THE WATERFALL GARDEN

PENANG

ILLUSTRATED GUIDE

By

R. E. HOLTTUM, M.A., F.L.S.
Director of Gardens, Straits Settlements

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THE WATERFALL GARDEN, PENANG.

The Waterfall Garden occupies the lower slopes of a valley leading into the hills, whose forest-covered slopes enclose it on all sides. At the head is the waterfall and reservoir, below which the stream and its tributaries flow through the garden.

The Garden was founded in 1884 as "a nursery for the planting of Colonial products", under the charge of the Gardens and Forests Department, Straits Settlements. The stream had already long been used for part of the town water supply; the reservoir, between the present garden and the waterfall, was built somewhat later. The site had been an old granite quarry, and was full of rocks, requiring much labour to bring it into the semblance of a garden. In 1884 part of the ground was cleared and roads were made. In 1885 it is reported that the garden was already much visited by the public and that 11500 trees had been supplied from the nursery for roadsides and other purposes. In 1886 the title Waterfall Garden was first used. From the beginning the garden was under the charge of Mr. Charles Curtis, who had been trained in the nurseries of Messrs. James Veitch and Sons at Chelsea and had subsequently been employed by that firm for some years as a plant collector in Mauritius, Madagascar, and the Malayan region. Mr. Curtis was an enthusiastic plant-lover and a born gardener, and the development of the Waterfall Garden is a monument to his energy and skill. He had charge of the Garden until his retirement, owing to ill health, in 1903.

The area of the garden is 72 acres. For convenience of reference, it is divided into sections, indicated by letters from *A* to *V*; these sections are marked on the plan.

Roads.—There are two roads for motor traffic, and a third narrow metalled road which is unsuitable for this purpose. The **Lower Circular Road** proceeds from the Entrance in a circle round the lower part of the garden, returning to the entrance. From it the visitor has access to all the plant houses except no. 10, and to the lily pond gully (R). Parking is only permitted in the portion of this road between the entrance and the middle bridge.

The **Upper Circular Road** leads off the lower road by the Garden Office and makes a circuit of the upper part of the garden, passing plant house no. 10 and the fern rockery (G), and returning to the lower road near the middle bridge. From the highest point on this road a path leads up to the reservoir.

The **Upper North Road** leaves the Upper Circular Road just below the reservoir and descends steeply again to the Upper Circular Road after passing near the northern boundary of the garden. It is not open to vehicles.

ARRANGEMENT OF PLANTS IN THE GARDEN.

Trees and shrubs.—The trees in the garden are in large part local trees remaining from the original natural forest (primary or secondary); other trees, chiefly ornamental, have been added, many of them being flowering trees, planted to add colour to the landscape. Flowering shrubs are also planted in groups to give colour effects; the chief flowering season is February to April. In sections *C* and *T* palms are planted, and other palms are to be found scattered in various parts of the garden. Section *F* is reserved for conifers. In other respects there is little systematic arrangement from a botanical standpoint, the principal aim having been to arrange the plants in such a way as to enhance the natural beauty of the landscape, due regard being also paid to the requirements of the individual plants. In the upper part of the garden certain areas are devoted entirely to trees. The smaller plants are arranged according to their requirements of sun or shade, in various rockeries, terraces and plant houses, which are detailed below.

Shade Plants.—These are grouped informally in the **fern rockery** at the head of the garden (G), and in the **lily pond gully** (R). It is impossible to label all plants in these areas; visitors who wish to identify particular species will find many of them grown as pot plants in the various plant houses, where they are duly labelled and to some extent grouped systematically, especially in houses 8, 9 and 10.

Sun Plants.—A number of the larger succulents (Cacti, Aloes, Agave, Euphorbia, etc.) are grouped together with the sun-loving orchids and some suitable herbaceous flowering plants in a terraced sun-garden in section *K*.

The Plant Houses.—These are numbered from 1 to 10. Nos. 4–7 are in the Potting Yard and are not open to the public. It is impossible to give here any detailed description of their contents, which are changed from time to time. They are referred to in turn in the itinerary.

Formal Garden.—A small formal garden with water lily tank, is situated in section V (adjacent to the nursery); the entrance is from the road between the Garden Entrance and the lower bridge.

THE FOREST ROUND THE GARDEN.

The forest on the slopes surrounding the Garden is evergreen, containing trees of many species, and is the characteristic native vegetation of Malaya. In the whole Peninsula there are about 2,500 kinds of trees, some of which are confined to the mountains. The tallest trees of the forest, which provide the best timber, are of a relatively small number of kinds, and a large proportion of them are members of the plant family Dipterocarpaceæ, which is almost confined to the Malayan region. The largest genus of the family is *Shorea*, and one of the conspicuous trees of the forest on the slopes round the Garden (particularly on the southern slopes) is the Seraya, *Shorea Curtisii*, named after Charles Curtis, first Curator of the Waterfall Garden. The leaves of Seraya are pale grey in colour, and the crowns of the trees show up against the prevailing greens of other trees.

Though the forest as a whole is evergreen, its aspect is not uniform nor unchanging. Different trees have foliage of very different appearance and colour, and crowns of different shape, and in many cases young leaves are different in colour from old ones. Young leaves are produced at rather irregular intervals by many evergreen trees, and trees of different kinds often do not renew their leaves together. The young leaves are sometimes fresh green, but more often pink or red. A few trees are deciduous, to the extent that they drop all their leaves at one time, but new leaves appear very quickly, and no native tree stands bare for more than a few days. A few trees develop autumn colours before leaf fall, but this is rather exceptional.

The flowering of most trees is not conspicuous, as the flowers are usually rather small. Flowering usually takes place during or after dry weather, and is most abundant in the early months of the year. There are many big climbers in the forest, and a few of them have conspicuous flowers, which may cover the crowns of the larger trees.

Part of the forest round the Garden lacks trees of the largest kinds, and consists of smaller trees, and trees of secondary growth. Of the latter, many are to be found round the forest edges, and many also within the Garden; these are mentioned in the Guide. The most abundant are *Crypteronia paniculata, Grewia paniculata, Eugenia Helferi, Eugenia pseudo-subtilis, Eurya acuminata, Alstonia scholaris,* and *Elaeocarpus petiolatus.*

DESCRIPTIVE TOUR OF THE GARDEN.

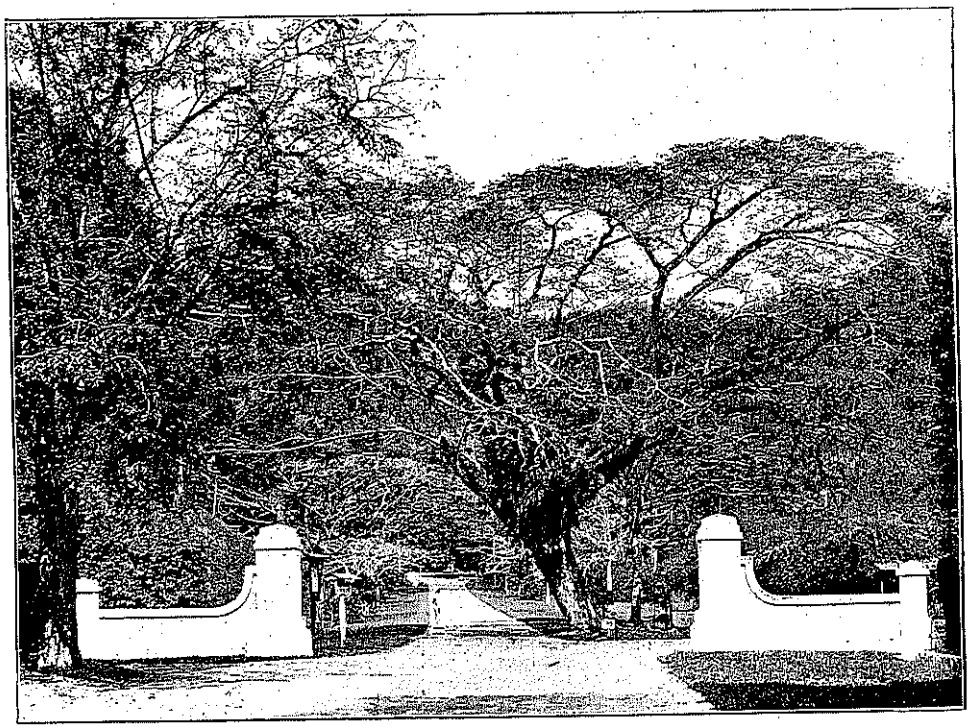
Note.—Malay or English common names, when such exist, are used throughout this guide; botanical names are also given. An index of all names will be found at the end of the book.

THE LOWER CIRCULAR ROAD. (Plate 1).

From the Entrance to the Office.

Opposite the entrance, on the corner of section *B,* is a fine Rain Tree (*Samanea saman*) ; this tree, a native of the northern parts of South America, is extensively planted in Malaya as a roadside shade tree. It usually carries a wealth of epiphytic orchids and ferns. The origin and significance of the name rain tree are somewhat doubtful; it is variously interpreted as referring to the new leaves being produced after rain, to the folding of the leaves on approaching rain, and to the fall of honey-dew excreted by certain insects often found on the tree in the West Indies. The leaves of the tree fold towards dusk.

The road proceeds straight from the entrance to the Garden Office; on the right is the stream, and on the left a steep bank at the top of which is the edge of the forest. At the foot of the bank, near the entrance, is a Bungor tree (*Lagerstroemia flos-reginae*) one of the most beautiful flowering trees of the Indo-Malayan region. The Bungor



1. The Entrance, with the Rain Tree beyond.

is an important timber tree in India (where it has several local names); in Malaya it rarely attains a large size. It is usually found by rivers. It is seasonal in flowering, the flowers appearing after the new leaves, about March. The typical form has mauve flowers, and there are varieties of various shades of pink. Also at the foot of the bank are plants of *Bougainvillea,* and higher on the bank the yellow-flowered *Allamanda cathartica.* The main collection of Bougainvilleas is in section *E,* and a note on them will be found on p. 26. The Allamandas are a group of scrambling shrubs from tropical America.

Beside the road, on the left, is a row of Penaga or Ceylon Iron-wood trees (*Mesua ferrea*); when well grown these trees are very decorative in form and foliage (which is bright red when young), and produce seasonally large white fragrant flowers. The timber is hard and very durable. There are also two fine trees of the same kind on the slope above the road. Further along, towards the office, are trees of Flame of the Forest (*Poinciana regia*) with their brilliant red flowers; this species is not so regular in its flowering in Malaya as it is in more seasonal climates. Next is another rain tree, which bears a plant of the giant Malayan orchid *Grammatophyllum speciosum.* This orchid produces long spikes of large yellow-orange flowers, mottled with dull red, usually about July and August. It is usually cultivated as a terrestrial plant; examples may be seen in sections *O* and *K.* Next to the office is a Rambutan tree (*Nephelium lappaceum*), a local fruit. Around this are plants of Cycas of two species. Cycas plants are palm-like in growth, but they are not related to the palms. They are the modern representatives of an ancient group of cone-bearing plants, and bear large cones. Two species are native in Malaya, *Cycas Rumphii* and *C. siamensis.*

Behind the Rambutan tree, on the forest edge, are clumps of the Pinang rajah, or sealing-wax palm (*Cyrtostachys lakka*). This beautiful palm is found in Malayan swamp forests, and is one of the most distinctive native ornamental plants.

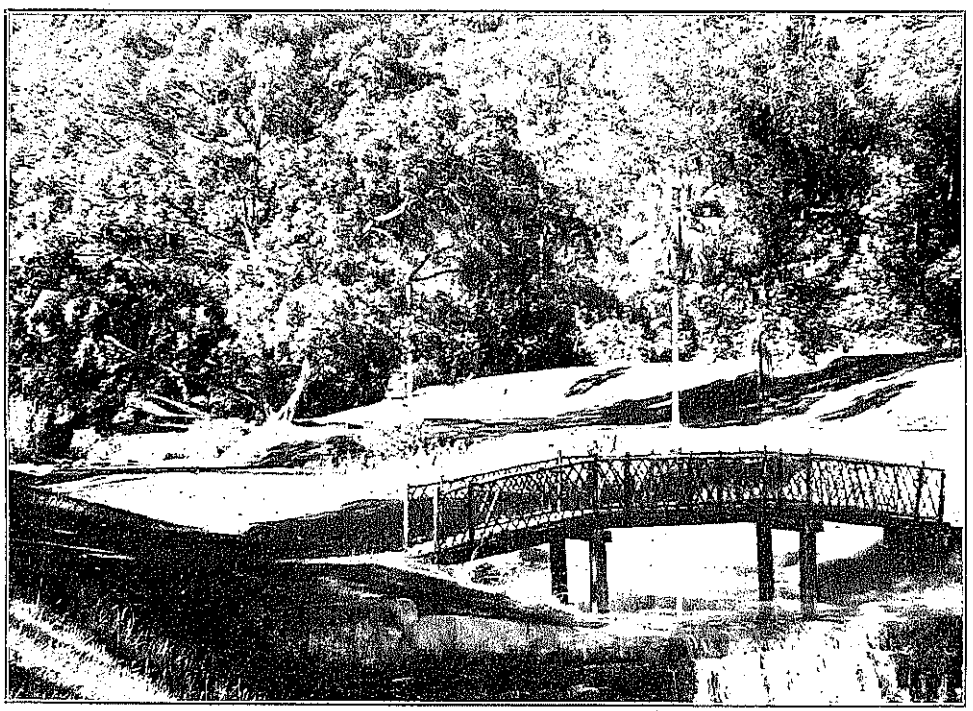
On the right, just before the junction of the upper and lower roads, are two clumps of the Traveller's Palm

(*Ravenala madagascariensis*), on the bank of the stream. This species belongs to the banana family. There is a hollow enclosed space, holding rain water, between the base of one leaf and the next; this source of water is said to be used by native travellers in Madagascar, where the stems of the plant are also used for building houses and the leaves for thatching. The plants never flower in Malaya and are propagated by suckers. Between these Traveller's Palms and the road is an Angsana or Sena tree (*Pterocarpus indicus*), a Malayan tree much used for roadside planting in Penang. Angsana trees produce masses of golden flowers, usually in the early part of the year. They yield a fine timber.

