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CONTENTS.

|   | Page. |
|---|-------|
| The Rozelle—Hibiscus Sabdariffa ... ..                                      | 73    |
| Notes on Cola trees in the Economic Garden, Singapore ...                   | 74    |
| Some cultivated Yams from Africa and elsewhere ...                          | 86    |
| The second phase in the history of the Botanic<br>Gardens, Singapore ... .. | 93    |

To be purchased at the Botanic Gardens, Singapore; from Messrs. Kelly and Walsh, Ltd., No. 32 Raffles Place Singapore.

## THE SECOND PHASE IN THE HISTORY OF THE BOTANIC GARDENS, SINGAPORE.

The history of the Botanic Gardens from their foundation in 1859 to the year 1874 was given in the last number of this Bulletin. Up to 1874 the Gardens had been the property of the Singapore Agri-Horticultural Society, which becoming unable to maintain them any more in a fitting condition sought the Colonial Government in that year with a request that their property and their debts upon it should be taken over, and the Gardens maintained out of public funds. To this the Government of the Settlements agreed, placing the Raffles Library and Museum Committee in charge until such time as the legislation which the case required could be passed. The legislation was passed in 1878 as the "Raffles Societies Ordinance, 1878"; and upon January 1st, 1879 a Committee consisting of the Colonial Secretary, the Colonial Engineer, and one unofficial member (Mr. R. Campbell, who had been the last Secretary of the Agri-Horticultural Society) assumed charge of the Gardens for the Government.

But for the four years from January 1st, 1875, to the end of 1878 the Gardens had already been carried on by means of Government funds, and the Government had authorised the Raffles Library and Museum Committee to apply to the Director of the Royal Botanic Gardens, Kew, for a Superintendent. To them Sir Joseph Hooker had sent out a very young man, Henry James Murton, son, it seems, of a Cornish nurseryman; and he had arrived in Singapore in October, 1875. He had halted in Ceylon on the way to visit the splendid Gardens there, and make his first acquaintance with tropical conditions; and he arrived with liberal donations of plants from thence.

He was too young to be over Niven, who had been the Society's Superintendent and now had the title of Manager, yet had to be by the terms of his appointment: this difficulty however was solved by Niven taking leave; and while on leave he unfortunately died. Murton carried on alone for a short time when Niven had gone, until a Head Gardener was appointed from England, named George Smith. Smith arrived in the early part of 1877; but died suddenly in April, 1878. Next in succession, in June, 1879, Walter Fox arrived from England, having been appointed by the Secretary of State to be Murton's second. For the care of the animals of the Zoo Murton had had the help of one, H. Capel, but only from some date in 1876 into 1877.

The buildings in the Gardens when Murton came were, (i) the house that he occupied which is now the Director's, (ii) an orchid house, (iii) a shed with birds in it, and (iv) cooly lines.

The roads were more numerous than now and narrower. They were not well surfaced, and their edges were limited by earth drains; but as many of the visitors were horsemen out for exercise, and visitors of this class had been more in preponderance when the gates were open only to subscribers, a soft road was in some degree suitable. The Main Gate Road was embanked along the

Lake side, the lawn being hollow upon the east of it. Trees were plentiful, especially fruit-trees of the commoner species. The flowering bushes were extensively cut over in order to meet the demand for bouquets to which the subscribers had a right. There was a croquet lawn on the side of the Bandstand Hill; and near by the Gardens Jungle approached the Bandstand a little more closely than now. Bands played regularly, and visitors took advantage of them for a promenade. The property which the Agri-Horticultural Society had bought in 1866 was undeveloped.

Murton entered upon his duties with great energy. Directed by a Gardens Sub-Committee of the Raffles Library and Museum Committee, he corresponded with all the Agri-Horticultural Societies and Botanic Gardens in the East from Hongkong and Brisbane to Mauritius, obtaining exchanges; he corresponded with Kew, and received many plants thence. In exchange he sent out plants of local origin, chiefly orchids. His new introductions he planted all over the Gardens, until in 1878 and 1879 we find him complaining of the lack of space for more. His work was much dominated by the rapid growth of the Zoo, the developed parts of the Gardens becoming dotted with enclosures for animals. He commenced an economic garden upon the undeveloped property, and planted extensive beds for cut flowers near to it.

Unfortunately he was unstable and careless. That which interested him he did; that which did not, he was ready to neglect; and therefore the Gardens Sub-Committee kept a tight hold on him, which the Government Committee tightened. This he resented. He grew absorbed in the Botany of the island, and compiled a manuscript flora, neglecting the Gardens for time to work on it, and neglecting his accounts which were found in confusion, and which he would not attempt to put right. Then followed in 1880 his dismissal. In 1881 he died in Bangkok, his death perhaps hastened by his having burned the candle at both ends.

