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CACTACEOUS
PLANTS

THEIR
HISTORY & CULTURE

LEWIS CASTLE

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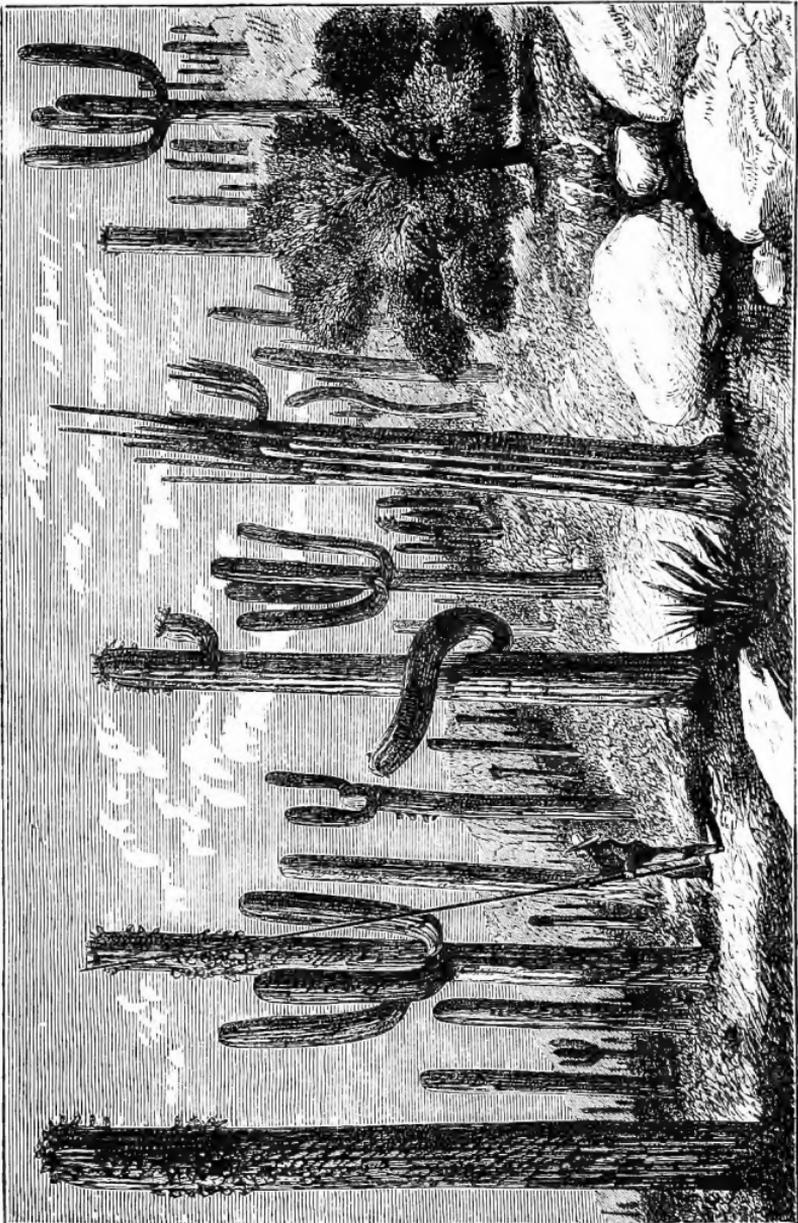


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DESERT SCENERY (SEE PAGE 11)

CACTACEOUS PLANTS:

THEIR

HISTORY AND CULTURE.

WITH NUMEROUS ILLUSTRATIONS

BY

LEWIS CASTLE.

(FORMERLY OF THE ROYAL GARDENS, KEW.)



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P R E F A C E .

MOST subjects connected with horticulture, as in other departments of literature, have been so thoroughly exhausted by numerous writers that there is little room for additional contributions. It is strange, however, that no treatise in the English language has hitherto been solely devoted to the large, peculiar, and interesting family of Cactaceous plants which long held a prominent position in popular estimation. Much has been written respecting them by skilled botanists and cultivators, but the information they have afforded is scattered through so many works and periodicals that it is inaccessible to the majority of amateurs and gardeners. Being persuaded that there are still many admirers of these plants I have endeavoured in the following pages to give a brief review of the whole family, noting the most handsome species, their culture and history, as succinctly as possible, to compress the work into a compass that would admit of its sale at a small price. A period of several years' study in the Royal Gardens, Kew, afforded me special facilities for observing the characters and requirements of the Cactææ, and the information thus obtained, together with many facts my position on the editorial staff of the *Journal of Horticulture* has enabled me to gain, is embodied in the treatise now submitted to the public.—L. C.

November 10th, 1834.

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INTRODUCTION.

GROTESQUENESS of form or habit is rarely found in combination with floral beauty in the vegetable world, yet no family affords more remarkable examples of this union of widely divergent qualities than the great and peculiar Cactus order. In many large groups of plants we find numbers possessing handsome foliage, but having only insignificant flowers, and in many others also when the flowers are more than usually attractive the foliage appears chiefly to serve the purpose of a foil to their rich or bright colours, having in itself nothing of a specially striking nature. There seems to be something of Nature's economy in thus developing one particular quality at the expense of others—a concentration of strength, which probably has a deeper meaning than we can perceive, for it is observable in the animal kingdom as well as amongst plants. The Cactus family is, however, an extraordinary exception, for, whether flowering or not, the majority of the plants constituting it are distinguished by most striking characters. They do not possess beautifully coloured or elegantly formed foliage to recommend them; on the contrary, true leaves are absent from nearly all, but in contrast to some of the most gorgeous flowers produced by plants, we see unwieldy masses of vegetable matter, spherical, cylindrical, or angular, armed with stout and formidable spines, and resembling what we might almost imagine to be the relics of a vegetation belonging to a period long prior to the development of the plant life familiar to us in the present age. Such would be the first impression; but when the brilliantly coloured rose, crimson, purple, or yellow flowers were seen the observer would be led to the conclusion that while the plant was advancing to so high a degree of floral beauty, one portion of its constitution must have been strangely stunted and altered by some external long-continued forces. There is an inconsistency of characters that must impress the least observant, and this imparts an interest to the plants which increases with the knowledge we gain respecting them, for

they are surrounded as it were by a degree of mystery that always adds charm to Nature.

Cactaceous plants have therefore much to recommend them to lovers of the curious and the beautiful, but the majority also possess another very valuable character—*i.e.*, they are easily grown, so easily in fact that the cottager who can only devote a small space to them in his window may, and often does, grow many of them as successfully as the greatest magnate in Europe with all the most elaborate horticultural appliances at his command. In the dry and heated atmosphere of a room which is so trying to most plants they are perfectly at home, and their demands upon the attention of their host are so slight that they may be left for weeks, nay months, without the smallest supply of water. It is not surprising therefore, that many of them are favourites with dwellers in towns, and many a toiler has had his heart lightened by a sight of the lovely flowers produced by his window "Cactus," or has felt the pleasure of exhibiting his vegetable curiosities to his friends. Amateurs, too, in many other grades of life have found in the cultivation of these plants the satisfaction which is derived from the constant study of the wonderful phases of plant-existence; and though it can never be expected that they will rise to a popularity approaching that of the Rose, yet there is a steadily increasing demand for them, and several nurserymen now make a speciality of them. Considerable stimulus has no doubt been given to the culture of Cactaceous plants by the efforts of J. T. Peacock, Esq., Sudbury House, Hammersmith, who, with the aid of his former gardener, Mr. Croucher, formed the largest private collection in this country, and this together with the wonderful collection at Kew has rendered the best of such plants familiar to Londoners. A large trade, too, sprung up a short time ago in "miniature Cacti," and this by bringing a number of forms within the reach of most people at moderate prices has still further assisted in popularising an interesting class of plants. The claims of the Cactæ to general notice having been thus briefly reviewed, a slight survey of the family may be now undertaken.

STRUCTURE.

The most prominent general character of the plants comprised in the natural order Cactæ is the unusually large development of cellular tissue, to which circumstance they in common with some others of different families owe the popular and wide designation of "succulent plants." The stem is, with few exceptions, leafless, and varies in form from the globular *Melocactus* to the columnar *Cereus*, being generally unbranched, except in *Rhipsalis*, *Opuntia*, and the slender-growing

Cereus. The surface is either marked with angular ridges from base to summit, upon which are arranged with great regularity a series of clusters of spines varying in size, colour, and number, or, as in the *Mamillarias*, the surface is broken into a number of small rounded projections or mamillæ, each crowned with a cluster of spines. These spines in several of the genera furnish useful characters in distinguishing the species, size, colour, and number, being found to be constant in the majority of cases. They are exceedingly numerous, and specimens of moderate size of *Cereus senilis* have been found to have from 50,000 to 70,000. In size, too, the *Cactææ* have a wide range of variation, from some of the diminutive *Mamillarias* a few inches high to the gigantic forms of *Cereus* which are found in their native habitats upwards of 50 feet high, and the huge *Echinocactus Visnaga*, single specimens of which have been introduced to this country weighing as much as a ton. These plants contain comparatively little woody tissue except when they are very much advanced in age, the cellular tissue being very largely developed in the majority of the typical forms, the cells being large and mostly filled with a clear water-like fluid, but in others with milky mucilaginous or slightly acrid juices. There is also usually a quantity of crystals of oxalate of lime, which are readily seen if a stem is cut after being dried. Having no leaves the function of respiration must be performed by the stem; but as this has to serve as a reservoir of nutriment generally exposed to a burning tropical heat, it is obviously of importance that the evaporation from the surface should be reduced to a minimum. As a means to this end we find that the stomata or breathing pores, which are so abundant on the leaves of most plants inhabiting temperate climates, are in the *Cactææ* comparatively few. To this, together with a peculiar structure of the walls of the cells forming the superficial layer, is due the remarkable heat and drought-enduring character that enables them to live and thrive where most other vegetation would perish.

The flowers differ much in size and colour, but they mostly agree in the large number of sepals, petals, and stamens, both the former very frequently coloured alike, and only distinguishable with great difficulty. The colours most abundant are shades of rose, crimson, purple, and yellow, some being white and others greenish. Many flowers possess a powerful and most pleasing fragrance, but they are usually of extremely short duration, some lasting but a few hours during the evening or night. The fruit is of a fleshy substance, and in the case of several species, such as *Cereus speciosissimus* and *Opuntia vulgaris*, it is edible, and when well ripened of a very agreeable flavour, somewhat resembling that possessed by some fruits of the Gooseberry family, to which the *Cactææ* are distantly related.

The succulent stems and absence of true leaves readily distinguish the Cactææ from most other families of plants. The Mesembryanthemum order, however, comes very near in floral characters, but is easily distinguishable by the ovary, which has many cells in the latter, while in the former the ovary has only one cell; Mesembryanthemums also possess normal leaves. The succulent Euphorbias are recognisable by their irregular flowers and abundant milky, often acrid sap, and the Aloe and Agave family are widely separated in botanical relationship, being members of the large class of Monocotyledons. A few isolated plants in other families assume a similar succulent habit, but they cannot be confused with the Cactææ.

DISTRIBUTION.

North and South America are the principal homes of Cactaceous plants, the greatest strength of the order being concentrated in Mexico, which contains nearly three-fourths of the entire number known. Brazil, Peru, Chili, Guiana, Colombia, and some other districts in South America also contain representatives, but in relatively small numbers. In Mexico the vegetation assumes an extraordinary appearance owing to the preponderance of species of *Cereus* and other members of the family, where in the several hot, dry, rocky, regions which characterise this portion of the American continent, the Cactææ flourish together with Agaves, Yuccas, Dasy-lirions, *Beaucarneas*, *Echeverias*, and similar plants of the Xerophilous, or heat and drought-loving type. The woodcut (fig. 1) will convey some idea of the aspect of the vegetation in many parts of Mexico; but one of the most remarkable representations of this scenery is in Julius Frœbel's "Travels in Central America and Mexico," portraying the lower part of the valley of Santa Cruz, in which are shown over fifty "Saguarro trees," as the *Cereus giganteus* is termed, some very strangely branched near the summit, and attaining the height of from 30 to 50 feet. In the Rocky Mountains some members of the family are found at great elevations, several having been observed by Mr. E. G. Loder exposed to very low temperatures, and are practically hardy in this country, forming a group of additional interest to the cultivator.

HISTORY.

The Cactaceæ, or Cactææ as this family is termed by some writers, derives its name from the word *Cactus*, under which generic title Linnæus grouped all the forms that were known in his time, and the name is still popularly applied to plants possessing the general characters

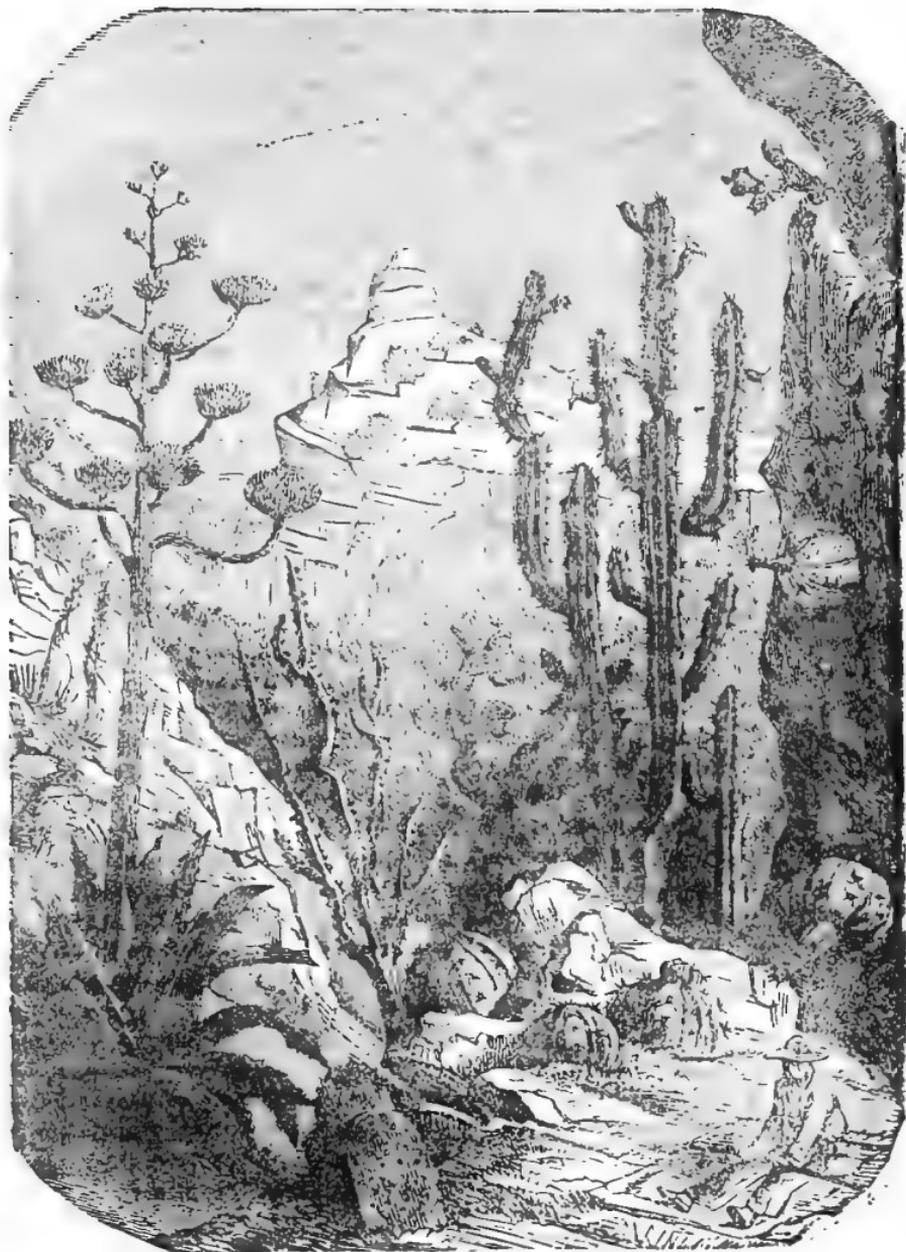


Fig. 1.—MEXICAN VEGETATION.

of the order. Botanically it is now obsolete, and the species are arranged under other genera, such as *Cereus*, *Echinocactus*, *Opuntia*, &c. The title "Cactus," or "Cactos," was applied by Theophrastus to some kind of spiny plant peculiar to Sicily, which, there appears good reason for supposing, was really *Cynara Scolymus*, the Artichoke, and therefore it was erroneously adopted for a class of plants widely separated from the *Compositæ*. Dioscorides, Athenæus, and Pliny mention this Cactus, but apparently referring to the same plant. A plant is also mentioned by Pliny under the name of *Opuntia*, which has been by some supposed to be *Opuntia vulgaris*. The passage runs thus:—"About the city of Opus there is an herbe called *Opuntia* which men delight to eat; this admirable gift the leafe hath, that if it be laid on the ground it will take root and there is no other way to plant the herbe and maintain its kind."—(*Holland's Pliny*). There is, however, much uncertainty about this, although the *Opuntia* has been long naturalised in Europe. Coming to our own country the earliest record of any cultivated members of the family occurs in Gerarde's "Catalogue of Plants" (1596), in which he mentions the *Ficus indica* (*Opuntia vulgaris*) said to have been brought from Zante by his servant, William Marshall. In his "Historie of Plantes" (1633) a good figure is given of it, also in Parkinson's "Garden of Pleasant Flowers" (1629) and "Theater of Plantes" (1640), the latter mentioning two forms, major and minor, the Greater and Lesser "Indian Figge Trees." One of these was included in the collection at the Oxford Botanic Garden, for in the catalogue dated 1658 is mentioned the *Ficus indica spinosa minor* of Parkinson. In the succeeding fifty years several species were introduced, chiefly through the Earl of Portland, and to the Royal Gardens, Hampton Court; so that in 1716, when Richard Bradley published his interesting little work on succulent plants, he was able to describe and illustrate five forms, chiefly of *Cereus* and *Opuntia*. In the same author's "Philosophical Account of the Works of Nature" (1739) good figures are also given of a *Cereus*, *Melocactus*, and *Opuntia*, with some description and reference to his previous work. During the eighteenth century Mr. Phillip Miller of the Chelsea Gardens brought several *Cactæ* into notice, at least eight being credited to him and described in his "Gardeners' Dictionary" in addition to those already known. By the end of this century, as we find from Wildenow's edition of Linnæus' "Species Plantarum" (1796), twenty-nine species were in cultivation or known to botanists, and all were arranged under the head "Cactus," the specific names being mostly the same as those adopted now. Martyn's edition of Miller's "Gardeners' Dictionary" (1807) enumerates twenty species as follows: *Cactus mammillaris*, *Melocactus*, *Pitajaya*, *heptagonus*, *tetragonus*, *hexagonus*, *pentagonus*, *repandus*,

lanuginosus, peruvianus, Royeni, grandiflorus, flagelliformis, parasiticus, pendulus, triangularis, moniliformis, Opuntia, Ficus indica, Tuna, cochinelifer, curassavica, Phyllanthus, spinosissimus, Pereskia, and portulacæfolius. From Aiton's "Hortus Kewensis" (1811) we learn that twenty-four of these were cultivated there, while when Haworth's "Synopsis Plantarum Succulentarum" was issued in 1819, about forty-five species and varieties were known.

The increase from this time was rapid, for Sweet's "Hortus Britannicus," 1826, enumerates ninety-four as in cultivation, while Decandolle's "Prodromus," published two years after, describes or mentions 183 under seven genera. The number of botanical travellers in America during the following twenty years added greatly to the knowledge of these plants, and by 1840 there were nearly 400 forms in cultivation (*Paxton's "Botanical Dictionary"*), which by 1850, when M. Labouret issued his elaborate "Monographie des Cactées," had increased to 670. Since then many others have been discovered and introduced, and a few years ago Mr. Jackson of Kew estimated the number of species at about 950, though at the present time they probably exceed 1000. Comparatively few large collections of Cactæ have been formed, and in recent years there has been none to equal those at Sudbury House, Hammer-smith, and in the Royal Gardens, Kew. In the latter establishment the handsome house devoted to succulent plants has long been one of the chief attractions to visitors, presenting a conspectus of one of the most extraordinary types of vegetation upon the globe.

GENERAL CULTURE.