On the Angsana and the Rain tree opposite to it are large plants of the Bird's-nest fern, *Asplenium nidus*. The large fronds overlap, and together form a hollow "nest" which catches dead leaves from neighbouring trees; these leaves decay, and through them the young fronds of the fern push upwards. In this way the plant is provided with food for its roots. The roots form an enormous spongy mass, which holds water for a long time after rain. Other smaller ferns often take advantage of this water-supply, and may be seen growing on or below the mass of roots. The Bird's-nest fern is very common on trees in Malaya, and is widely distributed in the tropics of the Old World.

Just beyond the Traveller's Palms, there is a wooden foot-bridge* across the stream, leading to section *S*, for the convenience of visitors whose cars are parked in the western section of the road. Near this bridge, by the stream, is a border of flowering plants which are changed frequently. Cannas are sometimes used on this border, and other Canna beds are near by. Cannas are among the most useful flowering plants in Malaya, and will remain flowering at all times of the year. The commonly cultivated kinds, of which there are a large number, are the result of the hybridisation during the past 70 years of several species from Tropical America. Before 1860 the only Cannas in cultivation were tall plants (6 to 12 feet) with small flowers, grown for their foliage.

* Plate 2.



2. The foot-bridge connecting sections B and S.

From the office to the Middle Bridge: Section *C*.

Continuing on the lower road (for description of the upper road *see* page 25), section *C* is on the left. This is a small triangle, containing chiefly palms. Other palms are found in section T, and scattered in various parts of the garden. In section *C* is a clump of Nibong palm (*Oncosperma filamentosa*), a local palm of swampy ground of which the hard trunks are used for building purposes. Other palms are: *Attalea cohune*, the Cohune nut of Brazil, the seeds of which were used by natives of Brazil as fuel for smoking Para rubber; *Chrysalidocarpus lutescens* from Madagascar, much used as an ornamental pot plant; two allies of the date palm, *Phoenix Roebelinii* and *P. rupicola;* the small Chinese palm *Rhapis flabelliformis* (stems exported from China as partridge canes) which forms dense clumps but rarely flowers in Malaya; and *Licuala spinosa*, a member of a group of rather small palms often found in Malayan forests.

Also in section C is a small tree of *Podocarpus polystachyus*, one of the two native lowland conifers in Malaya; it grows on sea shores and sandy ground behind mangrove. *Podocarpus* is a genus distributed chiefly in the southern hemisphere, belonging to the Yew family (Taxaceæ); it has no cones, but produces single seeds. There are a few other local species, of which one, *P. imbricatus*, is to be seen in section *S*. Beside the road is a small tree of the true Mahogany (*Swietenia mahogani*) from the West Indies. This tree occasionally fruits. The species grows fairly well, though never very rapidly, in Malaya, but requires a better soil than that of the Waterfall Garden, which is very poor and sandy.

Near the drain separating sections *C* & *E* are groups of one of the common trees of the Garden, Krian batu (*Eugenia pseudo-subtilis*). This species has a small edible fruit. The genus Eugenia is a very large one, and is represented by over 120 species in the Malay Peninsula. Most of them are trees of medium size; about 30 are common, and a considerable number are mountain species of restricted distribution. Several have edible fruits, the larger of which are called Jambu in Malay; those which have

small fruits, like the present species, are called Krian. The Rose-apple is Jambu bol (*Eugenia malaccensis*), of which a young tree will be found in section *N*.

Just beyond the drain, in section *E*, is a clump of Sago palms (*Metroxylon sagus*). These palms continually produce new shoots from the base; each new shoot develops into a trunk of limited growth which after a period of about 15 years flowers and dies. These trunks contain large stores of starch which is used up if they are permitted to flower and fruit; they are therefore felled before they begin to flower, and the starch (sago) extracted.

Section *B* (beyond the road junction).

On the right of the road, in the remaining part of section *B*, are several interesting trees. *Lagerstroemia floribunda* is a small-flowered species nearly related to the Bungor (*see* page 8). It is especially abundant in open country in the north of the Peninsula and makes a pretty ornamental tree. Behind this is a *Casuarina*, a tree of sandy sea coasts widely distributed in the Eastern tropics. The genus Casuarina has its chief centre of distribution in Australia, where there are many species. The local one is called *C. equisetifolia;* in Malay, Ru. It is not a conifer, but has minute flowers, the male and female flowers on separate branches. The leaves are so small as to be hardly visible, and their work is done by the slender green twigs.

Near by is the Pulai (*Alstonia scholaris*), a tall local tree related to the Jelutong and containing an abundant white latex. It has a soft white wood. The roots of an allied species are so soft and light that their wood is now used instead of pith for sun helmets. *Ficus macrophylla* is an Australian species, rather similar to *Ficus elastica*, the Gĕtah Rambong (formerly a source of rubber in the Eastern tropics). The Saga (*Adenanthera pavonina*) is a small local tree often used for shade purposes; its seeds are bright red and are sometimes used as beads.

On the stream bank, near the fine clump of Nibong, is an African oil palm (*Elaeis guineensis*); this is one of the varieties early introduced to Malaya, bearing fruit of a thick-shelled inferior type, useless for oil production. The

3. The Sentol tree near Plant-house No. 3.

oil palms now cultivated in Malaya are of the high-yielding Deli type.

On the opposite bank of the stream is a large clump of the tall Tiger grass (*Thysanolaena agrostis*), native of Malaya and widely distributed in tropical Asia. It is known by the Malay name of Buloh tubaro.

By the road are small trees of Tamarind (*Tamarindus indicus*); growing on one of them is a fine plant of the Siamese Elk's-horn fern (*Platycerium grande*). Ferns of this group have two kinds of leaves, one erect and bracket like, protecting the roots and holding humus, the other pendulous and repeatedly forked. The pendulous fronds bear spores on certain parts of their lower surface. This Siamese species differs from the common Malayan one in not having the special hoof-like spore-bearing portion of the pendulous leaves. The bracket leaves are also finely frilled.

On the right of the road at the end of section *B* is a thicket of *Arrabidaea* (or *Bignonia*) *magnifica*, a very free-flowering scrambling shrub from South America. This is one of the few members of its group which will flower freely in the lowlands of Malaya; most of them require a cooler or more seasonal climate.

In the thicket are also some Caryota palms, of a common small local species (*C. mitis*). Some palms of this genus are very large; they furnish a kind of sago, and also toddy.

Section *D*.

Next on the right is the small section *D*, containing plant house no. 3. Beside the road and paths in this area are planted varieties of Hibiscus. These varieties, which have single or double flowers, and range in colour from white to pink and red or to yellow and orange, are the result of a large amount of hybridisation between the Pacific species *Hibiscus rosa-sinensis* (the common hedge Hibiscus) and other species from China, Mauritius and Hawaii. In recent years many new varieties have been produced in Honolulu, whence some of the best now grown in the Garden have been imported.

By the small path leading along the top of the stream bank are fine trees of Sentol (*Sandoricum indicum*)* a local

* Plate 3.

fruit tree of the mahogany family, and Angsana (*see* p. 10). A slender climbing bamboo is supported by the Angsana. Opposite the Sentol, on the other bank of the stream (in section *S*) is a fine spreading Waringin tree (*Ficus benjamina*), a commonly planted shade tree; it is one of the many small-fruited wild figs of the Eastern tropics. The seeds of these wild figs are distributed by birds and often reach the branches of other trees, where many of them are able to germinate and grow epiphytically, like orchids and ferns. They put out many roots which clasp the trunk of the host tree and finally reach the ground; after this the Ficus plant increases rapidly in size and may completely strangle the host and replace it. Other allied Ficus trees are to be seen in sections *E* (by the upper road), *O*, and *B*.

Below the path, by the stream, are thickets of the grass *Saccharum arundinaceum*, allied to the sugar cane, and also a Raffia palm (*Raphia ruffia*). This palm is native of Madagascar; the part used as Raffia is the skin of the young unfolded leaflets. It is a swamp plant, and has special upward-growing breathing roots.

Between the plant-house and the stream is a fine Tamarind tree, and also a clump of the fishing-rod bamboo; (*Thyrsostachys siamensis*), one of the most graceful of the smaller bamboos. It has a solid stem.

On the plant-house roof are several interesting flowering climbers. *Bauhinia bidentata* is one of a number of local species which climb over the crowns of large forest trees and bear seasonally masses of beautiful orange flowers. Most climbing Bauhinias have a curiously twisted or flattened main stem of characteristic shape for each species; this is well shown by the present plant. *Bauhinia bidentata* usually has leaves with two small points at the apex; many other species have leaves deeply cleft, from which they are often called "camel's foot". This name is especially applied to the shrubby species (*see* section *V*, p. 24). The climber with pendulous inflorescences of large white flowers is *Thunbergia grandiflora;* the more woody climber with white flowers on short erect stalks is *Chonemorpha Rheedei*, from Ceylon, which is very fragrant both morning and evening.

Beyond the plant house, at the top of the stream bank, is a tree of *Alstonia scholaris* (*see* p. 12), and below, by the stream, *Agathis robusta*. The latter is an Australian conifer, with very broad leaves, a near ally of the Kauri pine of New Zealand. There is a very similar species in Malaya. Agathis yields a copal resin. On the opposite bank of the stream, screening the sheds of the potting yard, are two fine purple-flowered Bungor trees (*see* p. 8), and behind these a tall Casuarina.

Section *E* (lower part).

On the other side of the road, section *E* stretches upwards to the Upper Circular Road. On it, by the lower road, is a shrub of *Memecylon coeruleum*, a local species with pretty blue flowers and small edible fruit, and a tree of Penaga Laut (*Calophyllum inophyllum*), a Malayan sea-shore tree with handsome laurel-like leaves and white flowers. Behind these are other trees, some poorly grown. Among them are the following:

Elaeocarpus floribundus, a tree of India and Malaya, of which the fruit is eaten in Ceylon, salted like olives.

Sterculia parviflora, a Malayan tree which has brilliant red fruits.

Morinda tinctoria (Měngkudu), a small local tree the roots of which yield a fine orange-red dye.

Higher up, on the shoulder of the ridge, is another group, containing the following:

Sloetia sideroxylon, the Tampenis tree, which produces one of the heaviest and most durable of Malayan timbers.

Kopsia albiflora, a local flowering tree.

Sterculia foetida, a tree of sea coasts in the north.

Cassia fistula, the Indian Laburnum, a beautiful flowering tree much planted in Malaya.

Chloroxylon swietenia, the Satin Wood, native of Southern India.

Cinnamomum camphora, the true Camphor tree of China and Japan, which in Malaya only grows into a bush. The whole plant, including the leaves, is very aromatic. Camphor is obtained by distillation of the wood. There are better specimens in section *L*.

Approaching the middle bridge, the visitor sees on the left a mound covered with scrambling yellow-flowered bushes of Allamanda; with them is the blue *Petrea volubilis,* a beautiful climber from South America. Just against the bridge, at the foot of the mound, is a fine clump of the Malayan thorny bamboo, *Bambusa Blumeana.* On the bridge itself are climbers; on the left, *Camoensia maxima,* with enormous heavily-scented white flowers, from Africa, and on the right the Burmese *Congea tomentosa,* one of the most beautiful climbers of the Eastern tropics. (Plate 4).