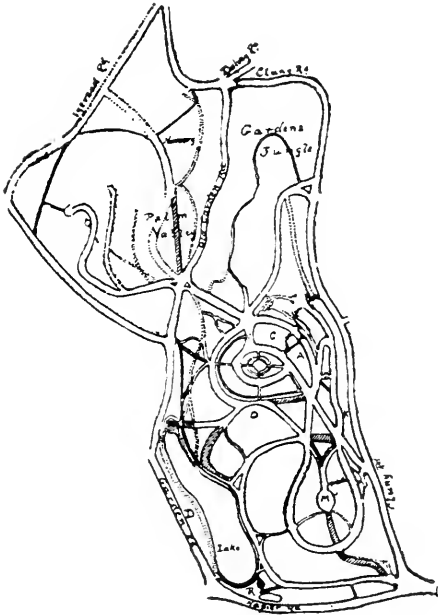
His qualifications had been good. Within five months of his arrival he had determined the cultivated plants in the Gardens, and made a list of them. He had bought from Collins when Collins was dismissed from the Museum, a collection of dried plants, mostly picked out of well-known herbaria and he appears to have increased it by his own collecting; he pressed the Government to buy it, and it appears that they did ultimately, but it had suffered considerably before Mr. Ridley first saw it.\* In 1877 he travelled much, first visiting Kedah for plants, then Gunong Pulai in Johore (June), and later, that he might study the sources of Gutta percha at the suggestion of Sir Joseph Hooker, he made under Sir Hugh Low's direction a long journey in Perak, visiting the Taiping Hills, Gunong Buloh and the neighbourhood of Kampar. A full account of this journey was printed in the Government Gazette 1878, pp. 101-110. No later journeys are recorded.

His influence upon the Gardens can hardly be described without first giving some account of the Zoo, as its growth and rapid

\* Vide Ridley in the Gardens Report for 1889, p. 7.

removal rather adversely operated against him. This is an account of it.

Immediately it was generally known that the Government would maintain a collection of animals in the Gardens gifts poured in. Sir Andrew Clarke presented a Two-horned Rhinoceros, Sir Ernest Birch a Sloth Bear, Messrs. Brinkmann and R. Jamie each a Sambhur Deer, Captain Kirk two Orang-utaus, the Acclimatisation Society in Melbourne an Emu, one Great Kangaroo, three Red Kangaroos and a Bush tailed Wallaby,—all in 1875; and in 1876, the King of Siam a Leopard, Mr. Hargreaves a Leopard,



Plan of the Botanic Garden showing the old and new roads. All roads made since Niven went are dotted: all roads closed since he went are cross shaded. R, is where the Rhinoceros' enclosure was: D, the deer enclosure: M, the Monkey House: K, the Kangaroo and Emu pens: A, the old Aviary: C, the first Carnivora house: O, Murton's Office.

the Sultan of Tringgamu a Tiger. These were in addition large numbers of gifts a smaller animals. All the large animals needed expensive arrangements for accommodation. For the Rhinoceros an enclosure with a house and a wallow were made near Napier Road by the foot of the lake. For the Deer an enclosure was prepared against Garden Road: for the Kangaroos and the Emu paddocks were fenced adjoining Cluny Road near the Office Gate; the Carnivora were given a house at the north east side of the Bandstand hill where the Agri-Horticultural Society had had an Orchid House. The aviary was erected on the east side of the hill. At the expense of a Chinese merchant of Singapore, Mr. Cheang Hong Lim, an ornamental iron structure was put up as a Monkey House (completed April, 1877) near where the Herbarium now is, to become the centre of the Zoo after Murton had gone.

The expenditure of building all except the Monkey house fell upon the Government grant and was too much for it so that Mr. Kröhn in the Annual Report for 1875 wrote "the money allowed although quite sufficient for the upkeep of a Zoological Garden of fair dimensions, is quite inadequate for the erection of suitable houses for the various animals."

At first two privates of a regiment stationed in Singapore were employed as keepers; then in 1876 Mr. Capel, for whom a small house was built below the Aviary. But Mr. Capel's pay, small as it was, made a large hole in the grant, and in 1877 he asked for a rise, which led to a decision no longer to retain him; Chinese next and then Javanese were resorted to as keepers, the system of using Javanese lasting until the end of the Zoo.

There were big losses among the animals; for instance in 1876 some evil-disposed person or persons killed a Bear, the Emu and a Cassowary in one night; the Rhino\* died in 1877 and two Kangaroos, and in 1878 both of the leopards. Losses so large caused the Committee to take the important decision of limiting the collection to small animals†; and they sent the Tiger and Orangutan and a number of other animals to Calcutta, as exchanges for Indian birds (Report 1879, p. 6). The year 1878, thus, saw the

\* The skeletons of the Rhino, and some other animals are in the Raffles Museum.