The numerous members of the Cactus family are exposed to widely differing temperatures in their native habitats, owing to the extent of the American continent over which they are distributed, but also to the great elevations on the mountains of those regions at which some are found, and it is principally in regard to heat that the treatment of Cactæ has to be varied. A large number, probably the majority of known species, frequent the desert-like plains and the rocky volcanic districts of Chili and Mexico, where they grow and flower under the fiercest tropical heat, not only uninjured, but positively luxuriating in their strange fashion in the burning rays of an unclouded sun. There for the greater portion of the year the soil is parched, and the atmosphere suffocatingly dry, and no other plants can exist except those which have become adapted to the peculiar conditions of the climate, either resembling their Cactus neighbours in developing a succulent growth containing an abundant store of fluid support, or possessing foliage

protected by a thick impervious leather-like epidermis, which effectually enables them to withstand the rapid evaporation constantly proceeding in such regions. It is not easy to exactly reproduce these conditions artificially when cultivating the plants in our northern climate ; we can, however, insure a sufficiently high temperature with the requisite aridity of soil or atmosphere, and this seems all that is needed, though undoubtedly the maturing effect of a roasting sun is missed to some extent. For these really tropical species a special house is required to give the cultivator an opportunity of growing them to the best advantage, as when included in a mixed collection of plants they are usually exposed to a much greater humidity than is beneficial to them, and they consequently flower less freely. This applies especially to the majority of the species of Echinocactus, Melocactus, Opuntia, and Cereus, though in the latter there are several exceptions, as some require the moist atmosphere of an ordinary stove. Nearly all the family need a free exposure to the sun ; but even amongst the tropical species there are exceptions to this rule, for *Rhipsalis* and *Epiphyllum*, being epiphytal in habit, succeed well in moderate shade, and can indeed be associated with such moisture-loving plants as Orchids and Ferns.

In ascending the mountains of central and northern America, where the Cactæ abound, some of the wandering species of most of the genera are found similarly happy in much lower temperatures, until at an altitude of 8 to 10,000 feet in the Rocky Mountains some forms of *Opuntia* and *Echinocactus* still constitute a portion of the vegetation, and are frequently exposed to frosts and snow. It will thus be seen that in a broad sense the Cactæ may for cultural purposes be divided into three groups :—1st, the tropical species from the lowlands and plains, extending for a short distance up the mountains ; 2nd, the intermediate species, which are found on the extreme northern limits of their distribution, and which rise to a considerable height in the mountains, but still below the frost line ; and third, those which inhabit the highest elevations. The two first would respectively require the temperature of a dry stove and a greenhouse, while the remaining group includes those which have been found to be hardy in England.

Except where very large collections are formed and every effort is made to imitate the natural conditions, houses cannot be specially devoted to each of the two former groups, and the plants are so extremely accommodating that they will apparently conform themselves to any reasonable treatment. Wherever these plants are made a speciality one house at least can be appropriated to them, and this is really all that is necessary, for the species from the tropical regions can be placed at the warmest end, the intermediate and cool species being accommodated in

different positions according to the varying temperature. A third class of cultivators, however, and by far the largest, are those who grow a moderate collection as examples of the most curious phase of vegetable life, and who cannot give them special quarters, being compelled to grow them with other plants. In this case the best general plan to adopt is to give them cool and dry treatment during the winter, a greenhouse or conservatory being a suitable place; while in the spring and summer, when growth is made, a heated frame facing south is admirably adapted for them, as there they can be arranged near the glass, fully exposed to the sun, and provided with sufficient moisture to stimulate growth without rendering it weak. The last method is an excellent one, even where the largest collections are grown, and better results have been obtained by so treating them than by any other method. Some, indeed, place the plants outside in a sunny position during the summer, but in our uncertain climate this is attended by many disadvantages, for they are liable to be much injured by sudden storms of rain or wind, and the varying temperature alternately accelerates and checks the growth, which consequently rarely becomes properly matured, and the delicate species are often irrecoverably damaged. On the continent, where the summer climate is more regular and the sun power greater, the case is quite different, and the practice is attended with proportionate success.

The cottager and others who grow their small collections of *Cactæa* in rooms must necessarily confine their attention to comparatively few species and varieties, but it is surprising how much pleasure and interest may be obtained from even such modest efforts as these. A table or shelf near a window is the position usually assigned to them, and under the circumstances it is the best they could have, as the plants are well exposed to light, they are surrounded by a dry atmosphere, and they are safe from frost. If in addition to these matters the plants are accorded a moderate share of attention in regard to the supply of water, there are very few of the *Cactus* family that will not thrive and occasionally flower. The *Cereus*, *Opuntia*, *Echinocactus*, and *Mamillaria* can all be so grown, but if a glass case can be provided for the smaller and more delicate kinds, it will be advantageous in protecting them from the dust and smuts that so soon accumulate in rooms, and which cling to the spines and surface of the stems, effectually spoiling their appearance and preventing their progress. Such cases can be readily constructed, or they can be purchased ready made, as several firms now sell them for the miniature "Cacti" that have obtained a good share of popularity during recent years. These miniature plants are particularly well adapted for rooms, and in their bright red diminutive pots have a very lively appearance.

They are sold, too, at such moderate prices that they are within the reach of all. As room plants indeed they are unexcelled, for though they do not possess the brilliant and profuse flowers of Pelargoniums and other ordinary softwooded plants, they never bear the sickly and miserable aspect that such too often do when they have been long grown indoors. I would by no means advocate the exclusion of the ordinary popular window plants, but as a reserve force the Cactæ are invaluable.

Temperature.—Where a large and mixed collection of plants is grown in one house, species from widely differing positions and climates have to submit to a uniform system of culture as regards temperature; but this, it appears, is not a particular disadvantage, for if a few general rules are observed these plants will thrive under any reasonable treatment. The delicate forms of Mamillaria, the robust Cereus, and the most tropical of the Echinocactus can be grown together in a house to which no heat is applied during the winter except to exclude frost, but then they should be kept very dry and must be placed in warmer quarters in the spring to start them into growth. There is an extensive collection which has been so treated for some years with good results, but they are under the care of an experienced cultivator who has devoted a life to the study of their peculiarities, and anyone who is not familiar with such plants would act unwisely in testing them so severely. The safest winter minimum temperature is 50° to 55° for all the tropical species, the half-hardy, and in wet districts even the hardy sorts, being preferably wintered in a frame where they can be protected from frost. From March onwards the temperature may be raised to 70° or 80° , while with sun heat it may be increased to 90° . In the height of summer, by which time the growth of the majority of the species will be completed, the house or frame must be fully ventilated, and no shade will be required. A free exposure to the sun is as requisite to consolidate the growth of these plants as in the case of most fruit trees. In the autumn the temperature may be gradually reduced as the external heat diminishes, 60° to 65° by day, and 50° to 55° at night, suiting all the family.

Soil.—It is a general idea that for these plants a special and elaborate compost is absolutely indispensable, yet they can all be satisfactorily grown in ordinary loam and sand provided the latter be added in sufficient proportion to render the whole thoroughly porous, and there is no doubt whatever that the conventional lime rubbish is often employed in quantities that are positively injurious. In the case of delicate plants the pieces of broken bricks used may occasionally have a bad effect by attracting and retaining the moisture near the roots, and the lime in excess has a tendency to diminish the porousness of the soil. A small proportion of lime should,

however, be employed for the *Cereus* and *Opuntia* type, as these secrete crystals of oxalate of lime in large quantities, and it is also advisable to add some finely broken bricks when the loam is inclined to be heavy. Indeed for all the strong-growing *Cacteæ* such material may be preferably employed, as it enables the cultivator to supply water more freely and safely than would otherwise be the case. The pots must be carefully drained, as this is a matter of much importance. From one-fourth to one-half the depth of the pot should be filled with draining materials, according to the size and condition of the plants which mostly require but little soil.

Water.—Under the cool system already mentioned very little water is needed for at least three months in the year—namely, November, December, and January, though when in pots the plants should be examined once a week. Some growers, however, especially those in the trade, turn the plants out of the pots at the commencement of winter, shake the soil from their roots, and lay them upon dry sandy soil, where they remain without the smallest supply of water until it is desired to start them in spring, when they are planted out in a frame to make their growth, being syringed and watered freely. In the ordinary Cactus house, which is kept at a rather higher temperature, water is needed more frequently even in winter, but some experience is required to determine the proper time to apply it. The soil must never be allowed to get in a stagnant saturated condition, or the strongest plants will soon die, and it is often more easy to judge by the appearance of the plant whether moisture should be supplied. If the whole tissue seems to be plump and full none is needed, but if there is the slightest approach to laxness, or a dullness in the surface colour, water should be given. In the spring and early summer, when growth is advancing, whether the plants are in a house or frame, slight syringing in the afternoon is very beneficial, particularly after potting, and it will not be necessary to apply water direct to the soil for a week or so after that operation, as the syringe will afford sufficient moisture. When growth is proceeding rapidly the plants may be watered twice or three times a week. The stronger freely flowering species of *Cereus* and others may be assisted with a little weak liquid manure, both when growing and approaching the flowering stage.

Potting.—February or March is a suitable time for potting the plants, and if the collection is large the earlier the operation is performed the better, provided the weather is open and mild. Some care is needed in obtaining the soil in proper condition, for it should neither be damp nor dust dry, but it is better to err on the dry side than in the other direction. When the plants are turned out of their pots most of the old soil may be shaken from the roots, and all dead dried roots must be cut off close to the stem, as much injury is often occasioned by allowing these old

portions to remain attached. Large specimens in tubs or pots of considerable size seldom need repotting, a top-dressing of fresh compost, with occasional supplies of weak liquid manure, being amply sufficient.

PROPAGATION.

The majority of the Cactæ are readily increased by cuttings, grafting and by seeds, each of which methods may be briefly described.

Cuttings.—The species of *Cereus*, *Opuntia*, *Rhipsalis*, *Epiphyllum*, and others with cylindrical or slender angular stems, can be increased by means of cuttings of the young growths, which may be taken off in the spring and summer and placed in a sunny position for a few days, until the cut surface has healed, or until a few roots are seen to be forming. They can then be inserted in pots of light sandy soil, and kept quite dry until growth commences, when slight syringing will be beneficial. The temperature of the house in which the plants are grown will be sufficient. The *Mamillarias* and some species of *Echinocactus* and *Echinopsis* produce a number of offsets from the base of the stems, which may be removed and treated like cuttings, and a large stock can be soon obtained of many species in this way.

Grafting.—The principal object of grafting in this family is to place delicate species upon stocks of a stronger character, so that there is less danger of the former suffering from superfluous moisture in the soil, as with some *Mamillarias*, or to elevate pendulous or drooping plants upon a stem, so that they can be seen to better advantage, as in the case of the *Epiphyllums*. Some of the slender *Cereus* seem to be benefited by being grafted on stronger stocks both in their growth and floriferousness, but the latter character is usually not much affected. There is one great objection to grafted plants, and that is that usually they have an incongruous appearance almost approaching to deformity, and on this account many growers do not practise it. The operation is generally performed in early summer when growth is proceeding, and the methods employed are extremely simple. The stock selected is usually a *Cereus*, such as *C. tortuosus*, *C. macrogonus*, or *C. peruvianus*, according to the habit of the plant from which the scion is to be taken, the second-named being one of the quickest growing of all, or the *Pereskia aculeata*; but this is principally reserved for the *Epiphyllums*. If one of the small globular *Mamillarias*, *Echinocactus*, *Echinocereus*, or *Echinopsis* is to be the scion the base should be cut smoothly across, and if the stock is a sufficiently broad stem this can be similarly smoothed and the scion placed level upon it, being secured in its place by matting or string passed over the plant and under the pot, so as to keep the cut surfaces in close contact.

No binding is required round the junction of the stock and scion, and if the plants are placed in a rather shady position for a few days and kept dry a union will soon be effected. When the scion and stock are slender, and if nearly equal in size, they may be grafted by cutting the former at the base into a wedge shape, with a corresponding notch in the latter, tying them carefully round in this case, but not too tightly, or the surface will be injured, and probably decay. Nearly all the species in the different genera of the Cactus order unite readily with each other, but it is not well to select a plant for a stock which differs greatly in quickness of growth from the scion or *vice versa*, for the success of the union is very uncertain in such cases.

Seeds.—Though the majority can be easily raised from seeds, this method is rarely resorted to except to obtain new varieties or hybrids. The seeds are mostly small, and should be sown in a compost of three parts sand and one of loam in a temperature of 60° to 65°. The best time is immediately the seeds are ripe, otherwise the spring months are the most suitable. Germination takes place in from one to three weeks, and the progress of the seedlings is often very slow for some months, during which time the greatest care must be exercised to prevent injury by too much moisture either in the soil or the atmosphere.

Hybridising.—Nearly all Cactaceous plants produce abundance of pollen, and are readily crossed, especially *Cereus*, *Phyllocactus*, and *Epiphyllum*, to which the efforts of hybridisers have been principally confined. By judicious crossing some handsome forms have been raised, and there is undoubtedly plenty of room for further experiments in this direction. For instance, the *Mamillarias* vary considerably from seed, yet very little has been done in this genus on any systematic plan. In the majority of species the pollen and stigmas are mature at the same time, and therefore if self-fertilisation is not desired the stamens of the flower selected for the seed-parent must be removed before the anthers burst; and if there are other flowers open at the same time a small piece of gauze or muslin may be tied over it both before and after the pollen is applied. The species of *Cereus* hybridise readily, and it is only necessary to observe closely the time when the flowers open, as some last but a few hours, often expanding late in the evening.

CLASSIFICATION.

A great number of methods of classifying the members of this family have been proposed, but that adopted by Hooker and Bentham in their "Genera Plantarum" is the simplest and best. Two tribes are formed. The first, termed *Echinocactæ*, is characterised by the calyx

tube being produced beyond the ovary, the stem being covered with elongated tubercles or ribs, which are rarely leafy. This includes the genera *Melocactus*, *Mamillaria*, *Pelecypora*, *Leuchtenbergia*, *Echinocactus*, *Discocactus*, *Cereus*, *Phyllocactus*, and *Epiphyllum*. The second tribe, *Opuntia*, has the calyx tube not produced beyond the ovary, and the stems are branching or jointed. The genera *Rhipsalis*, *Nopalea*, *Opuntia*, and *Pereskia* are placed under this head. Some secondary divisions are adopted, but they are not of much popular importance. In classifying the species the spines afford valuable characters, and those who are specially interested in this part of the subject will find an elaborate system detailed in Labouret's "Monographie." The genera which are reviewed in the following pages are taken in the order adopted in Hooker and Bentham's work already mentioned.

MELOCACTUS, *Link and Otto.*

(The Melon Cactus.)

About thirty species of plants found in the West Indies and tropical America are arranged under the genus *Melocactus*, and resemble each other closely in their leading characters. These are a globular unbranched fleshy stem 1 to 2 or 3 feet in diameter, regularly ribbed from base to summit, the ridges bearing a varying number of clusters of spines and a cylindrical portion, termed "the cap," produced from the apex of the stem, formed of a woolly substance, and closely set softer spines than those on the main stem. Upon this the small flowers are borne, tubular in form, and red or rose-coloured. All the species are natives of hot regions, generally growing in rocky or sandy situations exceedingly dry, but a few are said to be found near the coast or in salt marsh districts. Only one species—namely, *M. communis*, is in general cultivation, and this is probably owing to the fact that the plants are of little or no horticultural value, though as curiosities they are remarkable.

Culture.—The *Melocactus* is one of the most difficult of all to grow successfully, and it is rare that a thoroughly healthy specimen is seen; indeed, imported plants that have "the cap" developed when received seldom live long, and the only specimens which have a chance of success are those sent over in a young state or raised from seed here. A high temperature, very porous soil, abundant drainage, and little water are the chief points requiring attention, and when a plant assumes an unhealthy appearance water must be withheld.

Propagation.—Offsets are seldom produced unless the crown or cap be removed or damaged, or if the upper portion of the stem be cut off. When the surface is partially healed offsets usually appear round the margins, and these can be separated and grown on like those of other *Cactææ*.

MELOCACTUS COMMUNIS, *Link and Otto*.—"Who can but marvel at the care and singular workmanship shown in this Thistle?" wrote old Gerarde

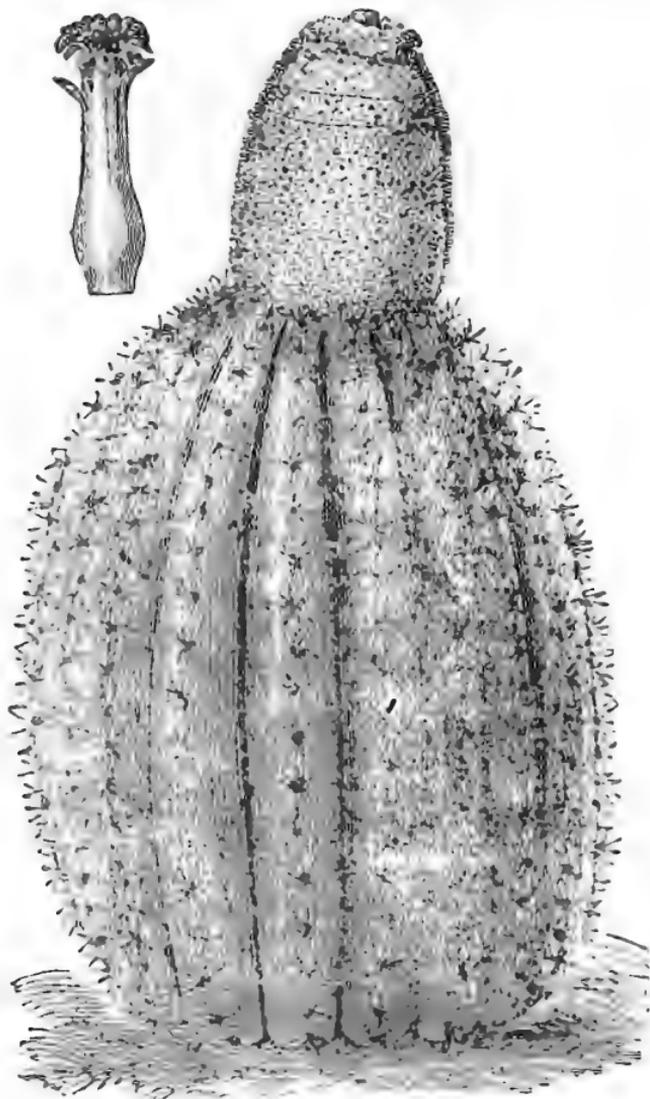


Fig. 2.—*Melocactus communis*.

in his "Herball," 250 years ago, and the question might be repeated at the present day with equal point. It is, indeed, much more

peculiar than beautiful, but it is interesting historically as one of the earliest known members of the family. Most of the early English writers on plants notice it, and the author named above gives a particularly good engraving, showing the cap and spines very clearly. He terms it *Melocardus Echinatus*, the Hedgehog Thistle, and says concerning it, "This admirable Thistle groweth upon the cliffes and gravelly grounds neere unto the sea side in the islands of the West Indies, called St. Margarets and St. John's Isle, neere unto Puerto Rico, and other places in these countries, by the relation of divers travellers that have journied into these parts who have brought me the plant itself with his seed, the which would not grow in my garden by reason of the coldnesse of the clymate." It was thus introduced early in the seventeenth century, but some time elapsed before it was generally known. Parkinson described it in his "Theater of Plantes," 1640, as "*Melocardus Americanus*," and gives a figure very similar to Gerarde's. Ray also fully describes it in his "Historia Plantarum," 1686, and states that it was then cultivated by Bishop Compton at Fulham. In Bradley's "Works of Nature," 1739, a small figure is given, and he mentions having seen specimens in the Royal Gardens, Hampton Court, and in the Physic Garden at Amsterdam. Miller grew plants of the species and several varieties at Chelsea, and it was included in the Kew collection of 1811.

Turk's Cap, Englishman's Head, and Pope's Head are some of the popular names that have been applied to this plant, all referring to the peculiar crown on the summit of the stem, a character by which it is easily recognised. It is found in several of the West Indian Islands, particularly on the island of St. Kitts, where it grows in large quantities in barren rocky districts. It is also found on the mainland, and specimens exceeding a yard in diameter are not uncommon, some being reputed to be two or three hundred years old. In places where it abounds the mules and other cattle are said to eat the plants after removing the spiny outer portion with their hoofs, as the fleshy substance of the stem affords a welcome supply of moisture. As grown in this country, the stems are from 12 to 18 inches high and about a foot in diameter, with from twelve to twenty ridges 1 inch to 1½ inch deep, conical in shape, and bearing clusters of eight or nine spines quarter to 1 inch long, the centre one being erect, and the clusters an inch apart. The flowers are about 1 inch long, tubular, and rosy red, somewhat suggestive of some of the small-flowered Fuchsias; these are followed by red oblong fruits resembling those of the *Mamillarias*.

