the mould as a stage of
"an *Erysiphe*. (*E. scandens*,
"Ernst) He figures what he con-
"siders to be 'conidia,' 'pycnidia,'
"and 'haustoria,' all of which are
"to be found in *Erysiphe*.

"I have carefully examined the
"leaves for many hours and wholly
"failed in finding either concatenate
"conidia, or pycnidia. I found, in
"some cases plentifully, the globose
"rough spores of the *Pellicularia*
"on short branches or pedicels, the
"latter remaining persistent after
"the fall of the spores. I am
"disposed to think that what
"Dr. Ernst believed to be haustoria
"are these persistent peduncles,
"the extremities of which are not
"rounded and closed as in the
"haustoria of the *Erysiphei*.

"The habit and character of the "mould is entirely different from "*Erysiphe*, which latter is always "more or less pulverulent and "never, as far as I am aware, are "the threads connected into a "stratum by a gelatinous film. "Neither is the action upon the "leaf, at all similar in its destructive character to the 'Koleroga.' "Although the stratum is thinner, "and much less dense than in "Mysore specimens, the character "is the same, and so characteristic "are the features which the threads "present (an unusual occurrence "in fungi of this kind) that I "recognised at once under the "microscope the identity of *this* "with the 'Koleroga.' From the "character of the threads, apart "from all other evidence, I should "doubt its ultimate development "into an *Erysiphe*.

"The thinner stratum renders the "present specimens better for "examination than those previously "examined and hence I observe "occasional knots caused by the "convergence of several branches, "and here short decumbent cells "are common, which are no longer "than broad, and attached in a "moniliform manner so that, if "they had been erect, and terminal "to short branches, these would "presumptively have been entitled "to regard as conidia. Any one "who is acquainted with the "conidia in *Erysiphe* would recognise the difference at once, and "see that these compact cushions of "short cells are by no means "identical with conidia. I do not "presume to determine what these "knots may portend, except that "they are not analogous to the "conidia of *Erysiphe*.

"It is needless to advert to other "features by which the mould is "distinguished from all known "species of *Erysiphe*, but it will "suffice to state that it is identical "with *Pellicularia Koleroga* and "that I am unable to find the concatenate conidia of an *Erysiphe* "type, or the supposed pycnidia.

'Iron-stain.' — The leaves "which have definite bleached spots "bear two distinct fungi. The minute "black perithecia scattered over "some of the spots are those of a "*Sphærella* with fusiform, uni-"septate spores contained in clavate "asci. This has been named "*Sphærella coffeicola*, Cke. On "other spots is a pretty yellow "*Stilbum* which is minute, with a "globose head, compacted of very "small nearly globose spores. This "is *Stilbum flavidum*, Cke.

"It is very doubtful whether the "circular spots are not the result "of some disease or previous para-"site and the *Stilbum* a late "development on the dead spots. "I can hardly think that the "*Stilbum* is the cause of the coffee "disease. No known species of "*Stilbum* occurs on living tissues.

"I have heard that sulphur has "been employed in some parts of "South America in the hopes of its "being a remedy. It is not this "kind of parasite which the sulphur "is likely to affect. It is a curious "fact, if proven, that this *Stilbum* "is the cause of the new coffee "disease, and yet it seems that the "majority of spots are without the "*Stilbum*. Is there no root disease "which predisposes to this leaf "spotting? The whole subject is "open to further investigation "amongst the living plants."

Copal-tree of East Africa.— Mr. Keit states in his report on the Natal Botanic Garden for 1880 that this valuable tree has been successfully introduced into Natal:—"Five "years ago Dr. Kirk, Her Majesty's "Consul-General at Zanzibar, pre-"sented the gardens with some

" seeds of '*Trachylobium Horne-*
" *mannianum*.' A number of the
" seeds germinated, have grown
" into fine plants, and flowered for
" the first time during the months
" of June and July last, but have
" not yet formed fruit. This plant
" appears to me eminently suited
" for our soil and climate, and as
" the severe droughts experienced
" have had no injurious effect upon
" it, and being evergreen and
" ornamental, it might be planted
" extensively, not only to utilize
" barren lands, but also on account
" of its prospective commercial
" value to the colony."

Dr. Kirk, Her Majesty's Consul-General, Zanzibar, writes to me (December 9) :—" I am distributing " Copal-tree seed in bulk to India " and Australia."

Gambier. — Flückiger and Hanbury state in the Pharmacographia (ed. ii., p. 335), that the source of this substance (also known as " Terra japonica ") *Uncaria Gambier*, Roxb. " grows in Ceylon, " where, however, no use is made " of it."

Dr. Trimen, Director of the Royal Botanic Garden, Peradeniya, writes (September 24) : —" In " the urgent demand for 'new pro-" ducts' here, one of the first " things I tried was to make some " Gambier from our plant. It " grows commonly not far from " the garden. I followed the " account given in the books, but " could not succeed in producing " the correct article. A very ex-" cellently astingent extract is " easily obtained, but it is black " like liquorice or the *Acacia* " *Catechu* extract, and not at all " like 'terra japonica.'"

The Ceylon plant, however, is not the same, as Dr. Thwaites at first supposed, with the true *Uncaria Gambier*. It is *U. dasyoneura* var. *Thwaitesii* (*see* Flora of British India, vol. iii., p. 31), and this as Dr. Trimen points out may account for the difference in properties.

Hevea in British Guiana.— Mr. Jenman, Superintendent of the Botanic Garden, George Town, sent copious specimens of the plant already referred to in the Kew Report for 1878 (p. 39). Professor Oliver, F.R.S., has reported upon them as follows :—" I have ex-" amined Mr. Jenman's specimens " carefully, and believe that they " are identical specifically with " *Hevea pauciflora*, Muell. Arg. " (= *Siphonia pauciflora*, Bth.) " and *Hevea Spruceana*, Muell. " Arg. (= *Siphonia Spruceana*, " Bth.), of these two names the " latter should be adopted, the " type-specimens of *Hevea pauci-" flora* being evidently abnormal as " to the inflorescence, and the " plant flowering in copious pani-" cles. The original *Hevea* " *guyanensis* of Aublet was based " upon specimens in fruit, of which " flowers were unknown. The " *Hevea* identified by Sagot (and " in De Candolle's Prodromus) " with Aublet's plant is quite dis-" tinct from Mr. Jenman's. The " name to adopt is *Hevea Spruce-" ana*, Muell. Arg."

Mr. Everard F. im Thurn, late Superintendent of the British Guiana Museum, has favoured us with the following note on this interesting " tree. "The Hevea is called in " Arawak, *Haatie* and in true " Carib, *Po-muy* in Ackawoi, *Sibi-" sibi*, and the kernels of the seeds " are used for fish-bait. Cartabac " are very fond of it, and when the " seeds are dropping, people always " go to shoot Cartabac under the " *Haatie* trees. They do not go " far from the water, but are always " found on the banks of the river " or the large creeks."

" Mr. Jenman also writes " I am

" reminded that there are plants " 15–20 feet high in the Castleton " Garden, Jamaica, raised from " seed received by Mr. Thomson " from this colony (Demerara) some " years ago."

India-rubber. — According to Messrs. Hecht, Lewis, and Kahn's report for 1880, the total import of of Para rubber (*Hevea*) into England during the year was 3,768 tons, of which 3,661 tons during the year went into consumption or was exported. Liverpool received 35 tons of Ceara Scrap rubber (*Manihot*) 100 tons of Guayaquil and Carthagena (*Castilloa*) most of which found its way to the United States, and 1,300 tons of (West) African (*Landolphia*) of which " all kinds were readily taken by " consumers and exporters," notwithstanding an increase in the imports of the year of 400 tons. London imported 370 tons from Assam (*Ficus*), 530 tons from Borneo (*Willughbeia*), and 900 from Mozambique (*Landolphia*).

The constant demand for caoutchouc for manufacturing purposes, and the efforts made by the Government India to foster the cultivation of rubber plants, especially the South American kinds has turned the attention of planters in our tropical colonies to the subject. A rather active correspondence has sprung up with Kew for information as to the little investigated native sources of commercial caoutchouc other than the South American, which has been so prominent a topic in preceding reports. A considerable body of information, especially regarding rubber-yielding plants of the natural order *Apocynaceæ*, has gradually accumulated, as the result of inquiry, and this has been carefully examined by the assistant-director who proposes to communicate the more strictly scientific results, with descriptions of the new species to the Linnean Society. The following abstract of the economic aspects of the subject will, I trust, be found useful by our colonial and Indian correspondents. It is arranged under geographical heads.

Africa.—All the present commercial sources of African caoutchouc belong to the genus **Landolphia.** This is a group of woody climbers, all of which probably yield caoutchouc, peculiar to Tropical Africa and the adjacent islands. African caoutchouc comes into commerce both from the west and the east coasts, and only one of the rubber-vines is common to both. The following are the rubber-yielding species at present known :—

West Coast.—1. *L. owariensis* is apparently the species possessing greatest latitudinal range. The genus *Landolphia* was founded upon specimens of it, collected in Oware by Palisot de Beauvois, and it extends from Sierra Leone where it was collected by Don to Angola, from which Kew possesses specimens from Welwitsch and Monteiro. It was collected on the Niger by Barter, and near the mouth of the Congo by R. C. Phillips (who states that it bears the native name of *Mvoochi*. A form not specifically distinguishable, was found by Schweinfurth in North Central Africa. He remarks (Heart of Africa, i., 192) that " it is well " known in the Guinea trade for " its production of caoutchouc." From the fruit "the sourness of " which exceeds that of the citron," the natives of Djur-land manufacture " a beverage refreshing as " lemonade."

The plant figured by Collins (Report on caoutchouc, pl. 4) as *L. owariensis*, differs, especially in its minute flowers, from the species as defined by Palisot de Beauvois,

and is possibly founded upon materials belonging to some other.

2. *L. Mannii*, sp. n.—A very distinct species collected by Gustav Mann at Corisco Bay (Lat. 1° N.), and not at present known from any other locality. Mann describes it as a climber 20 feet high, and yielding caoutchouc.

3. *L. florida*. — This beautiful species, originally described in the Niger Flora by Bentham, appears to be distributed over the whole of Central Tropical Africa. Its heads of large sweet scented jasmine-like flowers would render it a desirable introduction, from merely a horticulture point of view in stove-cultivation. On the Niger, according to Barter, its fruit, which is very sour, is eaten by the natives under the name of *Aboli*. According to Monteiro, who collected specimens in Angola, the India-rubber of South West Africa is derived from this.

Further information on the subject of *Landolphia florida* may be found in Thomas Christy's New Commercial Plants (No. 1, accompanied by a good figure) as well as below, amongst the East Coast species.

The form in which West African rubber comes into commerce is somewhat peculiar. It is accounted for by the method of collection which has been described as follows :—"Every part exudes a milky "juice when cut or wounded, but "this will not run into a vessel "placed to catch it, as it dries so "quickly as to form a ridge on the "wound, which stops its further "flow. The blacks collect it by "making long cuts in the bark "with a knife, and as the milky "juice gushes out, it is wiped off "continually with the fingers, and "smeared on their arms, shoulders, "and breast, till a thick covering is "formed. This is peeled off their "bodies and cut into small squares, "which are then said to be boiled "in water."

In the English markets it appears as more or less agglutinated masses of small cubes of which there are specimens in the Kew Museum under the name of Thimble rubber.

East Coast.—1. *L. Kirkii*, sp. n.—This well marked species has the smallest flowers at present known in the genus. Dr. Kirk describes it as the "narrow-leaf *Landolphia* "which yields the best rubber of "the Zanzibar coast." He adds, "as far as I could discover this is "the only species considered to be "of value by the people of the Dar-"Salam district." . . . "It un-"doubtedly yields by far the "greatest quantity and also the "best."

The development of the important india-rubber trade of Zanzibar is entirely due to Dr. Kirk's energy and sagacity. Writing to Kew, December 25, 1868, with specimens of the Dar-Salam rubber-vine and rubber made from it by himself, he says :—"This plant is a woody "climber, common along the mari-"time region, and abundant at the "mouth of the Zambesi, being found "largely at Shupanga on that river "at 100 miles from the coast. The "produce of this has been shipped "from Quillimane (Mozambique) "for America. The fault is that "the rough bark is often imbedded "in the gummy mass through care-"less collection. It is not an article "of trade at Zanzibar, but I have "been endeavouring to induce the "natives to collect it. The opera-"tion of tapping is very simple: "A slice of the rough bark is cut "off the surface, also just enough of "the true bark, when the juice "starts out in drops. These dry "as they are taken from the wound "with the finger, and applied to the "surface of the ball of caoutchouc.

" There is no evaporation required " by exposure in vessels. When " we consider the wide region over " which this plant grows, its abun- " dance in many places, and the " facility with which so indestruc- " table a substance can be collected, " I think in time this will become " one of the regular exports of " East Africa." The extract from a further letter of Dr. Kirk's, given in the Kew Report for 1877, p. 32, as well as later statistics, quoted below, will show how rapidly Dr. Kirk's expectations have been realised. In a report made to the Foreign Office, in 1880, Mr. F. Holmwood, the Vice-Consul at Zanzibar, gives the following account of an improved mode of collecting india-rubber from *mtiri* (apparently another mode of spelling *matere*, *L. Kirkii*) :—

" The process consisted in cutting " clean slices of bark from the trunk " and branches, from 3 to 10 inches " in length and from $\frac{1}{2}$ to $\frac{3}{4}$ inch in " breadth. The cuttings were made " sometimes from one side only, but " generally they were scored all " over the tree, about half of its " bark being thus removed. The " method of making the balls of " rubber—which average 2 inches " in diameter—is as follows :—A " quantity of milk is dabbed upon " the forearm and being peeled off " forms a nucleus. This is applied " to one after another of the fresh " cuts, and being turned with a " rotary motion, the exuding milk " is wound off like silk from a " cocoon. The affinity of this liquid " for the coagulated rubber is so " great that not only is every " particle cleanly removed from " the cuttings, but also a large " quantity of semi-coagulated milk " is drawn away from beneath the " uncut bark, and during the pro- " cess a break in the thread rarely " occurs. By working hard one " person can collect 5 lbs. of rubber " *per diem*, though the average is " only half this amount. I was " assured, however, that in the " interior, where the trees run large, " it is no uncommon thing for one " man to collect 7 or even 9 lbs. in " a day. . . . . The re- " gular season for the collection " of india-rubber lasts from about " the middle of May till the first " week in December. This has " little connexion, however, with " the state of the tree, but is owing " to the natives being generally en- " gaged during, and for some time " after, the rainy season in cultivat- " ing their lands."