† The following footnote is from a MS list of the animals in the Zoo on 27th September, 1877, which shows how large the Zoo was. The Rhinoceros had just died.—

|                      |                                     |
|----------------------|-------------------------------------|
| 1 Tiger              | 1 Heron                             |
| 2 Leopards           | 3 Manchurian Cranes                 |
| 2 Dingo Dogs         | 2 Pelicans                          |
| 1 Jackal             | 3 Black Swans                       |
| 1 Binturong          | 1 White Swan                        |
| 1 Sun Bear           | 2 Water Rails                       |
| 1 Fish Tiger         | 30—40 Teal and Mandarin Ducks       |
| 1 Civet Cat          | 2 Wood Pigeons                      |
| 2 Common Carys       | 2 Nicobar Pigeons                   |
| 1 Rabbit             | 1 Green Pigeon                      |
| 1 White Rat          | 3 Ring Doves                        |
| 1 Flying Fox         | 3 Common Doves                      |
| 1 Kangaroo           | 2 Parakets                          |
| 2 Red Deer (Bucks)   | 1 Blood Brested Pigeon              |
| 3 do. (Does)         | 2 Horned Owls                       |
| 3 Sambur Deer (Does) | 1 Sonnerat's Jungle Cock            |
| 1 Sambur Deer (Buck) | 1 Large Parraket                    |
| 2 Opossums           | 2 Crested Peacock Pheasants         |
| 1 Kawoo              | 2 Fireback Pheasants (Cock and Hen) |
| 1 Orang Outan        | 1 Pheasant (Cock)                   |
| 2 Wou-Wous           | 2 Rufus tailed Pheasants            |
| 2 Black Monkeys      | 1 Golden Pheasant                   |
| 1 Spider Monkey      | 4 Ring Neck Pheasants               |
| 1 Bear Macaque       | 4 Guinea Fowls                      |
| 1 Red face Macaque   | 2 White Eagles                      |
| 4 Porcupines         | 1 Falcon                            |
| 1 Cassowary          | 4 Hawks                             |
| 5 Pigtail Macaque    | 3 Sparrow Hawks                     |
| 1 Emu                | 4 Crowned Goura Pigeons             |
| 3 Peacocks           | 1 pair Argus Pheasants              |
| 1 Manila Duck        |                                     |

end of the ambitious Zoo<sup>s</sup> commenced in 1875. Deer were retained, as inexpensive to feed; and when in 1877 the fence of the first enclosure across the lake became rotten (it must have been a wooden structure) they were accommodated in the now empty Kangaroo enclosure temporarily: but it in its turn began to go to pieces in 1878 (Report p. 6): and in 1879 their old enclosure was repaired with a strained wire fence, and within it they remained until much later giving at times a lot of trouble by breaking bounds. Meanwhile the other enclosure for the large animals were swept away more quickly than they had been erected.

The uncontrolled growth of the Zoo, must have made a great difference to the Gardens; and it was well that as it had to go, it went so quickly: by 1879 equilibrium had been reached again. The short stay of the Tigers had caused the old orchid house to be removed and some terracing on a small scale to be done; the short stay of the Rhino had caused some levelling to be carried out, and ultimately its wallow became a Water lily pond: the erection of a house for the Keeper Capel left the Gardens in possession of a building which was afterwards useful for a number of years, as a gardener's house, and then under Cantley for his clerk.

We will take the year 1879 as a convenient one, for a description of the Gardens under Murton. They were then in their twentieth year: Murton had done his best planting; and the Zoo had become stable.

The visitor in 1879, approaching the Gardens from town, found at the entrance what Cantley afterwards called "heavy masses of masonry doing duty as pillars." Passing between them, he would have found two roads—neat roads newly bordered by brick drains\* one road leading straight forward, the other ascending to his right, and bordered by a particularly large drain. This road on the right soon after was closed and a pathway laid instead along its line; but in 1879 the visitor who followed it was conducted to the Herbarium Ring Road, and could cross it and proceed first on a path, then on a road, nearly straight to the southern face of the Bandstand hill, and on his way he would have passed the new Monkey house noting there that the roadway had been recently altered.

The other road, leading straight forward from the main gate is that which persists; at a little distance it was joined by a small path, by which anyone approaching from the Barracks could enter the Gardens through a turnstile upon a small bridge. A little further than this small path, the road reached the foot of the Lake and then followed its margin to another fork, the right arm of which now persists as the Main Gate Road, and the left

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§ To limit the Zoo to smaller animals was the first decision: to limit it to Malayan animals was a later decision. For an account of the animals in the Zoo when it was Malayan, vide Ridley in the *Journal of the Straits Branch of the Royal Asiatic Society*, No. 46, 1906, pp. 133-194.

\* Murton had been allowed to dig laterite from Goodwood Hill for these roads until the supply of good material there had been exhausted. Turf for the Lawns he was allowed to draw from Fort Canning and Magazine Hills.

as a footpath. The road on the left in 1879 completed a loop with the other of the roads from the Main Gate, while that on the right—the persisting road—led straight towards the Office Gate and on the top of the hill joined the Bandstand-Herbarium Ring system of roads. On the Main-Gate Road near the Gate Niven had had raised beds which obscured the unevenness of the ground; these raised beds had been removed, and a certain amount of smoothing had been done by Murton,—not as much as was subsequently done, but something—which still left the lawn too low on the left. From that lawn, Murton had newly removed large trees and a row of Betel palms which lined the boundary stream: clumps of Sago palms he had allowed to remain, as they persist still: in front of them he had planted many of his new introductions, and where the Betel palms were he had planted a row of palms of the genera *Stevensonia* and *Kentia*. Past the second clump of Sago palms Niven had had two small ponds which Murton had dug into one, at the end of which, had the Zoo grown as its promoters hoped, Alligators were to live: the near half of the pond was occupied by Waterlilies including *Victoria regia*, and the further half by the Lotus lily. Just beyond this pond had been the Rhinoceros enclosure with its wallow. Much levelling had been done to accommodate this animal which lived for such a short time in captivity, and had left the place improved; while the wallow, at first closed up, was later converted into a small pond.