The seeds are small, and in germinating produce two very minute cotyledons at the base of a globular fleshy stem. These have been overlooked by some botanists, and the plant regarded as a monocotyledon. In Decandolle's "Vegetable Organography" a figure is given showing the true form of a young seedling with the diminutive cotyledons at the base of the plumule or gemmule.

Numerous varieties have been named and described, such as *macrocephalus*, *oblongus*, *conicus*, *acicularis*, *spinosior*, *magnisulcatus*, and others, the names

of which indicate the leading characters, but seedlings seem to vary so much that these names are not of much value.

The engraving (fig. 2) is a reduced representation of a plant of *M. communis*, showing one of the conical type, and one-sixth the natural size; a flower is also given of the full size.

MAMILLARIA, *Haworth.*

(The Nipple Cactus.)

It would be very difficult to find any plants in the whole vegetable kingdom which present such beautiful examples of symmetry as the Mamillarias, and in their own family they are also unique in this respect, for though many of the grotesque *Opuntias*, *Cereus*, and *Echinocactus* possess larger and more brilliant flowers, and they are surpassed in horticultural value by *Phyllocactus* and *Epiphyllum*, yet for delicacy of design they are unrivalled. A large number of them resemble exquisite pieces of mechanism finished with the greatest minuteness and accuracy. Others, again, might be imagined to have undergone a kind of crystallisation, their whole surface being frosted over with star-like spiculæ arranged with geometrical precision; and still others appear as if covered with the finest gossamer. The graphic remarks of Dr. Lindley which accompanied the figure of *M. tenuis* in the "Botanical Register" in 1832 might well be applied to several species with even more accuracy than in that case:—"Gentle reader, hast thou never seen in a display of fireworks a crowd of wheels all in motion at once, crossing and intersecting each other in every direction, and canst thou fancy those wheels arrested in their motion by some magic power, their rays retained, but their fires extinguished and their brightness gone. Then mayst thou conceive the curious beauty of this little herb, a plant so unlike all others that we would fain believe it the re-animated spirit of a race that flourished in former ages with those hideous monsters whose bones alone remain to tell the history of their existence in the quarries of our sandstone, slate, and clay." Strangely beautiful indeed are most of the Mamillarias, and in contrast with their neat rosettes or stars of spines are the rosy, yellow, and white flowers, which are generally followed by small berry-like coral-coloured fruits, that, dotted amongst the spines, add another phase to the attractions of these plants. With so much to recommend them it is not surprising that they have become great favourites with cultivators of Cacti, and with that portion of the public who have obtained any knowledge of them.

The genus *Mamillaria* was founded by Haworth upon the *Cactus mamillaris* of Linnæus, one of the oldest cultivated species, and this was re-named by the first-mentioned author *M. simplex*. Two others

were associated with it—viz., *M. prolifera* and *M. discolor*, which at that time, 1819, were all that were known. Since then, however, the number of described species has been increased to 300, which abound in Mexico, the head quarters of the genus, some being also found in the West Indies, Brazil, and Bolivia, their habitats and the elevation at which they are found varying considerably. In characters of flowers and fruit the Mamillarias resemble several other genera, but the chief distinguishing mark is found in the mamillæ, papillæ, or tubercles from which the plants derive their name. The stem is cylindrical, globular, or conical, seldom exceeding 10 or 12 inches high under cultivation, and more frequently only 3 to 6 inches high and 1 to 3 inches in diameter. From this axis arise the teat-like projections termed the mamillæ, but for which the word tubercle is here adopted. These vary in size from minute elevations scarcely a sixteenth of an inch high to some 1 inch high and as much in diameter; in form they also vary, from cylindrical, spindle-shape, conical, or ovoid to angular and irregularly pyramidal. They are arranged spirally round the stem with great regularity, and each bears at its apex a cluster of spines, often in two series, the outer white, very fine and hair-like, from six to twenty, very closely set, and radiating laterally in a star-like manner, much resembling the pappus crowning the fruits of some plants in the Compositæ family; the inner series is usually composed of a few stiff spines, sometimes hooked at the points, and usually coloured differently from the others, being yellow, brown, red, or purplish.

The variations in these organs or appendages furnish the chief characters for distinguishing the species, and upon them some authors have constructed an elaborate system of classification in groups and sections. In Hooker and Bentham's "Genera Plantarum," however, Engelmänn's three subgenera *Eumamillaria*, *Coryphanta*, and *Anhalonium* are adopted for the main divisions. The first includes the majority of the species, which are characterised by the tubercles not being furrowed, and by the flowers being produced from the axils of the previous year's tubercles—that is, from the side of the stem. The second has furrowed tubercles, and the flowers produced from the apex of the stem or from the axils of the tubercle of that season's growth. The third was constituted a genus by Lemaire, but is regarded as inseparable from the Mamillarias, though in general appearance they are quite different, the tubercles in *Anhalonium* being spreading, thick, and leaf-like, somewhat after the style of the Gasterias.

Culture.—Many of the Mamillarias are found in limestone districts, and though inhabiting varying climates and elevations, they may be all grown in an intermediate temperature, such as a greenhouse, where they can be protected from frosts during the winter, but a higher tempe-

perature is needed during the spring and early summer when growth is advancing. A free exposure to light and sun is requisite at all times. The soil should consist of two-thirds sandy loam and one-third finely broken bricks and lime rubbish. The pots must be well drained, and water should always be carefully supplied, but much injury is often done by keeping the plants too dry. They should be examined at least once a week, even in the winter, and if the temperature is above 50° and the weather bright they may be safely watered if they require it. In colder quarters little will be needed during December and January. These plants may be advantageously grown in a glass case, as this protection keeps the dust from their beautiful spines.

Propagation.—The majority of the tufted and branching species can be readily increased, either by the offsets from the base, or by removing the side branchlets. The former only need potting like ordinary plants, keeping them rather dry until growth commences. The branchlets can be laid upon dry soil until some roots show at the base, and they can then be treated similarly. The more delicate sorts, or those that produce few offsets, can be grafted on any *Cereus*, to which they readily unite; and this has a double advantage, for while the plants often grow more strongly, they are also less liable to decay, as such forms will do unless very great care is exercised in supplying water. *Cereus tortuosus* and others of slender habit may be chosen for the small-growing species.

SELECT SPECIES.

M. ANGULARIS, *Hort. Berol.*—One of the more robust forms. The freely branching habit gives it a very distinct appearance, and when well grown it has a fine appearance. The largest specimen I have seen is in Mr. Peacock's collection, and is over a foot in diameter; in excellent health. Decandolle's *M. triacantha* and *M. cirrifera* of some gardens (not of Martius) have been regarded as varieties of this species, the last named corresponding to Salm's *M. angularis* var. *fulvescens*. It can be readily increased by offsets. Introduced in 1835. Strong-growing; stem freely branched, 4 to 8 inches high, 2 inches in diameter; tubercles conical, thick, a quarter of an inch long, having a tuft of white down at the top, and four or five white spines of irregular length; flowers rosy purple.

M. BICOLOR, *Lehmann.*—The whole surface of this plant appears as if covered with a fine cobweb, owing to the numerous closely-set white hairs which form the outer series of spines; and if grown under a case or in a position where the dust can be excluded it is one of the most striking of the genus. Some crested forms of this are grown, but they possess little beauty, and are usually simply deformities. The species was introduced in 1835.

Very distinct; stem cylindrical, somewhat club-shaped, 8 to 10 inches high, 2 to 3 inches in diameter, branching from near the base, tubercles very short, dark green, but hidden by the spines, which are in two series, the outer fine and hair-like, closely set, and spreading, the others being fewer, erect, and of a yellowish tint. The flowers are small and purple.

M. CAPUT-MEDUSÆ, Otto.—The Medusa's Head Mamillaria is by no means so formidable as its name implies, and though not so delicately beautiful as its neighbours it possesses a boldness that forms a striking contrast with them. A fine specimen, probably the largest in England, is included in the collection of these plants grown by Mr. Boller at the Woodfield Nurseries, Harrow Road, N., for which he has been awarded numerous first-class certificates at metropolitan and provincial shows. Stem usually 4 to 6 inches, or in exceptional cases 8 inches in height, globular or occasionally columnar; tubercles four-angled or ovate, bearing four small white spines and two thicker and stronger ones; flowers white, about 1 inch in diameter.

M. CIRRIFERA, Martius.—A neat and pleasing little plant, which does not flower so frequently as several others, but is well worth growing on account of its symmetrical appearance. Introduced in 1835. A freely branching and pretty species, with a cylindrical stem 3 to 4 inches high; tubercles short and conical, quarter of an inch long, glaucous green, and furnished with a crown of yellow spines; flowers bright rose, with yellow anthers.

M. DOLICHOCENTRA, Lemaire.—A somewhat variable species of strong habit, especially abundant in the neighbourhood of Xalapa, and included in most large collections of Cactææ. It was grown in the continental collections thirty years ago, but the date of its first appearance in England is uncertain. Several varieties have been described under the names of *phæacantha*, *straminea*, *Galeotti*, &c., but the last is generally considered synonymous with the first, and they are all chiefly confined to continental gardens. Stem stout, 6 to 8 inches high, 3 inches in diameter; tubercles conical, narrow, half an inch long, crowned with small tuft of white down and a few white spines of irregular length; flowers of moderate size, pale rose or reddish crimson; fruits red.

M. FISSURATA, Engelmann.—This plant, so far as I can ascertain, is not in cultivation in England, and is named here chiefly to illustrate the Anhalonium section of the genus, of which it is a very good type. It is well described and figured by Engelmann, and presents a very different appearance from the Mamillarias generally, though not structurally distinct. The root is thick and turnip-like, the tubercles being triangular in form, very thick, and with the upper surface strangely furrowed; they are arranged in a closely imbricated manner, very suggestive of some Gasterias, and from the centre arises the whitish pink flower about 1 inch in diameter and surrounded at the base by dense woolly substance. It is found in the same district as *M. pectinata*, chiefly on hard gravel or limestone soils.

The species of *Anhalonium* that are better known to cultivators are *A. elongatum*, *Salm*, *A. prismaticum*, *Lemaire*, and *A. sulcatum*, all of which more or less resemble *M. fissurata* in the form of leaves and habit. They are curious species, and bear strange resemblance to other plants—for instance, the leaves of *A. elongatum* have been aptly compared to those of some *Crassulas*, and of *A. prismaticum* and *A. sulcatum* to *Aloes* or *Haworthias*, especially *H. retusa*. These are all considered as *Mamillarias* now, Hooker and Bentham in this view following Engelmann and Miquel.

M. GRACILIS, *Pfeiffer*, var. *PULCHELLA*.—Amongst the small-growing cylindrical-stemmed species of *Mamillaria* none surpass this in delicate beauty. It is indeed an exquisite little gem, most symmetrical in the arrangement of its spines, and is moreover very easily grown and readily increased, as the diminutive side branches or offsets are produced in great numbers. Very dwarf, 1 to 2 inches high; stem cylindrical, half an inch in diameter; tubercles small and green; spines in one series, white, spreading and closely set; flowers pale yellow, of good size, and attractive.

M. MICROMERIS, *Engelmann*.—Unique in form and very beautiful, readily distinguishable from all other species in cultivation, but resembling one described by some writers as *M. microthela*. It is a Mexican plant, and according to the author of the above name is found "from El Paso to the San Pedro river, also in a single locality east of this river, in naked places on mountain tops or sides, only on limestone, never in the porphyritic region." An exceedingly fine engraving of the plant is given in Engelmann's "*Cactaceæ of the Boundary*," and the distinguishing characters of a variety named *Greggi*, which is of rather larger growth, are also shown. In the species the stem resembles a flattened ball 2 inches in diameter and $1\frac{1}{2}$ inch high, having in the centre at the apex a circular tuft of wool-like down about 1 inch across, surrounded by a fringe of stiff white spines; tubercles very small and closely set, each bearing a diminutive star of radiating white hairs, which fall from the older tubercles, giving the lower portions of the plant a peculiar appearance. The flowers are very minute, with about five sepals and petals, pale rose-coloured, and succeeded by red berries one-third of an inch long.

M. MULTICEPS, *Salm*.—Chiefly remarkable for the much-divided character of the stem; the flowers are also of a pleasing shade of colour and produced rather freely. The lower divisions and branches of the stem can be removed and potted when it is desired to increase the plant. Stem dwarf, much-branched or divided, 1 inch high, half inch in diameter; tubercles one-eighth to a quarter of an inch long, narrow, conical, green; spines in two series, the outer white, very fine and numerous, the inner yellow, larger, and stronger; flowers pale yellow with a reddish line in the centre of the petals.

M. NEUMANNIANA, *Lemaire*.—A bold and distinct species, free in growth, and well worth a place in a small collection. Introduced from Mexico in 1845. Stem cylindrical, 5 to 6 inches high; tubercles stout, three-eighths of an inch long, dark green, with a tuft of wool-like material at the apex and a few tawny spines about half an inch long; flowers of a rosy hue.

M. ODIERIANA, *Lemaire*.—An attractive plant, especially when in flower, but at all times it is one of the neatest of the genus, its spines being very regularly arranged, and the contrast in colour between the inner and outer series is striking. Stem cylindrical, 3 to 4 inches high, 2 inches in diameter, very symmetrical; tubercles one-eighth of an inch long, dark green; spines in two series, the outer close and fine, the inner tawny, half an inch to three-quarters of an inch long. Flowers reddish violet.

M. PARKINSONII, *Ehrenberg*.—A very distinct species, of bold habit, and attaining a larger size under culture than the majority of the *Mamillarias*. It is found in several districts of Mexico, principally on calcareous rocks. It has been cultivated in England and on the Continent for some years, but the date of its introduction is uncertain. Stout-growing; stem 4 to 8 inches high, 2 to 3 inches in diameter; tubercles small, each bearing a star of diminutive white hairs, and four to five stiff erect white spines 1 to 1½ inch long tipped with brown; flowers yellow. When grown as it is in the Oxford Botanic Garden this is one of the most beautiful of all the species, the spines being pure white and very numerous.

M. PECTINATA, *Engelmann*.—Few of the *Mamillarias* equal this in beauty, and it is much to be regretted that the plant continues so scarce in English collections. It is an example of Dr. Engelmann's sub-genus *Coryphanta*, and is said to be found on the limestone hills of the Pecos, whence it was introduced to Europe about twenty or thirty years since. The flowers last a very short time, generally only about two hours in the middle of the day, but they are succeeded by fruits half an inch long, which remain attached to the plant for a considerable time. Stem conical or nearly globular, about 3 inches high and 2½ inches in diameter; tubercles short and stout, each crowned with a rosette of white spines on one series, very even in size and regularly spreading half an inch or more across each star. Flowers yellow, generally produced singly from the apex of the plant and comparatively large, 2 inches in diameter, with very narrow and numerous petals, the sepals being also numerous, the outer reddish green and the inner resembling the petals. The woodcut (fig. 3) is an accurate reproduction of Engelmann's admirable engraving in the "Cactaceæ of the Boundary."

M. PHYMATOTHELE, *Bergm*.—A strong-growing plant, which has been in cultivation in Europe for forty years or more, and is now found in most English collections. Its name signifies "tumour-nipple," and refers to the swollen tubercles. Several species of *Mamillaria* have the specific names terminating with "thele," bearing the same signification with a qualifying prefix, as *microthele*, small nipple; *macrothele*, large nipple; and *polythele*, many nipples. In others the Latin is substituted for the Greek, and we have *longimamma* and *magnimamma* with corresponding meanings. Stem 5 to 6 inches high, 2 inches in diameter; tubercles a quarter of an inch long, conical, dark green, crowned with a small tuft of white down, a few white, spreading, hair-like spines, and four to six erect yellowish-red central spines about half an inch long. Flowers bright rose.

M. PUSILLA, *Decandolle*.—A diminutive but beautiful plant, meriting a place amongst the best forms of the genus. It is interesting, too, as being a

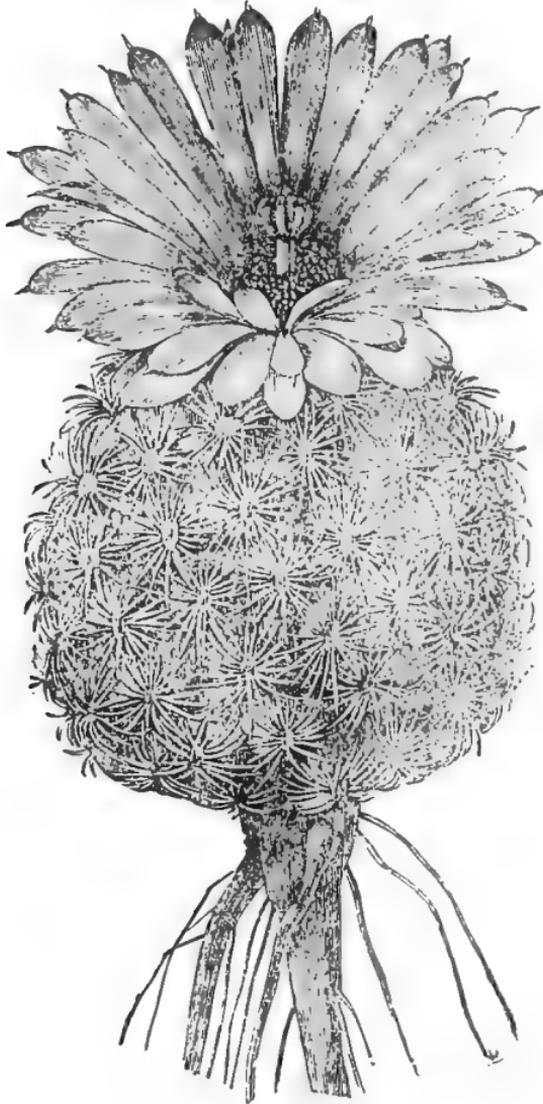


Fig. 3.—*Mamillaria pectinata*.

native of the West Indies and South America, whence it was introduced in 1820. This species appears to be identical with those described by Harvey

and others as *M. stellaris*, and is also probably the *M. stellata* of Loddiges' "Botanical Cabinet." Dwarf; stem 1 to 2 inches high, cylindrical-globular; tubercles narrow conical, one-eighth to a quarter of an inch long, dark green; spines in two series, outer numerous, fine hair-like, white, inner fewer, erect, and brownish. The flowers are freely produced, yellowish, the petals having a central line of rose.

M. RAPHIDACANTHA, *Lemaire*.—The needle-spined nipple Cactus is an exceedingly pretty species, small in its proportions, but very symmetrical, and covered with the most delicate little rosettes of spines imaginable. They are indeed needle-like in form, brightness, and rigidity, and the clusters resemble crystals of ice. A plant sometimes seen under the name of *M. raphidacea* appears to be the same as this. Stem cylindrical, 3 to 5 inches high and 1 inch in diameter, slender and elegant; tubercles short, conical, a quarter of an inch long or less, dark green; spines in one series, spreading star-like, eight or nine, closely set, a quarter of an inch long, white tipped with brown; flowers freely produced, about an inch in diameter, and purplish violet in colour.

M. RHODANTHA, *Link et Otto*.—The bright colour of the abundant flowers of this plant renders it a charming companion for the others named in this list, and will, moreover, bear a lower temperature than the majority; it has indeed been tried out of doors both here and in France during the summer months. It is a Mexican species, and was introduced in 1836. Several varieties are known and named, such as *neglecta*, *sulphurea*, *rufoceps*, *auriceps*, and others, but they differ very slightly from the species. Stem 2 to 6 inches long, 2 inches in diameter, freely branching; tubercles conical, one-eighth to quarter of an inch long, having at the apex a tuft of white down, rays of fine hairs, and six irregular white or yellowish spines quarter to half an inch long. Flowers produced in succession during the summer, bright rose, of medium size.