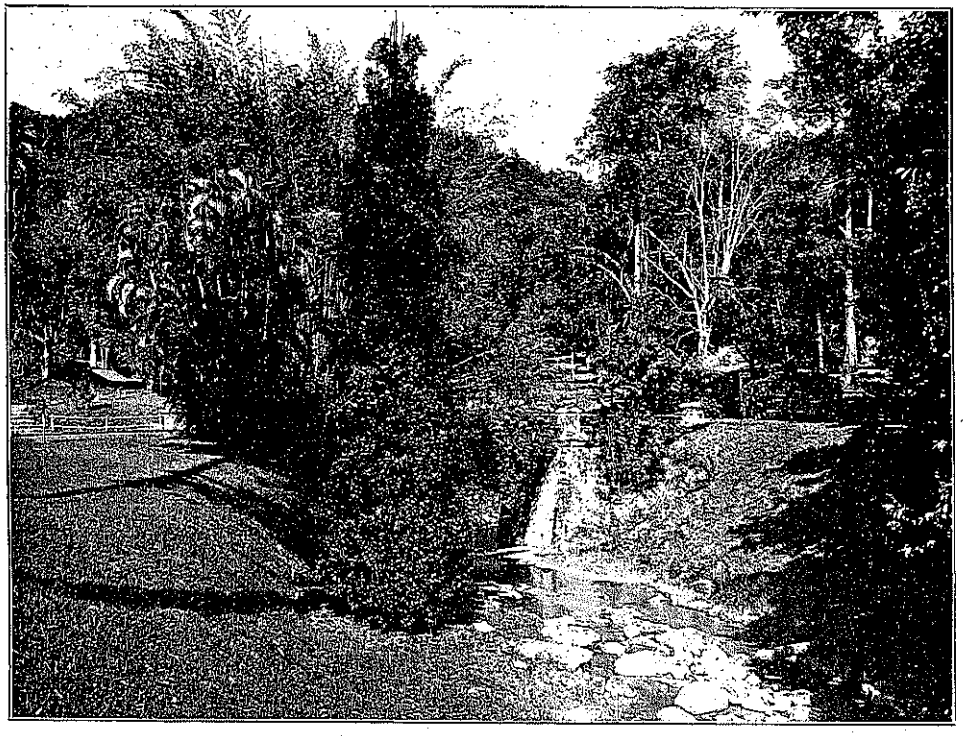
From the Middle Bridge to the Lily pond gully.

By the bridge, on the right, back from the road, is a fine tree of *Parkia Roxburghii;* the allied species, *Parkia speciosa,* of which the fruits (Petai) are eaten by Malays, will be found in section *H* (p. 36). Below the Parkia is *Cinnamomum parthenoxylon,* a Malayan tree of the same group as the true camphor tree (*see* p. 15); there are several other trees of this species in the upper part of the Garden.

Close to the road is a plant of the beautiful West Indian climber, *Odontadenia speciosa,* one of the most handsome flowering plants cultivated in Malaya. Unfortunately it is very difficult to propagate and rarely produces seeds here. The flowers have a delicate perfume. They are visited by sunbirds, which pierce the base of the tube to suck the nectar.

Overhanging the road, just before the potting yard entrance, is a tree of the Mabola, *Diospyros discolor,* from the Philippines; it is one of the persimmons, and has a large hairy pink fruit with a soft white flesh of rather poor flavour. The foliage of the tree is dense and handsome, and it is useful for shade purposes, but slow-growing.

On the left, opposite the potting yard entrance, are plant houses 8 and 9, in which are orchids, and a named series of foliage plants, especially Aroids, Dracænas, palms, and plants of the Ginger family. These plants are used for ornamental planting, and as climbers, in various parts of the garden, and the named set of potted specimens in houses 8 and 9 will enable visitors, if they desire, to identify plants growing elsewhere.



4. The stream below the Middle Bridge; *Agathis robusta* beside the stream.

The cultivation of orchids in Malaya is limited by our very uniform and warm climate, in which many of the most showy kinds grown in European glass-houses do not flourish. We are limited to the native species of Malaya and adjacent regions, and also very largely to lowland plants, with the addition of some of the Cattleyas and other orchids of Tropical America, and their hybrids. Among local orchids, the most showy and free-flowering require a sunny situation, and are to be found in the terraced sun-garden in section *K*. Other orchids, chiefly epiphytes, are grown in the nurseries, and when they flower are exhibited in plant house no. 8. In the Malay Peninsula are over 700 native species of orchids, but most of them have small flowers and are not of any decorative value. Some of these small-flowered species are exhibited for their botanical interest.

In house no. 9 are also some pitcher plants of local species, of the genus *Nepenthes*. *Nepenthes* are climbing plants, and the pitchers are the modified terminal portions of the leaves. The flowers are small and unattractive; they may sometimes be seen in plants near the fern rockery (*see* p. 31). The pitchers contain water, and in the water are digestive ferments secreted by special glands. Insects which fall into the pitchers are drowned and digested, and their substance is absorbed by the plant, which thus gains an additional source of nitrogenous food. The species usually grown here are *N. mirabilis*, which grows in wet places on Penang Hill, *N. Rafflesiana*, a very handsome lowland Malayan species, and *N. albo-marginata*, the common Penang Hill species.

Beyond the plant house is a small grass path, leading up to the terraced garden for orchids and succulents (*see* p. 42). Beside the lower part of this path are flowering shrubs, particularly *Ixora macrothyrsa*, a Sumatran plant of the Coffee family (Rubiaceæ), and Frangipanni (*Plumeria*) of various kinds. The typical Frangipanni, or Temple Flower, though undoubtedly native of tropical America, where all other species occur, was well known and planted in the Malayan region by the middle of the 17th century, and it is thought that the plant may by some means

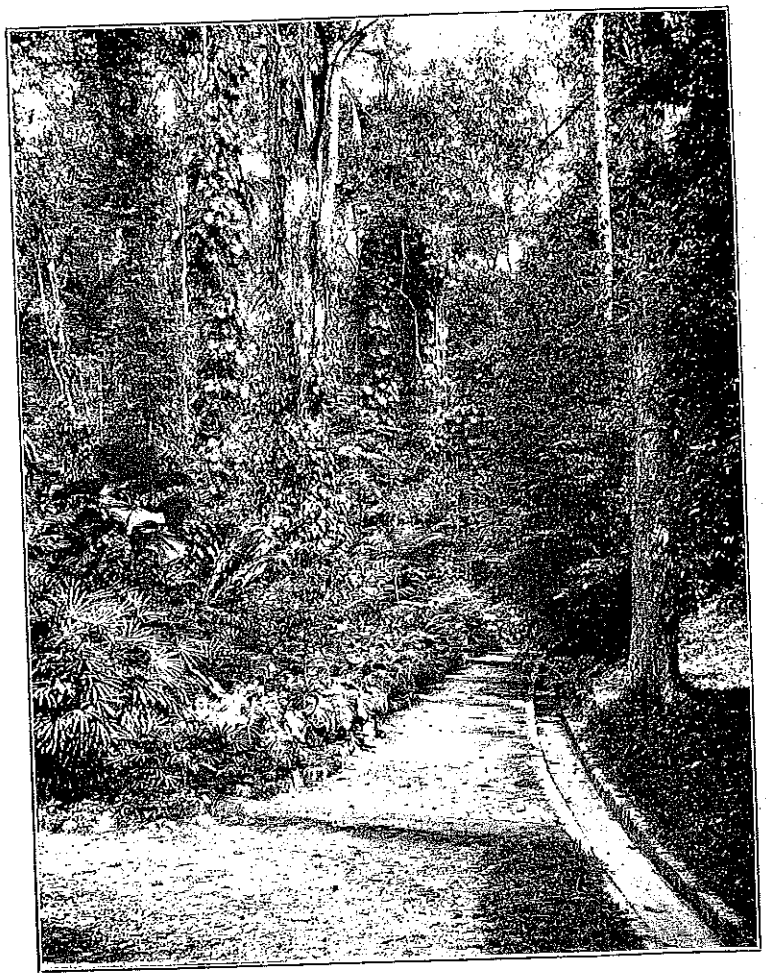
have been carried across the Pacific before the arrival of Europeans in the East.

Near the path is also a large plant of *Grammatophyllum speciosum*, the giant Malay orchid (*see* p. 9). This plant has sometimes as many as 60 spikes of flowers open together. Beyond the end of the plant house 9 is a tree of *Ficus retusa*, allied to the Waringin (*see* p. 14) and also, when it has the opportunity, a strangling epiphyte. *Ficus retusa* produces many hanging roots, and when these reach the ground they thicken, becoming pillars to support the long branches; thus the tree can spread over a considerable area, as is done on a larger scale by the allied Banyan tree of India (*Ficus bengalensis*).

Beyond this little path, the road reaches the foot of the steep valley-side, which is covered with forest almost down to the road. On the right hand side of the road is the potting yard, screened by a bamboo hedge. Overtopping the hedge are several trees. By the entrance is a large Waringin (*see* p. 14). Next is a Dadap tree (*Erythrina indica*), which flowers in the dry season. The leaves fall about January, and afterwards the tree is covered with scarlet flowers, before the new leaves appear. This species flowers poorly in the less seasonal climate in the south of the Peninsula. Further along the hedge are Australian species of Eucalyptus, which do not grow very strongly in Penang.

The Lily Pond Gully. (Plate 5).

The lily pond gully (section R) has a path on each side of it leading to the lily pond at the head. On the trees by the paths are climbing Aroids, chiefly species of the tropical American genus *Philodendron*, which have made themselves very much at home in the Garden (named specimens are in plant house 9). Among the most handsome is *P. sagittifolium*, with long narrow pointed leaves. These climbers have roots of two kinds; one kind are thin and grow horizontally around the supporting trunks, the other kind are thicker and grow straight down to the ground, where they absorb water like the roots of ordinary plants. The functions of support and water-supply are therefore separately



5. The path to the Lily Pond; on the trees are climbing Philodendrons.

provided for. There are also a few Malayan aroids, of the genus *Raphidophora,* on the trees in the gully.

In the gully are local trees, palms, ferns, gingers and other shade plants. Among the ferns the largest are a few kinds of local tree fern (of the genus *Cyathea*), including the largest Malayan species *Cyathea contaminans,* of which there are fine specimens just below the pool. There are also ferns of the genus *Angiopteris,* which have very short thick trunks but enormous leaves; in some favourable situations in Malaya these plants produce leaves 20 feet long. The rather small-leaved aroid covering several trees near the pool is *Philodendron oxycardium.*

In the pool are plants of *Nymphaea lotus* and its hybrids, with white, pink, and red flowers. This is the lotus of the Egyptians, not the Indian lotus (*Nelumbium speciosum*) which has leaves and flowers both standing high above the water, not floating on it. Other species of Nymphæa, with blue and yellow flowers, are grown in the tank in the formal garden in section *V.*

Around the pool are planted hybrid balsams of the *Impatiens Holstii* group, among which there is a large range of colour from pale pink to bright red. These are by nature plants of moist ground by streams. Other flowering plants near the pool are the pink *Ruellia rosea* and mauve *Sinningia maculata* from South America, the Black Lily (*Tacca Chantrieri*) from Malaya; also *Pseuderanthemum malaccense,* a pale mauve-flowered Malayan shrub which flowers seasonally, and a beautiful *Datura* with very large trumpet-shaped pendulous white flowers.

At the beginning of the return path, on the right, are plants of the very curious "gouty balsam", *Impatiens mirabilis,* from the limestone hills of Perlis. The stems of this species are thick and fleshy and are perennial. The flowers are yellow or almost white. Beside this path are some very fine aroids on the ground (not climbing), especially *Philodendron giganteum* (the largest) and *P. gloriosum* (with pale veins).

Opposite the bottom of the path is a thicket of small trees, palms, and bushes. Rising above it are two trees of *Crypteronia paniculata* (Bekoi), a common local tree of

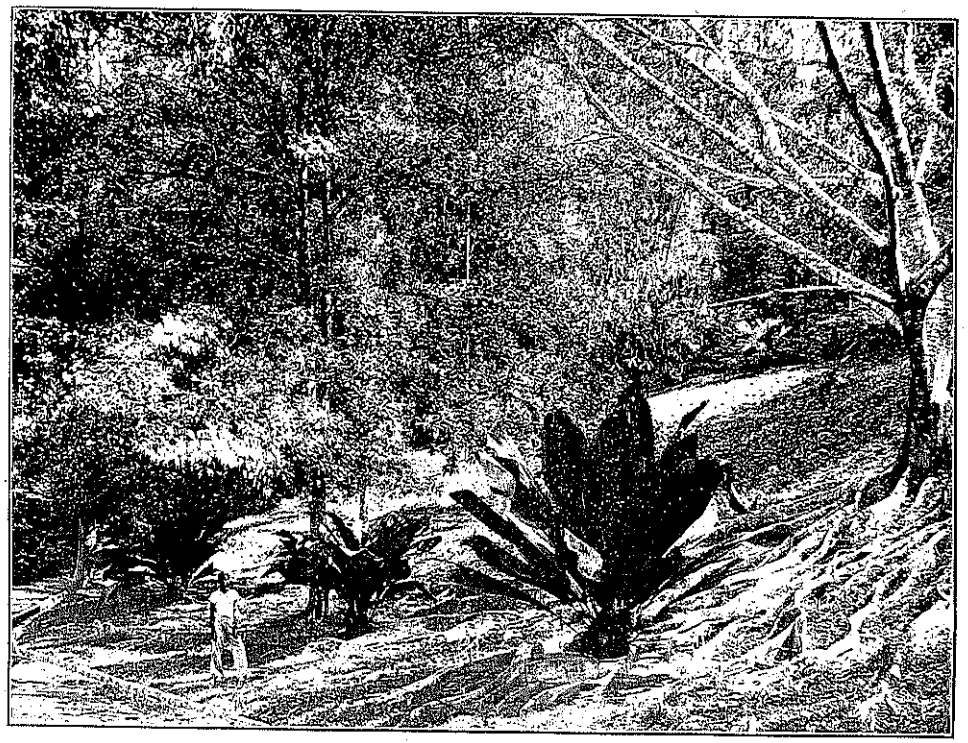
which there are many examples in the garden. These trees are beautiful when in fresh young leaf, usually twice in the year; the flowers, borne at the same time, are small and not brightly coloured. Palms in the thicket include *Caryota mitis, Iguanura spectabilis* (a small forest-plant of Malaya), *Licuala spinosa* (also in section *C*), and *Stevensonia grandifolia.*

By the road, near the bottom of the path, on the left, are several interesting trees. One of these is the true Cinnamon, *Cinnamomum zeylanicum;* the bark of young stems of this tree is the cinnamon of commerce. The species is native of Ceylon, and at present little cultivated in Malaya. There are Malayan species which have similar foliage, and are somewhat aromatic, but they are useless as a source of the spice. These cinnamons have very distinctive leaves with three prominent veins from base to apex. The Camphor tree and its allies, also belonging to the genus *Cinnamomum,* have leaves of a different type.