From the Main Gate to this point upon the north of the Road the visitor in 1879 would have found the hill side dotted over with disappointingly young plants, being Murton's new introductions planted in some order, Conifers near the Gate, Cycads near the turn by the foot of the Lake. The trees of *Casuarina sumatrana*, now so effective, were then three years old, and could not have been effective then.

The visitor on arriving at the foot of the Lake found himself in front of the strained wire fence by which the Deer, whose enclosure was between the Lake and Garden Road, were ineffectively prevented from getting loose and doing damage in the rest of the Gardens. No path existed at that time west of the Lake.

The islet in the Lake was occupied chiefly by a large *Ficus*.

Following the Lake side the visitor might have noticed that the Lawn on the right had been newly raised to the level of the road, so as to do away with the old embankment; this Lawn is sometimes called in the older papers the "main Lawn," and by that it may be judged that it was more open than now.

If the visitor had kept beyond the fork of this road to the left, following the Lake side, he would have been led to two small rather unfinished terraces upon the side of the Bandstand Hill where Murton had his office and an orchid house, as well as lines for coolies.

The Orchid house was occupied in 1879 by miscellaneous plants, largely annuals, for the orchids had been placed on trees

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§ Cantley smoothed them in 1882.

about the Gardens. Beds of annuals were upon the terraces early in 1879; but this form of bedding was stopped during the year on account of the expense.

The Office had big eaves, alike for affording a shelter against rain to visitors, as for ripening off plants of periodic growth. It was damp, and Murton kept no books in it. The orchid house was low and covered with creepers. The neighbourhood had been opened out considerably by removing old trees.

The visitor having reached the office could take the Lower Ring Road in either direction, or ascend the steps to Niven's lower terrace, and so reach the Bandstand, or if he cared he could proceed towards the Main Gate again down an avenue of palms between flower beds to the Monkey House, round which new planting had occurred in order to give shelter to the Monkeys, and where, as said, the road would have been found broken. This break was with the intention of preventing carriages from reaching the Monkey House, pedestrians instead being encouraged by means of four new paths one made out of the old roadway each blocked against carriages by a stone pillar.\*

If the visitor had entered the Gardens by the Office Gate, he would have found leading to the left the line of a closed-up road with a row of Araucarias on its south side. Three of these Araucarias still stand. The road had been the end of the Main-Gate Road, unintentionally so constructed as to lead strangers who had entered at the Main Gate out of the Gardens at the Office Gate. Such an arrangement, not unsuitable when the visitors were the subscribers to and owners of the Gardens, and therefore familiar with the turns of the roads, was unsuitable when the Gardens were becoming a resort for anyone and everyone: and the Sub-Committee ordered the closing of the end of the road. The road to the right was that which still persists—being apparently the first road made in the Garden of the Agri-Horticultural Society. Ascending it the visitor passed the end of the Herbarium Ring Road and then had on his left Murton's new palm plantation. On his right were more Araucarias in a row along the side of Cluny Road as far as the old Kangaroo enclosure, and a path led near them and gave a branch up hill to the Aviaries upon Niven's lower terrace.

The visitor would have found the roads about the Bandstand much as they are now. They had been narrower and the Upper Ring Road had been limited by a circular border which Murton had removed, as being an obstruction upon Band evenings; and he had thereafter been able to throw an extra eight feet into the road. He had also done away with many beds upon the upper terrace and substituted Crotons in tubs. The lower terrace was bedded with shrubs. The Aviary was upon it to the east of the Hill; and to the north-east, to which Niven's terracing had not extended, but where

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\* Two of these stone pillars are still in situ.



the Agri-Horticultural Society had had an orchid house, surrounded by trees, Murton had cleared considerably, and had made small terraces on one of which the Carnivora House had been placed. At its back trees had stood, which up to 1877 were heavily festooned with the beautiful indigenous climber *Thunbergia laurifolia*. Unfortunately it kills its supports; and no sooner had Murton commenced to construct a fernery under the shade of the creeper, than the trees began to fall; he wrestled with the situation by scaffolding, but this perished; and in 1879 there was little but an untidy corner, where the fernery had been commenced. Moreover Murton complained bitterly of the way in which his best ferns were stolen from this place. The Carnivora cages had been removed before 1879; and in their place Murton had planted a collection of Bromeliads. Behind them, across the Lower Ring Road and screening off the Propagating yard, was a tongue of virgin jungle, which is now cultivated for shade plants, and contains Shoreas with other typical forest trees; however the tongue has been lengthened slightly by newer planting.

West of the Bandstand hill the paths were not at all as they are now. Flower-beds were about the head of the Lake; and no screen of trees such as is now, but a plantation of Pomelo trees and trees of the Kenari nut, with behind them coolie lines, and a shrubbery near the Tyersall Gate.