M. SCHIEDEANA, *Ehrenberg*.—One of the prettiest and most distinct of the genus, and is of free growth and flowers profusely, also producing its reddish fruits occasionally, which have a pretty appearance nestling amongst the tubercles. It inhabits limestone districts at considerable elevations in Mexico, whence it was introduced to France in 1838, and to England some years later. It should be in every collection. Stem cylindrical, globular, 3 to 5 inches high, 2 inches in diameter; tubercles dark green, cylindrical, half an inch long, very narrow, quite distinct from the majority of species; spines yellowish, hair-like, and forming a small star nearly a quarter of an inch in diameter, much resembling the pappus on some of the *Compositæ*; flowers small and white.

M. SIMPLEX, *Haworth*.—This species is chiefly interesting in an historical point of view, for it was the first one introduced to Europe. It is mentioned by several of the old writers, and among them by Bradley in his curious work on "Succulent Plants" (1716). Ray states that it was grown by Bishop Compton at Fulham, and was also grown at Hampton Court in 1690.

Linnæus described it under the name *Cactus Mamillaris*, and states with truth that it is covered with bearded papillæ like the *Mesembryanthemum*, has a milky juice like the *Euphorbias*, and the fructification of the *Cactus*, remarks which would apply to many other members of the genus. With *M. simplex*, *M. discolor*, and a supposed variety of the former named *prolifera*, which is now referred to *M. flavescens D.C.*, Haworth founded the genus *Mamillaria*, which has since been adopted by nearly all writers, though the number of species has increased a hundredfold since his time. It is a native of tropical America. Stem simple, globular, 4 to 6 inches high; tubercles conical, small, crowned with a white down and two series of spines, the outer about twelve, white, the inner four to six, strong and reddish in colour; flowers small, greenish white.

M. STELLA-AURATA, *Martius*.—"Golden Star" is a euphonious and appropriate name for one of the most attractive of the genus, and one that is a great favourite with all who are familiar with these plants. When in good condition the whole plant is covered with star-like rosettes of yellow spines, which impart a very distinct appearance to it, especially when in contrast with the white-spined forms. It is regarded as identical with *M. tenuis* of Decandolle. Introduced in 1835. Stem 2 inches high, half an inch in diameter, freely branched and dwarf; tubercles short and green; spines in a flat spreading star-like rosette, very numerous, one-eighth to one-quarter of an inch long, yellowish tipped with reddish brown. Flowers small and white.

M. WILDIANA, *Otto*.—A charming species introduced from Mexico to France in 1835; but it did not make its appearance in English gardens until some years later, and even now it is not very generally known. It is one of the most select, and should be included in the smallest collections. A crested variety has been obtained and deserves the notice of those who admire these abnormal forms. Generally very dwarf, 3 to 4 inches high, but occasionally taller and more cylindrical, closely surrounded by offsets which are freely produced. Tubercles conical, dull dark green; spines in two series, the outer very fine, white, and closely spreading, the others much fewer and larger, yellowish, and hooked at the apex; flowers rose-coloured, borne at different periods of the year and rather frequently.

The species named in this list include some of the best of those cultivated in England, but there are many others that well deserve attention if it is desired to form a large collection. *M. phellosperma* in particular is extremely pretty, the stars of spines being large and neat, while the central spines are hooked at the apex like *M. Grahmi* and others, from which character it is named the Fish-hook Cactus. There is also a beautiful and delicate form in the Oxford Botanic Garden named *M. rosea-longisetata*, which has very small, closely set, white spines. *M. senilis*, a dwarf species densely covered with very fine hair-like spines, is also an attractive plant, but rather rare in England. The size of the

plants given in the preceding notes refer to cultivated specimens, none of which attain great heights, but in a wild state *M. coronaria* has been described as reaching 4 to 5 feet.

PELECYPHORA, *Ehrenberg.*

(The Hatchet Cactus.)

In a botanical point of view this genus and the following one are the most interesting in the family. They are both monotypic—that is, contain one species each, and are remarkable for certain structural peculiarities that have attracted much attention from students of the order. Pelecyphora is closely related to the Mamillarias, having a short cylindrical stem, covered with mamillæ or tubercles of a flattened form, and which have been supposed to bear some resemblance to a hatchet, as the generic name implies. At the apex, however, in the place of the spines of the Mamillarias are two rows of flat horny scales, which overlap like the tiles of a roof, and have been not inaptly compared to the scaly back of a woodlouse, to which character the specific name refers. The flowers are borne near the summit of the stem 1 to 1½ inch in diameter, consisting of several series of sepals and petals, numerous stamens and stigmas.

In culture and propagation Pelecyphora is similar to the more delicate Mamillarias; it requires a sandy soil, good drainage, and very careful supplies of water. Offsets are seldom produced, and the readiest method of increasing it is by seeds, which germinate freely in moderate heat, and numbers of plants have been so raised in this country as well as on the continent.

PELECYPHORA ASELLIFORMIS, *Ehrenberg.*—This, the only member of the genus, is a native of Mexico, where it was found by the brothers Tonel, associated with plants of the now discarded genus *Anhalonium*, which has been already mentioned under the Mamillarias. The first plants imported to Europe were received at Berlin, but found to be dead, and Labouret relates that Ehrenberg raised the first living specimen from seeds found in dried fruits contained in the axils of the tubercles. The plants so obtained were described by the last-named author in 1843, though the flowers were then unknown. In 1858 Lemaire gave a full description and illustration of the plant in the *Illustration Horticole*, vol. vi., t. 186, which drew much attention to it, and several growers of Cacti obtained plants for their collections. Amongst English cultivators Mr. Justus Corderoy of Blewberry, Didcot, Berkshire, was especially successful in raising young plants from seed, and through him numbers were distributed throughout the country; indeed, he claims to have done what growers could never do before nor since—namely, sell plants of Pelecyphora at 3s. each. Several of these seedlings he succeeded in flowering, and proved slightly different from Lemaire's plant in the colouring, the flowers of Mr. Corderoy's variety being uniformly rosy purple, while-

in Lemaire's plant they had an outer series of pale almost white petals. One of these specimens was submitted to Dr. Hooker, and figured in the

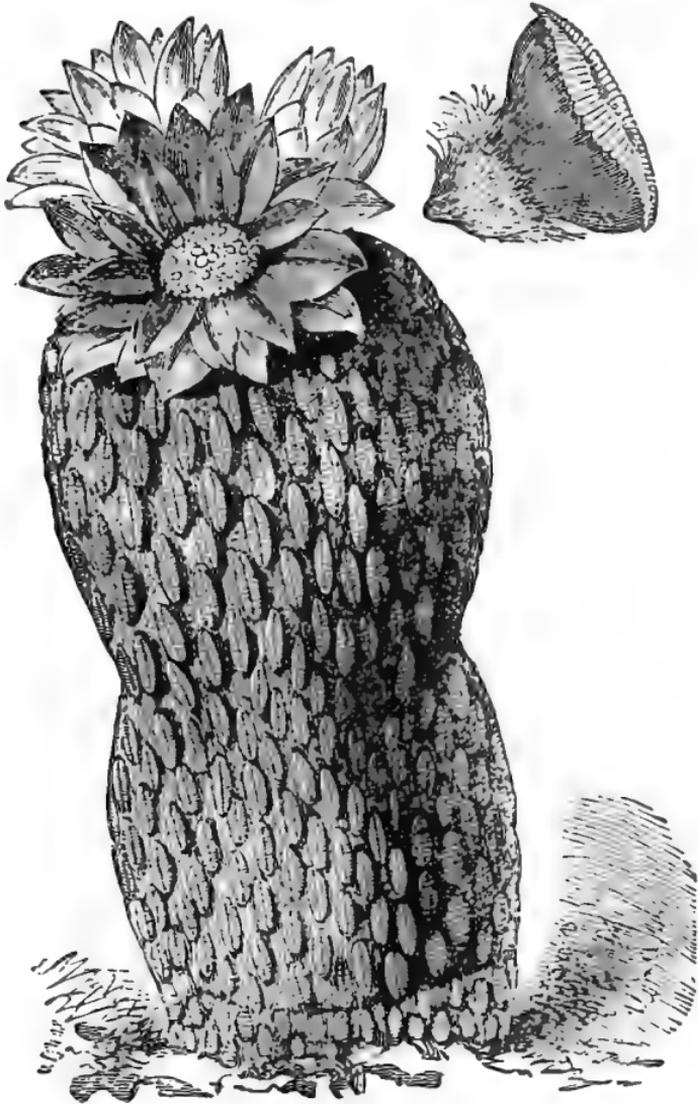


Fig. 4.—*Pelecyphora aselliformis* var. *concolor*.

"Botanical Magazine," 1873, t. 6061, under the name of *P. aselliformis* var. *concolor*. Though so interesting structurally, and pretty when in flower, this

Cactus continues very scarce, and few collections now include examples of it. Fig. 4 is engraved from a photograph of one of the Blewberry plants, representing it of the natural size, a single tubercle being shown at the side.

LEUCHTENBERGIA, *Hooker*.

Few who were unacquainted with *Leuchtenbergia principis* would, at the first examination of a plant not in flower, think it was a member of the Cactus family; it is so entirely distinct from all the genera and species in outward appearance, and might be easily mistaken for an Aloe or some relative of the Haworthias. A glance at the flowers would, however, be sufficient to indicate its true position in the vegetable kingdom, as the calyx is somewhat tubular with numerous lobes, the outer scale-like, the interior narrow and spreading, the petals being in two series, coloured like the petals, with indefinite stamens and numerous stigmas. The tubercles are triangular, about 3 to 4 inches long, crowned with several peculiar flattened ash-grey spines that have a withered appearance, and vary in length from half an inch to 2 or 3 inches. These tubercles are arranged spirally round the stem, and, owing to their differing so much from the tubercles in *Pelecypora* and *Mamillaria*, they have been the subject of much discussion as to their true nature. The apparent difficulty of the matter has been increased by the fact that the flowers are produced near the apex of the tubercles and not from the axil, as in the *Mamillarias*. Respecting this point also there has been a divergence of opinion, some writers describing it as producing the flowers from the axils and others from the apex. Writing me upon this subject, Mr. R. I. Lynch, Curator of the Cambridge Botanic Garden, observes, 'Lemaire in 'Les Cactées' ridicules the idea that the flowers of *Leuchtenbergia* are borne at the summit of the mammæ, but his information was untrustworthy. It does habitually flower from that position, as I have frequently seen. In some cases the flowers are produced near the apex of very little developed mammæ in the centre of the plant, and it would be easy to make a mistake as to the actual origin of the flower, as it is wedged in tightly by the other mammæ. Most flowers that I have seen were, however, borne quite clear of the centre.' This is undoubtedly the fact, as I have seen flowers down in the centre as described, and, without removing them, it would be almost impossible to decide whence they sprung; while, on the other hand, Mr. Corderoy has sent me a sketch showing the flowers quite clear from the other tubercles, and close to the summit, as stated by Mr. Lynch.

These tubercles therefore appear to be of a compound nature, representing the fusion of petiole and peduncle similar to what occurs in

Helwingia and *Erythrochiton*. Lemaire partly adopted this view regarding the mammæ of the three genera *Mamillaria*, *Pelecyphora*, and *Leuchtenbergia* as metamorphosed leaves, the spines representing the veins of the leaves, in which opinion many careful observers agree. Le Maout and Decaisne describe them as "arrested buds," and would thus give them more the nature of branches, while others incline to the view that they are simple elevations of the substance of the stem similar to the ridges in *Echinocactus* and *Cereus*.

This is a rather difficult plant to grow satisfactorily, but it should be treated similarly to the *Mamillarias* as regards soil, and most carefully

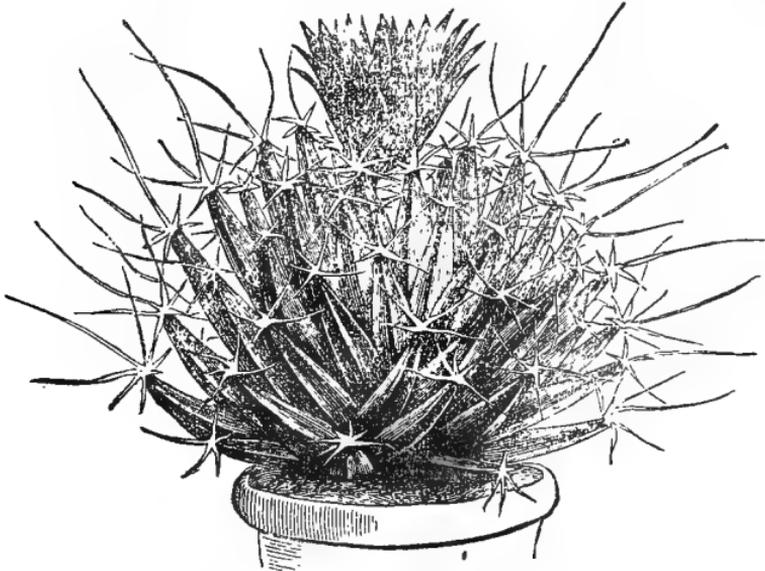


Fig. 5.—*Leuchtenbergia principis* (reduced).

attended in the supply of water, as the slightest approach to excess will result in serious injury and probably the death of the plant.

LEUCHTENBERGIA PRINCIPIS, *Hooker*.—In 1848 an excellent figure of this plant was given in the "Botanical Magazine," accompanied by a full description by Sir W. Hooker, which is so graphic that it is here reproduced. "Our largest plant is a foot high, its main trunk erect, but crooked, as thick as a man's arm, clothed with the dense mass of persistent bases of old mamillæ, or perhaps rather of the withered mamillæ themselves, shrunk and reduced to a mass of closely pressed scales. Above they gradually become more perfect, at first short and truncated till the crown of the plant is clothed with per-

fectly formed mamillæ, resembling aloid leaves 4 or 5 inches long, glaucous green, succulent, triangular, truncated at the apex, and there bearing six or seven long chaffy, or almost horny linear or subulate flexuose scales, of which the centre one is about as long as the mamillæ, and the others form a whorl round the centre, are about 2 or 3 inches long, spreading, triangular. These appear to be after a time deciduous, for the lower withered mamillæ are destitute of them." In the further description of the flower the position is said to be "from the axil of a mamilla," but in the "Genera Plantarum" this has been corrected. The flowers are large, of a rich clear yellow tint, and are usually solitary, though in some cases two are borne on one plant at the same time.

The species is a native of Mexico, having been found near the Rio del Monte, and introduced to the Royal Gardens, Kew, in 1847. Like the *Pelecyphora*, Mr. Corderoy has been very successful with this plant, and the engraving represents one from a photograph of eight plants, several being in flower, which he had taken some time since.

ECHINOCACTUS, *Link and Otto.*

(The Hedgehog Cactus.)

The Hedgehog Cactus genus is one of the largest in the whole family, and the two hundred species comprised in it include some of the most handsome and curious forms in this portion of the vegetable world. They are not so remarkable for beauty and symmetry of structure as the *Mamillarias*, but the flowers are usually large, brightly coloured, the tints most predominating being yellow, rose, and purple, while many are pure white. The flowers also in numerous species attain a considerable size, almost rivalling some of the *Cereus*; and as they frequently open for several days in succession they have not the defect of fugaciousness so common in other members of the family. The strangest character connected with the Hedgehog Cactus is, however, the enormous size which some of them attain. It is true they do not grow to so great a height as the *Cereus*, for few, even of the largest, exceed 4 or 5 feet in height, but they occasionally become excessively bulky, as in *E. Visnaga*, sometimes weighing as much as a ton, though there is every gradation from that to species as diminutive as the *Mamillarias*. The majority of globular stems like the *Melocactus*, with more or less strongly marked ridges from the summit to the base, usually slightly spiral, though frequently nearly vertical. In a few species these ridges are broken into a series of tubercles, which are sometimes nearly as distinctly separated as in the *Mamillarias*, and in others are partly confluent, until in the extreme cases they can only be traced by slight prominences upon the ridges. Whether moderately or strongly developed these projections are termed tubercles as in the other genera, and each bears a cluster of

spines, which vary in size from extremely small points that are scarcely discernible to gigantic and formidable horny spines 3 or 4 inches in length, straight and rigid, or hooked at the point; they are also sometimes in two series, the outer spreading and the inner erect. These furnish characters which assist in determining the species, and Labouret has given an elaborate system of classification, founded chiefly upon these appendages.

The flowers are produced from near the apex of the younger tubercles at the upper part of the stem, and are borne just above the cluster of spines. Sometimes they are clustered in a dense woolly substance somewhat like the cap of the *Melocactus* at the summit of the plant. The calyx forms a tube varying in length, being sometimes very long and funnel-shaped; it is usually scaly, the scales gradually passing into the lobes of the calyx, and these in turn into the petals, all the parts being very numerous, and not readily distinguishable from each other. The stamens are in great numbers, the filaments being united to the tube of the calyx. The style is columnar, the stigma with many rays, and the fruit is berry-like, to which the lobes of the calyx frequently adhere.

By various authors a few of the species have been separated under other generic names, as *Malacocarpus* of Salm Dyck, *Gymnocalcium* of Pfeiffer, and *Astrophytum* of Lemaire; but these have been found to be insufficiently distinct, and are now united with the *Echinocactus* by Hooker and Bentham.

The species are widely distributed, being found in Mexico and various parts of South America, but in the first-named country and adjoining regions they chiefly abound. There they are found in arid stony or rocky places, with very little soil for the roots, exposed to a high temperature in the summer and a much lower one in the winter—indeed, some endure frost and snow with such little injury that they might be reasonably expected to be hardy in this country. Some have been found to resist our winters, but comparatively few have succeeded at present, and doubtless the chief reason for this is the much greater amount of moisture in the soil and atmosphere.

Culture.—In growing the majority of the *Echinocactus* the chief points requiring attention are providing a well-drained soil, as they are all impatient of the least excess of water, and regulating the supply of moisture with much care. Most of the Mexican species in particular produce but slender and few roots, and only need small pots, as an excessive quantity of soil is positively injurious. These, too, will succeed in a temperature between 45° and 50° during the winter months, but then require scarcely any water.

Propagation.—Few of the Hedgehog Cactus produce offsets, and

are therefore not readily propagated in that way. When, however, the upper part is injured, or in the case of the columnar species if that portion is cut off, the lower part of the stem often produces several shoots like other Cactææ, and these can be treated as previously advised for offsets. In Mexico and elsewhere in North America certain species are very abundant in particular districts, some growing amongst the grass and scarcely visible, and travellers relate that where these are injured by fires or cattle they form a great number of shoots, becoming closely branched tufts or cushions of considerable size. The majority of the species can be easily grafted upon the *Cereus* or other genera except the *Opuntias*, to which they do not unite readily. Grafting is, however, unnecessary in most cases, as, except the very delicate species or abnormal crested varieties, they are best on their own roots. A few years ago Mr. Peacock had an interesting specimen of *E. Pottsi*, which was grafted upon three stems of *Cereus tortuosus*, and being raised several inches above the surface of the soil it had a very strange appearance.

SELECT SPECIES.

In so large a genus it is obvious that only a few can be named in these notes, but some of the most distinct of these in cultivation have been selected. Collections in general do not include perhaps more than a fourth of the entire number known.

ECHINOCACTUS BREVIHAMATUS, *Engelmann*.—A pretty and distinct species from San Pedro, very noticeable for the prominent globular tubercles, which might almost cause it to be taken for a *Mamillaria*. The stem is cylindrical, 5 to 6 inches high, and 4 to 5 inches in diameter. The spines are in two series, those of the ray twelve, half to three-quarters of an inch long, the central one 1 inch long, hooked at the point and yellowish brown in colour. The flowers are about 1 inch long, of a pale rose tint, but have a deeper coloured mid-vein, which brightens the flowers considerably.

E. CERATIOTES, *Otto*.—An elegant plant, which from its columnar growth and numerous rounded ridges has a very distinct appearance in a collection. The best specimens at Kew are 2 feet high, 8 inches in diameter at the base, and nearly as much at the top, except where young growth has been recently made. The ridges are twenty or more in number, half an inch deep, nearly as much across, somewhat rounded, and deep green. The spines are in clusters of twelve or more, 1 inch apart on the ridges, seven or eight of the outer spines being white, fine, and hair-like, four or five inner ones being rigid, 1 inch long, and of a bright reddish colour on the young growth, which has a pretty effect. It is a Chilian plant, and has been in cultivation for more than thirty years, but is rather scarce.