He further reports, that in the districts of Mungao and Kilwa alone india-rubber "has created a new " trade which finds profitable em- " ployment for all those classes " whose means of subsistence came " to an end with the suppression of " illegal slave trade. The total ex- " port from these places now (1880) " exceeds 1,000 tons annually. Since " last season the price has risen from " 140*l.* to 250*l.* per ton, and there " seems no reason to suppose it will " ever again fall to the former " figure."

With regard to the destruction of the rubber-vines by the collectors, Vice-Consul Holmwood takes a somewhat gloomy view. He says it is "admitted that while three " years ago the supply of india- " rubber was altogether derived " from the country within 50 miles " of the coast, the great bulk was " now procured from Mahenge and " Ubena, countries distant 150 to 200 " miles from Kilwa, the supply from " the more adjacent districts having, " moreover, greatly fallen off, and " in some instances entirely ceased."

A reference to the Kew Report for 1877 (p. 32) will show that experience on the East Coast of Africa, but repeats with regard to

the rubber-vines what has already largely taken place on the West Coast. There Mr. Skertchley is quoted for the statement "that the "natives who alone are the pro- "ducers have to penetrate deeper "and deeper into the forests for "each year's supply."

Consul O'Neill more recently remarks in his Report for 1880, on the trade of Mozambique:—"It is "curious to note the marvellously "rapid development of the india- "rubber industry. In 1873 only "443*l.* worth of india-rubber passed "through the custom-house of "Mozambique, in 1876 it reached "the value of 22,198*l.* and in 1879 "it exceeded 50,000*l.* It would "seem now almost to have reached "its climax, while the present rude "method of collecting this produce "prevails, and until communica- "tions with the interior are pro- "perly opened up, for the careless "cutting of the tree by the un- "taught hands of the natives has "resulted in the destruction of "enormous tracts of india-rubber "forest near the coast."

2. *L. florida.*—In 1879, Dr. Kirk made to the Foreign Office, "A "Report on the india-rubber plants "of the coast near Dar-es-Salam." From this important document the following remarks may be quoted as illustrating the patience with which Dr. Kirk has investigated the interesting question of the various natural sources of African rubber:—

"It has been for many years "known that the jungles on the "mainland contained almost every- "where an abundance of rubber- "producing lianas, and on my "first arrival in Zanzibar an attempt "was made at my representation, to "induce the people of Dar-Salam "to collect it; at that time, how- "ever, everyone was engaged in the "slave trade, and the experiment in "consequence failed. Within the "last few years india-rubber has, "however, become one of the chief "exports we possess. . . . . Last "year . . . . I found reason to "suspect that the India-rubber of "Zanzibar trade was the product "of more than one kind of bush "vine.

"It is now ascertained that there "are two qualities of Zanzibar "india-rubber, the produce of dif- "ferent plants, both of which grow "in the jungles and forests of the "coast. They were found as far "Lieutenant O'Neill penetrated, "or 50 miles inland. . . . . "Both the Zanzibar plants are "woody climbers rising 20 feet "from the ground, supported on "bushes or smaller trees, but "eventually forming a thick stem "of their own, the smaller branches "only resting on the surrounding "trees. . . . ."

In 1879 there seems to have been little fear of the exhaustion of the vines. "One important point," says Dr. Kirk, "which Lieutenant "O'Neill has determined, so far as "his observations extend, is, that "the plant is not killed, and but "little injured by the process of "tapping followed by the natives. ". . . . . The plants are certainly "not easily killed by the process of "collection, as I have seen hundreds "in full life so thickly scarred with "cuts that nearly two-thirds of the "bark must have been stripped from "the tree."

"Under a proper system of cul- "tivation it is evident, therefore, "that the plant may be more easily "preserved than many other india- "rubber yielding trees that are "being introduced, and, there is "reason to think will prove of rapid "growth. We know, moreover, that it "will endure a considerable drought, "and that one of the species will "flourish in light sandy soil. The "two species differ as to locality

" and soil, that yielding the best " India-rubber being found in drier " places than the other, which " seems to flourish best in damp " alluvial ground, yielding in con- " sequence a more watery juice, " and giving as now collected a " product that continues to lose " weight for many months by " evaporation. Both are woody " climbers, with rough outer bark " and stem from 1 inch to 5 inches " diameter, that scramble over or " twine amongst the trees or, where " these have falied, coil like snakes " on the ground, giving out small " twigs, that again mount up. The " best known species [*L. Kirkii*], " growing nearest to the coast and " yielding the best quality of rubber, " is easily distinguished by its small " lanceolate leaves, and its round " smooth fruit, pear-shaped at the " base. The other [*L. florida*] has " ovate obtuse leaves, of larger size " and more delicate texture, and " the fruit of this is spherical and " wrinkled on the surface. The " flower of the second being un- " known [at Zanzibar] it would be " premature to affix to either specific " names, a work that can be done " at Kew, only after careful com- " parison with known species from " other parts. The first species is " called by the natives '*Matere*,' " while the other is named " '*Mbungu*.'

Dr. Kirk has at last succeeded in transmitting to Kew specimens adequate for a complete scientific examination. The result has proved that the Zanzibar *matere* is a species hitherto unknown to science, and which may therefore be named in Dr. Kirk's honour *L. Kirkii*, to commemorate his discovery, not merely of the plant but of its immensely important commercial value. *Mbungu* proves to be identical with *L. florida* of the West Coast, which, as before remarked, appears to be distributed over the whole of Central Tropical Africa. Nor is it specifically distinct from *Vahea comorensis*, of the Comoro Islands, with respect to which it may also be mentioned that, according to Meller's Notes in the Kew Herbarium, it is called *Vaughinia* in Madagascar, and is the same as that from which the Malagash procure india-rubber.

Vice-Consul Holmwood states that "*mbungu*" is abundant on the Portuguese coast between Cape Delgado and Ibo, even close to the sea. "The rubber does not coagu- " late quickly, and the Makuas " who were collecting it used sand " to assist this process, and not, I " think, originally for the purpose " of adulteration. Here a few balls " of this rubber come down in " every parcel, and are accepted " and weighed with the bulk, but " the merchants inform me they " would only buy '*mbungu*' rubber " at a reduction of 25 per cent. " in price. . . . The fruit has " a very pleasant flavour, and an " agreeable acid taste."

3. *L. Petersiana*, sp. n.—In 1879 Dr. Kirk reported to the Foreign Office "that it appears from the " further observations of Lieutenant " O'Neill that there exists a third " variety of rubber, the produce of " a distinct plant, in all probability " a new species of the genus " *Landolphia*, which grows near " Tanga, on the coast of the main- " land opposite Pemba. The mode " of preparation of this india- " rubber differs essentially from " either of the other two kinds, the " juice being here gathered in a " fluid state by tapping, and coagu- " lated by heat, or in some other " way similar to that used in Ma- " dagascar or the Brazils. The " product is said, however, to be of " an inferior quality. . . . . " The native name given to the

" plant is *Mtolia* or *Mtoria*, which " I have often heard applied to the " edible fruit of a plant at Mom- " basa known to contain rubber " but in small amount."

From materials sent by Dr. Kirk, this species has been identified with one met with in Mozambique by Dr. Kirk (who notes that the native name is *Matiere* or *Matatubonsu*, and that the fruit is edible). With it must also be united the two species described by Klotzsch in Peter's Mossambique as *Willughbeia Petersiana* and *W. Senensis*, and it has also been found in Northern Central Africa and at Delagoa Bay.

This species has the leaves more oblong and blunter than in the two preceding. The upper surface is of the darkest green, while the under surface is apt to assume a yellowish tinge. It is easily characterised when in flower.

4. In a recent communication to Kew, Dr. Kirk has stated that he has found in the district comprising 100 miles west of Dar-Salam no less than five species of *Landolphia*. There are in all, through Dr. Kirk's persistent energy, and in the face of many discouragements and failures, no less than four of the species of the Zanzibar Coast in cultivation at Kew, and available for distribution to the Colonies. All can be readily distinguished even in young plants by the leaf-characters alone. Three have already been spoken of at length. The fourth is not sufficiently known to admit of scientific description. But it can be recognised by the rather broadly ovate leaves with blunt tailed apices. Further information about this species is much to be desired.

Borneo.—Sources of these kinds of India-rubber have always been veiled in more or less uncertainty, a state of things which, notwithstanding the material and specimens collected and transmitted to Kew by Mr. H. J. Murton, late Superintendent of the Botanical Gardens, Singapore, Mr. F. W. Burbidge, who in 1878 travelled in Borneo collecting for Messrs. Veitch, and Mr. W. H. Treacher, the Colonial Secretary of Labuan, and since carefully studied and sifted, cannot be said to be entirely cleared up. All, however, appear to be plants belonging to the natural order *Apocynaceæ*.

The most authentic information on the caoutchouc-yielding species of North-West Borneo is apparently that contributed by Mr. Treacher to the Journal of the Straits Branch of the Royal Asiatic Society for July 1879 (p. 58). He enumerates no less than eight, with the following names :—

1. Manungan pulau (*i.e.*, Manungan proper).
2. Manungan bujok.
3. Manungan manga (light coloured bark).
4. Manungan manga (dark coloured bark).

From the above is obtained the Gutta-lechak or Gutta-susu of commerce. [Gutta in Malyan means gum; lechak, elastic; susu, milk.]

5. Serapit larat.
6. Serapit pulau.

The produce of these is only used to increase the weight of the manungans, the milk not hardening sufficiently of itself.

7. Bertabu or Petabo pulau.
8. Bertabu or Petabo laut.

The produce of these is no longer marketable.

The different plants would appear to be accurately distinguished by the native collectors, and, if the best of them are to be sought and brought into cultivation, their precise botanical identification becomes important. With this object, both Mr. Burbidge and Mr. Treacher

have transmitted specimens to Kew which ought to throw much light on the matter. Unfortunately, there is some conflict of statement between them as to which plants bear the different names, and even as to which produce the best caoutchouc. Although Mr. Burbidge is an indefatigable naturalist and collector, it is possible that he would be less likely, in the course of rapid travelling, to arrive at information as accurate as someone resident on the spot and interested in the subject. I have, therefore, followed the authority of Mr. Treacher, as I believe Mr. Burbidge is himself disposed now to do.

Mr. Treacher remarks (l.c.) that all the species enumerated above have axillary flowers and edible fruits, and are distinguishable chiefly by the different shape of the leaves and fruit, and the corrugations of the bark. I am disposed to refer them all to the nearly related genera *Willughbeia* and *Leuconotis*, which in Malaya represents the allied *Landolphia* of tropical Africa, and has the same tall climbing habit, with woody cable-like stems.

1. *Willughbeia Burbidgei*, sp. n. —Manungan pulau, according to Mr. Treacher, has a pear-shaped fruit, while that of Manungan bujok is egg-shaped. The former may be identified with some certainty with specimens sent both by Mr. Treacher and by Mr. Burbidge, after whom it has been named.

In the Malayan peninsula a caoutchouc called Gutta-singgarip is collected. Mr. Murton has sent specimens, both from Singapore and from Perak, of one of the plants yielding it. Those from the latter locality being very imperfect were at first referred with hesitation to *Willughbeia martabanica*. But a further comparison of all the specimens shows that Mr. Murton's plant may be identified from both places with *Willughbeia Burbidgei*.

2. *Leuconotis eugenifolius*. —*Manungan bujok* according to Mr. Treacher has egg-shaped fruits. This would agree with *Leuconotis* rather than *Willughbeia*. It may, therefore, be *Leuconotis eugenifolius* of which Mr. Burbridge has sent us specimens, unaccompanied by a native name, but with the note that it "yields the best gutta of the "Bornean woods." This species is also indigenous in the Malay Peninsula.

3. *Manungan manga* according to Mr. Treacher, has round fruits. It may possibly be a *Willughbeia*. Mr. Burbidge, in his manuscript notes, states that Manoongan manga has round fruit rarely exceeding two inches in diameter. Its "light "corky bark and small fruits dis- "tinguish it" from other Bornean caoutchouc yielding plants. "It "yields very good gutta."

4. Surapit.—A fruiting specimen sent under this name by Mr. Burbidge may be referred with certainly to *Willughbeia*, but does not afford material for a further description, or for attaching a specific name. He remarks that it yields "the same milky exudation" as *W. Burbidgei* "but it is said to "produce bad gutta and is seldom "collected."

5. *Willughbeia Treacheri*, sp. n. —Mr. Treacher has sent us specimens from N.W. Borneo of one of the plants called *Bertabu*. It is a very distinct and apparently undescribed species of *Willughbeia* and may be named *W. Treacheri*.

Mr. Burbidge describes the caoutchouc of N. W. Borneo as being prepared 'by the addition "of *Nipa* salt (no doubt obtained "from the ash of the leaves of "*Nipa fruticans*) to the milk and

" stirring, and is sold in the form " of black greasy looking balls " about half a catty weight each, " these being threaded on a strip " of rattan for convenience of trans- " port," (a catty = 1⅓ lb.) Mr. Burbidge sent home authentic specimens, and part of these was submitted to Messrs. Silver & Co., who very kindly undertook to examine it. They reported " appa- " rently smoked, prepared free from " dirt; value (1879) 1*s.* 5*d.* per " lb." Mr. Silver further remarked " it at once strikes me as a great " improvement on that known in " the trade as 'Borneo.' I shall be " pleased to hear that there is a " prospect of a steady supply col- " lected after this fashion."

The above information, if it does not exhaust the subject, throws a good deal of light upon the origin of Bornean caoutchouc. And it conclusively disposes of a rather serious blunder which has crept into most books on economic botany.

In his Report on Caoutchouc (p. 24) Mr. Collins identifies the Bornean rubber known in trade (since 1864) under the name of " Gutta-susu," as the produce of *Urceola elastica*. This is, however, in the light of our present information, incorrect.

The caoutchouc derived from this plant was first described by Howison in 1799 in the Asiatic Researches (vol. v. pp. 157–166). Roxburgh has been shown by Bentham (Genera Plantarum, vol. ii., p. 716), to have united in his description of the plant which yielded Howison's rubber, the flowering and fruiting states of two distinct species. *Urceola elastica* instead of having a large round edible apricot coloured fruit has dry elongated pods. Gutta-producing plants with fruit of the former kind cannot therefore belong to the genus *Urceola* at all. In his report on Caoutchouc (p. 24), Mr. Collins has fallen into this error, and has indentified all the Bornean India-rubber as the produce of *Urceola elastica*, which is easily distinguished from all the plants previously referred to by its terminal inflorescence; there is, however, no evidence that any of it is actually derived from this source.