Along the Maranta Avenue was a long border with shrubs. Garden road had not ceased to be a public thoroughfare; and the Palm valley was untidy. Its slope under Garden Road had served Murton for a source of clay when he needed it, and so been bared; then he had smoothed it somewhat and tried to get it grassed over; toward Cluny Road it was covered with *Gleichenia* fern. An old cart track leading into the valley he had filled; and from the top, where he seems to have planted palms, a path was made down to the hollow which he had developed as an Economic Garden. In this Economic Garden in 1879 the visitor would have found patches of coffee,—Arabian, Liberian and Cape Coast,—the latter two being introductions of 1877; the first as elsewhere in the Peninsula was suffering from the attacks of *Hemileia*. He would have found Tea, Cacao and Sugar-Cane. The Canes were good introductions from overseas, and were much pilfered. He would have found Ipecacuanha struggling, and Cardamoms, Avocado Pear, and all the various rubber trees that Kew could send out, including *Hevea*, as well as 4000 pots of the local Gutta Singarip (*Willughbeia firma*) which it was thought had a future, and 2000 pots of Eucalypts. He would have found also Teosinté, Maize, Mahogany and various fruit trees.

There was a raised path limiting the Garden on the north and beyond it swamp forest. If the visitor had followed the path westwards he would have found large beds for flowering shrubs which Murton raised with the purpose of saving the flowers in the more public parts of the Garden from being cut for bouquets.

Murton had for the Garden in the year 1879 from Government \$7,580, and by subscriptions and sales a further \$370. Out

of it he was able to spend over \$3,000 on coolies' labour, so that as the wage was \$5 per mensem (and had been \$4), he had fifty men in employment besides his overseers, and that is more than the Department has been able to retain in the "Botanic Garden" for very many years up to the present year.

In the year 1879 the Government authorised the Gardens to commence planting a piece of land called the Military Reserve which lies to the north. This land is what is now known as the "Economic Garden." The first occupation of it began at once and a shed for Chinese coolies was erected, and a house for the Road foreman employed in the Gardens.

This Military Reserve was not altogether waste when taken over; its lower parts had been planted in indigo by Chinese, who lived on the slope among fruit trees. The low land seemed to Fox who happened to have been at Kew when Cross had returned from Para with his first Rubber seeds, to be just the kind of ground which Cross described as suited, and he took the young Hevea trees in the Palm valley to it. He set to work also planting on the higher ground, but single handed after Murton's fall could do little,

Murton's last work for the Gardens was the compilation of a Gardens' catalogue which was printed and published; but is not available in the Settlements, because Cantley suppressed it as altogether unreliable (Report for 1882, p. 13).

Nathaniel Cantley, a native of Thurso, N.B., Kew-trained and for a time Assistant Superintendent of the Botanic Gardens in Mauritius, was now appointed to succeed Murton. He arrived in the Colony in November, 1880, but was forced by illness to take leave in March, 1881. Again Mr. Fox acted while Cantley voyaged to England via the Cape. Sick as Cantley was when he went on board, he had some two thousand botanic specimens cut from the trees in the Gardens and their neighbourhood which he dried on the voyage with a view to getting them determined at Kew. It appears that many of these found their resting place in the Kew Herbarium. Cantley resumed charge at the end of 1881, and presented a programme of work to the Gardens Committee which obtained approval. First of all he it said that the Government had the formation of a Forest Department in mind, and with that in view Cantley proposed that the Military Reserve should carry a series of Malayan timber trees. This was approved; and because the space in the Botanic Garden for new introductions was, as Murton complained, restricted, Cantley wove into his series of Malayan trees, all those of his new introductions which had an economic value, until gradually the importations exceeded in number his Malayan trees. At the same time into the Botanic Garden he planted the things that had not an economic interest. Next he made, with approval, two nurseries, one for ornamental plants in the Botanic Garden, and one for forest trees in the Military Reserve. The second covered several acres adjoining Cluny Road and extending back a couple of hundred yards to where traces of it exist still in groups of certain trees. He arranged for the sale of plants from these Nurseries. Thirdly he asked for, and got, a

suitable office building wherein he could house a Herbarium and a library. Then he named the staff required, and the alterations necessary in the Gardens to bring things into order, including the adequate labelling\* of the collections over which Murton had complained of considerable difficulty, and for the effective policing of the grounds by day and by night.