E. CYLINDRACEUS.—A Mexican species of formidable appearance, fur-

nished with long and powerful spines, which interlace over the plant in a strange manner, and affording it a most effectual protection. The stem is globular, in the largest specimen I have seen about 6 inches high by the same in diameter. The spines are horn-like, with nodes like the antennæ of some large insects. They are 2 to 3 inches long, interlacing flat on the surface of the plant. Others are spreading or curved, 3 to 4 inches long, flattened, with a reddish tinge. As a curiosity this is one of the most striking of the genus. It was introduced from the Colorado district in 1877, but is scarce in collections.

E. ECHIDNE, *De Candolle*.—A distinct and rather attractive plant, which owes its name apparently to its cylindrical form and abundant spines, and to the former character probably is due the name of Viper Cactus which some have applied to it. The stems are 6 to 12 inches high, 6 inches in diameter, with eleven to twelve ridges 1 inch deep, and spirally arranged on the stem. The spines are half to 1 inch long, rigid, greyish white, and tipped with reddish brown, and are in clusters of seven to eight, about an inch apart on the ridges, their base being surrounded by a thick grey down. The flower is of moderate size, and bright yellow.

E. ELECTRACANTHUS, *Lemaire*.—Distinguished by a bold appearance that renders it quite unique and easily recognised. Well-grown plants are from 18 inches to 2 feet high, and 1 foot in diameter, with twenty-two prominent angular ridges 1 inch deep and the same in width, deep green, but having a cartilaginous edge. Upon this are borne the spines in clusters of nine, 2 inches apart; the spines are equal in size, 1 inch long, rigid, horn-like, and yellowish, the central one bright red at the base. The flowers are clear yellow. It is a native of Mexico, whence it was introduced some thirty or forty years ago.

E. HORIZONTHALONIUS, *Lemaire*.—A beautiful species, which, according to Engelmann, is found growing in strong soil at the summit of hills from Pecos to El Paso and north to Dona, and where it flowers freely from April to July. It varies greatly in size, but is globular in form, with nine to ten thick ridges, on which the clusters of spines are very closely set, the number usually being seven, thick and rigid. The flowers are funnel-shaped, purplish pink, the sepals being tipped with a darker shade of purple, and have a pretty effect when opening in the sunlight. The stamens are very numerous, and in some flowers as many as 1200 have been counted; they also have a rather pleasing appearance, the yellow anthers contrasting with the white filaments.

E. INGENS, *Zuccarini*.—This is one of the few Echinocactus which furnish any product of service to man, and even in this case it is far from being in general use. Several species produce a woolly or silk-like substance at the summit of the plant, but in this one it is particularly abundant, and in Mexico, according to Dr. Parry, it is collected and employed for stuffing pillows. The filaments composing it are not long, but soft and silk-like even in colour, somewhat resembling a similar product found round the base of

the fronds in some species of *Cibotium*. In the Kew museum are good specimens of the substance. Cultivated plants are 8 to 10 inches high, of globular form, with twenty to twenty-one ridges 1 to 1½ inch deep, spirally arranged. The clusters of spines are half an inch apart, and contain twelve to fourteen grey spines 1 inch long.

E. LONGIHAMATUS, *Galeotti*.—Remarkable for the length of the spines which give it a very peculiar appearance. It is also interesting for a character which may probably have some bearing on the fertilisation. It

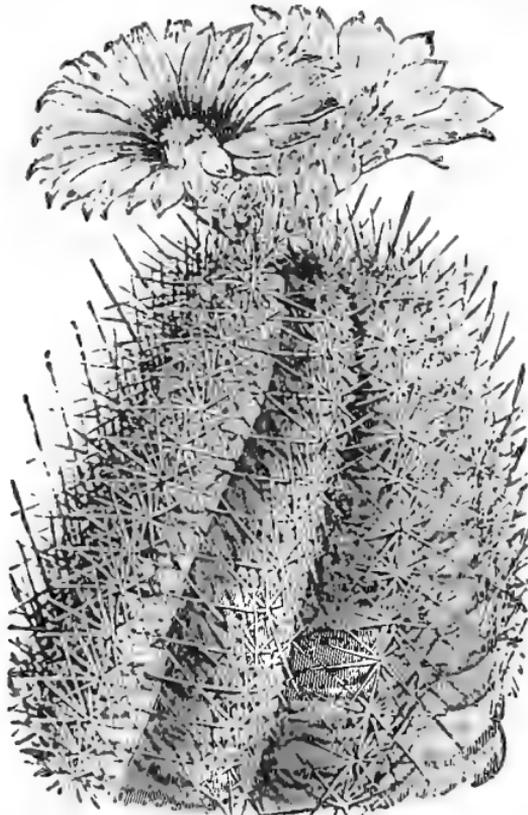


Fig. 6.—*Echinocactus rhodophthalmus*.

is well described by Engelmann as follows:—"The flowers form a groove just above the spines, separated from the spiniferous areolæ by two to five obtuse cylindric glandular bodies, which often exude a clear viscous liquid. I find them also in *E. setispinus*, *E. Emoryi*, and numerous others, and they correspond no doubt with the glands in the groove of *Mamillaria Scherri* and others. They appear with the flower, and are soft and fleshy

at the time, afterwards they become hardened, of the texture of the spines themselves, and persistent." It is difficult to tell what is the exact purpose these serve, as, beyond the fragrance of the flowers and the abundant stores of pollen, there are few temptations for insect visitors in most Cactaceous flowers. *E. longihamatus* is a native of the Rio Grande district near the Pecos and San Pedro rivers, and it was introduced by Galeotti in 1851. The stem is globular, 2 to 12 inches high, dark green or glaucous, with thirteen ridges of circular mound-like tubercles 1 inch high. These are about 1 inch apart, and bear six to fourteen strong rigid spines each, red when young, and brownish grey or black afterwards; the central one is sometimes 4 inches long, and terminates in a hook. The flower is 3 to 4 inches in diameter, with narrow yellow petals and greenish sepals. The fruits are described as "green and acid when young, but sweet when ripe." This species is particularly well grown in the Oxford Botanic Garden collection, which includes several large and handsome specimens.

E. RHODOPHTHALMUS, *Hooker*.—A neat and pretty species of moderate growth and flowering very freely. The stem is cylindrical, somewhat columnar in form, 6 to 8 inches high, 3 to 5 inches in diameter. There are eight to nine ridges closely set together, and upon these are the clusters of nine spines, each about 1 inch long, the central one the largest, the others spreading. These are in their earliest stages of a purplish hue, but as they grow older they lose the colour and become pale. The flowers are borne at the summit of the stem, are 3 to 4 inches in diameter, formed of narrow spreading petals, the colour being a pleasing shade of rosy crimson, much darker at the base, thus forming a ring of colour which greatly improves the appearance of the flower. The species is a native of San Luis Potosi in Mexico, and was introduced to this country by F. Staines, Esq., in 1847. It flowers during the summer months very freely, and is worth a place in any collection, but still continues rather scarce. The woodcut, fig. 6, is a reduced representation of the plate in the "Botanical Magazine," t. 4486, published in 1850. A variety named *ellipticus* was also figured in the same work subsequently, but it differs very slightly from the type.

E. MYRIOSTIGMA, *S.D.* (*Astrophytum myriostigma*).—Though in many respects this is totally distinct from the Hedgehog Cactus, yet botanically it has been found to be so nearly related to that genus that they could not be separated satisfactorily. It is very peculiar, and at a glance appears to be scarcely a living plant, so regular, rigid, and unplant-like is its form, that we might almost imagine it had been carved from a piece of stone. It seems to be an even greater departure from the forms of plant life with which we are most familiar than other Cactææ, strange as they are, for all vestiges of leaves or branches are lost, the spines and tubercles, their representatives in other species, have in this one disappeared, and the stem is bare except for some curious star-like scales or hairs. It forms a marked stage in the evolution of the genus, and appears to be the opposite extreme to the *Mamillaria*-

like species with prominent tubercles, between which almost every gradation can be found. The stem is seldom more than 6 or 8 inches high, 3 to 5 in diameter, and has five or six broadly triangular ridges 1 or $1\frac{1}{2}$ inch deep, with an even surface and edge devoid of spines. Upon the surface are a number of small grey or whitish flattened scales or hairs, which are thickly placed on the young growth, but fall off as the plant advances in age, and the lower part of the stem is sometimes quite bare. The flowers are produced near the summit of the stem, generally several together, which open early in the day and close in the afternoon from four to five o'clock, expanding on each succeeding day for nearly a week. Plants will also continue bearing flowers from June to September.

The scales above mentioned, when examined under a microscope of moderate power, are seen to consist of small hair-like filaments radiating from a central very short stalk. Appendages of this character are seen in few members of the family, and occurring as these do in the absence of the clusters of spines, it might almost be thought that they were debased forms of these. Against that fancy, however, is the fact that the scales are dispersed over the whole surface of the plant, and appear to be merely superficial, being easily removed with the finger-nail.

E. PFEIFFER, *Zuccarini*.—A bold handsome species, which at once attracts notice in a large collection, and is well worth a place in a small one. The stem is intermediate between cylindrical and globular, usually 1 foot high, 9 inches in diameter. The ridges are $1\frac{1}{2}$ to 2 inches deep, and $1\frac{1}{2}$ inch across at the base, triangular, deep green. The clusters of spines are 1 inch apart, and contain several yellowish-white rigid, semi-transparent spines about 1 inch long. In the Oxford garden is a beautiful specimen of this 2 feet high, one of the finest in this country.

E. SCOPA, *Pfeiffer*.—The Broom Cactus is a popular name applied to this Echinocactus, and it is an appropriate title, for the ordinary form is suggestive of a close birch broom, or more correctly the circular brushes employed in sweeping chimneys. It is extremely distinct, and by no means wanting in beauty of the Cactoid type. The stem in most cultivated specimens is cylindrical, 4 to 8 inches high and 3 to 4 inches in diameter, but it attains the height of a foot or more, upon which the numerous small ridges, thirty or more, are very closely set, and these in turn bear extremely abundant thickly set purple hairs, which cover the plant so densely that the surface is scarcely visible. The flower is neat in form, 1 to 2 inches in diameter; the petals narrow, serrated at the point, pale yellow, with bright crimson stigmas. It is a native of Brazil, whence plants or seeds were sent to the Continent early in the present century.

E. SCOPA CANDIDUS CRISTATUS.—This is one of the most extraordinary of the numerous monstrous forms that have been obtained from seed in the Cactus family. It is also one of the most beautiful, and, though rather delicate, it well deserves the little extra attention needed to keep it in health. No one would think for a moment that it is related to the species named

above, for it has undergone a most peculiar change. Instead of the regular symmetrical cylindrical stem it has become contorted, flattened, and irregularly twisted like the fasciated crest in the common Cockscomb. The surface is densely covered with small white tufts about the size of a large pin's head, from which arise numerous diminutive white hairs one-eighth of an inch long or less, and on the edge of the flattened lobes is a distinct furrow, which follows the twisting stem in each direction. In the sun the plant has a

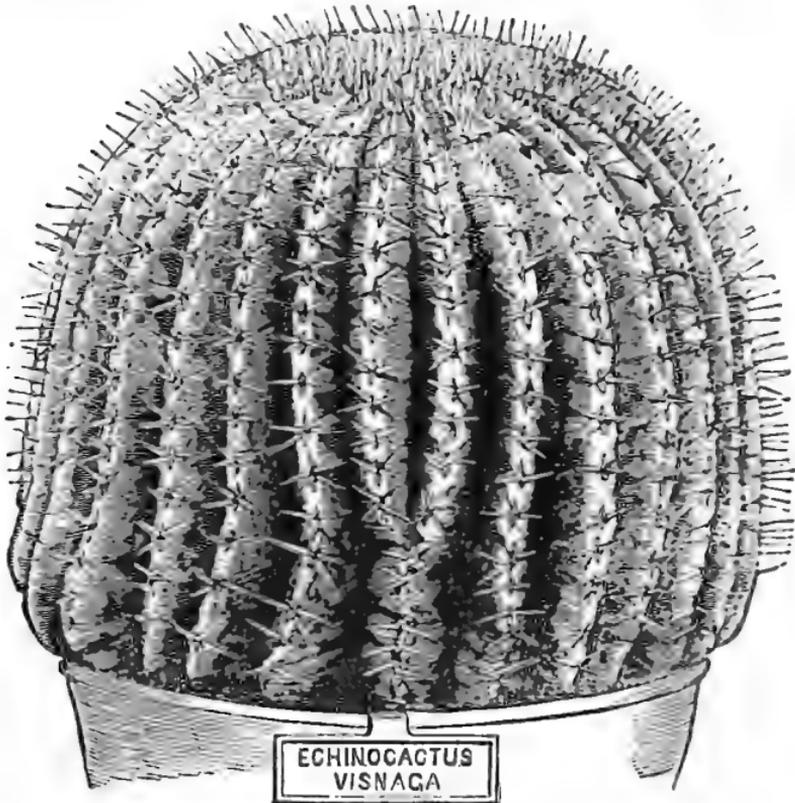


Fig. 7.

silvery appearance, which is very beautiful, but to preserve this dust or dirt of any kind must be carefully excluded from it. It is rather slow-growing, but succeeds best when grafted on a short stem of some *Cereus*, such as *C. Baumannii*, *C. macrogonus*, or *C. peruvianus*, and less difficulty is then experienced in keeping it in good health.

E. SIMPSONI.—This is especially deserving of notice as one of the hardiest of the genus, for it has been tried out of doors in some districts, and has

endured very low temperatures uninjured. It is said to be found farther north than any other Echinocactus, in Colorado at an elevation of 8500 feet, or still higher in more southern districts. The tubercles are loosely arranged, half to three-quarters of an inch long, with several white spreading spines and a central yellowish one. The flowers are purple or rose, rather small but numerous on the upper part of the stem. The plant is dwarf, rarely exceeding 6 or 8 inches high, and usually much less, and was introduced by Messrs. Backhouse several years ago.

E. VISNAGA, *Hooker* (the Toothpick Cactus).—Not only is this the most remarkable in its own family, but in some respects it is also one of the most peculiar in the whole vegetable world. Quite a sensation was created when in 1846 this extraordinary plant was first described by Sir William Hooker, in the *Illustrated London News*, and the particulars were published of the enormous weight and size which this species attains in its Mexican home. To F. Staines, Esq., of San Luis Potosi, is due the honour of introducing the first specimens to this country, which, however, was only effected after much labour and repeated trials, as the plants had to be conveyed many hundreds of miles across a most difficult country, with very rough roads, or in some parts none at all, and the only vehicles that could be employed were large waggons drawn by mules or oxen. The plants grow in deep ravines of the loftiest

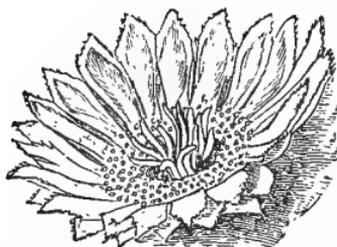


Fig. 8.—Flower of *E. visnaga*.

mountains of the district amongst large stones and rocks, with very little soil; but there they reach an enormous size, and being very slow in growth it is reasonably supposed that some of the largest must be several hundred years old. The finest specimen yet sent to this country was 9 feet high, $9\frac{1}{2}$ feet in circumference, and weighed 1 ton; but it died after it had been at Kew about a year. Smaller but still wonderful examples were subsequently sent,

the principal weighing about 713 lbs., was 4 feet 6 inches high, the longitudinal circumference was 10 feet 9 inches, the transverse circumference 8 feet 7 inches. This also has been lost, and there are now few large plants in cultivation, the two handsome specimens which so long formed a standing attraction in Mr. Peacock's collection having been lost a few years since.

The stem is cylindrical, with forty to fifty ridges, upon which the pale brown sharp rigid spines are closely set in clusters of four, 2 or 3 inches in length, and these, it is said, are used by the Mexican settlers as toothpicks. The flowers are borne at the summit of the plant in a dense woolly substance; they are 3 inches in diameter, with narrow petals serrated at the apex, and bright golden yellow in colour. The name *Visnaga*, or *Bisnaga*, is considered to be a corruption of *Bisacuta*, twice-pointed, or sharpened on both sides, in reference to the spines.

The woodcut, fig. 7, has been prepared from a photograph of one of Mr. Peacock's fine plants, which unfortunately have now been lost. These were about 2 feet high and as much in diameter, and continued in vigorous health for several years, but ultimately were damaged by a "drip" from the roof of the house, and rapidly decayed, despite the care exercised to prevent it.

DISCOCACTUS, *Pfeiffer*.

The two or three species which have been assigned the generic name of *Discocactus* are amongst the least interesting members of the whole family, and certainly their horticultural value is small. They are dwarf and semi-globose in form, very suggestive of an *Echinocactus* in appearance, and some writers have thought that the two genera were not sufficiently distinct to be separated. It must not, however, be confounded with the *Disocactus* or *Disisocactus biformis* of Lindley, which is a totally different plant, now referred to *Phyllocactus*. The principal characters adopted by Hooker and Bentham are the following:—Calyx and tube extending beyond the ovary, slender; base naked, smooth; lobes indefinite, exterior reflexed, interior larger. Petals in two series, spreading, interior smaller. Stamens indefinite; filaments adnate to the tube of the calyx, interior longer; anthers small. Stem depressed, ribbed; ribs few. Flower usually solitary from the apex of the plant, and fragrant.

The species are natives of Brazil and the West Indies, inhabiting dry sandy regions, and are found rather difficult of cultivation, and at the present time I do not know one collection which contains living plants. They require a warm sunny position and great care in supplying water, as the slightest excess results in the death of the plants.

D. INSIGNIS, *Pfeiffer*.—This is the best known, and is chiefly noteworthy for the fact that its flowers possess an extremely agreeable fragrance, which has been compared to that of Orange blossom. The stem is semi-globose, with nine or ten obtuse ridges, and a crown of white wool-like substance, from which are produced the long and slender flowers, having the sepals pink, and the petals white or blush-tinted. *D. alteolens* has the stem of a much darker green colour, and flowers with a less pleasing odour.

CEREUS, *Haworth*.

(The Torch Cactus.)

Leaving the globose or tubercled *Cactææ* represented by those previously described, we find in *Cereus* a greatly different mode of growth, the stem being greatly elongated, usually of small diameter in proportion to its height, frequently much branched, but bearing parallel ridges

from apex to base, upon which are arranged bundles of spines, as in other genera. In height these plants are the giants of their family, some forming in the native habitats enormous columns 40 to 60 feet high, while even in cultivation it is not uncommon to find specimens 15 to 20 feet in height. Some are very rapid growers, and make large plants in a few years. Others, again, are so slow in growth that a dozen years seem to make no appreciable difference in their size. There are, however, two very distinct sections or groups of species of the true *Cereus*, which differ considerably in habit; one species being distinguished by their erect rigid stems, and the other by the procumbent or trailing slender stems. The plants included in both bear handsome and abundant flowers, but the creeping or trailing forms are the most beautiful, and contain most of the much-famed Night-flowering Cactææ. The genus *Cereus*, however, as now constituted includes a large number of plants which were formerly assigned to other genera, but which modern botanists consider are entitled to no higher rank than sub-genera. Under the name of *Cereus* are therefore arranged over two hundred species, natives of tropical America, the West Indies, and Galapagos Islands, from regions differing considerably in temperature, but generally agreeing in the peculiar dry sandy or rocky nature of the soil they inhabit.

Hooker and Bentham thus characterise the genus and adopt the following subgenera as pointed out by Dr. Engelmann:—Calyx tube produced beyond the ovary; lobes numerous, exterior scale-like, interior elongated, spirally imbricated. Petals indefinite, larger than the calyx lobes, spreading. Stamens numerous; filaments adnate to the base of the calyx, the inner free. Ovary exserted, scaly. Style filiform. Stigmas five to indefinite. Fruit scaly or tuberculated. Flowers lateral, often nocturnal.

Echinocereus.—Calyx tube short, sub-campanulate. Stigmas thick, green. Seeds tuberculated. Stem dwarf, often sub-globose.

Eucereus.—Calyx tube long. Stigmas pale. Seeds smooth, rarely rugose. Stem tall. Spines in flower bearing and sterile parts of the plant not different.

Lepidocereus.—Calyx tube short, scaly; lobes few. Petals fleshy. Stigmas pale. Seeds smooth. Stem tall. Spines of floriferous or sterile fascicles alike.