Mr. Carl Bock has sent leaves of a plant yielding caoutchouc in S. E. Borneo. It is always difficult to arrive at any conclusion on such detached fragments. But the leaves may possibly belong to *Chilocarpus viridis*, which is a Bornean species.

Burma.—The bulk of the export of caoutchouc from Rangoon, which is considerable, is doubtless derived from *Ficus elastica*, of which according to Kurz (Forest Flora, ii., p. 444), whole forests exist in Upper Burma. There are, however, a number of Apocynaceous plants which yield it of more or less good quality. The following have been recorded:—

1. *Anodendron paniculatum.*—Mr. Strettell (note on caoutchouc, 1874, p. 2), quotes Kurz as the authority for this as a caoutchouc-producing plant. But Mr. Strettell adds that the quality is inferior.

2. *Chonemorpha macrophylla.*—Kurz (Forest Flora, ii., 187) quotes Mr. Parish as saying that " this " yields a considerable quantity of " caoutchouc."

3. *Urceola esculenta.*—This has already been referred to as a source of caoutchouc (Kew Report 1877, p. 31), under the name of *Chavannesia esculenta*.

4. *Willughbeia edulis* (with which *W. martabanica* is probably identical), has long been known as a source of caoutchouc, though the quality is said to be inferior.

FIJI.—There is nothing to add to the notices which have already appeared on Fijian caoutchouc, (Kew Report, 1877, pp. 31, 32, 1878, p. 39).

JAVA.—Mr. J. H. Campbell, a planter in Ceylon, wrote to Kew, July 28, 1880:—"Being interested "in India-rubber, I called on the "manager of an India-rubber "manufactory. He showed me "among other samples, one of a "kind of rubber which used to be "largely imported from Java, and "informed me that for manu-"facturing purposes it was nearly "as good as the best Para, but that "none of it had come into the "market for the last 15 years."

Nothing is known of the source of this valuable kind, and it is well worth investigation. It is probably a *Willughbeia*. Collins, however, states (Report, p. 22), on the authority of Dr. De Vrij, that Java caoutchouc is the produce of *Ficus elastica*.

MALAY PENINSULA.—1. *Willughbeia Burbidgei*.—Mr. H. J. Murton visited Perak in 1878 for the purpose of investigating the gutta producing trees of the Malay Peninsula. I quote the following passage from his report:—

"Gutta-singgarip agrees very "closely in texture, appearance, "and mode of preparation with the "gutta-soosoo of Borneo. It is "the produce of a large woody "climber with stems about six or "eight inches in diameter, of which "there are two varieties, one with "outer bark very dark, with "lighter coloured warts and inner "bark red, the other has the outer "bark light cork coloured, with "longitudinal channels, and the "inner bark light yellow. Both "yield edible fruits, of which the "Malays are very fond, that of one "being pomiform and the other "pyriform. The foliage of both "is much alike. The gutta from "the dark barked variety is con-"sidered the best."

The foliage specimens sent home belonged to the dark-barked kind, and as above stated, may be now referred with tolerable certainty to *Willughbeia Burbidgei* (though at first supposed to be *W. martabanica*).

Mr. Murton thus describes the mode of collection, "The stem is "generally ringed at intervals of "10 to 12 inches, and the milk "allowed to run into vessels made "of palm or other leaves, cocoa-nut "shells, or anything available for "the purpose; it continues to flow "for some time, but after flowing "for 10 minutes it gets very "watery and thin. One plant will "yield from 5 to 10 catties of the "coagulated caoutchouc. When "raw it has the appearance of sour "milk, and to coagulate it the "natives add salt or salt-water; "when freshly coagulated it is quite "white which gradually changes "to a darker colour. It keeps "white inside, and on cutting "it presents a foveated appearance, "the cells containing water and "salt, which have become enclosed "during coagulation. In texture "it is soft, very spongy, and very "wet."

A sample of Perak rubber sent home by Mr. Murton was referred to Messrs. Silver. They reported:—"The quality is inferior, being soft, "sticky, and partially decomposed. "If it had not this fault the quality "itself would be very fair, and its "commercial value would be about "the same as negro-head Para "rubber. In their present state "the commercial value would be "(1878) from 10*d.* to 1*s.* per lb. "This decomposition could probably "be avoided in the collecting; it "would then be a good commercial

"article." Mr. Silver himself informed us that it was "wanting in "that property known as 'nerve,' "which is discoverable by closing "the teeth on a piece of it. I "apprehend that this is a fair test, "and that the difference is to be "accounted for by the plant pro- "ducing a weaker sap for instance; "the milk in some cases coagulates "more readily than in others, there "being less moisture on pressing "it between the fingers."

2. *Chilocarpus flavescens*, sp., n. —In his report for 1878 Mr. Murton stated that he had "arrived at the "conclusion that there were at "least five rubber-producing trees "in the jungle," belonging to the Singapore Botanical Gardens. Of these, as already mentioned, one is identical with *Willughbeia Burbidgei*. Another is an undescribed plant *Chilocarpus flavescens;* of this Mr. Murton has sent excellent specimens to Kew, together with the wood and "gutta prepared in the usual way." On this Messrs. Silver reported "The quality of "this rubber is very fair, and it "would be useful in our manu- "facture. The present market "value (1879) is about 1*s.* 3*d.* per "lb."

Information is still wanting as to the second caoutchouc-producing plant of Perak noticed by Mr. Murton, and the three others of which we have no particulars from the jungle at Singapore. The task of securing good identifiable specimens of these may be commended to Mr. Cantley the present Superintendent of the Botanic Garden. Mr. Murton has, however, succeeded in identifying a few other elastic gums met with in the Malay Peninsula.

3. *Gutta-rambong* from the interior of Perak appears to be produced by *Ficus elastica*.

4. *Gutta-jelutong* is used in Perak for adulterating gutta-percha "rendering it very brittle." Foliage specimens of the tree producing it may be referred with certainty to *Alstonia costulata* already mentioned (Kew Report, 1878, p. 39) as a caoutchouc-producer.

Mr. Murton states in the Journal of the Straits Branch of the Royal Asiatic Society (July 1878, p. 107) that *Gutta-jelutong* is "obtained "from a species of *Alyxia*." But this is, I think, an error.

5. *Gutta-burong* is only used in Perak for bird-catching. It is produced according to Mr. Murton by various species of *Ficus*.

Pernambuco. — *Hancornia speciosa*.—Our attention having been drawn to this plant as the source of Mangabeira rubber, steps were taken to obtain through correspondents a supply of seeds. These we have received and the plants raised from them will in due course be distributed. The plant itself is well-known (*see* Collins, Report on Caoutchouc, pp. 23, 24). The rubber appears to be of good quality and the tree has also the merit of producing an excellent fruit about the size of an Orleans plum, and yellow in colour specked with red. The fruit in fact in Pernambuco is more valued than the caoutchouc.

I extract the following information on the subject from Consul Bonham's Report on the trade of Pernambuco (1879)—

"Mangabeira rubber is obtained "from the trees of that name, which "are to be found in large numbers "in the interior of this, as well as "of the other northern provinces. "The reports which I hear have "been received from Liverpool of "the reception of this article are "far from favourable; the price "went up to 2*s.* 7*d.* per lb., but "has fallen again, and it would "appear that 1*s.* per lb. is about "the price obtainable in England

" in ordinary times. An idea of " the great value of this article " having got abroad here, the price " rose to an absurd figure, having " during this last season varied " from 8,000 reis, or 16*s.*, to 26,000 " reis, or 52*s.* per 15 kilos, or 33 lbs. " The method employed in the " preparation of the rubber is very " primitive, and I think may easily " account for the article not being " well received; if the milk were " treated in a more careful manner, " there seems no reason why the " rubber should not be favourably " received. At present the plan " adopted is simply to mix alum " with the milk, which causes it to " coagulate; the lumps of rubber " are then placed in the sun, after " which it is sent to the market; " from this defective mode of pre- " paration a great loss of weight " afterwards occurs, frequently as " much as 40 to 50 per cent., some " say even more."

QUEENSLAND.—Mr. H. A. Wickham (whose services in obtaining for Kew at the instance of the Government of India a supply of seeds of *Hevea brasiliensis* are recorded in the Kew Report for 1876, p. 8) writes from the Lower Herbert River: "The lofty tree, growing in " the 'scrubs' here, which produces " gutta (*vide* sample sent to Kew) " is *Ochrosia elliptica* as I am in- " formed by Baron von Mueller."

Indian turpentines. — The surplus specimens of turpentines from British India removed from the India Museum were placed in the hands of Professor Armstrong, F.R.S., Sec. C.S. for investigation. He reported (December 10), " Of " all the substances which you sent " me from the India collection some " time ago, the only one which has " hitherto furnished any result of " interest is that labelled Crude " Turpentine, *Pinus khasyana*, " Burma. It consists of a solid " resin similar to colophony and of " a liquid 'turpentine oil.' The " latter is remarkably pure and free " from smell and ought I should " say, to be very valuable for pur- " poses for which the French and " American oils are used. Scienti- " fically it is interesting in several " ways; it has the greatest amount " of action on polarized light of any " *coniferous* oil of turpentine with " which I am acquainted, the rota- " tory power of a 200 mm. column " being about 76° for light of the " refrangibility of the D line, " whereas that of French oil of " turpentine is about 60°, and that " of American oil about 30° on the " average. Neither French nor " American oil, especially the latter, " are homogeneous, but this *P.* " *khasyana* oil, so far as I can " judge from the examination of the " small quantity at my command is " almost a pure substance. It may " therefore be worth while to call " attention to it.

" You also sent me some tur- " pentine from *Pinus longifolia*, " Calcutta. The oil from this, " however, has a marked and not " very pleasant odour, and a low " rotatory power (13° per 200 mm.). " There was too little to examine " and I cannot give any opinion as " to its value.

" These coniferous oils are of " great interest chemically, and it " would be a good thing if people " abroad could be induced to send " over samples (as large as possible, " gallons rather than quarts) for " examination. The discovery in " *Pinus sabiniana*, California, of a " hydro-carbon quite different from " turpentine oil shows that one " must not take it for granted that " the oils are all of the same com- " position."

This report has been communicated to the Government of India, and I trust that Professor Arm-

strong will be furnished with the ample material he desires for the further investigations which he has kindly promised to undertake.

Indigo.—I am also indebted to Professor Armstrong for the following note, the interest of which speaks for itself:—

"During the past year chemistry "has achieved a remarkable triumph, "none less than the discovery by Prof. "Baeyer, the successor of Liebig at "Munich, of a method of producing "indigo artificially, which it is pro- "posed to employ on a large scale "(Patent No. 1177, 18th March "1880.) The process is a some- "what complicated one, and consists "in converting toluene C_7H_8, a hydro- "carbon contained in coal tar, by a "series of reactions into cinnamic "acid. This acid is acted upon "with nitric acid under certain "special conditions, and the resulting "nitro-acid deprived of a portion of "its hydrogen by combining it with "bromine and then treating with "sodium hydrate. A body termed "nitrophenylpropiolic acid is thus "obtained, which has only to be "dissolved in water together with "a certain quantity of alkali and of "grape sugar and the solution "warmed to produce *pure* indigo- "blue.

"The conversion of the nitro- "phenylpropiolic acid into indigo- "blue takes place in this manner "with such facility that it is pro- "posed to form the indigo-blue *in* "*situ*, on the fabric, by dipping it "in the mixed solution and then "steaming so as to bring about the "chemical change.

"Notwithstanding the number of "operations involved in the manu- "facture, it is stated that it will be "possible thus to produce indigo "at such a price that it can even "enter into competition with the "natural article, and that by sub- "stituting the method of dyeing "above indicated for the trouble- "some and somewhat uncertain "indigo vat-method there will be "a still more distinct advantage "gained over the natural article. "It is difficult at present to estimate "the influence which this discovery "may have on the production of "indigo in India, but when it is "remembered, to take an analagous "case, that the discovery of a "process of manufacturing madder- "red was only made in 1869, and "that now it is almost impossible "to procure natural madder-red or "garancine, the annual value of the "imports of which into the United "Kingdom alone for the years "1859 to 1868 amounted to about "1,000,000*l.* sterling, it is difficult "to avoid the conclusion that arti- "ficial indigo will most seriously "interfere with, even if it does not "within very few years altogether "displace, the natural article."

Massoy bark.—This aromatic product has long been known as an article of commerce in the Malay archipelago. It is derived from a tree of the laurel family (*Laurineæ*) which is indigenous and apparently confined to the forests of Southern New Guinea. The botanical determination of the species has long been desired, and during the voyage of H.M.S. Challenger Mr. H. N. Moseley, F.R.S., one of the naturalists attached to the expedition, succeeded in obtaining specimens both of the bark as well as fruits, which were deposited in the Kew museum. These suggested an affinity with the genus *Cryptocarya*. Subsequently during his travels in New Guinea D'Albertis made a small collection of plants, which were examined by the distinguished traveller and botanist Beccari. I extract the following note from the appendix to the English edition of

D'Albertis's New Guinea (vol. ii., p. 398).

"*Massoia aromatica*, Becc. (*Sassafras Goesianum*, Cat. H. Bot. Bog.) In D'Albertis's collection there is but one small specimen of the bark of this *Laurinea*, which is highly aromatic, and in great request by the Malays as an article of commerce. I have been obliged to find a new generic name for this plant, which it is a positive error to call *Cinnamomum* or a *Sassafras*, as has hitherto been the case, both flowers and fruit having been unknown. From an examination of imperfect specimens it appears to me that the flowers are those of a *Cryptocarya* and that the fruit resembles that of the Madagascar *Ravensara*, the seeds having the appearance of being entirely ruminated. The name *Massoia* I derive from Massoi, the Malay name of the plant."

Mpafu tree of Tropical Africa.—Dr. Kirk, Her Majesty's Consul-General at Zanzibar, has made some enquiries with respect to the "mpafu" tree, which is frequently mentioned by Commander Cameron in his volumes of travels entitled "Across Africa." As will be seen from the quotation below it appears to be an oil-producing tree of great value. It does not seem to be met with East of Lake Tanganyika and Dr. Kirk remarks to me in a letter (December 9) "its allies will be West African no doubt, for once you pass the Tanganyika you change the type and get among grey parrots and gorillas both common to the West Coast but unknown east of the lake."