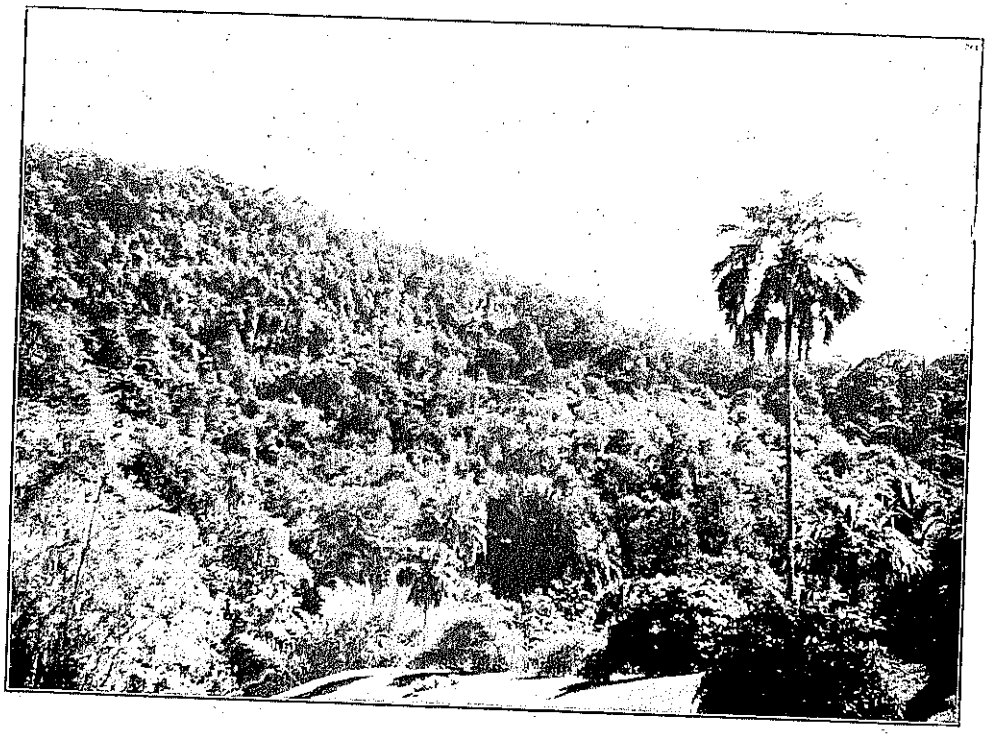
Near by is a tree of Getah Taban Merah (*Palaquium gutta*), the principal source of gutta percha. This tree belongs to the same family as the Sapodilla or Chiku. It is native of Malaya. The latex will not flow easily, like that of the Para rubber and Jelutong (which belong to different families), and tapping must be done by a large number of cuts throughout the whole height of the trunk. Formerly the trees were felled to facilitate tapping, but this was a very wasteful method. In recent years methods have been perfected for extracting the gutta from leaves, and the trees are now grown in plantations in Pahang and Java.

Behind these trees is a very fine specimen of *Ficus procera,* a local species, with large spreading roots. This species is allied to *F. retusa* (*see* p. 18) and *F. elastica* (p. 12) but has no ærial pendulous roots.

Among the roots of the Ficus are three plants of the Daun Payong palm (*Teysmannia altifrons*). This very interesting palm is found abundantly in scattered localities in the Peninsula. Its undivided leaves make excellent temporary roofing material. It never has a tall stem. Plants of this palm are difficult to establish in cultivation; these are particularly fine examples. (Plate 6).



6. *Teysmannia* palms among the roots of *Ficus procera*.



7. The forest slopes above the Garden, from top of section E.

Beyond the Teysmannia palms, on the edge of the thicket, is a Durian tree (*Durio zibethinus*). The heavy fruits hang in bunches on the underside of the main branches of the tree. The principal fruit season in Penang is about July.

On the edge of the forest behind the *Ficus procera* there is a fern-thicket composed of species of *Gleichenia*, for which the Malay name is Resam. Ferns of this genus are characteristic of open places, and are abundant throughout the wetter parts of the tropics. They have slender creeping rootstocks which produce long much-branched scrambling or climbing fronds something like bracken, to which however they are not nearly related. True bracken also occurs in Malaya; the common Resam may be distinguished from it by the repeatedly forked branches of its fronds.

Sections *S* and *T*. (Plate 7).

On the left the forest continues almost down to the road. On the right the open lawn *S* extends down to the stream. From near this point on the road there is a fine view of the waterfall, seen above plant-house no. 3.

On the lower part of section *S* is the Waringin tree already mentioned (p. 14). Near the road are several other trees. *Crypteronia paniculata* is mentioned above (p. 19). *Eugenia grandis* (Jambu laut) is a large seashore tree, often used for planting. It has masses of white flowers two or three times a year; the fruit is not edible (for notes on the genus Eugenia, *see* p. 11). The African Tulip Tree, *Spathodea campanulata*, is often planted for ornamental purposes. It has large bright red cup-shaped flowers, which are produced almost continuously throughout the year. It rarely produces seeds in Malaya.

In a group near these trees are a number of interesting ornamental shrubs.

On the left, section T begins to open out, and on it near the road is a shelter. Behind the shelter are some ornamental shade plants, and overhanging it are small trees of *Randia exaltata*, a local species, which often flower beautifully about March; the flowers are white and trumpet-shaped.

In front of the shelter, near the road, are two shrubs of *Calliandra haematocephala,* with bright red flowers. This species, a native of South America, belongs to the same family as the Acacias or Wattles. The most conspicuous part of its flowers is the mass of red stamens; in this it resembles the Australian Bottle-brush, Callistemon, though belonging to a quite different family.

The raised bandstand in section *S* has a circular path round it. On the right of this path are trees of Mangosteen (*Garcinia mangostana*) and *Podocarpus imbricatus.* The latter is a Malayan conifer usually found in mountain forests; its leaves are small and somewhat resemble those of *Dacrydium* (*see* p. 28).

Inside the path, round the foot of the mound, are two species of Podocarpus with more normal leaves; the Malayan *P. polystachyus* and the E. African *P. gracilior.* The latter is a very decorative small tree under Malayan conditions; in Africa it produces a useful timber. Also in this area are plants of the Chinese Juniper (*Juniperus chinensis*), which is useful as a small formal tree but never grows to a large size in Malaya.

Near the bandstand are two fine plants of *Latania Commersonii,* a very handsome palm from Mauritius, one on each side of the road. One plant is male (in section *T*) and the other female.

Between the bandstand and the stream is a big clump of bamboo of one of the Himalayan species, and beyond this a clump of the sealing-wax palm (*see* p. 9).

In section *S* also, opposite plant house no. 2, is a large bush of *Kopsia fruticosa,* native of Burma; this has pretty pink flowers, which it bears freely almost throughout the year. Near by is a tree of *Casuarina sumatrana,* a species with a more compact habit than the common Casuarina. It is found native in Sumatra and Borneo but not in the Peninsula.

In section *T* are planted a number of palms. Some of these are also found in section *C* (p. 11). Others are mentioned below.

Corypha gebanga, a Malayan species closely allied to the Talipot palm of India and Ceylon. Fibre from the leaves

is an important hat-making material in the Philippines. The trees do not flower until they have reached their full growth; the flowers are then produced in an enormous inflorescence above the leaves, fruits follow, and then the tree dies. Palms of this type are fairly abundant in the north of the Peninsula, in Kedah and Perlis.

Pholidocarpus Kingianus is a common palm of swamp forest especially in the south of the Peninsula.

Zalacca conferta, with its spiny leaf-stalks, is another Malayan swamp plant, and sometimes forms impenetrable thickets. An allied species produces an edible fruit (Buah Salak) and is much cultivated in Java, though not often seen in Malaya.

Among these palms are some rattans, which are climbing palms with slender stems. There are many kinds of rattans in Malayan forests; they chiefly belong to the genera *Calamus* and *Daemonorops*. The longest single stem recorded is about 600 feet. The leaves of rattans are armed with small recurved hooks, which serve to hold on to supporting trees and so enable the plants to climb to the tree tops. The leaf-bases, also usually spiny, form large sheaths completely enclosing the stem, which is only exposed after the leaves are old and have rotted or fallen away.

In section *T* also are trees of *Mangifera caesia*, the Binjai, a wild local mango, which is very handsome when in flower.

Plant-House no. 2 is an artificial rockery, roofed over in two spans. In it are planted a number of ferns, aroids, palms and other foliage plants. On the roof are climbers of the species *Chonemorpha Rheedii, Thunbergia grandiflora* and *laurifolia*, and *Odontadenia speciosa*, all of which have already been mentioned.

Between the plant house and the bridge is a large clump of the thorny Malayan bamboo (*Bambusa Blumeana*); beside it are a small bushy tree of a local species of *Dracaena*, and a Kabong palm (*Arenga saccharifera*). The Kabong or sugar palm is used as a source of palm sugar, and also provides abundant black fibre (on the leaf bases) which makes strong ropes.

Section *V.*

Beyond the bridge is a tree of *Polyalthia longifolia,* native of the drier parts of Ceylon. This is a useful ornamental tree in India but has not been very successful in the wetter climate of Malaya. Close to it is a larger tree of *Dracontomelum mangiferun* (Sakal), represented also in section *K.*

Beside this tree is the entrance to the nursery for flowering pot plants. Beyond is a border planted with ornamental shrubs, in front of a bamboo hedge. One of the shrubs is *Bauhinia acuminata,* an Indian species with white flowers (for climbing Bauhinias *see* p. 14). Another shrub is a Malayan Jasmine, *Jasminum Maingayi,* the white flowers of which have a very sweet scent during the heat of the day.

There is an entrance through the hedge to a small enclosed formal garden. In this is a tank containing water-lilies, some of which are similar to those in the water-lily pool in section *R.* There are also other species, including *Nymphaea capensis,* a blue-flowered species from South Africa and its mauve variety *zanzibarensis* (both very fragrant), and *N. mexicana,* with pale yellow flowers, from Mexico. The blue and mauve flowers open in the morning after the sun has become hot, and remain open till dusk; the white and red flowers of *N. lotus* and the yellow *N. mexicana* are only open in the early morning and close by about 10 o'clock.

In one corner of the formal garden is a group of trees of *Cochlospermum gossypium,* an Indian species with handsome large yellow flowers. This is a useful ornamental tree for small gardens.

Opposite the formal garden entrance is plant-house no. 1. This contains chiefly specimen foliage plants. In the centre is a small rattan plant of the genus *Daemonorops;* over the roof of the house, on one side, is a fine plant of *Bougainvillea glabra,* which is nearly always covered with flowers.

Near the plant-house, by the stream, is a large clump of bamboo, the culms of which are yellow with stripes of green. This is a variety of *Bambusa vulgaris,* found

throughout the tropics. Its young shoots are edible but are inferior to some other kinds.

THE UPPER CIRCULAR ROAD.

From the Office to the Upper Bridge.

On the right is section *C* (described on p. 11). On the left, in the edge of the forest behind the office, are several trees of *Crypteronia* (*see* p. 19). Beside the road is a row of *Cassia fistula*, the Indian Laburnum; the pulp in the long pods is used medicinally. Behind the Cassia trees is one of the old trees of Para rubber (*Hevea braziliensis*), planted in 1886, the subject of some early tapping experiments.