Pilocereus.—Calyx tube short, scaly; lobes few. Stigmas pale. Seeds smooth. Stem tall. Sterile and floriferous fascicles dissimilar.

Echinopsis.—Calyx tube elongated, downy; lobes numerous. Stamens in two series; the exterior adnate to the calyx tube, inner free. Fruit scaly. Stem depressed, ribbed, globose, or cylindrical.

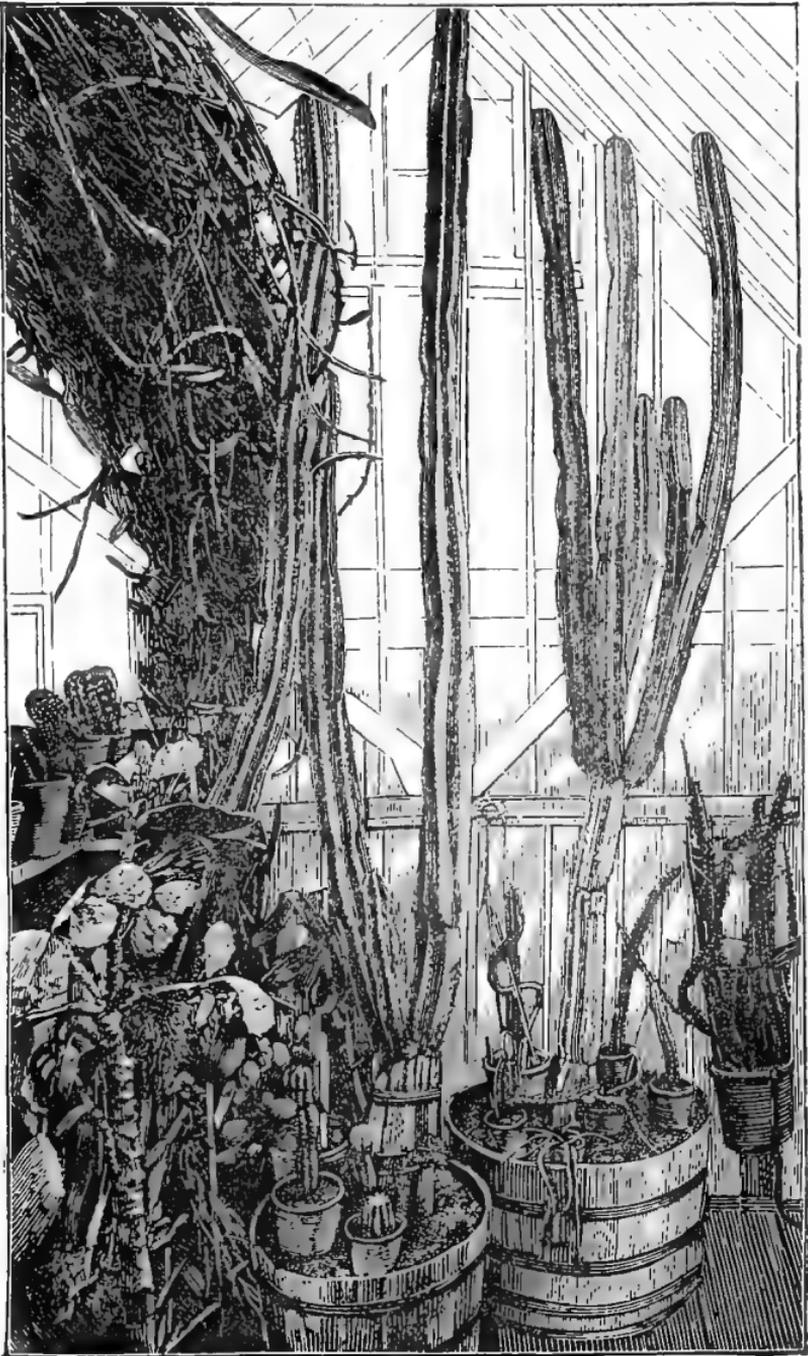


Fig. 9.—*Cereus peruvianus* at Cromwell House.

Culture.—In so large a genus there must necessarily be some difference of cultural requirements, but this chiefly refers to the temperature, and if the region and elevation at which the plant is found is known there will be comparatively little difficulty in ensuring its success. Most of the true *Cereus* (the *Eucereus* of the above table) need a tropical temperature, with similar soil to other genera, though as a rule the strong-growing species can be safely encouraged with a little well-decayed manure if necessary. The trailing sorts need very little rooting material, and some indeed, as *C. grandiflorus* and its allies, obtain sufficient nutriment by their stem roots alone when upon a suitable wall or trellis. They can all be readily propagated by cuttings of the growth, and even large portions of the stem will root if separated from the parent and placed in dry soil. So readily are roots produced that in some parts of tropical America live fences are formed by placing portions of the stems in closely together, and it is said that they rarely fail. The use of certain species as stocks for grafting other *Cactææ* upon has already been noted, and it need only be added that almost any species is suitable for the purpose provided it be not of too slow growth.

SELECT SPECIES.

It will be convenient in considering these to take the true *Cereus* first.

CEREUS PERUVIANUS, *Pfeiffer*.—Under various names this *Cereus* has been known to botanists and grown in European gardens for upwards of 150 years, and it is therefore the most familiar example of the columnar species. The titles by which it has been designated, such as pentagonus, hexagonus, and heptagonus, refer to the number of ridges or angles upon the stem, and owing to these varying considerably the same species in different stages has received the respective names. *C. pentagonus* of Haworth has been regarded as distinct from *C. peruvianus*, but there appears to be little doubt that in a broad sense all that have been described under these names are simply variations of one type represented by *C. peruvianus*, which is a native of many districts in tropical America. There with *C. giganteus* and other allied species it forms a remarkable feature, the tall rigid stems being sometimes freely branched in candelabra-like manner, and producing at certain seasons abundance of beautiful flowers.

In cultivation this *Cereus* grows rapidly, and soon, if unrestricted, attains a height of from 12 to 20 feet, a few specimens being seen as much as 30 feet high. Probably the most remarkable in England are those in Mr. Major's collection at Cromwell House, Croydon, of which an engraving is given in fig. 9, prepared from a photograph very kindly furnished by Mr. Major. The original plant (the central one in the figure) was bought in Holland in 1852; but by cutting down the stem at intervals a family of fine specimens has been obtained, some of which are equally as large as the parent. The old stem

has two branches, each 4 feet high, three others 6 feet high, and a small one 18 inches in height. One straight unbranched stem, the first top taken off, is 13 feet high. The next cutting developed into a fine plant, now in Mr. Peacock's collection, about 14 feet high, with several branches, and which last year had as many as thirty-six flowers. The fourth plant is 8 feet high, with two branches; the fifth, which has been topped, has two branches 11 feet high, two 6½ feet high, and one 18 inches in height. It will thus be seen that one plant has produced a total length of stem, counting all the branches, of 80 or 90 feet, of an average diameter of 5 inches, in about thirty years. The Cromwell House collection includes many rare and beautiful Cactaceous plants; but this group of *Cereus* is undoubtedly the most remarkable of all.

Plants of moderate age generally have the stem from 3 to 6 inches in diameter with narrow ridges 1 to 1½ inch deep and 2 inches apart, very distinctly marked in the young growth, but on older stems the ridges are nearly lost. The clusters are 1 inch apart, containing six to eight brownish spines half to 1 inch long on a small brown tuft of wool-like substance, which is sometimes scarcely perceptible. The stem is usually deep green, but the young growth occasionally assumes a glaucous blue colour almost as strongly marked as in *C. Jamaru*. The flowers are white or sometimes tinged with red, 4 to 6 inches in diameter, and are borne freely during the summer months on the upper portion of the stem or branches.

C. PERUVIANUS MONSTROSUS.—This is a peculiar variety of the fasciated or contorted type so frequent in these plants. The substance of the stem is most strangely twisted and irregular in form, grotesque in the extreme, and not bearing the slightest resemblance to the species except in the flowers. Specimens 4 or 5 feet high are sometimes seen in cultivation, but one of the largest is in the possession of Dr. Paterson, Fernfield, Bridge of Allan, Stirlingshire, which is very old, and shows the peculiar character of this strange variety remarkably well. A smaller form of this variety named minor is also grown, and rarely exceeds 6 or 8 inches in height, peculiarly contorted, but not so fasciated as the other.

CEREUS GIGANTEUS, Engelmann.—No stranger phase of vegetation can be conceived than that formed by the Giant *Cereus* in the districts of Mexico where it abounds, for these enormous columns of vegetable matter have been recorded as attaining the height of 60 feet, and specimens 40 to 50 feet high are of frequent occurrence. In particular localities, too, they are exceedingly numerous and near together, views of the scenery in such districts having a most peculiar appearance. Travellers have without exception commented in wondering terms upon these singular occupants of rocky or sterile soil; but one of the best descriptions is that by Möllhausen in his "Diary of a Journey from the Mississippi to the Coasts of the Pacific," in which he remarks: "The absence of every other vegetation enabled us to distinguish these Cacti columns from a great distance, as they stood symmetrically arranged on the heights and declivities of the mountains,

to which they imparted a most peculiar aspect. Wonderful as each plant is, when regarded singly, as a grand specimen of vegetable life, these solemn silent forms, which stand motionless even in a hurricane, give a somewhat dreary character to the landscape. Some look like petrified giants stretching out their arms in speechless pain, and others stand like lonely sentinels keeping their dreary watch on the edge of precipices." In Dr. Engelmann's magnificent work on the Cactaceæ of the Boundary Survey is an admirable engraving of such a scene on the banks of the Gila, New Mexico, from a drawing by Möllhausen ; and so well does this portray the characters that it has been reproduced in several works (including the *Flore des Serres*, vol. xv., and the *Treasury of Botany*). Some of the giants are shown with enormous stems, from which proceed a number of branches, which, when a short distance from the main stem, assume a rigidly perpendicular position, and give a candelabra-like appearance to the plant. One is represented with eight branches, varying in size, while older specimens which have lost the greater portion of the soft cellular tissue have only the woody or fibrous matter remaining, and this has been most strangely torn, until the ends of the branches resemble birch brooms. In this state they remain for many years, still further increasing the peculiarities of the landscape.

Julius Froebel has given a very graphic description of a *Cereus* district in his "Travels in Central America," page 498, which is worth reproduction here : "In the lower part of the valley of Santa Cruz the gigantic columnar Cactus, *Cereus giganteus*, is first seen upon the road. The inhabitants of the country call it Saguaro ; but various authors, and recently Bartlett, have applied the name of Pitaya (*Pita-haya*) to this remarkable plant. This name, however, belongs to another species of Cactus of a similar but much lower growth. The Saguaro presents a thick fluted column, the size of a man's body, and 30, 40, and even 50 feet high, with sometimes three or four branches at its top, the whole looking like a gigantic-candelabrum. The fig-shaped edible fruit grows at the edge on the top of the columns ; and from the great height of the latter it would be difficult to get at them did not this remarkable plant itself afford the means of reaching it. The old stems, when decayed, split into a number of thin poles, standing in a circle the height of the entire column, enveloped in a loose network ; and by the aid of these the traveller is enabled to knock down the fruit. I have been told that these poles form an article of export from the port of Guaymas, and in Europe are made into walking sticks, and sold under the name of 'Spanish canes.' I cannot, however, vouch for the correctness of this account. The Pimas at the old Mission of San Xavier del Bac had a large store of Saguaro fruit, which is used as food in various ways. It is eaten fresh ; the sap is boiled to a syrup, known throughout Sonora by the name of 'Miel de Saguaro ;' and a flour is prepared of the cleaned and dried seeds, which have some resemblance in appearance and taste to Poppy seeds, and are contained in the fruit in great quantities. This flour is made partly into bread and partly into a chocolate-like drink,

called Atole. The fruit of the Pitaya is said to be far better than that of the Saguaro. Both are of great importance to the population of Sonora. In some bad harvests occasioned by the want of rain, shortly before my journey through this State, a large portion of the inhabitants were obliged to live on these and other wild Cactus fruits."

Cultivated plants of this *Cereus* are mostly of small size, not exceeding 4 or 5 feet in height, and the majority are much smaller. These are generally inclined to be globular when young, but as they advance the ridges become apparent, of which there are generally twelve, 1 inch deep and thick, and $1\frac{1}{2}$ to 2 inches apart. The spines are ashy grey, twelve to twenty or more in a cluster, rigid, half to 1 inch long, the clusters being about half an inch apart. The stem is 6 inches to 12 inches in diameter in cultivated plants, but becomes much larger in its native habitat. The flowers I have not seen in England, but they are described by Engelmann as creamy white, the petals $1\frac{1}{2}$ inch long and three-quarters of an inch broad. By the same authority it is said that the fruit has the hardness of a green Cucumber, bursting open with three valves, and then looks like a flower, owing to the abundant crimson pulp inside with black seeds. This pulp, which has the consistency of a fresh Fig, separates from the other portion of the fruit when ripe and falls to the ground.

Some difficulty is experienced in growing *C. giganteus* in this country, its progress being very slow in its early stages, and in reference to this it is worthy of remark that Engelmann mentions "the young plants are almost always found under the protecting shade of some shrub, especially *Ceradium floridanum*, so characteristic of the barren wilderness." It would therefore appear that shade is beneficial in assisting the growth at first, and the hint might prove serviceable to growers who are not very successful with it. The seeds germinate freely, and those distributed by Mr. Thurber in Europe and America some years ago have yielded a large number of plants, so that the species is by no means rare. Closely related to this is *C. Thurberi*, which is found in some districts of Mexico, and is said to bear a fruit like an Orange, 3 inches in diameter, with crimson pulp. It is termed Pitahaya by the natives, and under that name is mentioned by several travellers.

Many more species might be described, but it will suffice to mention a few of the most interesting, as large collections are seldom seen in cultivation. *C. niger* is noteworthy for its peculiar dark green colour, which is especially observable in the young growth. *C. Jamacaru*, a Brazilian species, is very distinct and even handsome, for the ridges are very prominent, and the colour of the young shoots is quite a glaucous blue, sometimes very bright. *C. Tweediei* is a pretty and distinct species, with slender stems and tubular orange yellow flowers 2 inches long, and crimson stamens. It is free, and when in flower is very beautiful.

C. triangularis, an old inhabitant of English gardens, is easily distinguished by its triangular stems, and is remarkable for its bright scarlet fruit, the size of a goose's egg, the flavour of which is compared to Straw-

berries ; indeed the plant has been called the Strawberry Pear. This is often grown trained to the roof of a house, and some specimens so treated at Kew have a most beautiful appearance when in flower. One plant has had seven or eight blooms open at the same time, each of these measuring 12 to 14 inches in diameter, scarcely less handsome than *C. grandiflorus*. The plants above mentioned usually flower in August or September. *C. repandus* also has a fruit which is considered to resemble a Strawberry in flavour, and the dry stems were at one time used as torches to assist the natives in catching fish. *C. macrogonus* is a quick-growing species, and is therefore useful for grafting many other Cactæ upon, as has been already noted. *C. candicans* is notable for its slow growth, and as far as I can ascertain it has never flowered in this country. Mr. Major has a plant in his collection at Cromwell House which is nearly thirty years old, and is not 2 feet high— one of the most extraordinary instances of slow growth which has come under my observation.

The climbing or slender-growing species, which include some of the most beautiful and useful of the *Cereus* in a horticultural point of view, are numerous, but the following may be named as particularly worthy of culture :—

C. GRANDIFLORUS, *Haworth*.—The Night-flowering *Cereus* has gained a fame which entitles it to prominent notice, and plants might well be included in every garden, for its flowering is a source of interest to the least observant persons. In the character of producing its blooms at night it is not alone, as several of the slender-growing species have a similar habit, but none equal this in beauty and fragrance.

“That flower, supreme in loveliness and pure
As the pale Cynthia's beams, through which unveiled
It blooms, as if unwilling to endure
The gaze by which such beauties are assailed.”

The flowers are really magnificent, and a plant with a dozen or two expanded at the same time has a superb appearance, particularly in the early evening when the flowers first expand, and the powerful fragrance they emit is very agreeable, having been not inaptly compared to Vanilla. The stem is nearly cylindrical, with a few faintly marked ridges, bearing small clusters of spines, and rarely exceeds 1 inch in diameter, but attains a length of many feet, freely branching. The flowers vary in size from 6 inches to 12 inches in diameter, the usual size being 8 or 9 inches ; the sepals are narrow, acute, and spreading, about one-quarter of an inch broad, 4 to 5 inches long, and thirty to forty in number, forming a beautiful fringe round the broader pure white petals, which are more in the form of a cup, the stamens being extremely numerous with very long filaments. Mr. Major, however, informs me that he has seen two very distinct forms, one having the petals distinctly cupped, and the other with them spreading more like the sepals, the two forms also differing slightly in colour.

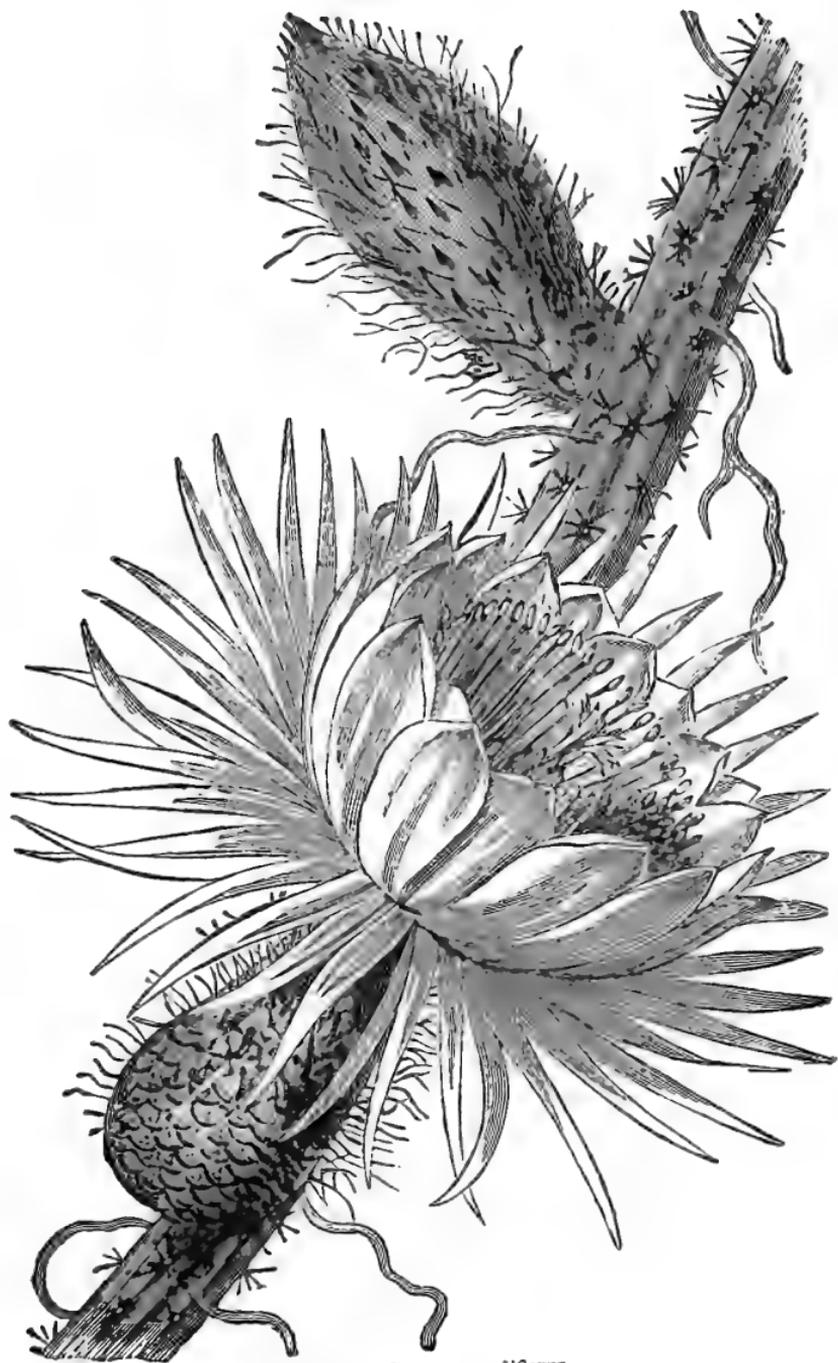


Fig. 10.—*Cereus grandiflorus*.