Commander Cameron's account of the tree is as follows :—

"On this march" [through the Uguhha country W. of lake Tanganyika, long. 29°–30°,] "I first saw the 'mpafu,' from which the scented oil is obtained. It is a magnificent tree, often thirty feet and more in circumference and rising to eighty or a hundred feet before spreading and forming a head, the branches of which are immense. The oil is obtained by soaking the fruit—which has some resemblance to an olive—for a few days in large pits of water, and when the oil collects on the surface it is skimmed off. It is usually of a reddish colour, very pure and clear, with an agreeable smell. Under the bark are great masses of scented gum, used by the natives in fumigating themselves." (Vol. i., p. 328.)

"It is common from the western side of the Taganyika to the commencement of Lovalé," [long. 22°–30°] (vol. II., p. 326.) It does not seem from Cameron's observations therefore to be met with in the part of Africa traversed by him west of the watershed of the rivers flowing into the Atlantic.

We have, however, in the Kew Museum "stones" of a *Canarium* collected by Dr. Welwitsch in the district of Cazengo in Angola, with the following note :—"Semina arboris Mubâfo, quæ resinam de Mubâfo (Resin. elemi speciem) plorat. arbor 30–60 pedalis, coma ovata, foliis pinnatis." These agree fairly well with a stone sent to us by Dr. Kirk, and which is one of two brought by Mr. Thompson on his return to Zanzibar from west of Tanganyika. If not absolutely identical, the "*mpafu*" and "*mubafo*" must be closely allied, and this confirms Dr. Kirk's prediction that the former belonged to the West Tropical African flora. It is possible also that the names are etymologically connected.

Myrrh.—*Bésabol.*—In the Kew Report for 1878 (p. 41) reference

is made to the botanical origin of this drug, the source of which has been long unknown, though it is a not unimportant article of trade with India.

The plants obtained from Somali land by Mr. Wykeham Perry have grown vigorously at Kew during the past year, though they have not flowered. We have little hesitation in identifying them, however, from foliage alone, with *Hemprichia erythræa*, Ehrenberg, originally collected in the island of Ketumbal in the Red Sea; of this we have authentic herbarium specimens.

Professor Engler, who has been working at Kew during the past year on a revision of the *Burseraceæ*, reduces the *Hemprichia*, doubtless correctly, to *Balsamodendron*, or rather to *Balsamea*, Gleditsch, a generic name which Engler, following Baillon, holds to have priority of *Balsamodendron* (Engler, Bot. Jahr. i., p. 42).

The Bêsabol plant may be held therefore, as far as available material goes for its determination, to be *Balsamea erythræa*, Engler. This conclusion is strengthened by Professor Engler's having identified a plant collected by Dr. Kirk, Her Majesty's Consul-General at Zanzibar, in Somali land (whence Bêsabol is derived) as *Balsamea erythræa*, var. *glabrescens*, and this particular form agrees with the living Kew plants.

In the Kew Report (1878, p. 41) we suggested that *Balsamodendron Kataf*, Kth. (*Amyris Kataf*, Forsk.) was allied to the Bêsabol plant. Bentley and Trimen, in their careful work on medicinal plants, under Tab. 60 suggest the identity of this with *Hemprichia erythræa*, and they are possibly correct, though Professor Oliver had referred it (Flor. Trop. Africa, vol. i., p. 326), to *Balsamodendron Playfairii*, which yields gum Hodthai, while Professor Engler retains it as a distinct species.

Professor Flückiger in the second edition of Flückiger and Hanbury's learned Pharmacographia, apparently identifies (p. 146) Bêsabol with Hodthai. The gums themselves are certainly distinct, and if what is stated above be correct the plants yielding them also.

Nepal cardamoms.—In the second edition of Hanbury and Flückiger's Pharmacographia (pp. 649, 650), it is stated that the plant yielding this drug has not been identified with any published description. Dr. King has, however, pointed out to us that it is undoubtedly produced by *Amomum subulatum*, Roxb., as stated by him in Journ. Linn. Soc. xvii., pp. 3–5, (See also Kew Report, 1877, pp. 27, 28).

The Nepal and Bengal cardamoms described by Hanbury and Flückiger as distinct drugs are in point of fact one and the same, and both are known as *Buro elachi*, and are derived from the same source, *Amomum subulatum*, Roxb. They are not, however, to be confounded with the fruits of *Amomum aromaticum*, Roxb., which is quite different. These, as Dr. King informs me, were doubtless in the market in Roxburgh's day, but are now unknown in commerce.

Pai-cha wood for engraving.—With reference to this wood (see Kew Reports, 1878, pp. 41, 42; 1879, p. 38), we have been favoured with the following report by Mr. R. H. Keene on its suitability for engraving purposes:—"I like the "wood very much, and prefer it to "box in some instances; it is freer "to work and consequently quicker, "and its being uniform in colour "and quality is a great advantage; "we often have great difficulty in

" box in having to work from a " hard piece into a soft. I think it " a very useful wood, especially for " solid bold work. I question if " you could get so extreme a fine " black line as on box, but am " sure there would be a large " demand for it at a moderate " price."

Mr. R. J. Scott accompanied this report with the following note:— " I may remark that he [the en- " graver] does not intend it to be " understood that pai-cha is " qualified to supersede box, but " for inferior subjects for which " coarse brittle grained box is " used. Of the woods that I have " tried pear and hawthorn I " think better than pai-cha. I " have sent also a block made from " what we have known as *Tecoma* " *pentaphylla*. Of its merits I think " I have reported before; it is the " only likely successor to box that " I have seen yet, but it is not " embraced as a deliverer should be, " but its time may not be far off."

Palghaut matting.—A very fine kind of matting is made at Palghaut which is not very far from Tinnevelly. The material used appears to me the split culms of *Cyperus corymbosus* (= *C. tegetum*); these are divided into very narrow slips, and the matting is therefore much more flexible and closely woven than other kinds made in China or India from the same plant. We are indebted to Dr. Bidie, Superintendent of the Government Central Museum, Madras, for a valuable series of specimens for the Kew Museum, illustrating the manufacture and the method of preparing the material.

Paper materials.—1. *Esparto.*—I extract the following statistics from Consul-General Playfair's report on the trade of Algiers (1879):—

Destination.	1877.	1878.	1879.
	Tons.	Tons.	Tons.
France - -	2,080	1,078	1,252
Great Britain - -	42,710	46,255	47,761
Spain - -	20,859	12,133	11,699
Portugal - - -	1,885	927	1,182
Belgium - -	1,199	166	784
Other Countries -	25	10	17
Total - -	68,758	60,569	62,596

" The employment of this fibre " for the manufacture of paper " ensures for it a ready sale, in " quantities as great as can be " brought to the coast from the high " plateaux. As soon as the rail- " ways, constructed almost ex- " clusively with this object, are in " full working order, it is hoped " that the prices may be kept con- " siderably under what now prevail."

2. *Muddar.*—Some correspondence has taken place with Kew on the subject of this well-known Indian plant (*Calotropis gigantea*) which " grows all over India; it seems to " thrive on soils that either destroy " or reject everything else." Mr. G. W. Strettell, of the Indian Forest Department has published a pamphlet entitled " a new source of " revenue for India," in which (pp. 30, 31) he expresses the opinion that *Muddar* must " afford " a material for paper, as good as, " and cheaper than esparto."

In a " memorandum on materials " in India suitable for the manu- " facture of paper," by L. Liotard, of the Indian Agricultural Department (which is well worth the attention of those interested in new paper materials), the following remarks by the Curator of the Victoria and Albert Museum, Bombay, are quoted (p. 18):—" This is, in my " opinion, one of our most valuable

" fibres. It is white, soft, silky, " and of great strength, and per- " fectly adapted for cordage, textile " fabrics of all kinds, and paper. " It is quite capable of taking the " place of flax. The main draw- " backs to its extended use are the " difficulty of preparing it and the " present limited supply; both of " these, especially the latter, can be " overcome. There is no part of " this presidency in which the " shrub does not flourish; it seems " indifferent to soil or climate, " growing as well in Bombay as in " the driest parts of the Deccan. " It needs neither culture nor " water, and will flourish in dry " sandy soils when every other " plant is withered and dead. " There is no lack of waste land in " the Deccan and Khandesh, which " might be profitably utilized for its " production, and where the plant " already grows; the great advan- " tage being in the fact that, when " once established, it needs no " further care, and is the source of " a perennial supply of valuable " fibre."

On the other hand, Mr. Routledge, who has paid much attention to paper materials, informs us:— " Without wishing to detract from " the merits of the fibre as a textile " material (as its value is unques- " tionable for such purpose), I feel " assured that neither it nor any " other exogenous plants of similar " character can ever compete with " esparto, nor be produced at a " sufficiently low cost to admit of " their being employed as paper- " making materials."

3. *Wood-pulp.*—This is becoming an important paper material. Acting Consul-General Septimus Crowe reports that in 1880 in Norway " two new wood-pulp factories " were brought into action, six are " about to be built, and eight of the " nineteen old establishments for " the mechanical production of pulp " are to be considerably enlarged. " Besides these there are now in " work, with one exception, one " chemical wood-pulp factory, two " paste-board factories, and seven " paper factories. This branch of " industry seems specially adapted " to Norway, inasmuch as it renders " the waterfalls profitable, and so " aggrandizes the country by means " of one of its natural forces, becom- " ing thus in fact an entirely new " industrial development." Much of this pulp finds its way into this country, where it is worked up, into paper, more or less in combination with other materials. The export has increased with extraordinary rapidity. In 1870 it was 553,150 kilos.; in 1879 it had reached 20,772,890 kilos.

Poison-bulb of South Africa.—Colonel Sir W. Owen Lanyon, the Administrator of the Transvaal, sent to Kew a number of specimens of the poison-bulb of South Africa (*Buphane toxicaria*). A few of these were placed in the hands of Professor Sydney Ringer, who has made a careful study of the physiological action of the plant. (Ringer and Morshead, Archives of Medicine, June 1880). It is reported to be highly poisonous to cattle, and the Hottentots are said to use it to poison their arrows. He found that it contained an alkaloid (hemanthia) the action of which " corresponds very closely, if indeed " its behaviour be not identical " with that of the alkaloid from the " common daffodil (*Narcissus*), a " member of the same order. In " warm-blooded animals both dilate " the pupil, whether administered " internally or topically applied. " Both dry the mouth, produce " general weakness, tetaniform " twitchings, nausea, sickness, and " hurried breathing. . . . . The " action both of narcissia and

" hemanthia is in many respects " similar to that of atropia. . . . . " As far as cats are concerned " hemanthia is a far more powerful " alkaloid than atropia." Whatever may be the effect on the smaller animals, which, however, when used as an arrow poison it probably rather stupifies than kills, its poisonous action on man is scarcely strong enough to make it very formidable.

Sabicu-wood.—This is the produce of *Lysiloma Sabicu*, a leguminous tree indigenous to Cuba. Its wood is excessively hard and durable, and has been much valued for shipbuilding. The stairs of the exhibition of 1851 were made from it, and at the end of the season were little if anything the worse for wear. It is grown in the Bahamas, where it has probably been introduced. In his report for 1879 Governor Robinson states: " This wood is " mainly used for manufacturing " purposes in connection with " cotton spinning. . . . . The " export, however, has never at any " time been large, and the demand at " best has always been precarious." On making inquiry in this country, Messrs. Joseph Gardner and Sons inform us that Bahama Sabicu is used in this country for the manufacture of shuttles and bobbins. They inform us that, " the " demand for bobbins is pretty " regular, but so far our friends do " not seem to think much of it for " shuttles, so the consumption is " but small."

Potato disease.—A committee of the House of Commons having been appointed to consider the possibility of taking steps to counteract the potato disease in Ireland the Assistant Director was summoned to give evidence.

Sikkim leaf-bellows. — In my Himalayan Journals (vol. i., p. 53) I have described the leafless trees of *Cochlospermum Gossypium*, which I met with in flower in the Saone Valley. I remark " of the " leaves the curious rude leaf-" bellows are made, with which the " natives of these hills smelt iron." Not having the opportunity of comparing the leaves on the spot, I took this statement on the authority of residents, and it has become current (as in Brandis, Forest Flora, p. 17). A careful examination of a second specimen from the Indian Museum proves that the leaves used are really those of *Bauhinia Vahlii*.

Socotra.—A committee of the British Association for the Advancement of Science, of which I was nominated a member, having been appointed to take steps for the investigation of the natural history of Socotra, Professor Bayley Balfour was induced to undertake the task in the place of Colonel Godwin-Austen, who had originally offered his services. Professor Balfour left this country on January 9th, and returned home on April 21st. He was most kindly received by the Political Resident at Aden and his staff, and, under the authority of the Admiralty, was conveyed to the island in H.M.S. " Seagull " and brought back in the despatch boat " Dagmar." Professor Bayley Balfour, who unhappily suffered subsequently somewhat from fever contracted in the island, succeeded in bringing to England a very large collection illustrating both the fauna and flora, this being the first scientific examination ever made of its natural productions. Professor Balfour brought numerous specimens of the plant yielding the Socotra Aloes (Aloe Perryi, see *supra*, p. 21), and also of the *Dracæna*, which yields the Dragon's Blood of the island (see Kew Report, 1878, pp. 35, 36). These are now living at Kew, where also has flowered an entirely new

type of Begonia (*B. socotrana*), which proves to have great horticultural merit. Professor Bayley Balfour's collection of dried plants contain a singularly large proportion of new types and novelties generally, and when worked up will be a contribution to systematic and geographical botany of the greatest importance. The Committee have decided that the first set of the specimens shall on distribution be presented to the Kew Herbarium.

Tea cultivation.—*India.*—The following statement, quoted from the "Madras Mail," gives an astonishing picture of the progress made by this industry: "In 1850 "the area under plant was approxi- "mately estimated at not more than "1,000 acres, and the total outturn "of tea at little over 250,000 lbs. "At the present time the area "under plant may be put down "at 206,700, viz.:—

	Acres.
"Assam - -	85,000
"Cachar - -	47,000
"Sylhet - -	18,000
"Darjeeling and "Terai - -	34,000
"Dehra Doon -	4,300
"Kangra Valley -	7,400
"Kumaon - -	4,400
"Chittagong -	4,200
"Chota Nagpore -	3,300

"producing about 40,000,000 lbs. "of prepared tea, and representing "a capital invested not far short of "15 millions sterling, while about "two millions sterling are spent "annually in India in the working "and upkeep of the plantations. "Of the advantages accruing to "India—directly to the people, and "indirectly to the Government— "from the disbursement of so large "an amount of money there can be "no question. It will be seen that, "of the total area of 207,600 acres "brought under cultivation, 150,000 "acres lie within the administrative "circle of the Chief Commissioner "of Assam; and the statistics of "that province demonstrate the "continuous and rapid progress of "its revenue and general prosperity "during the period in question—a "prosperity which may be fairly "claimed as being almost entirely "due to the beneficial influence of "the tea industry. There still "remains, however, a vast field for "future development, not merely "in the production of tea, but for "almost every kind of crop grown "in India, more especially rice."