Cantley was a great advocate of order. The arboretum he planted in botanical sequence on the system of Bentham and Hooker with one end at the Cluny Road entrance to the Economic Garden and carrying the series eastwards. He had made in 1882-85 from near the foot of the Lake to the Tyersall Gate a series of flower beds‡ whereby the visitor was introduced to this system in ornamental plants; but the impossibility of filling the beds with plants suited to the climate broke his scheme down. Thirdly when Murton's palm collection wanted replanting, he proposed to arrange it according to the "Genera Plantarum." What Cantley meant in 1882 by saying that the Singapore Gardens had never been a "Botanical Garden," was that this botanical orderliness which so appealed to him was not present, nor the plants labelled. He had extensive flower beds on the Lower terrace of the Bandstand Hill, which held no less than 20,000 plants; and in 1886 made more at the Main Gate. In administration this love of order did much for the Gardens; for instance, Murton had left cooly lines in three places, and Mr. Fox had complained that numbers of men were continually walking about at night who when questioned always had the excuse that they were proceeding from the one set of lines to see their friends in another, and that this conduced to thefts: Cantley concentrated the coolies in his new propagating yard partly in new buildings, and partly in buildings left by Murton, Capel's house because the clerk's house. To a place near to the Propagating yard he took the Plant Houses; and to a place near enough also and furthermore conveniently reached by visitors he took the Gardens office. Putting forward the need of a building in which Flower shows could be held he induced the Government to build in 1882 between the office and the Propagating yard the Large Plant House; and it has been used again and again for that purpose, the collection of pot plants within it being removed temporarily.

The Zoo he concentrated in 1885 at the Monkey House, erecting new aviaries like brackets on either side of it: and encircling these again for shelter with trees and shrubs.

Thus Cantley cleared the Bandstand Hill of all buildings; for the office was no longer wanted, nor the little very unsuitable orchid house, nor the cooly lines; and a Rosary was made where they had been: the Aviary also disappeared from the lower terrace. The Rosary beds were just as the beds containing Cannas are now,

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\* Murton's labels had been painted by convicts in the jail

‡ There is preserved in the Public Works Office a ground plan with levels showing the Main Lawn covered with flower beds and the curves of the paths to the old Monkey House altered. This plan, which is undated, appears to have been connected with Cantley's desire to maintain a collection of bedded plants illustrating Systematic Botany.

but instead of grass had walks between them. Upon the top of the Hill he planted in 1882 *Araucarias* and *Crotons*, and placed ornamental vases and garden seats. At the head of the Lake he launched an undertaking which failed. He removed the flower beds; and a big cistern having been made in 1886, he threw up mounds which were to be irrigated and to support delicate ferns. While this was being done, he altered the footpaths on that side of the hill so as to conduct visitors to the fernery, and he planted trees round the cistern to hide it.

North-east of the Bandstand hill close to where Murton's fernery had fallen, he made another fernery. Here he had forest overhead, and by thinning it, and throwing the surface into mounds into which stone was inserted, he obtained a very suitable place. Funds did not enable him to finish it rapidly and what was started in 1883 was not completed for a long time.

The shrubberies all along the border of Cluny Road to the Large Plant House he first made. New gate posts were erected at the Main Gate in 1885 and topped with globes in 1886. By the kindness of Messrs. Gilfillan, Wood & Co. he was allowed to place a hand pump across the Cluny Road and pump water to the Plant Houses from the head of the little stream that runs there. He did not follow up Murton's scheme of raising flowers for bouquets at the west of the old Economic Garden, but laid out what we now call Lawn R in stiff rectangular beds for the purpose. In the Economic Garden in 1883 he experimented with European vegetables.

Cantley's staff for working the Gardens consisted of himself, Walter Fox, a clerk, a foreman gardener and a propagator, both the latter two selected as being able to read and write, a label-printer a mason and a carpenter. Three constables were quartered in the Gardens each taking a day and a night beat in turn just as the watchmen do now. In the first three years of his service in the Colony the Government grant was \$10,000 which was expected to cover all expenses, with the help of \$750 to \$850 from subscriptions and sale of plants. In 1886 the pays of Cantley and Fox were excluded, and the Government vote put at \$7,000. The forest vote maintained the planting upon the Military Reserve.

Cantley, as time went on, became more and more tied by his Forest work. Then at the end of 1887 his health again broke down and he went to Australia on leave where he died. Mr. H. N. Ridley succeeded him in the next year. But before Mr. Ridley had arrived in the Colony a little "Guide to the Botanic Gardens, 1889," had been prepared by Mr. Fox and was in the press. As it gives an account of the condition of the Garden at the age of thirty years, the reader is referred to it. All which here follows will be but a statement of subsequent changes taken seriatim in order that it may be clear what of that on which the eye of the visitor of 1918 rests, was absent in 1889.

Mr. Ridley's service marks the third period in the history of the Gardens: and it will not be reviewed. The four outstand-

ing results of it are: firstly, the excellent Herbarium of the Higher plants and ferns of the Malay Peninsula, whereby he is now enabled to write a Flora of the Peninsula; secondly, the considerable planting of Rubber, whereby as the Peninsula enormously benefited, so too the Gardens obtained a large income enabling them to be maintained without an increase of the Government's vote although the relative value of the vote was much reduced with the fall of the dollar; thirdly, the housing of the Gardens' staff upon the Military Reserve ground; and fourthly, the commencement of publication of results. He was in charge of Forests up to 1901; but from 1892 the Military Reserve or Economic Garden ceased to be maintained out of a Forest vote.