Large specimens of this *Cereus* are not rare in old gardens, but the finest known to me is one in a stove at Leigham Court, Streatham, the residence of Mrs. Treadwell. This covers a space on the back wall about 30 feet long and 3 or 4 feet wide. The old stem and roots are lost, the plant subsisting entirely upon the moisture in the atmosphere of the house, and that furnished by the moss with which the trellis is packed, and in which the branches have freely rooted. About forty grand flowers have been produced by this plant in one season, which generally expand in batches of a dozen or so, and the only encouragement the plant receives when making its growth is syringing it with clear water and occasionally with very weak liquid manure. Flowers were kindly sent me by the gardener, Mr. E. Butts, and the characters are well portrayed in the woodcut (fig. 10). Another very large specimen is grown in a house at Pendyffryn in Wales, which Mr. Siddall of Chester informs me has had from sixty to eighty flowers open at one time.

CEREUS GRANDIFLORUS MAYNARDI.—This magnificent hybrid is unfortunately now rather scarce, yet its beauty and distinctness entitle it to prominent attention. In 1837 Mr. H. Kenny, gardener to Viscount Maynard, Easton Lodge, Dunmow, Essex, crossed *C. speciosissimus* with pollen from *C. grandiflorus*, and, the fertilisation proving successful, seeds were obtained which produced the plant under notice. This combined the characters of the parents in a striking manner, the habit of growth and form of the flowers of *C. grandiflorus*, with the addition of the rich colour of *C. speciosissimus*, rendering it invaluable. The flowers are 9 to 11 inches in diameter, and 7 to 9 inches long, the petals more cupped than in the ordinary *C. grandiflorus*; they are rich red with a tinge of orange, and usually last for two or three days, opening every evening. At its original home, Easton Lodge, now the residence of Lord Brooke, the plant had been quite lost, until recently, by the generosity of Mr. Major of Croydon, a specimen was furnished to the gardener Mr. H. Lister.

C. SPECIOSISSIMUS.—Though stronger in growth than the majority of the trailing species, this may be considered in that group, as it is more frequently grown trained to a wall, rafter, or trellis than in any other way. With very slight support it will assume an erect habit, but the upper parts of the branches then hang downwards, indicating the natural habit of the plant. It is a superb plant, and when in flower it cannot be rivalled in brilliancy by any other plant grown under glass. Large specimens are frequently seen in old gardens, but one of the most notable that I have seen is at Orsett Hall, Romford, the residence of Captain Whitmore. This has about thirty stems, each 6 to 8 feet high, which have been produced by repeatedly cutting down the main stem, and during April or May there have frequently been from sixty to eighty buds and flowers upon the plant at one time, sometimes twenty being fully expanded. This plant is in a large pot, and has not been disturbed for many years. The gardener, Mr. R. Castle, states that all the assistance it requires is a good supply of water at the time of flowering, with a little weak liquid manure occasionally. It is, however,

a fast-growing species, and is benefited by a rather richer compost than that usually afforded such plants, a small proportion of old manure being incorporated with the loam and sand employed.

The stems often assume a reddish hue, are about $1\frac{1}{2}$ to 2 inches in diameter, with three to five rather deep ridges, furnished with prominent clusters of spines in dense tufts of white wool-like substance. The flowers vary greatly in tint, usually presenting a beautiful combination of scarlet and purplish crimson, the petals being quite glossy and shining in sunlight. They vary in size from 6 to 8 inches, the petals expanding fully with abundant stamens. When cut and placed in water they will last three or four days, retaining all their brilliance of colour for that period. The fruits are green, ovate in form, 1 to $1\frac{1}{2}$ inch long, with a pleasantly flavoured subacid pulp, somewhat suggestive of nearly ripe Gooseberries.

The species was originally introduced from Mexico to Madrid, and was thence sent to Paris by the Comte de Salm. It passed to this country, and is believed to have first flowered in the collection of the Comtesse de Vandes about 1820, when it was figured in the "Botanical Register" (t. 486).

Numberless varieties have been raised from *C. speciosissimus*, as it seeds freely and crosses readily with other species. Many years ago Mr. Donald Beaton raised scores of seedlings from crosses between that and *C. flagelliformis*, and has stated that he never found a barren seedling. Mr. Pressley, gardener to W. Boyd, Esq., Plaistow, also raised some seedlings about 1832, some of which were exhibited, one named *lateritius* being described as of a very beautiful scarlet tint. Much attention was given to these plants about that time, for Sir Edmund Antrobus is said to have exhibited specimens with from 200 to 300 flowers each, which were as greatly admired then as large specimen Orchids are now. I have been informed that an extremely large plant of this *Cereus*, producing hundreds of flowers every season, is grown on the back wall of a vinery at The Grange, Barnet, the residence of Sir Charles Nicholson, Bart.

C. SPECIOSISSIMUS HYBRIDUS [MALLISONI].—A beautiful hybrid from *C. speciosissimus* (the seed parent) and *C. flagelliformis*, which is deservedly a great favourite in many gardens. It was raised over fifty years ago by Mr. Mallison, gardener to Sir Samuel Scott, and is curiously intermediate between the parents, resembling the seed parent in the size, colour, and form of the flowers, and the other in habit, though with rather stronger stems. It has bright rosy crimson flowers 4 to 6 inches in diameter, very freely produced, and most handsome when the stems are trained to a rafter and then allowed to hang over a path. It is grown in this way at Kew, where a fine specimen is grafted upon a stem of *C. MacDonaldiæ*. It requires a rather warm position in a stove.

C. MACDONALDIÆ, *Hocker*.—A handsome slender-stemmed species, which ought to be grown much more generally than it is at present, for it is one of the finest of the night-flowering Cactææ. It resembles *C. grandiflorus* in the size and appearance of the flowers, which are frequently 12 to 14 inches in

diameter, with creamy white lanceolate petals with an outer fringe of narrow yellow sepals. The growth is, however, different, the surface of the stem being covered with irregular tubercles, not distinctly ridged as in most other species; it is slender, usually half to 1 inch in diameter, and trailing. A fine specimen is grown in the Cromwell House collection, trained over the wire arch shown in fig. 9, p. 41, and this plant has produced flowers 14 inches in diameter. Mr. W. Wright, the gardener in charge of this collection, has crossed *C. MacDonaldiæ* with pollen from *C. speciosissimus*, which may be expected to yield an interesting and beautiful progeny. The species was introduced from Honduras to Kew by Mrs. General MacDonald, and first flowered in the Royal Gardens in 1851.

C. FLAGELLIFORMIS, *Haworth*.—Under the popular names of Whip-cord and Rat's-tail Cactus this plant is well known, and probably is the most generally grown of all the *Cereus*. It is one of the oldest-known in England, having been introduced in 1690 by the Earl of Portland, the same year as *C. triangularis* made its appearance here. The plant was cultivated by Miller, and was included in the Kew collection in Aiton's time. In reference to its habit and the number of ridges on the stem it was named by some of the old writers *Cactus repens decemangularis*, and amongst other still older titles bestowed upon it was *Ficoides americanum*, in reference to its native country, Peru, and contiguous districts of South America. The stems are very slender, about half an inch in diameter, and they grow to the length of 4 or 6 feet, being of pendulous habit. At Kew there is a fine example grafted upon a stem of *C. rostratus* 6 feet high, which has a dense cluster of branches, about sixty, each 4 or 5 feet long. When flowering this has a most striking effect, the bright rosy-coloured flowers, which are produced in spring and early summer, being extremely attractive. Owing to its very pendulous habit this species is generally seen to better advantage grafted on a stem of the columnar *Cereus*, upon any of which it seems quite at home. When on its own roots it appears to succeed best in a loamy compost, porous, but heavier than is usually given to *Cactææ*.

Many other trailing *Cereus* could be named, such as *C. Napoleonis*, *C. rostratus*, *C. Lemoinei*, *C. Karstenii*, *C. nycticallis*, *C. Cavendishi*, *C. serpentinus*, and *C. colubrinus*, but they are mostly rare, and as regards their floral attractions, those already described are preferable. Where, however, the space can be afforded them they are all worth growing and for training on arches like those in the *Cereus* house shown in fig. 9 they are extremely interesting and beautiful, as by associating several together a lengthened period of flowering is insured. If the wire netting be packed with moss, and this is occasionally damped in hot weather, it affords all the moisture the plants need.

The true *Cereuses* having been noticed, the three other groups which are now referred to the genus *Cereus* demand attention.

ECHINOCEREUS.—In general appearance, and particularly in the

regularity and beauty of their spines, the plants grouped under the head *Echinocereus* are somewhat suggestive of the *Mamillarias*, or in a few cases of the *Echinocactuses*. The stems are mostly cylindrical, of moderate height, much dwarfer than the majority of *Cereuses*, and approaching to a semiglobose form; they are marked by longitudinal ridges either straight or spiral, and these bear the fascicles of spines sometimes in two series, differently coloured. The flowers differ very much in size, colour, and beauty; some do not exceed an inch in diameter, and others are fully 4 inches across; some are green or dull yellow, while others are of the brightest yellow, rose, or purple. In a horticultural point of view they are very interesting, for several of the most ornamental and free-flowering species are hardy in dry positions, and they all succeed in a cool frame or house, being therefore especially suitable for amateurs who have no convenience for growing the tropical *Cactææ*. Another important and valuable quality is the length of time the flowers last, in which respect they are quite different from the majority of their allies. Some will expand every day for a week, and in a few exceptional cases the flowers will continue opening at intervals for twelve or fourteen days. They also display a great partiality for sunlight, and generally open about mid-day or early in the afternoon, closing before dusk. The fruits of most of the species are edible, and pleasantly flavoured with the peculiar Gooseberry-like acidity, which it has been already stated is characteristic of the family; and further, some of them assume rich tints in ripening that are very ornamental.

The culture of the *Echinocereuses* is very simple, as where they are grown out of doors it is chiefly necessary to protect them from excessive rain or stagnant moisture in the soil, as they will endure very low temperatures, provided the soil and air be dry, without the slightest injury. This is the great difficulty with which we have to contend with in growing them out of doors in England; and it is safest to have a cool frame for their winter quarters, or a suitable covering if they cannot be readily moved. Mr. E. G. Loder, Weedon, Northampton, has been very successful with these plants, and on several occasions he has shown groups of the most attractive species at Kensington, when they caused quite a sensation, as few are aware of their beauty when in flower. The same gentleman fully explained his system of treatment at one of the evening meetings of the Royal Horticultural Society at Burlington House, the substance of which is the same as that indicated in the preceding notes; but plants have been left out at Weedon unprotected throughout severe winters. The *Echinocereus* in common with a few *Echinocactuses* and *Opuntias* do not, however, succeed on a level surface, and when placed out they should have a dry sloping bank near a wall,

preferably in a southern aspect, as to insure their flowering well they need a thorough ripening.

E. GONACANTHUS.—This and the following were collected in the Rocky Mountains, and shown by Mr. Loder at Kensington on June 14th, 1881, when the Floral Committee awarded first-class certificates for them. Since then they have become great favourites with many persons, and the number of their cultivators is fast increasing. *E. gonacanthus* in particular is extremely handsome when flowering, and is not surpassed by any related species. It is dwarf in habit, rarely exceeding 6 inches in height, the stems ribbed and spinose, bearing the flowers in clusters on the upper part. The blooms are about 3 inches long and 2 inches across the mouth, of an intensely bright orange red, and possessing a lustre like that seen in the petals of some of the *Phyllocactus*, the bright green stigmas contrasting strangely with the other portion of the flower. They also continue expanded for a week or more, and under favourable circumstances last for nearly a fortnight.

E. FENDLERI.—Very distinct from the preceding, but almost as beautiful, is *E. Fendleri*, and the two make excellent companions for a rockery or similar situation. The last-named is rather stronger in growth than the other, reaching a height of 8 inches, cylindrical in form, and bearing two series of spines, the smaller radiating laterally and light in colour, the central ones much longer, very dark, nearly black, and upturned. Even when not in flower the plant is attractive, and is easily recognised when once seen. The flowers are sometimes as much as 4 inches in diameter, and about the same in length, varying slightly in hue from a dark rose to a rich shining crimson, very handsome and striking in bright sunlight. They have the peculiarity, however, of only remaining open for two or three hours at mid-day, closing and re-opening for a week or more. Engelmann states that in Mexico this opening and closing of the flowers is very constant, the former taking place at noon on each day, and the closing about 2 P.M., but under our cloudy skies the regularity is not so marked, and in dull weather the flowers often refuse to open for several days. The early summer months is the time at which the blooms usually appear, and like *E. gonacanthus* this species requires a sandy or rocky soil, though both can be well grown in properly drained pots.

Numbers of other species are known, but few are in general cultivation, though some may be briefly mentioned as distinct and beautiful. One of the best is *E. dasyacanthus*, which is especially notable for its regular and handsome fascicles of spines. Its flowers are also large and bright yellow, being produced near the summit of the plant, and opening about noon. In common with some other members of the genus it has a remarkable number of stamens, as many as 1700 having been counted in one flower, while the fruit when ripe is of a fine purplish colour. *E. ctenoides* also has large yellow flowers and closely set fascicles of spines on narrow spiral ridges. *E. caespitosus* has fine and pretty spines symmetrically arranged; *E. longisetus* is notable for its long deflexed spines; *E. stramineus* forms dense masses of heads like

some of the *Mamillarias*, has long formidable spines, and bears dark rose-coloured flowers. *E. phæniceus*, *E. pauciflorus*, *E. chloranthus*, and *E. viridiflorus* are also curious forms. One very distinct variety in Mr. Boller's collection must not be omitted—namely, *E. pectinatus rufispinus*, which has numerous neat brown spines, and bright shining rose-coloured flowers 3 inches in diameter.

PILOCEREUS.—The “Old Man” Cactus is one of the curiosities of plant life which always attract attention, and its appearance is certainly sufficiently strange to excite some surprise. *Pilocereus senilis* derives both its botanical and popular names from the large number of long silvery white hairs which cover the upper portion of its stem, and impart a peculiar resemblance to the hoary head of an aged man. These hairs are really soft weak spines, which attain the length of several inches, and instead of spreading regularly, or projecting rigidly, as in other members of the family, they are flaccid and pendulous, thickly clothing the stem. As was remarked, however, in the case of the *Mamillarias*, it is necessary to protect this plant from dust if it be desired to preserve its beauty, for it has a very disreputable and unwholesome appearance when what should be silvery white hairs become dingy and stained. It is, therefore, preferably grown in a small glass case, where with a few other select Cactuses it will be seen to excellent advantage. Though *P. senilis* is one of the best known species in small collections, yet large plants are seldom seen, and probably the finest in England is that grown at the Oxford Botanic Garden. This is 16 feet high, of proportionate diameter, and has been in cultivation at least a hundred years, having been originally imported by the Duke of Bedford, and transferred at the dispersal of the unique Woburn collection to Oxford. Even this height is said to be exceeded in its native home of Mexico, where specimens have been described as reaching the height of 20 feet. One character common in varying degrees to all the Cactæ, but very strongly developed in the “Old Man” Cactus, is the large quantity of calcium oxalate secreted in the cells of the stem. To such a degree are these crystals formed, that old stems when cut lose the succulent portion of their structure, but still preserve their form, becoming almost like petrified stems, solid, heavy, and stone-like. Examples of this kind can be seen in the museums at Kew, the whole centre of the stem being filled with lime crystals.

Several other species are in cultivation in botanic gardens and a few collections, perhaps the best known being *P. Celsianus*, which has extremely fine hairs closely pressed to the surface of the stem, and having a cobweb-like appearance; very distinct from *P. senilis*. There is also one dwarf-growing rare species, named *P. chrysomallus*, which has golden spines. The *Pilocereus* very rarely flower in cultivation, though

they are not difficult to grow, succeeding under the same treatment as the other tall-growing *Cereuses*.

ECHINOPSIS.—The fourth group of species arranged under the wide term *Cereus* includes a number of plants at one time considered to be related to the *Echinocactus*, but which are readily separated from that genus by the long tubular or funnel-like flowers produced from the side of the stem instead of near the summit, as in the Hedgehog Cactus. From the true *Cereuses* they are also distinguished by their dwarf globular stems, and from the *Echinocereus* by the long flowers and smooth seeds. Many of the species are very handsome when in flower, and several are as hardy as the *Echinocereuses*, being therefore employed on rockeries or in warm situations out of doors with *Opuntias* and a few *Mamillarias*. Owing to this hardiness of constitution they are useful as window Cacti, and are generally grown for that purpose in the miniature pots before mentioned. Some do not flower quite so freely as their relations, but they are easily grown, almost the only requisite being to avoid giving them too much water either in the soil or in the stems, as they are very liable to decay, particularly during the winter.

E. EYRIESI.—One of the best known of the species, and when in flower it is undoubtedly one of the most beautiful and interesting in cultivation. The stem is very regularly globular, with small angular ridges, which bear small dark spines set in little tufts of white hairs. The flowers are 6 to 8 inches long, like a curved funnel, and are 4 to 5 inches across at the mouth, formed by numerous tapering white petals spreading symmetrically. A most important character is the delicious fragrance possessed by the flowers, which is very powerful and most pleasing. Referring to this plant, Dr. Lindley has written in the following eulogistic but well-merited terms, "When young the blooms resemble long sooty grey horns covered with thick shaggy hairiness, and would never be suspected to conceal a form of the utmost beauty or a clear and a delicate complexion. When the hour of perfection has arrived, and the coarse veil of hair begins to be withdrawn by the expansion of the unfolding petals, one is amazed at the unexpected loveliness which stands revealed in the form of this vegetable star." The plant is a native of Mexico, whence it is said to have been first introduced by Sir John Lubbock, who forwarded specimens to the London Horticultural Society. A variety named *glaucus* has also been obtained, but it differs little from the type except in the slight glaucous tinge of the stem.

E. OXYGONA.—This has been described as an *Echinocactus*, but is now included with the *Echinopsis* for the reasons already named. It is somewhat similar to *E. Eyriesi* in the form of the stems and the ridges, but the spines are brown and the tufts of hair or *pulvini* are not so white. The flowers, however, are extremely beautiful, and by many would be considered more handsome than those of the preceding species. The flower tube in good examples is fully 8 inches long and 4 inches in diameter, less contracted than

in *Eyriesi*, and the petals not spreading so horizontally. In colour the outer part of the tube is curiously marked with green and red, the petals being white stained with red on the margins, which gives them a very pretty appearance.

E. CAMPYLAOANTHA, Pfeiffer (*Echinocactus and Cereus leucanthus*).—This is a Chilian plant, where it was found by Dr. Gillies at Mendoza, and the plants introduced first flowered in the London Horticultural Society's Gardens in 1831. It has a conical stem with fourteen to sixteen ridges and strong spines, the central one in each cluster being 3 inches long, whitish, and curved upwards. The flower tube is 5 to 6 inches long, dark green, with short ovate petals, white tinged with pink, the expanded portion of the flower being 2 to 3 inches across.

There is a score or more of other species, each of which possesses some attractions. *E. cinnabarina* has very bright cinnabar-red flowers, which contrast agreeably with the light-coloured form. *E. Pentlandi* has orange-red flowers, and a variety named *coccinea* is very bright red, almost scarlet. *E. multiplex* has whitish flowers, but its variety *cristata* is more noteworthy than the type. It has peculiarly contorted stems, the ridges being apparently folded transversely, as if the plant had been compressed laterally. Like other crested varieties of *Cactææ*, it would not at a glance be thought to be related to the species of which it is considered a variation. *E. pulchella* has pale rose flowers produced in the spring months; *E. Schelhasi* bears white flowers like *E. Eyriesi*; this is said to have been crossed with *Cereus speciosissimus*, and plants produced that presented some resemblance to both parents, but whether they ever flowered or not I have not been able to ascertain. *E. Zuccariniana* is a beautiful species with large white flowers, very fragrant and resembling *Jasmine*; it has also produced a handsome rose-coloured form by a cross with *E. oxygona*, and a crested variety is also grown. Many others are in cultivation, Mr. Peacock numbering thirty-two species and varieties in his collection, and the majority of these have large handsome flowers.