United States.—The following experiment in the direction of enabling the United States to grow its own tea supply seems to me worth noting. The Commissioner of Agriculture reports that Mr. John Jackson, who had had the management of tea plantations in Assam, had purchased the estate of Dr. Jones in Georgia, "on which "were growing patches of neglected "tea plants of all sizes, most of "them having sprung from a few "old trees set out by Dr. Jones in "1850." Mr. Jackson laid out a tea garden of 100 acres, and made samples of tea from the leaves of the older plants. These were sent to Messrs. W. J. and H. Thompson, of 38, Mincing Lane, who reported: "The samples "represent teas of a high type. "The flavour, though not strong, "is remarkably fragrant. The "infused tea indicates somewhat "too light fermentation, but has "all the characteristics of high "quality."

There can be no doubt apparently as to the feasibility of tea cultivation in the Southern States. The ultimate success of the experiment will probably depend upon the supply of labour at a sufficiently cheap rate to enable the produce to compete with foreign tea.

Tonga.—In the autumn of 1879

Messrs. Allen and Hanbury submitted to me for investigation specimens of a new drug from Fiji which was reputed to have great therapeutic value as a remedy for neuralgia. It was originally brought to this country, I believe, by Mr. H. J. Ryder, of Mango island, Fiji. I am informed that he in turn obtained it from a settler married to a half-caste Tongan, who first prepared it for her husband's use, and her native island gave its name to the drug.

The composition of tonga was discussed in a paper by Mr. A. W. Gerrard, published in the Pharmaceutical Journal (April 24, 1880, pp. 849, 850). He found it to consist "mainly of a mixture of fibrous "material, probably a root, and the "inner bark of plants, the botanical "sources of which are unknown, "the main constituents of the bark "being pectin, glucose, a little "essential oil, and fat; the fibre "containing a volatile alkaloid, "which is probably the active prin-"ciple, and may for the present be "named tongine, also some chloride "of potassium."

Mr. E. M. Holmes, by looking through Seemann's Flora Vitiensis to find what plants were likely to yield fragments similar to those met with in the drug, arrived at the conclusion that they were most probably derived from the stem of an aroid of the genus *Raphidophora* and possibly *R. vitiensis*. He thought that the bark was derived from some member of the family *Sapotaceæ*.

We have recently learnt from Mr. C. W. Hansen, who made some enquiry upon the subject while in Fiji, that Mr. Holmes' determination is substantially correct, and that the so-called root is in reality fragments of the stem of a *Raphidophora*, probably *R. vitiensis*. The bark and leaf fragments which compose the remainder of the drug as it comes to this country Mr. Hansen believed to be yielded by a *Premna*, probably *P. taitensis*, which is *à priori* unlikely to have any active qualities.

Museums.

The **revision of the collections** in Museum No. 2 has been continued, attention having been given principally to *Palmaceæ*, *Cyperaceæ* and allied orders.

The magnificent **collection of forest produce** received from the Government of India in 1878 (see Kew Report, p. 50) has been examined, selected from, and incorporated in the permanent collections and the duplicates distributed. The whole collection comprised 98 packages and consisted of "1,113 "specimens of timber as well as of "a number of large rounds, planks, "bark pieces, specimens of trees "grown in plantations, bamboos, "canes and other palms, gums, "fibres, fruit, and other miscel-"laneous forest produce."

This collection, important as it was, was completely overshadowed by the transference to Kew of the entire Economico-botanical collections forming part of the **India Museum** at South Kensington. These were unreservedly handed over to the Royal Gardens, the India Office undertaking to pay all the expenses of removal, to expend a sum not exceeding 2,000*l.* in an extension of Museum No. 1 so as to provide the increased space required for the intercalation of a complete set of specimens of Indian vegetable products, to make a grant of 200*l.* a year for the efficient maintenance of the Indian collections, and to place at the disposal of the establishment, three days a week for a period of five years, the services of Dr. Cooke, one of the curators of the museum under the India Office.

The chief difficulty which presented itself in carrying out the transfer arose from the fact that, besides a large exhibited collection, there were extensive store accumulations which had been sent from India in connection with a scheme at one time contemplated of systematic distribution of arranged collections to provincial museums. There being no adequate store accommodation at Kew for the reception of this mass of material, some difficulty at first presented itself as to how it was to be dealt with. As soon, however, as the breaking up of the India Museum was decided on, numerous applications for a share of its contents were addressed to the India Office, who communicated them to Kew with the intimation that the Secretary of State would be glad that, as far as possible, they should be acceded to. Further requests from other institutions were subsequently made to Kew.

To a few institutions it appeared that the India Office had already to some extent pledged itself, more particularly the City Industrial Museum, Glasgow. A number of arranged collections exhibited in cases, which were unsuitable to the plan and method of the Kew Museum, were, therefore, packed up and handed over at once to this institution. A similar and expensively mounted revolving case of fibres was sent to the Dundee Museum, and a large collection, more especially illustrating the rural industries of India, was, with the assent of the Secretary of State, handed over to the Indian Institute at Oxford. The bulk of the silk collection was sent to the Animal Products Museum of the Science and Art Department at Bethnal Green, and the large collection of wheat samples upon which Dr. Forbes Watson's Report on Indian wheat was based (with the exception of the selected types which were retained for Kew), were handed over to Professor Church for the Food Museum of the same Department.

In addition to the economico-botanical collections Kew was allowed to select from the Art section of the Museum an additional number of objects of suitable size to illustrate as completely as possible at Kew the industrial application of Indian vegetable products.

The Science and Art Department very courteously placed at our disposal their large vans for removing collections to different parts of the country. The economico-botanical collections other than those specified above filled twelve of these, while eight more were filled with cases which the India Office also transferred to us.

The two large temporary sheds erected for the shelter of the workmen during the hail-storm repairs (Kew Report, 1879, p. 6), were fortunately still standing. One of these was boarded in and heated with hot water, and formed during the winter a convenient packing and sorting room. The first step was to select a full and complete series for the Kew museum. The detailed labour involved in this may be judged from the fact that of rice alone there were about 2000 samples from the most widely distributed districts of India and weighing in the aggregate about three tons. Every one of these was carefully examined and compared, and a series was separated showing every type of variation to which Indian rice is subject. The amount of this variation in form, colour, and texture is almost inconceivable, and the trouble and expense which must have been involved in the accumulation of the specimens is amply justified by the clearness with which this fact is now brought out.

In form the individual rice-grains vary from elongated to ovoid, in texture from translucent to pearl-white opacity, in colour from white to pink, brown, mottled, and even black. In fact the natives of each district of India appear to have their specialised local variety, and this fact is a source of administrative difficulty in the case of famine, as the natives of a given district are by no means always prepared to accept other rice, such as Carolina, as a substitute for that to which they are accustomed.

After the separation of the Kew series the **Distribution of** the **duplicates** was proceeded with. In all 25 places and institutions received a share, the total number of boxes and packages sent away amounting to 146, besides two van-loads of specimens sent to the Food Museum at Bethnal Green.

The following is a list of the more important recipients :—

Blackburn, Museum; box of vegetable products.

Copenhagen, Botanic Garden; box of woods from Forest Department.

Dundee, Museum; large swing-case containing collection of fibres.

Edinburgh, Museum of Science and Art; 426 specimens of vegetable products.

Edinburgh, University; collection of Indian drugs.

Exeter, Albert Museum; box of vegetable products.

Glasgow, City Industrial Museum; 7 exhibition cases containing arranged collections of dyes, drugs, tea, coffee, cereals, cotton, &c.; carved black-wood sideboard; 8 boxes containing 581 specimens of miscellaneous vegetable products.

Hamburg, Handels Museum; two boxes of vegetable products.

Harvard University, Massachusetts, Arboretum; six boxes and packages of Indian woods from Forest Department.

Harvard University, Massachusetts, Museum; three boxes of woods from Forest Department and eight boxes vegetable products.

London, Bethnal Green Museum, Animal products collection; 19 drawers illustrating Indian silk, 20 specimens of silk products.

London, Bethnal Green Museum, Food collection; 446 specimens of Indian wheats, 2102 miscellaneous samples of vegetable food-products.

London, British Museum, Botanical Department; 121 large specimens of Indian woods, two boxes of woods from Forest Department, large bamboo stem.

London, British Museum, Christy collection; 21 miscellaneous ethnographical objects.

London, India Office; Royle collection.

London, Pharmaceutical Society; ten boxes of pharmaceutical products.

London, University College; collection of Indian drugs.

London, Parkes Museum of Hygiene; four boxes of food-products.

Mauritius, Bowen Museum; six boxes of vegetable products.

Melle-lez-Gand, Musée Commerciel-industriel; two boxes vegetable products.

Newcastle-upon-Tyne, Museum; two framed specimens of cotton plants.

Oxford, Indian Institute; collection of agricultural models, photographs illustrating cotton industry; 16 boxes of miscellaneous vegetable products.

Paris, Jardin des Plantes; box of vegetable products.

Strassburg, University; collection of Indian drugs.

Sydney, Technological Museum; 5 boxes of vegetable products.

Sydney, Economic Museum, Botanical Gardens; box of vegetable products.

Taunton, Museum; box of vegetable products.

Washington, Department of Agriculture; 2 boxes of woods from Forest Department.

In addition a small reserve store has been retained at Kew for the supply of future applicants.

The set of vegetable products reserved for Kew has been carefully intercalated in the exhibited collections. It is far more extensive and complete than that which was originally open to the inspection of the public at South Kensington, and the comparison of the specimens in the process of incorporation has led to a great improvement of the botanical determination of the individual samples and of their nomenclature. Every specimen from the India museum bears a small blue distinctive label. The number of specimens so distinguished is about 4,000.

The India Office also sent to Kew about 36 tons of **Wood specimens,** which had been lying for years at the India Office Stores in the Belvidere Road, Lambeth. These specimens, the existence of which had long been known, had been vainly asked for for Kew many years before. They consisted of 3,358 specimens suitable for museum purposes, being mostly of commodious size, and evidently collected at considerable expense and with a good deal of care. Comparatively few were identified in any way, but the majority bore impressed numbers corresponding probably to lists and catalogues now no longer in existence, or at any rate not forthcoming.

Of these specimens 2,318, being without names, history, or information regarding them of any kind, were destroyed. Their loss is the less to be regretted as Kew is now in possession of good specimens of Indian woods from the Forest Department collection already referred to and accurately determined by its scientific officers.

Of the remainder, 51 specimens are preserved in the timber collection of the Royal Gardens; 121 specimens were sent to the Botanical Department of the British Museum; 281 were sent to the museum of the Arboretum of Harvard University, United States; 557 specimens, expensively mounted on brass tripod stands, forming the Schlagintweit Collection, but much deteriorated and useless to Kew on account of the loss of labels and catalogue, were eventually sent through the India Store Department to the Forest School at Dehra Doon.

The India Office also transferred to the Royal Gardens the **Iron house** belonging to the India Museum, and defrayed the expense of its removal to Kew and re-erection and warming with hot water. This is a most useful addition to the museum department, as there has hitherto been no convenient accommodation for the work of distribution and packing or for the temporary store of duplicates.

The net result of a somewhat laborious transaction is that the Kew Museum has been very greatly enriched by the intercalation of a series of specimens illustrating the vegetable resources of our Eastern empire far exceeding in completeness anything in our possession before. The Indian Government is benefited by having its collections exhibited in a more commodious and accessible way than had been hitherto possible and kept in good order by experts trained to the work, while the members of the public who visit the museum for scientific or commercial purposes have the advantage of comparing the Indian products with others exhibited alongside of them from the colonies and foreign countries.

The India Museum grant has

enabled me to retain as **Museum prèparateur** George Badderley, who held a similar position under the India Office. This supplies a want which has long been felt, as hitherto the whole of the work incidental to museum management, such as mounting specimens, &c., was performed by the museum attendants, who had no special qualification for the task, during hours when the museums were not open to the public.

The **Other principal contributions** received during the last year have been :—

Bacci, Dr. L. ; chestnuts, chestnut flour and cakes made of the flour.

Balfour, Prof. Bayley ; specimens of aloes in various stages as prepared in Socotra ; skin such as is used for receiving the fluid aloes from the leaves ; samples of Dragon's Blood of various forms, and skin such as is used for exporting Dragon's Blood from Socotra ; knives used by the people for cutting the leaves of *Aloe* and stems of *Dracæna* to obtain the juices ; gums of *Acacia*, *Balsamodendron*, *Boswellia*, &c.

Bidie, Dr. G. ; specimen of Tinnevelly matting made of culms of *Cyperus tegetum*, and culms of the same entire and split for making mats.

Brant, Lieut. James ; pillow, dish, spear, and paddle from Fiji, made of the woods of *Afzelia bijuga* and *Calophyllum*.

Bretschneider, Dr. ; a collection of fruits, seeds, &c. from Pohua Shan, a mountain west of Peking, 8,000 feet high.

British Museum, Botanical Department ; Trunk of Sago Palm (*Metroxylon Sagu*).

Burgoyne, Burbidges, & Co. ; specimen of Spanish senna, copper vessel such as is used to export essence of lemon from Palermo, samples of perfumes, oils, &c.

Christy, T. ; razor strop made of *Herminiera elaphroxylon*.

Clarke, C. B. ; photographic views in Calcutta Botanic Garden.

Cooper, W. M. ; two logs of Pai-cha wood (*Euonymus sieboldianus*).

Cordua, Carl ; samples of Italian rice, Hungarian beans, peas, &c.

Dickie, Dr. ; "Kiesel Guhr," Diatomaceous deposit, Bogangore, Aberdeenshire.

Duthie, J. F. ; specimens of mats and matting, ropes, &c. made of Baib Grass (*Spodiopogon angustifolius*) ; frame made of wood of *Wrightia tinctoria*, and plates of wood of *Wrightia tomentosa* and *Cordia Myxa*.

Firth, James F. ; a large series illustrating commercial qualities of coffee.