It is not given to everyone so admirably to round off his service as Mr. Ridley is doing; he will finish his Phanerogamic Flora of the Peninsula in retirement. Meanwhile the Gardens have entered upon their fourth period, with two outstanding objects (1) to extend the study of the Botany of the Peninsula to the Lower Plants, and (2) on the horticultural side to widen the efforts in acclimatisation by the use of all those opportunities which selection and plant-breeding afford. For both purposes officers have been appointed, but the War has delayed the start.

#### APPENDIX.

*Changes subsequent to Cantley's death which have made differences in the appearance of the Gardens.*

There is nothing which throws greater difficulties into an understanding of the Annual Reports of the Gardens than their inconsistencies in the names of buildings and roads. The same plant house, for instance, is in one year the "Shade-plant house" and in another the "Aroid house"; and what is true of the plant houses is still more true of the roads. In 1913 names were given to the important roads, that they might be cited in Police regulations, and they were labelled: since when the whole of the Gardens has been divided into areas which, in the Botanic Garden, are denoted by letters, and, in the Economic Garden, by numbers. In the Botanic Garden the letters denoting each area appear upon the labels to the trees. The accompanying map records them; and the reader may find it a guide to him in running through the following list of the more noticeable changes made since Cantley's death.

#### CHANGES NEAR THE MAIN GATE.

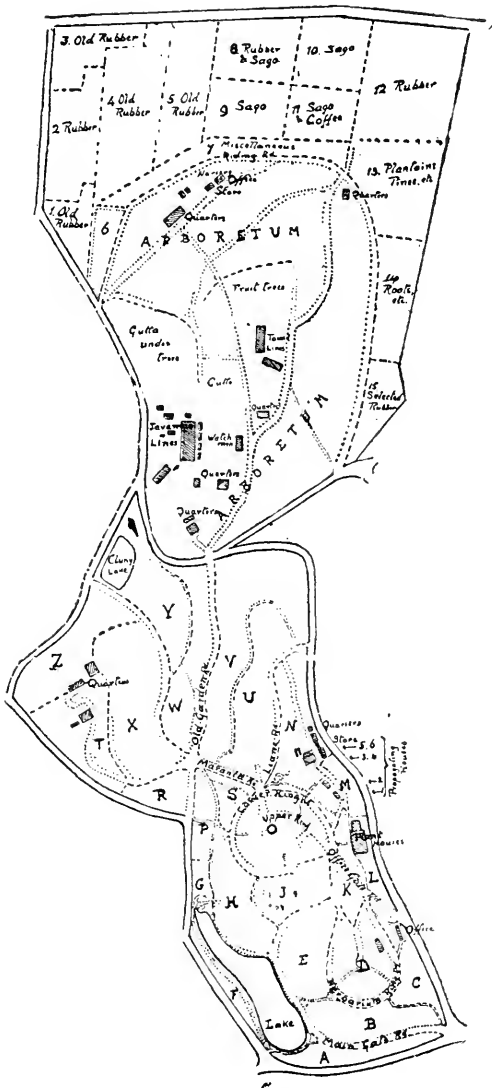
A brick boundary wall with iron railings was erected from the Main Gate to the Office Gate, 1904.

Cannas, first introduced into the Gardens for bedding in 1894, have been made of great use near the Main Gate since 1914.

The little path towards the Barracks across Lawn A. was closed in 1912.

Small paths round the ponds were closed in 1916.

A new coral-bordered outflow was made from the Lake to the Ponds, with falls upon it, 1918.



Plan of the Botanic and Economic Gardens showing the "lawns," "areas," or "blocks" into which they are divided. The Lawns and Areas in the Botanic Garden are designated by the letters of the Alphabet. The Blocks in the lower part of the Economic Garden are designated by numbers. The position of the Gardens' building is indicated. For the fullest preservation of the amenities of the Botanic Garden, most of the quarters are in the Economic Garden.

#### CHANGES ABOUT THE SIDES OF THE LAKE.

The embankment of the Lake was raised one foot, 1890.

A path through Lawn F. was made and a collection of Leguminous trees planted along it, 1889.

An oil engine was installed within a clump of trees at the junction of Lawns E. and K., by which water is supplied to the Bandstand Hill, Fernery, Propagating Yard and Plant Houses, 1907.

The islet was planted with the larger plants now on it, 1891, cleared of undergrowth and turfed 1904, but the undergrowth has returned.

A kiosk on Lawn E. was erected as a shelter, 1907.

#### CHANGES ABOUT THE HEAD OF THE LAKE.

Cantley's mounds for ferns were planted with *Sansevieras* and other succulents, 1888-89; then trees sprang up on them which were suffered to remain; and when their shade was sufficient, rocks were inserted into the mounds and ferns encouraged, 1904. But as the paths were too narrow, they were reduced in number and the mounds reshaped in 1914; and a hollow walk, coral-bordered, was made upwards through the lower part of the big cistern, 1915. Two pools were constructed in this "Dell," 1915; and they were connected with the inflow from the Tyersall Lakes, in such a way that the muddy rain water from Garden Road and elsewhere should be excluded, 1918.

#### CHANGES ON LAWN D.

The Aviaries were removed, 1905-07, the Monkey House being left to serve as a shelter until 1913, when it also was removed.

The Herbarium building was erected, 1903. For the history of its contents, see the Annual Report of the Gardens for 1889 and subsequent reports.