Beyond the lines of Cassias, the forest edge recedes in a bay; in the bay are planted *Saraca* trees. *Saraca* is a genus of the family Leguminosæ; its species, including several native in Malaya, are small ornamental trees, bearing seasonally masses of small orange flowers. The young leaves are usually pink or red, and hang down in limp tassels until they have reached their full size. The leaves of *Brownea* (p. 26) do the same. Near the road is also a young *Amherstia* tree. This species is native of lower Burmah, where it is cultivated about the monasteries. It has very beautiful flowers on pendulous inflorescences. In Malaya it very rarely produces seeds, and is difficult to propagate. In the same bay are some palms, and at the far end of it, by the road, is an African Oil palm (*see* p. 12).

Beside the road on the right is a handsome tree of *Ficus microstoma*, a species closely allied to the Waringin but with larger leaves. On the right of the road is a valley. On the slope beyond it, at the lower end, is a Batai tree *Peltophorum ferrugineum* (a native leguminous tree which has deep yellow flowers); then, to the left and further back, are trees of *Pentace Curtisii*, *Grewia paniculata*, and at the upper end of the valley the Tembusu, *Cyrtophyllum peregrinum*. The *Pentace* and *Grewia* are among the common local trees of the Garden. The Tembusu is a Malayan tree of secondary forest in wet places or on heavy soil; it has seasonally numerous small cream-coloured very fragrant flowers, followed by small orange berries which are very

astringent but much sought after by fruit-bats. In favourable conditions, the Tembusu is one of our best native ornamental trees for landscape planting; the trees are shapely, leafy almost to the ground, and the flowers very attractive.

After the bend in the road, on the right, are some trees on the edge of section *E: Chaetocarpus, Grewia,* and *Podocarpus,* the first being a small tree of open country in the north of the Peninsula, having small but very fragrant flowers. Next is a small tree of *Saraca indica,* an Indian species which grows best in rather more exposed positions than the Malayan ones (*see* p. 25).

Beyond this, the main lawn of section *E* opens out, and on it are a number of flowering shrubs and trees, particularly Bougainvilleas. The genus *Bougainvillea* (named after the famous 18th century French navigator) is native in the northern part of South America. There are two principal species, *B. spectabilis,* with large rather soft and slightly hairy leaves, and *B. glabra* with smaller smooth leaves. There are several varieties of each of these, and the varieties have been hybridised in cultivation so that a number of forms exist. Most of them thrive and flower best in a more seasonal climate, but several are very successful in Malaya, and they are among our most useful flowering shrubs. Of the *spectabilis* group the following are in this garden in addition to the typical form: Mrs. Butt, Rosa Catalina, Lateritia, Mrs. Fraser, Maude Chuttleburg. Of the *glabra* group: Cypheri and formosa. The flowers of Bougainvilleas are small, usually cream-colour; the conspicuous parts are coloured bracts surrounding the flowers and persisting for a considerable period.

On the shoulder of the ridge, below plant house no. 10, is a low spreading tree of *Brownea grandiceps.* This is a native of Venezuela. The scarlet flowers are grouped together in large hanging bunches; in Malaya they are visited for their honey by hovering sun-birds. The young leaves are pendulous in the same way as those of *Saraca.*

Further down the ridge is a young *Adansonia,* the Baobab tree of Africa. This tree attains an enormous girth but no great height. The bark contains a useful fibre, the

flowers are large and very handsome, the leaves and seeds are edible and the fruit is used in native medicine. There is an old tree in Penang at the junction of Peel Avenue and Macalister Road; this tree flowers regularly but does not fruit.

Still lower on the lawn are flowering trees of *Peltophorum, Erythrina* and others; also a group of fan palms of the species *Livistona chinensis.*

Plant house no. 10 stands beside the road. In it are principally ferns and the foliage Begonias which require shade. Maidenhair ferns of the genus *Adiantum* are found in most parts of the world, but it is particularly the species of Central and South America which are cultivated for decorative purposes. The commonest species grown in Malaya is *Adiantum tenerum,* native of Mexico and the West Indies. This has leaflets jointed at the base, falling off separately when old. In cultivation it has given rise to a considerable number of forms, among which the finest is var. *Farleyense,* the leaflets of which are large and frilled. There are several other forms also to be found in the plant houses. The other common maidenhair is *Adiantum cuneatum* which has rather smaller leaflets; this has also several varieties. Besides these typical Maidenhairs, there are several large species of Adiantum, the finest being *A. peruvianum* and *A. trapeziforme,* from the Andes of Peru. Maidenhair ferns grow naturally in rock crevices in shady forest.

Other ferns in the plant house are Malayan species. In the Peninsula there are about 500 native fern species, many of which may be seen on the hill in Penang. Some of these grow on the ground, and some on trees.

In addition to the Malayan ferns are local species of *Selaginella,* plants with very small leaves arranged in regular rows on branches; each branch has the form of a single fern leaf. These are all plants of shady forest and require constantly moist conditions. The most decorative species is the Philippine *Selaginella peltata.*

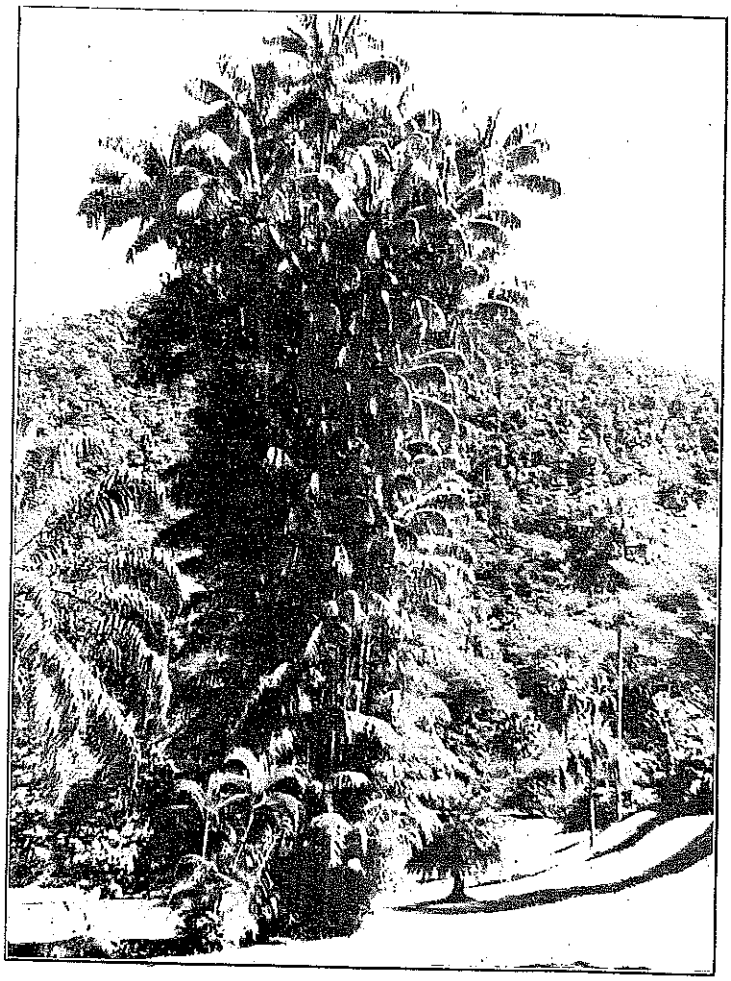
Begonias are cultivated either for flowers or foliage. The very large-flowered tuberous Begonias do not grow well in Malaya, but there are some quite fine flowering species,

especially *B. coccinea* (from Tropical America) and its hybrids; these mostly require a certain amount of exposure to sun and wind and are not grown in plant house no. 10. The foliage Begonias require a shady sheltered situation; they are mostly hybrids of the Assam species *Begonia Rex*, and a selection of them are grown in this plant-house. There is a great variety of colour and patterning in the leaves.

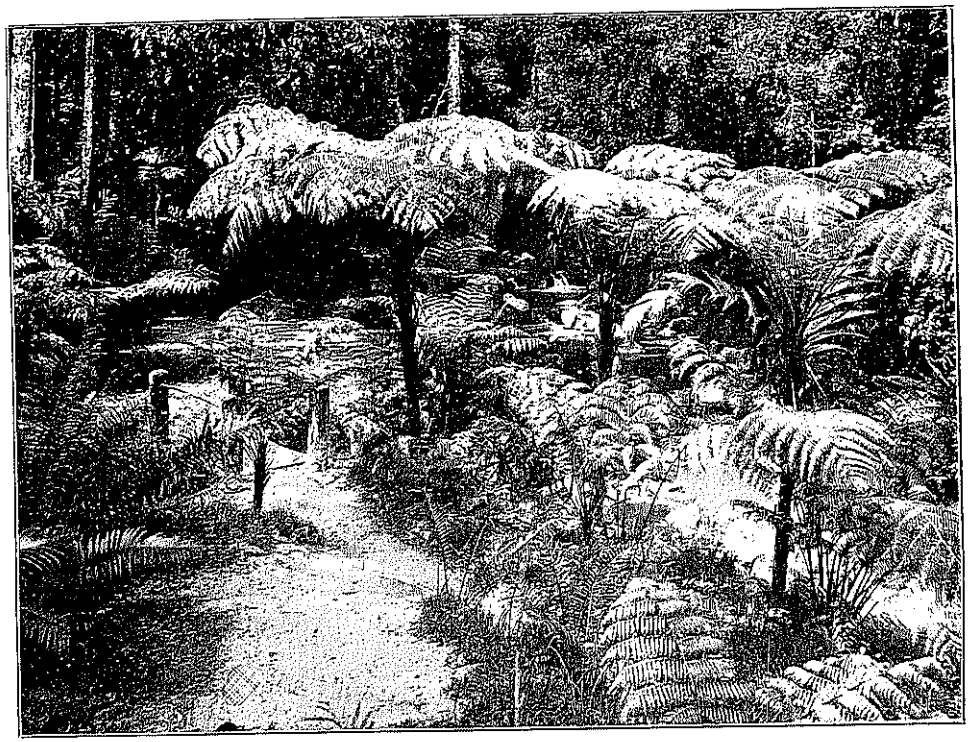
Opposite plant house no. 10 is section *F*, containing conifers. At the back, on the edge of the forest, are fine trees of the local species *Dacrydium elatum*, which is a common tree on the hill at Penang and is much planted for ornamental purposes. It is a very shapely tree but slow-growing. Like *Podocarpus, Dacrydium* is a southern genus belonging to the Yew family; its small seeds are produced singly, not in cones, and are not easy to find. Also in section *F* are species of *Casuarina*, similar in habit to conifers, but not allied to them (*see* p. 12).

Beyond the plant-house, the western part of section *E* stretches down to the stream. There is an attractive vista across to section L, with the forest slope above it. At the end of section *E* is a shady rockery through which a path leads down to the fern rockery by the stream, just below the upper bridge.

On the left of the road, opposite the path to the rockery, is a little valley with a small stream in it. Beside the stream is a tall plant of *Pandanus Houlletii*. The genus Pandanus comprises about 200 species, confined to the tropics of the Old World. There are about 30 species in Malaya; the leaves of several of them are useful for making mats, and for *kajangs* (roofing mats for protection against rain). Most pandans grow in wet places. Their trunks, like those of palms, do not grow in thickness, and are supported at the base by a succession of thick strut-roots which grow out from the trunk. The leaves are something like pineapple leaves, and are arranged in a spiral, from which character pandans are sometimes called *screw-pines*. The fruits are large, round or elongate, those of *P. Houlletii* being rather like a pineapple in appearance. There is another and larger



8. Clump of Nibong palm in section E.



9. Entrance to Fern Rockery; the tree-ferns are *Cyathea contaminans.*

plant of *P. Houlletii* by the same stream but on the opposite side of the road.

Beyond this small stream, the edge of the forest comes down to the road, and continues as far as the stone bridge which crosses the main stream at the head of the Garden. On the right of the road the ground slopes away down to the fern rockery by the stream; the rockery contains a number of trees which are mentioned below (p. 32).

Beside the bridge, on the left, is a fine clump of *Bambusa Blumeana,* the Malayan thorny bamboo; similar clumps have already been noted beside the other bridges. The stream above the bridge flows steeply down from the waterfall. Below the bridge the visitor looks down on the upper part of the fern rockery; against the bridge on his left are trees covered with a climbing *Bauhinia* (*see* p. 14) which at times flowers very beautifully.

Beyond the bridge on the left is a path leading up to the reservoir. Near this path is a young tree of *Ficus religiosa,* the sacred Pipal or Bo tree of India. The long narrow leaf-tips are characteristic. Beside the entrance to the path, on the right is a fine *Parkia* tree; on the left a *Calophyllum.*

The Fern Rockery. (Plate 9).