Ford, Charles ; complete opium smoking apparatus ; mats and matting made of *Lepironia mucronata*, models of Japanese fruits, &c., photographic views in Hong Kong.

Fortnum, Mason, Messrs., & Co. ; collection of preserved fruits, &c.

Gardner, Messrs. J., and Sons ; shuttle and spindle made of Sabicu wood (*Lysiloma Sabicu*).

Gray, Dr. Asa ; seeds of "Chia" (*Salvia Columbaria* and *S. carduacea*) from South California.

Hance, Dr. ; complete opium smoking apparatus ; plants of *Cyperus tegetiformis* and *Lepironia mucronata* used for making matting, and matting made of the same, and series of articles made from Chinese Coir or Hemp Palm (*Chamærops Fortunei*).

Henriques, J. ; various baskets, mats, &c. made of leaves of *Chamærops humilis*, and baskets of *Arundo Donax*.

Hollings, J. S. ; fine specimens of rhizomes of green ginger.

Im Thurn, E. F. ; a large collection of the vegetable products and manufactures of British Guiana.

Johnston, Surgeon-Major Wilson; wheat grains mixed with *Lolium temulentum*, which caused cerebro-spinal symptoms in troops at Candahar.

Kinch, Prof. E.; a large collection of vegetable food products of Japan.

Lucy, Charles, and Nephew; 13 samples illustrating wheat and its milling products.

Macintosh & Co. (Hugh Birley), 14 specimens of various India-rubbers of commerce.

Maw, George; "Kype" or "Wisket" made of split saplings of oak.

Mueller, Baron Von; a large collection of agricultural implements, handles, waggon shafts, &c. made of woods of *Eucalyptus spp.* *Acacia melanoxylon*, *Dammara australis*, &c.

Pharmaceutical Society of Great Britain; numerous samples of North American and other drugs.

Scott, R. J.; block of Pai-cha wood prepared for wood engraving; also a prepared block of wood of *Tecoma pentaphylla*.

Veitch, Messrs. J.; Cones of Japanese *Coniferæ*.

Webb, Edward; specimens of Montserrat Lime fruits.

Jodrell Laboratory.

The principal researches conducted in the Laboratory during the past year have been those of Dr. Pfitzer, Professor of Botany, University of Heidelberg, on the morphology of the vegetative organs of orchids. A preliminary account of the results of Dr. Pfitzer's researches is published in the Gardeners' Chronicle for Dec. 11, 1880.

F. O. Bower, Assistant to the Professor of Botany, University College, on the germination and histology of the seedling of *Welwitschia mirabilis*, published in the Quarterly Journal of Microscopical Science for January 1881.

The Laboratory has also been employed for the experimental demonstrations given to the employés of the Royal Gardens (see *supra*, p. 5), and for the examination of the University of London for the degree of Doctor of Science in the subject of Physiological Botany.

North Gallery.

A building has recently been erected in the pleasure grounds, at the expense of Miss Marianne North, from designs prepared by James Fergusson, F.R.S. It is situated opposite the Temperate house, and consists of a gallery measuring 50 feet long by 25 in breadth, with a small studio and caretaker's house attached to it.

It is intended to exhibit in it an extensive collection of coloured sketches in oil made by Miss North in nearly all the tropical and sub-tropical regions of the world for the purpose of illustrating the various aspects of the vegetable kingdom and the forms of flowers and fruits in the countries she has visited.

It is expected the exhibition will be opened to the public shortly after Miss North returns from Australia, where she at present is completing her collection by delineating the characteristic flora of that region.

The main building is erected in red bricks, with Bath stone dressings, in a plain classical style, with a low-pitched roof, covered with zinc, and terminating in pediments at either end. The mode of lighting is not by skylights, as is usual in picture galleries, but by windows between pilasters in the upper part of the walls below the ceiling, and immediately above a narrow gallery that runs all round the room.

The building is now so far finished that the effect of this arrangement can be judged of, and, in so far as the exterior is concerned,

is certainly ornamental and pleasing. What its internal effect may be cannot be ascertained till the pictures are hung in it, where they will probably be by the end of the year.

HERBARIUM.

As already recorded (p. 56), the arrangement under which the Economico-botanic collections of the India Museum were removed to Kew included the **Transference** to this establishment **of the services of Dr. Cooke,** the well-known mycologist, for three days a week. Dr. Cooke, besides being at hand to give information in respect to any matter connected with the Indian collections lately under his charge, has undertaken the re-arrangement of the collections of Thallophytes in the Herbarium, as well as the duty of reporting upon questions connected with plant-diseases produced by fungoid organisms which are submitted to Kew. Dr. Cooke has at once attacked the arrears of the section of the Herbarium devoted to fungi, which, owing to the press of work in keeping the phanerogams and ferns constantly worked up, has been somewhat neglected.

The services of Dr. Cooke are a most welcome aid to this department. There is still, however, much need of help with regard to its mechanical and clerical work. The former includes the gluing down and poisoning of the specimens, a duty which has hitherto been performed by the museum attendants as overtime work. There are many reasons why it would be preferable that this should be done in the herbarium building under the supervision of the keeper, and if the gluing and poisoning could be made to keep pace more thoroughly with the arrival of new accessions the utility of the herbarium for purposes of scientific research would be much advanced. There is nothing but the want of necessary hands to prevent new collections from being rapidly intercalated in the permanent collection within a few weeks of their arrival.

Clerical help is much needed for labelling duplicate collections for distribution to provincial and foreign museums, and for keeping up the catalogues. Of these there are two which are found of the greatest public importance. Steudel's Nomenclator of all published species of plants (up to 1840) has from time to time been kept posted up in an interleaved copy, and the same work has been done on Pritzel's Index Iconum, a catalogue complete up to 1866 of all published figures of plants. This indispensable work has been accomplished by funds supplied by private liberality. With proper clerical aid these two catalogues might be kept constantly posted up, and such work, which could hardly be accomplished except in a national library, would be gratefully appreciated by all students of systematic and horticultural botany.

Mr. S. Le Marchant Moore having resigned his appointment as Senior Second Assistant in the Herbarium Mr. N. E. Brown, A.L.S., Second Assistant, has been promoted to the post.

Mr. R. A. Rolfe, an advanced gardener in the Royal Gardens, was appointed Second Assistant in the place of Mr. N. E. Brown, after a public competition, conducted by the Civil Service Commission.

Principal additions.—Under this head four gifts of great interest and value require prominent mention.

1. The Herbarium of the late Dr. Schimper, Professor of Botany in the University of Strassburg, purchased and presented by the Baroness Burdett-Coutts. During

a long and distinguished career as a botanist Dr. Schimper devoted his best energies to the study of fossil plants and European mosses, resulting in respect of the latter department in the publication of the "Bryologia Europæa" in conjunction with MM. Bruch and Gümbel, a work embracing a critical account in six volumes quarto, with six hundred and forty plates, of the mosses of Europe. This great work marks an epoch in the history of this branch of botany, and will remain as a standard of reference that can never be superseded as such, however much the study of the group of plants to which it relates may advance. Dr. Schimper's Herbarium, upon which the Bryologia was in the main founded, contains a profusion of specimens of *Musci* collected with unrivalled judgment and preserved and ticketed with scrupulous care. It further contains the muscological collections of Bruch and other of the older botanists, who published on the group, together with a miscellany of interesting plants (especially *Hepaticæ*) from various sources. The addition of Schimper's Herbarium to those of the late Director of Kew (who was equally eminent during his early life as an author on mosses), of Dawson Turner, and of G. E. Hunt (*see* Kew Report for 1873, p. 9), render the collective muscological herbaria now at Kew, enriched as they are by the labours of Wilson and Mitten, by far the most complete and most accurately named of any in existence.

2. On the death of General Munro, C.B., whose name has been for thirty years familiar to the reader of the Kew Reports, his Herbarium, together with the choice of his botanical works, became by his will the property of the Royal Gardens. This valuable collection occupies a position in respect of the vast and important order of grasses similar to what Schimper's does to European mosses. During upwards of forty years of active military service in every quarter of the globe General Munro devoted all his leisure time to botanical pursuits, and by making the grasses his special study he acquired an unrivalled knowledge of one of the most extensive and difficult and at the same time important tribes of plants in an economic point of view. This knowledge, which is to a great extent contained in notes attached to his herbarium specimens, has for many years past been at the service of every scientific worker in the same field, and there have been no botanical works of importance published of late in this country, in which this order of plants has been treated of, in which General Munro's name does not appear as a gratuitous contributor. Besides the collection of *Gramineæ*, this herbarium contains many others formed by General Munro in India, where he was stationed for several years, from the south of the Peninsula to the Indus and Tibet frontier, in Canada, Bermuda, the West Indies, the Crimea, &c.

Nor should a record be here omitted of General Munro's great services to the Gardens of Kew as a correspondent and contributor of many year's standing. He was himself a skilful horticulturist, combining the scientific knowledge with the skill of a trained gardener, which extended to ornamental and domestic plants, including fruits and vegetables. This practical knowledge was even more conspicuously than his scientific, at the service or others, for he was the originator of soldiers' gardens wherever his regiment was stationed, and the zealous promoter of their welfare in many other ways.

3. The herbarium of the late

Dr. Goodenough, Bishop of Carlisle," a well-known botanist of the commencement of the century and one of the founders of the Linnean Society, has been presented by the Mayor and Corporation of Carlisle to the Royal Gardens. It contains nearly 2,000 species, and is of much importance from comprising not only the species he first of all described, more especially *Carices* and *Algæ*, but an extensive selection of plants cultivated at the period alluded to in the Gardens of Kew, and which were published in the Hortus Kewensis. It also contains the Barbary plants collected by the celebrated traveller Shaw, which were the first ever brought to England from Algeria and Morocco.

4. A complete herbarium of Swiss flowering plants, comprising about 3,300 species, all carefully selected, accurately named, and mounted on white paper, corresponding with that of the Kew Herbarium, has been presented by MM. Favrat (Professor of Botany in Lausanne) and Barbey of Valleyres. As a complete illustration of the beautiful flora of that rich country this leaves nothing to be desired.

The following is a list of the names of the **Other principal contributors** to the Herbarium during 1880.

Europe.

Cooke, Dr. M. C.; British and other Fungi (177).

Desmazière's; "Plantes Cryptogamiques de France" (2,800, purchased).

Flahault, Dr. Chas.; Norwegian and Lapland (77).

Heldreich, Dr.; Greek (114, purchased.

Henriquez, Dr. J. A. (Coimbra); Portuguese plants, principally fungi, (269).

Husnot, T.; French mosses, (25).

Huter, Rupert; Spanish (467, purchased).

Kiæer, F.; European mosses (100).

Larbalestier, C.; Lichens (200, purchased).

Lindeberg, Dr. C. J.; Scandinavian Hieracia (150).

Markham, Commander; Arctic, collected by Mr. Grant in Franz Josef Land.

Massalongo, Dr. C., Ferrara; Hepaticæ (30, purchased).

Mougeot and Nestler; Crypt. Vogeso-Rhen. (the last volume) (purchased).

Schimper, Dr. A. F. W.; Mosses, various, (1550, purchased, exclusive of the herbarium presented by the Baroness Burdett-Coutts).

Societé dauphinoise; French, &c. (491, purchased).

Thuemen, Baron von; "Mycotheca universalis" (300, purchased).

Trevelyan, Sir Charles, K.C.B.; various collections made by the late Sir Walter Trevelyan (329).

Vize, Rev. J. E.; British fungi (100, purchased).

Winslow, Dr.; Swedish.

Donations of European plants have also been received from A. Bennett, A. W. Bennett, Mrs. F. Croker, Miss G. Davies, C. Lacaita, J. C. Mansell-Pleydell, W. Mitten, Alfred Newton, C. B. Plowright, Rev. T. A. Preston, Mr. Roper, Dr. C. Sanio, and F. Townsend.

Asia.

Aitchison, Surgeon-Major; Afghan.

Balfour, Prof. I. B.; Arabian from Aden (47).

Beddome, Col.; S. Indian (97).

Blunt, Lady Anne; collection made in her remarkable journey into Central Arabia.

Brandis, Dr.; N. Central and Western India (135).

Bretschneider, Dr.; N. Chinese (8).

Brotherus V. F.; Caucasian mosses (238, purchased).

Collett, Col.; Afghan (80).

Edgeworth, M. P.; N., Central, and Western India (93).

Ellis, R.; Western Himalaya (507).

Hunter, Capt. F.; Arabian, collected north of Aden (273).

King, Dr. G.; Indian (51).

Murray, Jas. A.; Algæ from Kurrachee (26).

Pierce, Edwin; Beloochistan (161).

Pierre, L.; Cochin Chinese and Cambodian plants, the first received from those countries; a most important contribution (418).

St. Petersburgh, Imperial Botanic Gardens; 2,475 species from their botanical collectors in Caucasus (640 species), Siberia (225), Turkestan (760), Persia (92).

Sampson, T.; Canton (127)

Scully, J.; Nepal (256).

Veitch, Messrs.; Chinese and Japanese, collected by their traveller Mr. Maries; a very extensive and valuable contribution (1,626).

Watt, Dr. G.; selections from his large Herbarium, made in various parts of India, with valuable attached notes.

Woodrow, G. M.; Bombay.

There have also been received a few specimens of Afghan plants from Dr. Cattell, and Surgeon-Major Johnstone; of Chinese from Dr. Bushell, C. Ford (of Hong Kong), and Dr. Harris; of Japanese from Mons. A. Franchet, and Dr. Thurber; of Sumatran from Dr. Beccari; and Malayan from Mr. Low, of Perak.

Africa.

Berlin, African Society of; Angolan (37, purchased).

Clarke, C. B.; African *Commelynaceæ* (22).

Drummond Hay, Miss.; N. Moroccan collection made during Sir J. D. Hay's Embassy from Tangiers to Fez (220).

Henderson, A.; Guinea (18).

Hutton, Henry; Cape (70).

Kiæer, F.; Mosses of Africa and Madagascar (30).

Kirk, Dr. J., H.M. Consul-General, Zanzibar; India-rubber yielding plants of East Tropical Africa.

Kitching, Langley; Cape (202).

Lisbon, Escola Polytechnica; Angola (407).

Nelson, W.; Cape (549).

Paris, Jardin de Plantes; Algerian (7).

Rogers, Rev. W. Moyle; South Africa (260).

Rohlf and Ascherson; Lybian Desert (122).

Schweinfurth, Dr. G.; Egyptian (145).

Soyaux, H.; Gaboon (69).