#### CHANGES ON THE BANDSTAND HILL.

A Bulb Garden was made where Cantley's series of herbaceous annuals were, 1888.

A Marantaceous border was planted behind it, 1888.

Sand was supplied first on the Bandstand for the children's play ground, 1902.

Rose beds were made round the tall palms upon the Hill, 1915.

Two additional feet were added to the breadth of the Upper Ring Road by narrowing the border drains and improving them, 1905.

The climbing *Thunbergias* upon the north side of the Hill, brought down their supporting trees, 1889, just as they had done in 1876, and did again in the neighbouring edge of the Gardens Jungle in 1915.

#### CHANGES ABOUT THE PLANT-HOUSES.

The roof of the Large Plant House (Exhibition House of the older reports) was modified with the object of improving the light, 1897, 1898, and 1918. Its gable was built, 1918. Its central pillar was built, 1898; the coral arch in it was built 1898; its tank was constructed, 1900.

The Annexe to the Large Plant House was built, 1889, and reconstructed 1895-96; its tables were lowered and the house altered, 1904.

Little rockeries were made just to the north west of the Annexe, 1890.

#### CHANGES IN THE PROPAGATING YARD.

The old cooly-lines which were infected with *Ankylostoma*, were removed, 1899.

Cantley's Orchid House was removed, 1895.

The Roadway to the Propagating Yard from the Large Plant Houses was continued to the Rogie entrance, and its line through the Yard altered so as to give more room on the side where the plants are grown and less upon the side towards Cluny Road: the entrance from Cluny Road close to Lermite Road was closed, 1890.

Propagating House No. 1 was built, 1898, and reconstructed in 1911; No. 2, an old house, was reconstructed in 1896; No. 3 was built for shade plants, 1901; No. 4 was built for orchids, 1908; the Glass-roofed House No. 5, built 1898, was rebuilt in 1906; and the similar house No. 6 was built, 1908.

New unshaded tables were built east of the two glass-roofed houses, 1917 and also north of them, 1918.

A new path parallel to the Lower Ring Road was made to the Fernery, and planted with Aroids, 1889.

A collection of Scitamineae was built up under the Tampoi trees where Cantley had proposed to raise orchids, 1890 forwards.

Quarters for two carpenters built, 1907.

#### CHANGES ABOUT THE PALM-VALLEY.

The long rectangular beds where Cantley raised flowers for bouquets were closed, 1890.

The old Monkey House was re-erected over the top of the Valley to serve as a shelter for any one caught by rain in this part of the Gardens, 1914.

The entrance to the Gardens' Jungle path was altered so as to pass it, 1914.

The pathway down the Palm Valley was converted into a road and new paths made to east and west of it (that to the west however closed again later), 1891-92.

The plantation of palms commenced by Murton at the head of the Valley, was extended down the valley, 1891 forwards.

The nursery in the hollow was enlarged, 1891.

The swamp against the Tyersall Road was converted into a Lake, the Cluny Lake, bridged for the Roadway, 1891-92. The bridge was converted into an embankment, 1894, and the embankment raised, 1896. The Lake was confined on its southern side, 1912; and the pond, cut off on its west side by the road, was filled, 1914.

#### CHANGES ABOUT THE DIRECTOR'S HOUSE.

Beds for cut flowers at the back were changed in position, 1889 and then abandoned gradually.



Tyersall Road having been made, the old path at the back was allowed to become closed up, 1890. The upper corner of Tyersall Road was improved in 1904.

Near the Assistant Director's house, benches were placed for raising annuals, etc., 1915.

A small orchid house was constructed of the iron of the old bear cages, 1917.

A Sun rockery was constructed for Agaves, 1914.

#### CHANGES IN THE ECONOMIC GARDEN.

The Riding road was made, 1899-1900.

A roadway intended to continue the line of Garden Road through the Arboretum and be metalled for carriages, so to bring visitors to much that is of interest in this part of the Gardens, was laid down, 1915.

Blocks Nos. 1 and 3 were planted with rubber, 1886-88.

Block 2 which had been covered with forest trees left from Cantley's forest nursery, was planted with rubber, 1904.

Blocks Nos. 4 and 5 planted, 1884-87, and forwards.

Block 12 planted, 1913.

Castilloa planted in Block 14, 1900.

Ficus elastica planted with coffee in Block 11, 1905.

The Hill-sides dug, planted and returfed in sections, 1894, forwards.

The hill top towards the west planted with gutta, 1897-99.

The neighbouring slope towards Cluny road planted through under jungle with gutta, 1903.

Rubber smoke house, built, 1909.

Quarters for 3 subordinates built, 1891, rebuilt, 1908; and for another 1893; and for another, 1915; and for another 1916.

Economic Garden tool-shed built, 1907.

Economic Garden Office built, 1908.

Lines for Tamil coolies built, 1892; rebuilt 1910, and extended, 1918.

Lines for Javanese coolies built, 1899, and extended, 1918.

Lines for watchmen built, 1899; rebuilt, 1910.

Quarters for an Assistant Curator built, 1910.