Returning along the road to the rockery entrance path on the border of sections *E* & *G,* we enter the upper rockery. Beside the path, close to the road, is a tree of *Sapium baccatum;* this is a local tree having a white latex and belonging to the same family (Euphorbiaceæ) as the Para Rubber. Shading the upper rockery is a big *Crypteronia* and other common local trees. The smaller plants include several local palms; and also a large plant of *Cycas Rumphii* (*see* p. 9). On the trees are climbing aroids similar to those in the lily pond gully. Covering the rocks is a small shrub with pretty coloured leaves, *Strobilanthes Dyerianus,* native of Burma. In India and Ceylon there are many species of Strobilanthes as undershrubs in the forest; some of them flower gregariously at intervals of several years. In Malaya are 18 species, but gregarious flowering is not recorded.

Among the rocks are plants of *Billbergia thyrsoidea*, a representative of the tropical American family Bromeliaceæ. These plants have a close rosette habit with oblong leaves which overlap at their bases, forming a series of cups which hold water. Water collects in the base of the plant after every rain, and is absorbed by special glands in the leaf bases. In this way the plant secures a water supply which will carry it on from one rain to the next. These plants normally grow on trees, where their roots are not in contact with the soil water. Billbergia has seasonally a very brilliantly coloured inflorescence.

After passing through the upper rockery the path begins to descend, and comes out again on the border of section *E;* by the steps just before the lawn opens out on the right is a small tree of *Eurya acuminata*, a common small-leaved tree which is found in thickets and on the edge of forest in many parts of the garden. On the right of the path as it descends towards the main stream, are a tree of a fine large-leaved *Ficus*, and lower down a Pandan, probably *P. Houlletii* (p. 28). On the left of the path is a *Jacaranda* tree with fine fern-like foliage; this is native of South America and has seasonally beautiful blue-mauve flowers. It is a very useful small ornamental tree.

At the foot of the path, by the stream, we turn to the left. Opposite the bottom of the path is a group of ferns, consisting chiefly of *Cibotium barometz*. This has large leaves like a tree fern, but no tall trunk, and on its short thick rootstock are masses of brown silky hairs, which may be used to stanch a bleeding wound; the rootstock itself is used as a tonic in Chinese medicine. The sporangia of this fern are protected by small flaps reflexed on the edges of the lower surface of the leaflets. In Malaya it is not a common fern, growing chiefly in rather open rocky places in the hills; it has a wide distribution in tropical Asia.

Near by are tall plants of the species *Cyathea contaminans*, the common tree fern of Malayan mountains, and the largest local species. The bases of the leaf stalks are armed with sharp thorns. Though the leaves are rather similar in form to those of Cibotium, the sporangia are quite differently placed, being in round unprotected groups on the

lower surface. This character is common to all species of Cyathea (to which genus our Malayan tree ferns belong), except that in some species the young sporangia are protected by a thin membrane. Other local species of Cyathea which grow in the fern rockery are *C. latebrosa* (the common tree fern of the lowlands), *C. squamulata*, *C. alternans*, and *C. brunonis* (with undivided leaflets).

Opposite the Cibotium plants, on the other side of the path, towards the rockery, are scrambling plants of *Nepenthes ampullaria*. This is one of the commonest lowland Malayan pitcher-plants, and is characterised by having the lids of the pitchers narrow and turned backwards so that they are useless as a protection from rain. These pitchers are almost always borne in groups resting on the ground, rarely on the climbing stems. This plant may often be seen flowering, the flowers being small, greenish to dull purple, in large groups at the ends of the climbing stems.

Facing the entrance to the rockery, the visitor will find on his left a plant of the fern *Dipteris conjugata*, a Malayan fern which is common in open places on Penang Hill. It has tall leaf-stalks bearing fronds deeply cleft into two halves, and is of particular botanical interest; though the genus is now confined to the Malayan region, fossils of allied ferns have been found in rocks of Jurassic age in England and other quite distant parts of the world.

The rockery itself contains a number of Malayan ferns, including several which are characteristic of rocky river banks. Named plants of some of them will be found in plant house no. 10. Among the larger ferns are species of the genus *Angiopteris*. These are not tree ferns, having no trunk, but their fronds are among the largest of all ferns, being sometimes as much as 20 feet long. In Malaya, plants of Angiopteris are fairly common by streams in shady forests, especially at medium altitudes. They are of interest as being representatives of one of the most ancient plant families still in existence; their ancestors lived in the Carboniferous epoch.

On a tree near the entrance to the rockery is a large plant of *Platycerium grande*, the large Siamese fern mentioned on p. 13.

The rockery is shaded by a number of trees, which include the following species:

Cratoxylon polyanthum; several trees, with slender smooth trunks and pale red-brown bark. This is a member of the same family as the St. John's Wort (*Hypericum*); and has pink flowers after its new leaves are fully grown; the leaves fall all together once a year. This species is less decorative than its allies, *C. formosum* and *C. Maingayi,* which bear masses of pink and white flowers respectively while they are bare of leaves. *C. formosum* is represented by a single tree in the rockery and *C. Maingayi* in the thicket beside the stream in section *E*.

Garcinia nigrolineata (Kandis jantan); several trees, with slender trunks having rough black bark finely tesselated. The genus Garcinia is represented by 36 species in Malaya, the Mangosteen (*G. mangostana*) being one of them. Nearly all contain a resinous yellow latex. Several species have edible fruits (*G. Hombroniana,* Manggis Hutan; *G. atroviridis,* Asam Gĕlugur; *G. globulosa,* Kandis). *G. nigrolineata* has small inedible fruits. On one of the Garcinia trees is a plant of *Vanilla Griffithii,* a climbing orchid native of Malaya. It has large handsome flowers, which are not very freely produced. It is allied to the Vanilla plant of commerce, which is a native of Tropical America.

Artocarpus Kunstleri (Gĕtah Tĕrap). Trees of this species have very large stiff leaves, and a sticky latex which is used as bird-line. It is one of the Malayan allies of the breadfruit (*Artocarpus incisa*), native in the Pacific.

Artocarpus lakoocha (Tampang Ambong etc.). This is another Malayan member of the breadfruit tribe; it has rather small smooth acid pulpy fruits which are edible.

Ficus variegata (Ara batu). Two big trees at the upper end of the rockery, the bark smooth and pale and the trunk provided with very short branches which bear figs. This is a common tree in the Peninsula. As in the edible fig, there are two kinds of trees, bearing respectively female figs and gall figs; the former are more or less edible, but the latter are not. The function of the gall figs is to provide for the gall insects which pollinate the female figs. This

species belongs to a different group from the Waringin already mentioned on several occasions.

Cinnamomum parthenoxylon (*see* p. 16); two fine trees at the upper end of the rockery, a little back from the stream.

Phaeanthus lucidus, a small spreading tree at the foot of the steps at the upper end of the rockery. This belongs to the same family as the custard apple (Anonaceæ), and has fragrant flowers. It is fairly common in Malayan forests.

Erismanthus obliqua, near the Phæanthus, another small tree found in the undergrowth of Malayan forests.

Homalium propinquum, a fine tree at the foot of the bridge; this is another Malayan forest tree. Upon it is a climbing aroid, *Philodendron lacerum,* from Tropical America.

On the bank by the small path leading up to the road at the head of the rockery are plants of *Nepenthes albomarginata,* the common pitcher plant of Penang Hill. This species is easily recognised by the white band all round the pitcher just below the mouth.

From the Rockery to the Middle Bridge (path by stream).

Returning to the lower end of the rockery, we keep beside the stream, following a grass path which will lead us down to the middle bridge. If the visitor wishes to omit this path he should pass on to p. 35. Just after passing the path on the right leading up to the upper rockery, we find on the left, beside the stream, a young tree of *Ficus irregularis* from Celebes, a wild fig with narrow leaves on drooping branches, somewhat resembling a weeping willow. The figs are yellow and very small. This tree will grow to a large size, but is very difficult to establish, and often takes several years before it begins good growth.

The path then passes below the water pipe leading from the reservoir. The pipe is supported by stonework which is covered with the climber *Faradaya papuana* (family Verbenaceæ); this is a stout woody climber with white flowers, from New Guinea. Proceeding straight ahead along the top of the stream bank, on the lower edge of section *E,* we pass next a thicket of small local trees and bushes which

conceal the stream; this thicket ends in a big Waringin tree (*Ficus benjamina*) on a rock, over which its roots spread in characteristic fashion. Next beyond the Waringin, standing by itself, is a fine tree of *Grewia paniculata* (Chenderai hutan), with a fluted trunk. This is a member of the same family as the Linden tree, and is one of the common trees of the Garden; it is abundant in open country throughout the Peninsula.

The thicket continues for a little distance further, and then there is again an open view down to the stream, beside which is a tall of *Sterculia foetida*. This tree, like many of its allies, is deciduous; it is a coast tree of north of the Peninsula. On the opposite bank of the stream close by is a tree of *Duabanga sonneratioides* (Berembang bukit) with large leaves on irregular drooping branches. This tree, belonging to the same family as the Bungor (p. 8), is distributed northwards to the Himalayas. It is common in mountain valleys at medium altitudes in the Peninsula, and grows very rapidly, often attaining a large size; the timber is soft, and is used for tea chests in India. The flowers are inconspicuous.

Beyond the opening, on the near bank of the stream, is a tree of *Pentace Curtisii* (one of the common local trees in the Garden), a clump of a local bamboo, and then a hollow in which are trees of *Jacaranda*, some pandans, and palms of the species *Arenga saccharifera* (Kabong, p. 23) and *Bentinckia nicobarica*. On the top of the bank, by the path, is a fine tree of the genus *Melia* (to which the Neem tree belongs); this tree has not yet been identified specifically.

Beyond the Melia tree the valley side and bottom are open. In the bottom are *Cycas* plants (*see* p. 9). The path continues to the Middle Bridge; beside it is a bush of *Petrea rugosa*, a shrubby species allied to the climbing *P. volubilis* referred to on p. 16. Near the end of the path, under shelter of the big bamboo and scrambling over some rocks, are plants of the Scorpion orchid, *Arachnis moschifera*. This is a local species which produces seasonally long sprays of handsome flowers. The tip of the upper sepal has a scent-bearing gland.

From the Fern Rockery to the Upper Circular Road (Section *H*).

Returning along the stream to the place where it is crossed by the water-pipe, we cross by a foot-bridge just below the pipe. On the stream bank at the far end of this foot-bridge is a Tampenis tree (p. 15) and on it is a woody climber of the genus *Connarus*. There are several local species of this genus, and they are common large climbers. They have usually minute flowers in large masses, followed by brightly coloured fruits and seeds.

Beyond the stream a path turns to the right, leading downstream again along the border of section *H* and joining the Upper Circular Road opposite the junction of sections *K* and *L*. Beside this path are plants of the palm *Borassus Machadonis*, a local relative of the Palmyra palm of India, and several clumps of bamboos.

In Malaya, bamboos are not so numerous in species, nor so conspicuous a feature of the landscape, as in subtropical regions further north. There are about 40 local species, of which a few are grown for their edible young shoots; others are also planted about villages for their many domestic uses. Bamboos belong to the grass family, and their flowers are similar to grass flowers; the flowering of most bamboos is however rare. In seasonal climates like that of India it is usual for all bamboos of a single species to flower together at intervals of several years; the plants then are said to die and to be replaced by seedlings. In Malaya flowering of bamboos is not usually gregarious in this way, and the plants do not die after flowering.

Continuing along the upstream path on section *H*, on our left is a screen of trees hiding and protecting the fern rockery. The path approaches a small flight of steps; on the right is a shapely tree of *Filicium decipiens*, an ornamental tree from Ceylon. By the steps is a rock, on which are growing plants of *Clusia odorata* and the climber *Odontadenia speciosa*. The *Clusia* is a Tropical American representative of the same family as the Mangosteen (Guttiferæ) and is interesting on account of its habit of growth, which resembles that of the strangling figs of tropical Asia (p. 41).

As the path approaches the Upper Circular Road, on the right is a very large *Parkia* with flattened roots rising much above the ground level. On this tree and on the ground near by is *Bignonia unguis-cati*, a creeper with beautiful yellow flowers which are usually produced in the dry season. This plant climbs by means of small hooked tendrils which are very like the claws of an animal.

The path joins the Upper Circular Road opposite the entrance to the Upper North Road. If the visitor wishes to take the Upper North Road he should turn to page 39.

From the Upper Bridge, down to the Middle Bridge.

Descending the Upper Circular road, on the left is a fine Angsana tree (*Pterocarpus indicus*). On the right is section *H*, among rocks on the border of which, towards the road, are grouped shrubs of several kinds of *Ixora*. Ixora is a genus of the same family as coffee (Rubiaceæ), and is represented in Malaya by many species, mostly shrubs of shady forest. Nearly all Ixoras have showy flowers, red, orange or yellow, and many have been cultivated. The commonest ones in Malayan gardens are *I. macrothyrsa* and *I. congesta*, tall shrubs with orange flowers, from the Malayan region, and the red-flowered south Indian *I. coccinea* and its varieties. There are many Malay names for local Ixoras, the commonest being Pĕchah Pĕriok, Jarum-Jarum, and Siantan.

The trees on the right of the road, along the edge of section *H*, are all common ones which have already been mentioned, except *Linociera pauciflora*, a Malayan tree of the Olive family.