Thomson, J.; a most interesting collection from the Highlands of the lake district of Africa, made during his expedition with the late Mr. Keith Johnstone.

Wakefield, The Rev. T.; valuable collection from East Tropical Africa (146).

Wilson, The Rev. T. C.: good collection from the Victoria Nyanza river.

Wood, J. M., Natal (505).

Madagascar and Mauritius.

Baron, R.; Madagascar (300).

Bescherelle, Em.; Mascarene mosses (165).

Hildebrandt, Dr.; Madagascar (561, purchased).

Kitching, Langley; Madagascar (202).

Parker, G. W.; Madagascar (400).

North America.

Berlin, Royal Herbarium of; species of *Cuphea* (26).

Brace, L. J. K.; Bahamas (165).

Curtiss, A. H.; Florida (219, purchased).

Davenport, G. E.; American ferns (16).

Greene, E. L.; American and Arizona (100).

Haydon, Walter; Hudson's Bay (79).

Hemsley, W. B.; American (9).

Gray, Prof. Asa; various American (192, including 92 collected in Mexico by Schäffner.)

Wright, W. G.; Californian (12).

Specimens have also been received from Messrs. Eaton (Florida), Mellichamp, Mohr (2 species of *Pinus*); Parry, Drs. (American) and Watson, Sereno.

West Indies and Guiana.

Fendler, A.; Trinidad ferns (54, purchased).

Garber, Dr. A. P.; Porto Rico (142).

Jenman, G. S., Botanical Gardens, Demerara: a fine collection of 798 species, and another of palms.

Paris, Jardin de Plantes; French Guiana (51).

Thurn, E. im.; Guiana (506), and excellent specimens of palms.

Various West Indian specimens have been received from Gen. Sir J. H. Lefroy, D. Morris (Jamaica), Dr. Nicholls (Dominica), and H. Prestoe (Trinidad).

South America
(Excluding Guiana).

Ernst, Prof.; Venezuela.

Hieronymus, G.; Argentine Republic Collections (179, purchased).

Lorentz, D. P.; Uraguayan (53, purchased).

Markham, Commander; Galapago Islands (29).

Petersburgh, Imperial Botanical Gardens of; Brazilian (530).

Veitch, Messrs., New Grenada; collections of their traveller, Mr. Kalbreyer (454).

Miscellaneous S. American specimens have been received from W. A. Forbes (Brazil), Dr. Lindberg (Chili), Prof. Nation (Peru), Dr. Spruce, and Dr. H. G. Reichenbach.

Australia.

Bennett, J. J., Executors of the late; the completion of Brown's Australian collection made during Flinder's voyage in 1804.

Mueller, Baron von; various Australian.

Paris, Jardin de Plantes; plants of Capt. Baudin's voyage to Australia (647).

New Zealand.

Cheeseman, T. F. (30).

Kirk, T.: (64).

Travers, W. T. L.; a large collection.

Polynesian Islands.

Eaton, Prof.; Sandwich Islands.

Hildebrand, Dr.; Sandwich Islands.

Luerssen, Dr.; various Polynesian (340).

Powell, The Rev. T.; Samoan (75).

Antarctic Islands.

East, Capt., H.M.S. Comus; Crozet Islands.

Geheeb, A.; Kerguelen's Land mosses (10).

India Office collection of botanical drawings. —As the sequel to the transference to Kew of the economico-botanical collections from the India Museum, the collection of drawings of Indian plants in the India Office library, 3,359 in number, have been deposited under the direction of the Secretary of State for India in Council in the library of the herbarium of the Royal Gardens.

This very extensive collection will be intercalated with the general collection of Icones plantarum at Kew, which is certainly the largest

in existence and which it will enormously enrich and extend.

The following is the India Office list of the separate collections of which the whole is the aggregate:—

Royle, Carey, and others	1,791
Roxburgh	171
Wight	150
Craufurd and Prince	23
Finlayson	71
Colebrooke	47
Buchanan	87
Hamilton	123
Horsfield	59
Marsden	48
Parry	125
Mysore plants	19
Prince of Wales Island	160
Madras School of Art	4
Court	89
Chinese	392
	3,359

In communicating officially the transfer, Mr. Stanhope wrote, "I "am directed to add that in trans- "ferring these drawings to your "custody Viscount Cranbrook is "influenced mainly by the desire "that a collection so rare and "valuable should be made better "known and more generally useful "to science than it has been "hitherto."

BOTANICAL PUBLICATIONS prepared in connexion with the work of the Herbarium.

Surgeon-Major Aitchison has contributed to the Linnean Society (Journal, vol. xviii, pp. 1–113) a memoir on the flora of the Kuram Valley based on the examination at Kew of the collections made by him while attached to General Sir Frederick Robert's force. He returned to Afghanistan in March.

Mr. J. G. Baker, F.R.S., First Assistant in the Herbarium, has contributed to the Linnean Society A Synopsis of *Aloineæ* and *Yuccoideæ* (Journal, vol. xvii., pp. 148–241).

Mr. Bentham, F.R.S., and the Director have published Vol. iii., Part i., of the *Genera Plantarum*, bringing the work down to the end of the Gymnosperms.

Dr. Braithwaite has studied the moss collections in preparation for his elaborate illustrated work on British Mosses, of which the *Sphagnaceæ* have been published.

Mr. N. E. Brown, A.L.S., Senior Second Assistant in the Herbarium, has contributed to the Linnæan Society a memoir on new and imperfectly known *Aroideæ* (Journal, vol. xviii, pp. 242–263).

The Director has edited the 106th volume of the Botanical Magazine, containing illustrations and descriptions chiefly of plants which have flowered in the Royal Gardens, also (assisted by various botanists):

The Flora of British India, Part 7 (Vol. ii., pp. 737–792, and Vol. iii., pp. 1–192). And,

Icones Plantarum, vol. xiv., Part 1.

Mr. Elwes, F.L.S., assisted by Mr. J. G. Baker, F.R.S., has completed the publication of his illustrated monograph of the genus *Lilium*.

Dr. Engler, Professor of Botany at Kiel, has studied in the herbarium for his monograph of the *Burseraceæ* published in the Botanische Jahrbucher, vol. i.

Dr. Ch. Flahault, Faculté des Sciences, Paris, has studied Arctic plants in the herbarium, with a view to his expedition to Nova Zembla.

Dr. Asa Gray (Emeritus, Professor of Botany, Harvard University), has studied in the herbarium the North American collections for his Flora of North America.

Mr. W. B. Hemsley has continued the preparation of the Botany of the Biologia Centrali-Americana, of which parts 3–6, have been published.

Mr. B. D. Jackson has published his "Guide to the Literature of Botany," for which he carefully examined the Kew Library. He found, besides a large number of publications not to be met with in other libraries, more than a thousand of which the titles are not given in Pritzel's Thesaurus (*see* Journal of Botany, 1880, p. 177).

G. Maw, F.L.S., has continued the preparation of his elaborate monograph of the genus *Crocus*.

A. W. Peet, of the Madras Forest Department, has studied Indian botany in relation to his official employment in India.

L. Pierre (Director of the Botanic Garden, Cochin China, has studied Indian plants for the preparation of his Flore Forestière.

Dr. G. Watt (Bengal Education Department) has been engaged in naming his extensive Indian Herbarium, and monographing the Indian species of *Primula*.

I have, &c.

(Signed) Jos. D. Hooker, *Director*.

To the Right Honourable
The First Commissioner of Her Majesty's Works and Buildings.

APPENDIX I.

Number of Visitors in the Year 1880, *as compared with* 1879.

	1879.	1880.
Total number on Sundays - - -	239,540	315,629
Total number on weekdays - - -	329,594	408,052
	569,134	723,681

Greatest monthly attendance (May) - - - -	172,263
Smallest monthly attendance (January) - - -	8,170
Greatest weekday attendance (May 17th) - - -	61,831
Smallest weekday attendance (December 20th and 22nd) -	12
Greatest Sunday attendance (June 13th) - - -	24,069
Smallest Sunday attendance (November 14th) - - -	380

Number of Visitors in each month.

	1879.	1880.
January - - -	4,252	8,170
February - - -	5,127	15,331
March - - - -	20,515	48,307
April - - - -	51,913	35,399
May - - - -	41,538	172,263
June - - - -	112,310	106,469
July - - - -	82,587	95,169
August - - - -	142,963	142,395
September - - -	69,654	60,095
October - - - -	23,185	20,430
November - - -	10,501	10,451
December - - -	4,589	9,202

APPENDIX II.

List of **Aloineæ, Yuccoideæ,** *and* **Agaves** *cultivated in the Royal Gardens, Kew.**

Natural Order LILIACEÆ.

ALOE, *Linn.*

62. „ abyssinica, *Lam.* Abyssinia.
„ „ *var.* Peacockii, *Baker.* (P.)
78. „ africana, *Miller.*
54. „ albispina, *Haw.*
27. „ albocincta grandidentata, *Baker.*
64. „ arborescens, *Miller.*
„ „ *var.* frutescens. *S.D.*
3. „ aristata, *Haw.*
74. „ Bainesii, *Dyer.*
76. „ Bolusii, *Baker.*
14. „ brevifolia, *Miller.*
56. „ cæsia, *S.D.*
19. „ chinensis, *Baker.* China.
70. „ chloroleuca, *Baker.*
45. „ ciliaris, *Haw.*
43. „ consobrina, *S.D.*
1. „ Cooperi, *Baker.*
73. „ dichotoma, *Linn.*
52. „ distans, *Haw.*
67. „ drepanophylla, *Baker.*
77. „ ferox, *Miller.*
16. „ glauca, *Miller.*
„ „ *var.* rhodocantha, *D.C.*
33. „ grandidentata, *S.D.*
32. „ Greenii, *Baker.*
17. „ heteracantha, *Baker.*
5. „ humilis, *Miller.*
A. echinata, Willd.
„ „ *var.* Candollei, *Baker.*
29. „ latifolia, *Haw.*
A. Saponaria var. *latifolia,* Haw.
12. „ lineata, *Haw.*
„ Lynchii, *Baker.*
39. „ macracantha, *Baker.*
40. „ microstigma, *S.D.*
53. „ mitriformis, *Miller.*
„ „ *var. A.* Commelyni, *Willd.*
„ „ *var. A.* flavispina, *Haw.*
„ „ *var. A.* spinulosa, *S.D.*
„ „ *var. A.* xanthacantha, *Willd.* (P.)
51. „ nitens, *Baker.*
55. ALOE nobilis, *Haw.*
30. „ obscura, *Miller.*
A. picta, Thunb.
18. „ Perryi, *Baker.* Socotra.
71. „ platylepis, *Baker.*
81. „ plicatilis, *Miller.*
„ „ *var.* major, *S.D.*
65. „ pluridens, *Haw.*
60. „ purpurascens, *Haw.*
69. „ Salmdyckiana, *Schultes, f.*
28. „ Saponaria, *Haw.*
A. umbellata. S.D.
A. picta var. *minor,* Willd.
15. „ Serra, D.C.
13. „ Schimperi, *Todaro.* Abyssinia.
24. „ serrulata. *Haw.*
23. „ striata, *Haw.*
A. albocincta, Haw.
A. Hanburyana, Naud.
47. „ striatula, *Haw.*
79. „ supralævis, *Haw.*
59. „ succotrina, *Lam.*
25. „ tenuifolia, *Lam.*
46. „ tenuior, *Haw.*
80. „ Thraskii, *Baker.*
35. „ tricolor, *Baker.*
75. „ variegata, *Linn.*
66. „ vera, *Linn.* Mediterranean region and Tropical Asia.
A. barbadensis, Miller.
A. vulgaris, Lam.
6. „ virens, *Haw.*
„ „ *var.* macilenta, *Baker.* (P.)

APICRA, *Willd.*

6. „ aspera, *Willd.*
7. „ bicarinata, *Haw.*
2. „ deltoidea, *Baker.*
5. „ foliolosa, *Willd.*
1. „ pentagona, *Willd.*
„ „ *var.* Willdenovii, *Baker.*
A. spiralis, Willd., *non* Linn.
3. „ spiralis, *Baker,* non *Willd.*
A. imbricata, Willd.

* The species are arranged under the genera in alphabetical order, but the numbers prefixed, which are taken from Mr. Baker's monographs, indicate their position in a systematic arrangement. All the Aloineæ, unless it is otherwise stated, are natives of the Cape of Good Hope. Those marked with a "P" are in the Peacock collection, temporarily exhibited in the south octagon of the Temperate house (*see* Kew Report, 1878, p. 6), but not in that belonging to the Royal Gardens.