On the left of the road, on the bank bordering section L, is a bushy tree of *Baccaurea Motleyana* (Rambai), which has pleasant juicy white fruits, in pendulous bunches; this is one of the local fruits which is not so well known to Europeans as it should be.

Next, a little back from the road, is a fine tree of *Eugenia Helferi* (small leaves), and in front of it a bushy *Ficus* and a young *Dichopsis* (of the gutta-percha family). Following this in succession down the road are:

Bouea macrophylla (Kundangan), a tree of the mango family, with smallish edible fruits.

Derris elliptica (Tuba), a woody climber, now much cultivated for its roots (tuba root), which contain a poison which is very effective as an insecticide. Long before this use was discovered, Tuba was known to the Malays as a fish poison. There are allied plants in South America, of the genus *Lonchocarpus,* which have similar properties and are used by the natives there as tuba is used by the Malays.

Dillenia indica, (Simpoh) a small tree, native of India and Malaya, often planted locally. The sepals close over the large fruit as it develops; the fruit is juicy and used in Indian native medicine.

Cymbopogon nardus (Citronella grass, Serai Wangi). The leaves of this grass contain citronella oil, which is extracted by steam distillation.

Brownea grandiceps (*see* p. 26).

Palaquium obovatum. Two fine trees, in a group a little back from the road. This is one of the numerous Malayan species of the Gutta percha family.

Brownea ariza, a small-leaved species, is at the end of the steep bank.

Back from the road, is an *Agathis* (p. 15) and other trees, near the small stream separating *L* and *K*. This stream flows under the road, which is carried by a small bridge. Just before this bridge, on the right, the stream-side path from section *H* joins the road. By this path are trees of *Crypteronia* and *Vitex vestita* (Leban) a common small Malayan tree; by the stream is a tree of *Artocarpus Kunstleri* (Gĕtah Tĕrap, p. 32).

Beyond the bridge, on the left, is the lower end of the Upper North Road, and by it is a *Crypteronia.* On the right of the road, in Section *J,* is an Angsana, and by it a Mango tree. The Malayan climate is not suitable for the better kinds of mango, which need a long dry season to flower and fruit properly. There are allied local species, with inferior fruits. Next beyond the Mango is a tree of *Angelesia splendens,* one of the few local species of the family Rosaceæ.

Beside the lower part of the road are several common trees already mentioned. In addition to these there are in section J (on the right) :

Strychnos nux-vomica, a little back from the road. The seeds of this small Indian tree furnish the drug strychnine.

Hymenaea courbaril, the locust tree of the West Indies, which furnishes a useful resin and good timber. It is a fine tree of large size, and fairly rapid in growth.

Schima noronhae (Kĕlat gĕlugor), a local tree of the tea family. It has white flowers and bright red young foliage; there are many of these trees on the hill at Penang.

In section *O* (on the left) are:

Elaeocarpus petiolatus (*Dĕrumum hitam*). This is a common local tree, pretty when in flower. There are several common species of Elaeocarpus (family Tiliaceae) in the forest round the Garden.

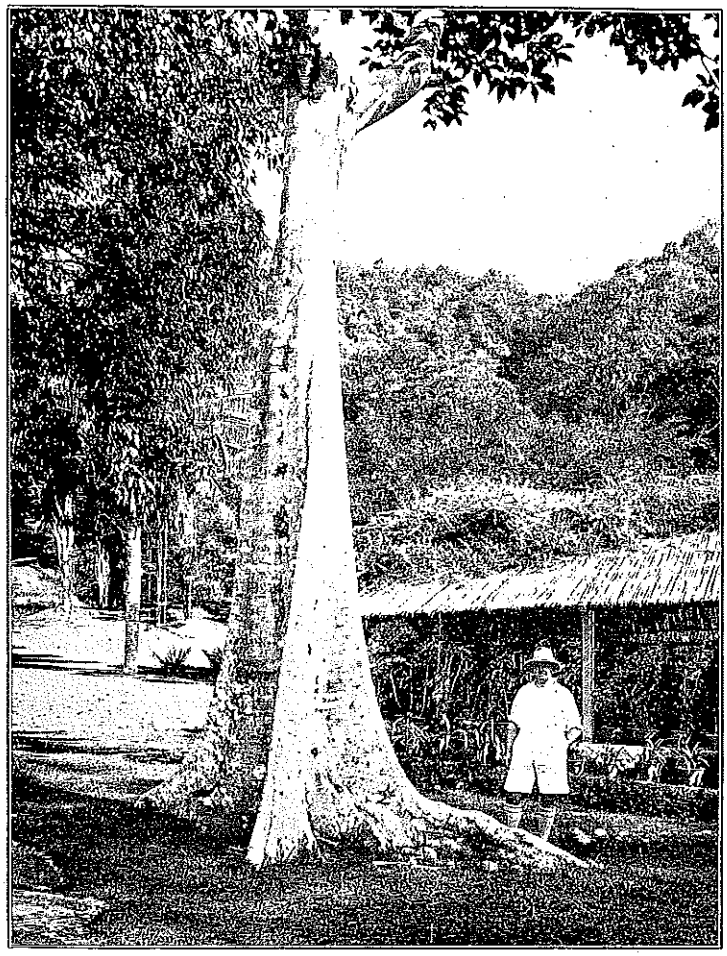
Spondias mangifera (Hog plum, Kedondong), a tree of the Mango family, is back from the road near the Elæocarpus. This species has a small fruit which is used medicinally. There is an allied species, *S. dulcis,* of which the fruit is edible.

*Sterculia macrophylla,** a tall tree on the left near the bottom of the road. The base of the trunk is supported by spreading buttresses; buttresses of this kind are common in tropical trees, and their shape is often characteristic. This tree has handsome scarlet fruits.

Opposite the Sterculia, on the right of the road, is an Angsana tree carrying a large fern of the species *Platycerium coronarium,* the common Malayan Elk's horn fern. The pendulous fronds of this fern, repeatedly forked, carry near their base hoof-like appendages which are the spore-bearing organs. The erect leaves serve for protective purposes.

By the road, towards the bridge, is a bushy mass of the woody climber *Heteropterys laurifolia,* a beautiful yellow-flowered Mexican plant, and near it a prostrate plant of the large aroid *Epipremum giganteum* (Rengut). This aroid is common on Penang Hill, climbing over rocks in sunny places. It has very large leaves; the flowers and fruit are poisonous, and have been used as an ingredient of dart poison by aboriginal tribes in Malaya.

* Plate 10.



10. Buttressed trunk of *Sterculia macrophylla.*

11. The Upper North Road: on the right *Litchi chinensis*, on the left *Eugenia densiflora* and *Ixonanthes reticulata*.

THE UPPER NORTH ROAD. (Plate 11).

We enter this road at the upper end; on our left is the steep slope below the reservoir, and beyond the reservoir enclosure is section *M*. On the left, by the road are two Angsana trees. Under the second Angsana is a plant of *Landolphia Kirkii,* an African species formerly used as a source of rubber. On the right, the first tree by the road is *Swietenia macrophylla,* the Honduras mahogany, and immediately beyond it is *S. mahogani,* the West Indian mahogany. The Honduras mahogany grows very rapidly under local conditions. It has a fine dark glossy foliage and is a useful tall avenue tree.

Back from the road on the right are fruit trees, of which the Rambai has already been noted as seen from the Upper Circular Road. Others are:

Lansium domesticum (Langsat), a Malayan fruit of the mahogany family (Meliaceæ). There is also another variety of *Lansium domesticum* which bears fruits called *Duku;* these have a thicker rind than Langsat. Both duku and langsat vary somewhat in quality; at their best, both are very palatable.

Phoenix sylvestris (Wild date palm); native of N. W. India, closely allied to the true date palm but bearing small fruits.

Cynometra cauliflora (Nam-nam). A Malayan tree bearing flowers and fruits on short branches on the trunk. The fruits are acid.

Litchi chinensis (Lychee). This Chinese tree, allied to the Malayan Rambutan, grows well in Malaya but very rarely flowers. It has a beautiful close dark foliage and is a useful ornamental tree but is slow in growth.

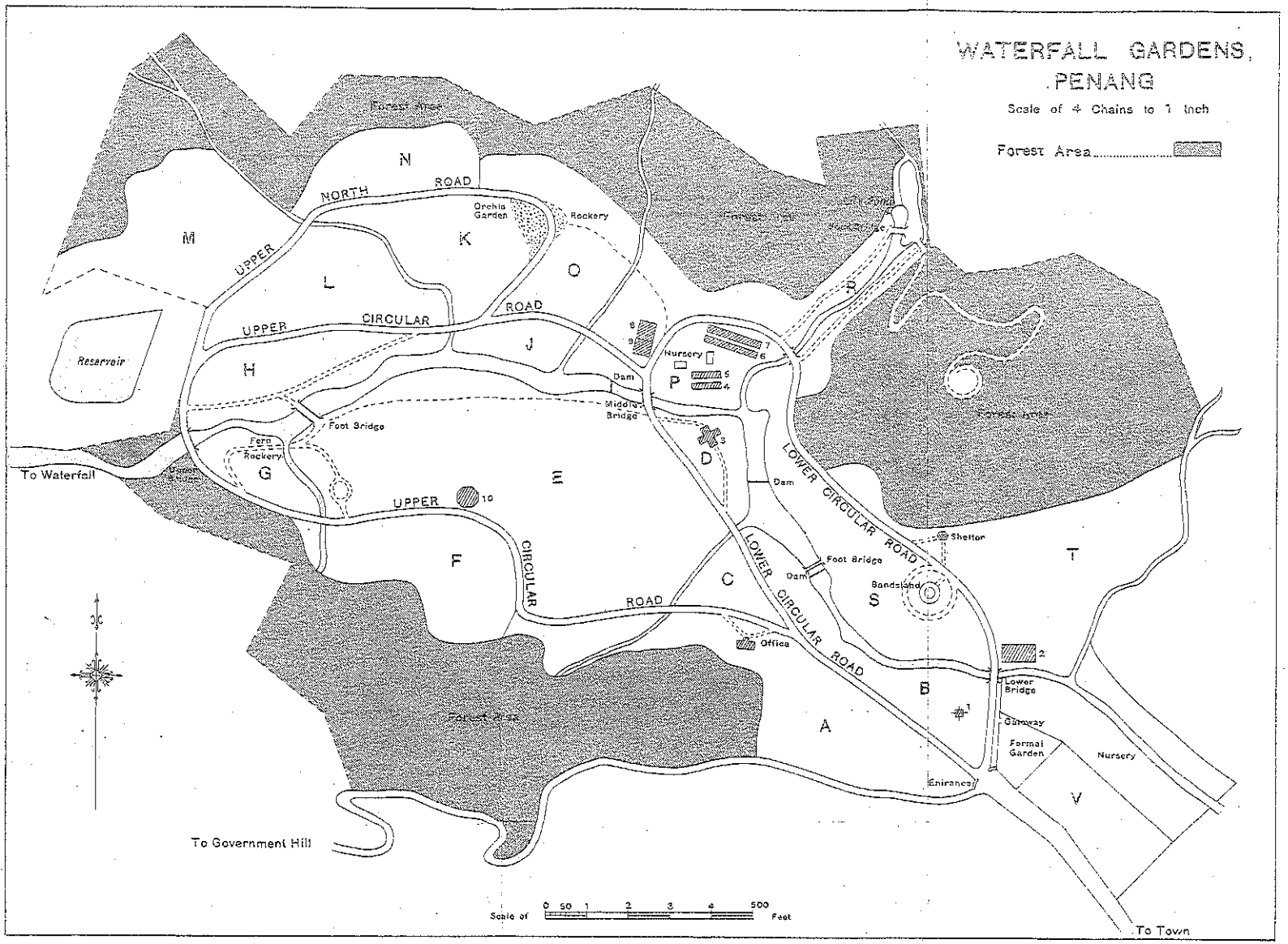
On the left, in section M, by the road is a bushy tree of *Bassia latifolia,* an Indian species of the gutta percha family (Sapotaceæ). The fleshy flowers of this tree are an important article of food in some parts of India, and the seeds contain an edible oil. On the twigs of this tree are numerous small nests of a black ant.

Section *M* has been set aside for planting species of the genus *Ficus*. At the back, near the forest edge, are some

WATERFALL GARDENS, PENANG

Scale of 4 Chains to 1 inch

Forest Area



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old trees, and younger ones will be found nearer the road. For notes on the genus Ficus *see* pages 14, 32, 41.

On the edge of the forest beyond the Ficus trees is a tree of *Mangifera caesia* (Binjai) a Malayan species closely allied to the mango. The fruits are poor in quality. The tree is very handsome when in flower. To the right of the Binjai is a Pulasan tree (*Nephelium mutabile*). This is a Malayan fruit closely allied to the Rambutan, but with blunt protuberances instead of hairs on the fruit. In section *M* also are *Raphia* palms and a fine plant of the Cohune palm.

Opposite the Lychee trees, on the left of the road, is a tree of *Eugenia densiflora;* this has large masses of white flowers. Next beyond it is a *Cinnamomum parthenoxylon.*

On the right, beyond the Lychee trees, there is an opening and a view to the sea. By the road is a small tree of *Pterospermum Jackianum,* a species of Siam and the north of the Malay Peninsula.

Next we cross a bridge over a small ravine. This ravine is well shaded by a thicket of trees and is in this way safe from the breeding of malaria-carrying mosquitos, which only breed in open unshaded places. In the ravine, below the bridge, is a tree of *Macaranga hypoleuca* (Mahang puteh), easily distinguished by its white young branches and its 3-partite leaves. The branches of this species, as of other Macarangas, are inhabited by ants, which make their way into the pith, hollow it out, and use the hollow as their nest.

Beyond the bridge the ground rises steeply to the left of the road; on the forest edge are bushes of *Wormia subsessilis* (Simpoh gajah). This is a common small local tree and has pretty yellow flowers. After the petals have fallen the sepals close again, protecting the developing fruit; when the fruit is ripe it opens in the form of a star, having somewhat the appearance of a flower. On the right of the road is the thicket shading the ravine.

A little further on, on the bank just above the road on the left, is a Nutmeg tree (*Myristica fragrans,* Buah Pala). The nutmeg is a native of the Moluccas, and was formerly much cultivated in Penang. There are many wild species of the family native in the Malay Peninsula, but

none are of use as spices. Behind the nutmeg is a spreading tree of *Eugenia Helferi.*

Beyond this tree the edge of the forest recedes, the ground sloping more gently, and on the slope is a shapely tree of *Garcinia bancana.* By the road is a group of young Clove trees (*Eugenia caryophyllata,* Bunga Chingkeh). The Clove, like the nutmeg, is a native of the Moluccas. It is now little grown in Penang. The whole plant, including the leaves, is aromatic; cloves are the dried flower buds of the tree.

On the right, between the road and the thicket bordering the ravine is a group of coffee plants of different kinds. These are classified in two groups, of which Liberian and Robusta coffees are typical examples. *Coffea liberica,* Liberian coffee, is the species most commonly grown in low-land areas; it was the first coffee introduced to the East which will thrive in Malayan lowland country. *Coffea arabica,* the original Arabian coffee, can only be cultivated in the hills. The other coffees here represented are all from tropical Africa and are of relatively recent introduction to Malaya. Of the liberian group we have *C. liberica, C. excelsa* and *C. abeocuta;* of the robusta group *C. robusta, C. canephora,* and *C. uganda.*

On the left is a spur down to the road, with flowering trees and shrubs upon it. Below the road, in section *K,* is on open lawn leading down to the Upper Circular Road. On the lawn are a number of trees, chiefly of kinds seen before.

Beyond the spur, on the left, standing out in front of the forest edge, is a *Crypteronia* tree bearing a large-leaved strangling *Ficus,* the roots of which clasp the trunk of the *Crypteronia.* This shows the way in which a Ficus, starting as a seedling in the fork of a branch of another tree, gradually develops a strangling root-system and so finally replaces the original tree.

A little further on, just above the road, is a tree of *Ochrocarpus siamensis* with fine dark foliage. This is a Siamese tree, having its southern limit in the Langkawi Islands. It is allied to the genus Garcinia.

The Orchid and Succulent Garden (Section *K*).
(Plate 12).

Within the bend of the road, on the lower side, is a terraced sun-garden for succulents, orchids and other plants which flourish in an exposed situation.

The succulents may be divided into two types, those with fleshy leaves and those with fleshy stems; in both cases the fleshy part serves as a water reservoir. The plants are native of the drier parts of the tropics, and will withstand considerable periods without rain. In Malaya many of them will grow quite well provided they have sunny position, but some of them do not flower. The smaller succulents are difficult to grow in the open as they will not tolerate heavy rains, but some of them may be grown under glass.

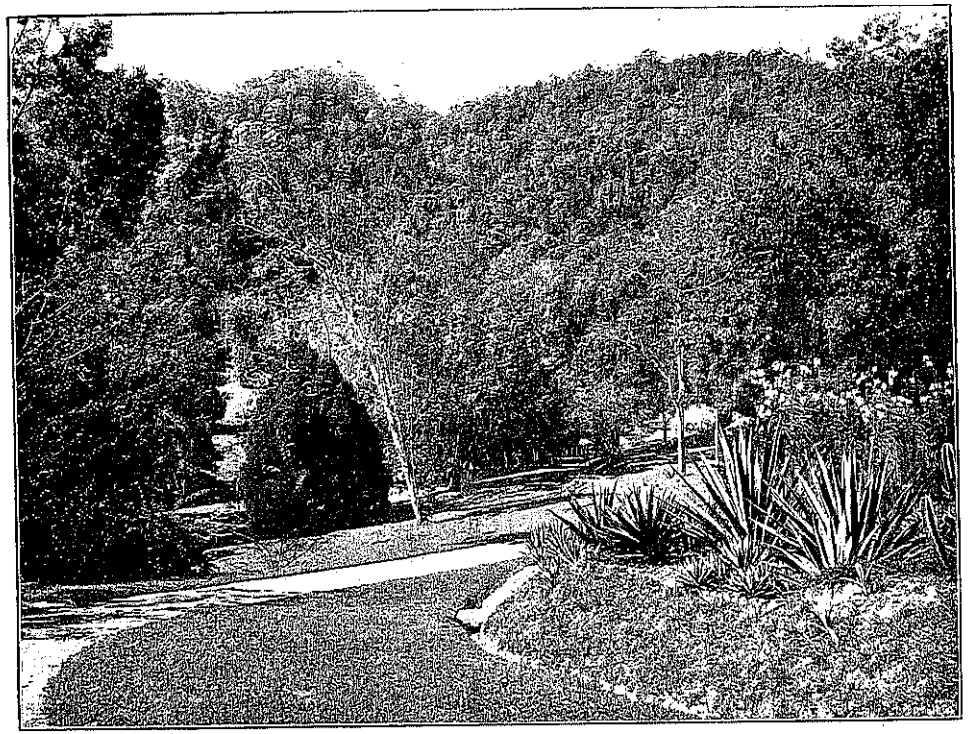
Succulents with fleshy leaves here represented are:

Aloes, of various kinds, chiefly from South Africa. The juice from the leaves is used to prepare the bitter drug aloes, which has been used medicinally from ancient times. Flowers are produced in the axils of the leaves, and the plants continue to grow indefinitely.

Agave, various species, including the Sisal hemp, *Agave sisalana.* Agaves are native of Mexico and other parts of tropical America. They have very stiff leaves, which contain strong fibres; the Sisal Hemp is the one principally cultivated, but others are also used. Agave plants, after growing for a number of years, produce a terminal inflorescence, often 20 feet or more in height. The whole substance of the plant is used up in the production of this inflorescence, and after fruits have been formed the plant dies. The natives of Mexico cut off the young flowering shoot and collect the sap which exudes, in the same way as palms are tapped for toddy.

Furcraea, allied to Agave and similar in growth. The inflorescence is very tall and the white flowers handsome. *F. gigantea* furnishes the fibre called Mauritius hemp; the name is misleading, as Furcraea is native of Tropical America.

Sansevieria, a genus of the lily family, chiefly found in tropical Africa. Several species are grown; all yield a fibre known as bow-string hemp, which is now in little demand.



12. View from the Orchid-Succulent garden in section K.

Yucca. There are many species of Yucca, native in Mexico and neighbouring regions. Their stiff leaves contain a strong fibre, which is little used commercially. The plants bear tall inflorescences of beautiful white flowers; the plants do not die after flowering. *Yucca aloifolia* is the only species at present grown in the Garden.

Succulents with fleshy stems here represented are:

Cereus. There are a very large number of species of this genus, which is native of the drier parts of tropical America; they are the typical Cactus plants, of columnar form. Few species of Cereus will flourish in the wet Malayan climate, the most robust yet tried being *Cereus peruvianus,* the hedge cactus, which grows well and flowers freely; the flowers open at night. Cereus plants have no ordinary leaves, but bear thorns instead. Some species have edible fruits.

Opuntia, the prickly pear. This genus also belongs to the Cactus family, but the stems are in more or less flattened segments, instead of erect columns. The segments usually bear spines which represent leaves, but a few kinds are spineless. The fruits of some are edible (whence the name prickly pear). *O. coccinellifera* is cultivated as food for the cochineal insect. Opuntias are native of America, but have been planted in many other parts of the world. In Australia and South Africa some species have grown so vigorously as to be troublesome weeds; their control by the introduction of insect pests has recently been effected. In Malaya a few species grow well in open sunny places, and *O. monacantha* flowers freely .

The orchids in the terraced garden are terrestrial and climbing species which require a sunny situation. The principal types are as follows:—

Spathoglottis. A common Malayan ground orchid, cultivated in many varieties, with flowers varying from bright purple to white.

Arundina, the Tapah Weed. A terrestrial orchid with erect stems and grassy leaves. There are three local species, the finest being *A. bambusaefolia,* which has large flowers somewhat resembling those of the American Cattleyas.

Grammatophyllum speciosum, the giant Malayan orchid, already mentioned on p. 9.

Vanda. This is a large group of orchids, a few of which have a climbing habit and grow in open sunny places. Of these, *V. teres* from Burma and *V. Hookeriana* (Kinta Weed) from Malaya, have long been known in cultivation. These two species, cultivated in the garden of Miss Joaquim in Singapore, gave rise to a hybrid, which proved to be very free-flowering and was named *Vanda Miss Joaquim* in 1893. This hybrid is now extensively cultivated for cut flowers, as it is much more free-flowering than either of its parents, both of which are also here represented. The Vandas and other climbing orchids are supported on living posts of *Erythrina,* the Dadap tree; this is partly for convenience, to save the necessity of renewal of posts. The Vanda plants climb by means of ærial roots.

Arachnis. Plants of this Malayan genus are called scorpion orchids. They climb in much the same way as the Vandas already mentioned, but have flat leaves instead of cylindrical ones. The flowers of all are very handsome. There are three common species, *A. moschifera, A. Maingayi* and *A. alba. A. alba,* the white scorpion orchid, is smaller in growth and flowers more freely than the others. It is a very useful plant for cut flowers.

Renanthera is a genus allied to Arachnis, growing in the same way. The flowers are usually scarlet, and very handsome.

There are also in the rockery some other flowering plants, including a handsome tall *Pitcairnea* with bright red flowers. This is a member of the pine-apple family (Bromeliaceæ), from Tropical America.

Below the road, on the left and round the bend, is another smaller rockery for succulents; this contains the succulent species of *Euphorbia.* Euphorbia is a very large genus, some members of which have adopted a succulent habit and closely resemble Cacti in appearance; their flowers are however quite different. The principal species here grown are *E. tirucalli* from Africa, *E. antiquorum* and *E. neriifolia* from tropical Asia. All have a white latex.

Also by the road at the top of this rockery is a plant of *Phyllanthus angustifolius,* from tropical America. This has flattened leaf-like branches called phyllodes, on the edges of which are borne flowers. The true leaves are minute structures in the notches on the edges of the phyllodes.

Continuing down the remaining part of the road, on the left, below the rockery, are species of *Cassia,* including *C. multijuga* (small tree with yellow flowers, from America), *C. renigera* (a Burmese species with beautiful pink flowers), *C. nodosa* (a Malayan species with pink flowers) and *C. grandis* (a Brazilian tree with salmon-pink flowers).

Also close below the rockery is a fine tree of *Podocarpus polystachyus,* and beyond it a tree of the Indian satinwood, *Chloroxylon swietenia.*

On the right, next below the terraced garden is a tree of *Elaeocarpus petiolatus;* by the road further down is *Ailanthus malabaricus,* an Indian relative of the Chinese Tree of Heaven, which is often cultivated in Europe. Opposite the Ailanthus in section *O,* back from the road, is a *Eucalyptus* tree, one of the few which have grown successfully in the garden.

Crossing the drain (which passes through a culvert under the road), we see on the extreme right, back against the thicket bordering the stream separating sections *K* and *L,* a fine tree of *Sandoricum radiatum.* This is a wild local species allied to the Sentol (p. 13). Behind it, in the thicket, is a still taller tree of *Dracontomelum mangiferum* (Sakal), a member of the mango family the acid fruits of which are eaten cooked with fish by the Malays. The leaves are deciduous, and turn orange colour before falling.

Near the road is a tree of *Mimusops Elengi* (Bunga Tanjong). The fragrant star-shaped flowers are made into necklaces by children. By the bottom of road, on the right, at the junction with the Upper Circular Road, is a tree of *Emblica pectinata,* the Malacca tree. The name of the Settlement of Malacca is said to have been derived from this tree, but other derivations have also been suggested. The fruit is edible and is used medicinally in India.

By walking to the small bridge just beyond the road-junction, one has fine views up section *H* and across section *E*, with the forest-covered hillsides above them.

INDEX OF PLANT NAMES