Gasteria, *Duval.*

40. „ acinacifolia, *Haw.*
„ „ *var. G.* ensifolia, *Haw.*
„ „ *var. G.* puripuncta, *Haw.*
„ „ *var. G.* nitens. *Haw.*
44. „ apicroides, *Baker.*
10. „ bicolor, *Haw.*
5. „ brevifolia, *Haw.*
Aloe brachyphylla, S.D.
41. „ candicans, *Haw.*
26. „ carinata, *Haw.*
16. „ cheilophylla, *Baker.*
42. „ Croucheri, *Baker.*
25. „ decipiens, *Haw.*
14. „ dicta, *N.E.B.*
7. „ disticha, *Haw.*
„ „ *var. G.* angulata, *Haw.*
„ „ *var. G.* angustifolia, *Haw.*
„ „ *var. G.* conspurcata, *Haw.*
„ „ *var. G.* natalensis, *Baker.*
12. „ excavata, *Haw.*
38. „ excelsa, *Baker.*
37. „ fuscopunctata, *Baker.*
33. „ glabra, *Haw.*
Aloe carinata, Ker.
31. „ lætepuncta, *Haw.*
24. „ maculata, *Haw.*
Aloe Lingua, Ker.
35. „ marmorata, *Hort.* (P.)
9. „ mollis, *Haw.*
4. „ nigricans, *Haw.*
„ „ *var. G.* fasciata, *Haw.*
„ „ *var. G.* polyspila, *Baker.*
„ „ *var. G.* platyphylla, *Baker.*
„ „ *var. G.* subnigricans, *Haw.*
36. „ nitida, *Haw.*
32. „ obtusa, *Haw.*
Aloe trigona, S.D.
6. „ obtusifolia, *Haw.*
Aloe Lingua var. *brevifolia*, S.D.
29. „ parvifolia, *Baker.*
39. „ Peacockii, *Hort.* (P.)
28. „ pethamensis, *Hort.*
22. „ picta, *Haw.*
Aloe Bowieana, R. et S.
11. „ planifolia, *Baker.*
23. „ pulchra, *Haw.* (P.)
Aloe obliqua, D.C.
Aloe maculata, Ker.
15. „ retata, *Haw.*
Aloe dictyodes, Roem. et Sch.
13. Gasteria spiralis, *Baker.*
45. „ squarrosa, *Baker.*
2. „ subverrucosa, *Haw.*
8. „ sulcata, *Haw.*
Aloe Lingua var. *angulata*, Haw.
34. „ trigona, *Haw.*
Aloe elongata, S.D.
1. „ verrucosa, *Haw.*
Aloe carinata, D.C.
A. disticha, Thunb.
„ „ *var.* latifolia, *Haw.*
„ „ *var.* scaberrima, *Baker.*

Haworthia, *Duval.*

25. „ albicans, *Haw.*
„ „ *var. H.* virescens, *Haw.*
36. „ altilinea, *Haw.*
H. mucronata, Haw.
39. „ angustifolia, Haw.
Aloe stenophylla, R. et S.
57. „ arachnoides, *Haw.*
45. „ atrovirens, *Haw.*
H. pumila, Haw.
15. „ attenuata, *Haw.*
Aloe Radula, Bot. Mag., t. 1345.
58. „ Bolusii, *Baker.*
40. „ chlorocantha, *Haw.*
8. „ coarctata, *Haw.*
55. „ Cooperi, *Baker.*
34. „ cuspidata, *Haw.*
35. „ cymbiformis, *Haw.*
H. concava, Haw.
16. „ fasciata, *Haw.*
21. „ glabrata, *Baker.*
„ „ *var.* concolor, *S.D.*
„ „ *var.* perviridis, *S.D.*
9. „ Greenii, *Baker.*
11. „ hybrida, *Haw.*
46. „ lætevirens, *Haw.*
13. „ nigra, *Baker.*
18. „ margaritifera, *Haw.*
„ „ *var. H.* erecta, *Haw.* (P.)
„ „ *var. H.* granata, *Haw.*
„ „ *var. H.* semimargaritifera, *Haw.*
43. „ mirabilis, *Haw.*
53. „ pallida, *Haw.*
6. „ papillosa, *Haw.*
10. „ Peacockii, *Baker.*
23. „ Radula, *Haw.*
30. „ recurva, *Haw.*
7. „ Reinwardtii, *Haw.*
„ „ *var.* minor, *Hort.*

32. Haworthia retusa, *Haw.*
24. „ rugosa, *Baker.*
59. „ setata, *Haw.*
Aloe setosa, S.D.
20. „ subattenuata, *Baker.*
5. „ subrigida, *Baker.*
22. „ subulata, *Baker.*
H. Radula var. *lævior*, Haw.
41. „ tessellata, *Haw.*
„ *var.* H. parva, Haw. (P.)
4. „ tortuosa, *Haw.*
A. rigida, Bot. Mag. t. 1337.
33. „ turgida, *Haw.*
3. „ viscosa, *Haw.*

Lomatophyllum, *Willd.* Mauritius and Mascarene Isles.
macrum, *S.D.*
borbonicum, *Willd.*

Beaucarnea, *Lemaire.*
4. „ Bigelovii, *Baker.* California.
Dasylirion Bigelovii, Torrey.
1. „ longifolia, *Baker.* Mexico.
Dasylirion longifolium, Zucc.
Yucca longifolia, Karw.
2. „ recurvata, *Lem.* *Mexico.*
Pincenictitia tuberculata, Hort.
„ *var.* B. stricta, *Lem.*

Dasylirion, *Zuccar.*
4. „ acrotrichum, *Zucc.* Mexico.
D. gracile, Zucc.
Yucca acrotricha, Schiede.
5. „ glaucophyllum, *Hook.* Mexico.
D. glaucum, Zucc.
D. serratifolium, Baker.
6. „ serratifolium, *Karw.* and *Zucc.*
D. laxiflorum, Baker.
9. „ Hookeri, *Lem.* Mexico.
D. Hartwegianum, Hook.
D. cæspitosum, Scheidw.
Beaucarnea Hookeri, Baker.
10. „ quadrangulatum, *S. Wats.* Mexico.

Yucca, *L.*
1. „ aloifolia, *Linn.* Mexico and West Indies.
„ „ *var. Y.* serrulata, *Haw.*
„ „ *var. Y.* tricolor, *Hort.*
„ „ *var. Y.* Draconis, *Linn.*
15. „ angustifolia, *Parsh. non Carr.* Mexico, *&c.*
„ „ *var. Y.* stricta, *Sims.*
20. „ baccata, *Torr.* Mexico, *&c.*
Y. californica, Nuttall.
„ „ *var.* australis, *Engelm.*
„ „ *var. Y.* circinata, *Baker.*
„ „ *var. Y.* scabrifolia, *Baker.*
4. „ Desmetiana, *Baker.* Mexico.
16. „ filamentosa, *Linn.* N. American shores.
„ „ *var.* maxima, *Baker.*
„ „ *var. Y.* flaccida, *Haw.*
„ „ *var. Y.* bracteata, *Engelm.*
„ „ *var. Y.* meldensis, *Hort.*
11. „ flexilis, *Carr.* Mexico.
Y. mexicana, Hort.
„ „ *var. Y.* ensifolia, *Baker.*
„ „ *var. Y.* nobilis. (P.)
7. „ glauca, *Sims.* N. America.
13. „ gloriosa, *Linn.* N. Carolina and Florida.
„ „ *var. Y.* superba, *Haw.*
„ „ *var.* plicata, *Carr.*
„ „ *var. Y.* recurvifolia, *Salisb.*
Y. recurva, Haw.
„ „ *var. Y.* Ellacombei, *Baker.*
5. „ guatemalensis, *Baker.* Mexico and Guatemala.
Y. Roezlii and *Ghiesbreghtii*, Hort.
Dracæna ensifolia, Hort.
„ „ *var. Y.* Mooreana, *Hort.* (P.)
6. „ rupicola, *Scheele.* Texas.
Y. lutescens, Carr.
Y. tortilis & contorta, Hort.
14. „ Treculeana, *Carr.* Texas and North Mexico.
Y. aspera, Regel.
Y. canaliculata, Hook.
Y. undulata, Hort.

AGAVE, *Linn.*

86. „ albicans, *Jacobi.* Mexico.
A. concinna, Hort. non Baker.
A. Ousselghemiana, Jacobi.
43. „ americana, Linn. Trop. America.
A. Milleri, *Haw.*
„ „ *var.* luteo-picta, *Hort.*
„ „ *var.* A. ornata, *Jacobi.*
„ „ *var.* A. picta, *S.D.*
„ „ *var.* striata, *Hort.*
„ „ *var.* variegata, *Hort.*
22. „ applanata, *Lem.* Mexico.
92. „ attenuata, *S.D.* Mexico.
A. glaucescens, Hook.
A. spectabilis, Hort.
46. „ Botterii, *Baker.* (P.) Mexico.
83. „ Bouchei, *Jacobi.* Mexico.
90. „ Brauniana, *Jacobi.* Mexico.
99. „ bromeliæfolia, *S.D.* Mexico.
80. „ caribæa, *Hort. Kew.*
67. „ Celsiana, *Hook.* Mexico.
89. „ chloracantha, *S.D.* (P.) Mexico.
40. „ coccinea, *Roezl.* Mexico.
51. „ Corderoyi, *Hort.*
58. „ dasylirioides, *Jacobi.* Mexico.
A. dealbata, Lem.
54. „ densiflora, *Hook.* Mexico.
20. „ Deserti, *Engelm.* S. California.
93. „ Elemeetiana, *Jacobi.* Mexico.
50. „ excelsa, *Jacobi.* Honduras.
Kellocki, Hort. non Jacobi.
31. „ ferox, *Koch.* Mexico.
A. Bonnetiana, Hort.
1. „ filifera, *S.D.* Mexico.
„ „ *var.* A. filamentosa, *S.D.*
„ „ *var.* Ortgiesiana, *Hort.*
„ „ *var.* superba, *Hort.*
61. „ geminiflora, *Gawl.* Mexico.
17. „ Ghiesbreghtii, *Lem.* Mexico.
70. „ Goeppertiana, *Jacobi.* Mexico.
41. „ Gustaviana, *Hort. Cord.*
77. „ Haseloffii, *Jacobi.* Mexico.
7. „ heteracantha, *Zucc.* Mexico.
28. „ Hookeri, *Jacobi.* Mexico.
19. „ horrida, *Lem.* Mexico.
A. Desmetiana, Hort. non Jacobi.
A. Regeliana, Hort. non Jacobi.
„ „ *var.* A. Gilbeyi, *Hort.*
„ „ *var.* macrodonta, *Baker.*
60. „ Houlletii, *Jacobi.*
73. AGAVE, Humboldtiana, *Jacobi.* Mexico.
49. „ Ixtli, *Karw.* Vera Cruz, &c.
A. Karwinskii, Zucc.
A. rigida, Engelm.
„ „ *var.* A. fourcroyoides, *Jacobi.*
„ „ *var.* A. ixtlioides, *Lem.*
„ „ *var.* A. rigida, *Miller.*
11. „ Kerchovei, *Lem.* Mexico.
A. Beaucarnei, Lem.
„ „ *var.* canaliculata, *Hort.*
„ „ *var.* inermis, *Hort.*
„ „ *var.* A. Baxteri, *Hort. Peacock.*
„ „ *var.* A. Veitchii, *Hort. Peacock.*
74. „ kewensis, *Jacobi.* Mexico.
5. „ lophanta, *Jacobi.* Mexico.
„ „ *var. A. cærulescens*, *S.D.*
48. „ lurida, *Ait. Mexico.*
A. vera-cruz, Miller.
„ „ *var.* A. Jacquiniana, *Schult.*
36. „ macracantha, *Zucc.* Mexico.
„ „ *var.* A. Besserariana, *Jacobi.*
103. „ maculata, *Regel.* Texas and N. Mexico.
A. maculosa, Hook.
41. „ Maximiliana, *Hort. Saund.* Mexico.
A. Gustaviana, Hort. Cord.
42. „ mexicana, *Lam.* Mexico.
A. cyanophylla, Jacobi.
A. Beaudeuriana, Jacobi.
84. „ micracantha, *S.D.* Mexico.
47. „ miradorensis, *Jacobi.* Cent. Brazil.
A. Desmetiana, Jacobi.
85. „ mitis, *S.D.* Mexico.
12. „ Nissoni, *Hort. Verschaf.* Mexico.
38. „ Palmeri, *Engelm.* (P.) S. Arizona.
18. „ Peacockii, *Croucher.* (P.) Mexico.
53. „ polyacantha, *Haw.* Mexico.
A. xalapensis, Roezl.
A. uncinata, Jacobi.
A. chiapensis, Jacobi.
10. „ Poselgerii, *S.D.* Texas and N. Mexico.
30. „ potatorum, *Zucc.* Mexico.
91. „ pruinosa, *Lem.* Mexico.
A. Kellocki, Jacobi.
A. Ghiesbrightii, Hort.
A. dentata, Hort.

9. Agave pumila, *Hort. de Smet.*
52. „ Regeliana, *Jacobi, non Hort.* Mexico.
62. „ regia, *Hort. Saunders.* Mexico.
13. „ Roezliana, *Hort.* Mexico.
82. „ rupicola, *Regel.* Mexico.
A. densiflora, Gartenfl. t. 410. non Hook.
55. „ Salmdyckii, *Baker.* Mexico.
A. Keratto, S.D. *non* Miller.
24. „ Salmiana, *Otto.* Mexico.
A. atrovirens, Karw.
A. tehuacanensis, Karw.
A. Jacobiana, S.D.
„ „ *var.* A. latissima, *Jacobi.*
A. Lehmanni, Jacobi.
A. mitræformis, Jacobi.
A. coarctata, Jacobi.
75. „ Sartorii, *Koch.* Mexico and Guatemala.
A. Noackii, Jacobi.
A. cæspitosa, Todaro.
A. rufocincta, Jacobi.
2. „ schidigera, *Lem.* Mexico.
29. „ Scolymus, *Karw.* Mexico.
„ „ *var. A.* Verschaffeltii, *Lem.*
„ „ *var. A.* Saundersii, *Hook.*
„ „ *var. A.* crenata, *Jacobi.*
„ „ *var. A.* Leopoldii, *Hort.*
21. „ Shawii, *Engelm.* S. W. California.
71. „ Smithiana, *Jacobi.* Mexico.
26. „ Seemanniana, *Jacobi.* (P.) Guatemala.
„ „ *var.* rotundifolia. (P.)
100. „ sobolifera, *S.D.* West Indies.
56. „ striata, *Zucc.* Mexico.
„ „ *var. A.* ensiformis, *Hort.*
56. „ „ *var. A.* hystrix, *S.D.*
„ „ *var. A.* recurva, *Zucc.*
61. Agave Taylori, *Hort. Williams. Hybrid.*
87. „ Thomsoniana, *Jacobi.* Mexico.
48. „ Toneliana, *Hort. Peacock.* (P.)
35. „ utahensis, *Engelm.* S. Utah and Arizona.
14. „ Victoriæ-Reginæ, *T. Moore.* Monterey.
A. Consideranti, Carr.
104. „ virginica, *Linn.* S. U. States.
97. „ vivipara, *Linn.* Old World.
A. Cantula, Roxb.
A. Rumphii, Hassk.
28. „ Wislizeni, *Engelm.* N. Mexico.
A. scabra, S.D.
9. „ xylacantha, *S.D.* Mexico.
101. „ yuccæfolia, *D.C.* Mexico.
A. Colniana, Jacobi.

Beschorneria, *Kunth.*
„ bracteata, *Jacobi.* Mexico.
„ Colniana, *Jacobi.* Mexico.
„ Tonelii, *Jacobi.* Mexico.
„ tubiflora, *Kunth.* Mexico.
„ yuccoides, *Jacobi.* Mexico.

Bravoa, *La Llave and Lex.*
„ geminiflora, *La Llave.* Mexico.

Doryanthes, *Correa.*
„ excelsa, *Corr.* N. S. Wales.
„ Palmeri, *Hill.* Queensland.

Fourcroya, *Vent.*
„ Bedinghausii, *K. Koch.* Mexico.
„ cubensis, *Haw.* Trop. America.
„ flavo-viridis, *Hook.* Mexico.
„ geminispina, *Jacobi.* Trop. America.
„ gigantea, *Vent.* Trop. America.
„ Lindeni, *Jacobi.* Trop. America.
„ Selloa, *Koch.* Mexico and Guatemala.

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