PHYLLOCACTUS, *Link.*

The two most valuable genera in the whole *Cactus* family, considered from a horticulturist's standpoint, are undoubtedly the *Phyllocactus* and the *Epiphyllum*, and they are the only two which can be said to have partially escaped the modern neglect of the *Cactææ* as garden plants. These are still established favourites in many places, but they are comparative strangers to numbers of cultivators who might advantageously include them in their collections. Profuse in flowering, with large showy blooms, most variously coloured, from the richest crimsons and brightest scarlets to the most delicate rose and blush tints, they are unexcelled in beauty by any of the ordinary plants grown for decoration. So far from being fastidious or requiring any particular routine of culture,

they are often treated with utmost carelessness, stored in "out-of-the-way" corners, and left in a measure to take care of themselves; yet do they repay their ungenerous hosts with abundance of glorious flowers, and then only are they brought into sight, to be again consigned to the old quarters when the flowering season is over. Like every other plant that is easily grown the Phyllocactuses and their allies respond most promptly to liberal treatment, and well as they may seem to be under the careless system, they are incomparably superior where their moderate requirements are studied and provided for. It is sometimes said that the flowering period is so short that they are scarcely worth the space they occupy for so many months, but assertions such as these have been formed upon limited experience. Phyllocactuses may be had in flower for three or four months in the year by having a dozen or two plants in different stages, and with the Epiphyllums the flowering season can be prolonged for at least six months out of the twelve in an almost unbroken succession. Outside the ordinary decorative plants, such as Pelargoniums, &c., there are very few which possess so many recommendations as these, and it is to be hoped that their merits will become more widely recognised.

The genus *Phyllocactus* as now constituted includes thirteen species, natives of tropical America, Mexico, and Brazil, and are chiefly distinguished by their flattened leaf-like branches, with a prominent midrib, and by the large many-petalled flowers being produced from the notches in the edge of the stem or branches. These characters suffice in a broad sense to separate them from *Cereus* and *Epiphyllum*, their near neighbours. They are also epiphytal in habit, but this character is shared by several other *Cactææ*, and is therefore only useful as a cultural guide. In gardens, and even amongst botanists, there has been much confusion respecting these plants, some of the species having been referred to *Cereus*, some to *Epiphyllum*, and most of the older forms appear in works under the title *Cactus*. The principal confusion has, however, been between the *Epiphyllums* and the *Phyllocactus*; for even now, although the distinction has been clearly pointed out by recent writers, the two names are frequently employed in current literature as synonymous.

CULTURE.—The most important item in the culture is the soil, and this is easily provided. A light turfy loam should form the basis of the compost, and to this may be added one-third of leaf soil, old dried cow manure, and sand, well mixed together and employed in a rather dry state. The pots must be well drained, as the plants do not require a great depth of soil, and any approach to stagnation about the roots is the surest means of causing failure. When plants have attained a good size

and the pots are filled with roots an annual top-dressing of soil and manure will be sufficient without repotting them, and is even preferable, as the plants appear to flower more profusely when retained for some years in the same pots. It is, however, occasionally necessary to turn the plants out to see that the drainage is in proper condition. As regards temperature, Phyllocactuses are by no means particular; they will succeed in an unheated house or frame, in a greenhouse or in a window, and in all these positions the majority will flower freely, but the best results are obtained by having them in a warm greenhouse, what is termed an intermediate house, during their growing period. After the growth has been completed they can be placed in cooler and more airy quarters, or a similar result can be obtained by keeping the frame closed while growth is advancing and ventilating freely afterwards.

PROPAGATION.—They are readily increased by means of cuttings, which, if inserted in sandy soil in moderate heat and kept rather dry for a week or two, only slightly syringing them, will form roots, and can be placed singly in 60-size pots. Seeds are produced freely, and these may be sown in pans of light soil, placed in a dry part of the stove or in a warm house until they germinate, when a light position must be afforded the plants until they are large enough to be potted singly. It is curious that the young stems are usually cylindrical at first, often becoming triangular before they assume the flattened form, and some, like *P. multiflorus*, continue more or less triangular, with occasional variations to the typical character.

SELECT SPECIES.

P. ACKERMANNI *Haworth*.—One of the most handsome and best known forms in cultivation, remarkable alike for the large size, rich colour, and profusion of its flowers. It has been regarded by some writers as a hybrid, and is mentioned as such by Herbert, but upon what evidence does not appear. Lindley, on the other hand, gives a full account of the plant, and states that it was brought from Mexico by Mr. George Ackermann, in whose honour it was named by Haworth, the original stem having first flowered in Mr. Tate's nursery in June, 1829. A somewhat peculiar circumstance is, however, mentioned by the same authority—namely, that a seedling raised by Mr. Smith, gardener to Lord Liverpool, Coombe Wood, was flowered at the same time, and proved so similar in its characters that they could only be distinguished by a close examination. Whatever it be there can be no question respecting its beauty, and that is sufficient to recommend it to the attention of the readers of these notes. The flowers are 6 to 8 inches in diameter, with rich crimson shining petals, the outer ones lighter in colour. The stems are flat and deeply crenated or notched, bearing the flowers on

these depressions. Several varieties and hybrids have been raised from *P. Ackermanni* by crossing it with species of *Cereus*, especially *C. speciosissimus*, which has yielded a race of handsome forms differing in the colour and size of the flowers, but chiefly shades of crimson or red. It is also said that *P. Ackermanni* has been successfully crossed with *Cereus flagelliformis* in France, the plants resulting differing greatly from both parents, but I have never had an opportunity of seeing these forms. A beautiful hybrid between *P. Ackermanni* and *P. crenatus* has been raised and flowered in this country, in which the inner petals were of a soft pale rosy tint and the outer a deep crimson, affording a pretty contrast. One valuable character of this species and its varieties is that they may be had in flower from May to August or even longer than that with a good stock of plants brought forward a few at a time.

The woodcut (fig. 11) represents a flower and portion of the plant much reduced.

P. ANGULIGER, *Lemaire*.—An extremely distinct plant, easily recognised by the deeply angled stems 2 to 3 inches in diameter, which are indented on the margin somewhat like a large saw with the teeth turned upwards, forming blunt triangular lobes. The flowers, which are 3 to 5 inches in diameter, the petals white, the sepals narrow, orange or yellowish, and spreading, open during the day, and continue expanded for a considerable time, giving out a powerful fragrance. It was found by Hartweg during his travels in the west of Mexico growing upon trees in a forest where Oaks predominated, and specimens were by him sent to the Horticultural Society.

P. BIFORMIS (*Disocactus biformis*, Lindley).—Though not equal in attractions to other *Phyllocactuses*, this is an interesting plant, forming in appearance a link between those species and the *Epiphyllums*, but it is not likely to become of much garden value, and will only be grown to make a collection complete. The plant was introduced to England from Honduras at the same time (1839) and by the same persons as *P. crenatus*, and was described as a *Cereus*, but was subsequently constituted a genus by Lindley under the name *Disocactus*, and by Salm Dyck under the slightly different title of *Disisocactus*. The selection of these names was doubly unfortunate, first because there is a genus termed *Discocactus* quite distinct from this, and secondly because the plant does not possess sufficient characters to separate it from *Phyllocactus*, to which it is now referred by botanists. Plants in cultivation are usually rather small, but they will attain the height of 3 feet, branching freely and forming a rather graceful fleshy shrub. The branches are narrow, flattened and leaf-like, reddish on the margin, and bear the flowers at the points. The petals are narrow, 2 to 3 inches long, and partially combined into a kind of tube of a pale rosy pink colour. The flowers, however, do not last long, and are followed by bright red fruits about half an inch long, which, being produced abundantly, have a rather pretty effect.

P. CRENATUS.—A magnificent species, undoubtedly one of the best in the



Fig. 11.—*Phyllocactus Ackermannii*.

genus, and one that has proved extremely valuable in the hands of hybridisers, as with the crimson-flowered species it has yielded a number of intermediate tints, such as soft rose, blush, and pale crimson. The stems are flat as in the others, but they are only slightly crenated; the flowers are fragrant, of great size, 6 to 8 inches in diameter, with numerous lance-shaped petals, pure white and spreading. It is a native of Honduras, whence it was sent with several other plants by Sir Chas. Lemon, Bart., to Mr. G. Ure Skinner, in 1839, and it first flowered four years after its receipt. Seven years later—namely, in 1850, Mr. Gordon succeeded in raising at the Royal Horticultural Society's Gardens a series of remarkably beautiful hybrids between this species and *Cereus speciosissimus*, which attracted much admiration at the time, and are still found in a few collections. The pollen was taken from the *Cereus*, making the *Phyllocactus* the seed-bearing parent, and the result was that the seedlings resembled the latter in form of the stems and flowers, but the colours more nearly resembled the *Cereus* slightly softened and varied. All these hybrids proved extremely floriferous and useful garden plants. This cross was repeated in 1870 by Col. Charleton of Braddon, Isle of Man, but a greater variation in colours resulted, the tints ranging from the pure white of the *Phyllocactus* to brilliant scarlet. Mr. C. M. Hovey, Boston, United States, also produced a race of hybrids between *Phyllocactus crenatus* and what he terms *Epiphyllum splendidus*, but which is presumably some scarlet form of *Phyllocactus*. These were raised about the same time as Col. Charleton's, the flowers of all being remarkably large, from 8 to 12 inches in diameter, and very freely produced. The best of them are the following—Alice Wilson, orange scarlet; Mauve Queen, purplish pink; Orange Gem, shining orange; Pink Queen, mauve pink; Sunset, rich crimson; and Refulgence, dark scarlet. A fine variety of *P. crenatus* is grown at Kew under the name of *Vogeli*, which has very large flowers of a rich rosy tint, and probably originated from some similar cross to those already named. *P. Gordoniana*, which has bright rose-coloured handsome flowers, appears to have had a similar origin.

P. HOOKERI, *Salm.*—In the "Botanical Magazine," plate 2692, a figure of a fine white-flowered *Phyllocactus* was given under the name of *Cactus Phyllanthus*, an extremely old inhabitant of English gardens. In the opinion of several other writers it is quite distinct from and superior to that species, the name given above being consequently bestowed upon it. The branches and stem are flat and slightly crenated, 2 to 3 feet high, producing the flowers on the margin. These have a long narrow tube, and tapering white petals 2 to 3 inches long and about a quarter of an inch broad. It possesses a most agreeable fragrance, and usually flowers in the summer months from July to September.

P. LATIFRONS (*Cereus oxypetalus*, Decandolle).—A very strong-growing species, quite the giant of its family, producing stout flattened stems 4 to 5 inches broad, deeply crenated, and 8 or 10 feet high. A fine specimen, with several stems fully 8 feet in height, is grown in the Kew collection,

and when in flower it has a remarkable appearance. The flowers seem to share the large dimensions of the plant, for they are 7 to 8 inches long and about 6 inches in diameter, the petals of a delicate clear creamy white, and the sepals and tube of a reddish hue. It is a native of Mexico and some districts to the south of that country, and has been in cultivation for a considerable time, though the date of its introduction is uncertain.

P. PHYLLANTHUS, *Salm.*—As the oldest cultivated *Phyllanthus* this possesses a certain degree of historical interest, but it is not particularly beautiful, and is far surpassed by *P. crenatus*, *P. Ackermanni*, and the handsome hybrids that have been mentioned. Its branches are flattened and crenated, bearing long tubular flowers in the style of *P. Hookeri*, but not so broad at the mouth; creamy or greenish white, opening at night, and possessing a peculiar odour. According to the "*Hortus Kewensis*" the plant was cultivated by Phillip Miller in 1710, and a very good figure was given in Dillenius's "*Hortus Elthamensis*" in 1732, with a long description of the plant under the name of *Cereus Scolopendrii folio brachiato*. It is the Spleenwort-leaved Indian Fig of Miller, and is said to have been originally obtained from Brazil.

P. PHYLLANTHOIDES, *Salm (Cactus speciosus, Bonpland).*—An extremely beautiful species, and, like *P. Ackermanni*, one of the most floriferous of the family, continuing in bloom during the greater part of the summer. With such an important character it is surprising that hybridisers have not employed the species more frequently in crossing with others, but it has no doubt contributed a few to the series of garden forms, and some of those with rose-coloured flowers can be traced to it. In the typical form the stem is flat, the margin crenated, and the centre reddish. The flowers are about 2 to 3 inches long and 3 to 4 inches across at the mouth, the petals being ovate or lance-shaped, and coloured rose and white in irregular streaks, very delicate and handsome. As *Cactus speciosus* it was mentioned by Bonpland, who, with Humboldt in 1801, found it growing on trunks of trees at Turbaco, south of Carthagena. Plants or seeds were introduced to Europe by those travellers, and the first flowers were produced at Malmaison in May, 1811, plants also flowering about the same time in the Montpellier Botanic Garden.

Of other *Phylloactuses* which do not need detailed description the following are worthy of mention:—*P. caulorrhizus*, which has handsome flowers 6 inches in diameter, the petals white, and the sepals pale green; *P. Jenkinsoni*, a hybrid or seedling variety, with large beautiful and richly coloured flowers of a brilliant crimson-scarlet hue, very free, and a favourite with many growers. Concerning this plant, as also in reference to the adaptability of *Phylloactuses* as window plants, Mr. J. Udale, Shirecliffe Hall Gardens, Sheffield, writes:—"Cacti are associated with my earliest memories, for in a window at home we had a plant of *P. Jenkinsoni* and one of *P. speciosus*, each of which has flowered profusely almost every season for the last thirty years; and as pruning was frequently resorted to, their progeny are now innumerable. The plants were grown in the window during

autumn, winter, and spring, being placed in the open air during the summer; and with such simple attention they have for so many years been a source of considerable pleasure." *P. multiflorus*, a floriferous form, with reddish-crimson flowers, the surface of the petals having a peculiar satin-like lustre, is a similarly useful variety; whilst one named in honour of Mr. Peacock is marked by a very rich shade of crimson.

Numbers of fine varieties and hybrids have been raised at various times, but there yet remains plenty of room for further additions to the list of useful Phyllocactuses. By crossing amongst themselves with the best of the *Cereuses*, or even with the *Epiphyllums*, some grand results might be obtained. The last-named cross has been attempted, but unsuccessfully, though if one has failed others might succeed, and a totally distinct race would doubtless be produced.

EPIPHYLLUM, *Pfeiffer*.

No members of the Cactus family are so extensively grown or so generally useful as the *Epiphyllums*, and yet it may be safely asserted that their merits are not half so well known as they deserve, or as might be expected by those who have satisfactorily proved their value. There can be no question that *Epiphyllums* are thoroughly useful garden plants, and wherever large numbers of plants have to be grown for decorative purposes they are almost indispensable. For the smallest collections they are equally appreciated, and though not quite so well adapted for windows or rooms as some of the *Phyllocactuses*, they can be grown and flowered in such positions, and therefore furnish an important addition to what may be termed home plants. They possess several qualities, each of which alone would be amply sufficient to render them worthy of recommendation, but the principal of these is their period of flowering. This extends from November to February, and during these four months an unbroken succession of flowers can be ensured by having a few batches of plants, which can be readily brought on to follow the earliest-flowered. The same plants will, however, often continue attractive for more than a month, producing abundance of their bright beautiful flowers throughout the whole of the time, at a season when flowers are scarcest and the demand greatest. Another good trait in their character is their free and quick growth, which enables cultivators to obtain plants of good size in a short time. They are readily propagated, most profuse and constant in flowering, their blooms are marked by a number of extremely rich and bright shades of colour, and the plants can be employed in a variety of ways—in pots as dwarfs, standards, or pyramids; planted out for training on the roof of stoves, and in baskets for the decoration of conservatories. It is not surprising, therefore, that *Epiphyllums* are gradu-

ally advancing from the comparative obscurity into which they had fallen, and one of the surest indications of this increasing popularity is afforded by that great emporium of plants, Covent Garden Market. There small useful specimen Epiphyllums may now be frequently seen side by side with the ordinary market plants, and one grower in the neighbourhood of London is paying special attention to them for supplying the market. The majority of the plants raised for this purpose are in 48-size pots, and are grafted on *Pereskia* stocks 9 inches or a foot in height, forming in two or three years compact handsome specimens. These usually make their appearance on the stalls during November and December, and are sold at prices ranging between 1*s.* 6*d.* and 2*s.* 6*d.*, according to the size of the plant and the quality of the variety. Comparatively few different forms are sent to market; two or three of the richest-coloured and most floriferous are the favourites, and with these the demands are supplied.

CULTURE.—It may be premised that there is no especial difficulty in growing Epiphyllums fairly well, as they will do that with very ordinary treatment; but to have them in the best condition, their floral beauty fully developed, attention to a few details is requisite. These are, however, so simple that no one need be deterred from growing the plants by any fear of non-success. As for Phyllocactuses, the basis of the compost employed should be light, turfy, and preferably somewhat sandy loam, that which has been in stack for a few months being the most suitable. Respecting this there is no difference of opinion, but with regard to the other ingredients several different practices are followed. Some cultivators do not employ any manure in the soil, simply giving a moderate proportion of crocks, broken charcoal, lime rubbish, or sand with the loam, preferring to apply the manure as a liquid or in the form of top-dressings. Others, again, advocate incorporating various manures in the compost at first prepared, using and recommending for this purpose cow, horse, sheep, deer, and fowl manure, each grower fully believing in the especial efficacy of his favourite stimulant. A third, and according to my experience the best system, is to employ a small proportion of manure, say one-fourth of the bulk of soil, and to give what further assistance may be needed either in a liquid state or as a top-dressing. The advantage of this method is, that while some encouragement is given to the roots, a stagnant and unwholesome condition of the soil is avoided until the plants are strong enough to assimilate their food rapidly, and then it can be supplied in exact proportion to their wants. The *Pereskia aculeata*, upon which Epiphyllums are usually grafted, is a strong-rooting and quick-growing plant, absorbing moisture and nutriment from the soil very rapidly; therefore when it is bearing a large head of Epiphyllum

the assistance afforded should be of a most liberal character, and it is only by such means that the finest and most abundant flowers can be produced. There is, then, little fear of giving too much manurial aid to these plants, and, as an example of this, I have been informed that many years ago some exceedingly fine specimen *Epiphyllums* were grown in a garden in Lincolnshire, potted in a compost of equal parts good loam and old Mushroom-bed manure. These attained the age of twenty years, and annually bore an enormous number of flowers—a sufficient proof that the treatment suited them; but they were in experienced hands, and the smaller proportion of manure advocated above is, to say the least, safer. It matters very little what kind of manure is employed, but I give the preference to that from the cowyard, using it in a dry state and finely broken for mixing in the soil, while as a liquid it is equally beneficial. Clay's Fertiliser, either in the compost or mixed with loam as a top-dressing, is also a valuable stimulant, and manure collected in fowl roosts or runs suits *Epiphyllums* admirably.

Some importance is attached by a few growers to the due employment of lime rubbish or charcoal in the soil, but this is by no means so essential as is supposed, though a few nodules of charcoal or finely broken bricks assist in keeping the drainage in proper condition. During the growing and flowering periods abundance of water is necessary, and in consequence every care must be exercised, especially for large specimens, to insure that the pots are thoroughly drained. This can be easily effected in the usual way with potsherds, or crocks as they are commonly termed, and then there will be no danger in supplying water liberally.

After flowering less moisture will be required, and the soil may be allowed to become partially dry for a few weeks, only giving a little water to prevent the branches being rendered flaccid. Then as growth is resumed the water supply may be increased, and with occasional syringings progress will be rapid in a suitable temperature. This should range from 55° to 65°, or ten degrees higher with sun heat, and when the plants flower they may be arranged in an ordinary greenhouse or conservatory. Much depends upon a thorough maturation of the growth, and therefore the plants must at all times have a position fully exposed to the sun, as they never need shading, and with proper attention to ventilation to avoid rendering the growth weak, good results may be confidently expected.

PROPAGATION.—*Epiphyllums* are readily increased by cuttings grafting, and seeds, the two former methods being most frequently practised, the other being resorted to chiefly with the object of producing new varieties. Cuttings of two, three, or more joints of the branches strike readily at any season of the year if inserted in pots of sandy soil,

kept rather dry, and placed in a warm house or frame. These plants upon their own roots are very useful for small pots to be employed as a marginal row on the conservatory stages; they can also be used for filling baskets, and in several other similar ways. The most important method of increase is, however, that by grafting, as the majority of the larger plants are worked either on the *Pereskia* or *Cereus speciosissimus* stocks, and by that means the natural drooping habit of the *Epiphyllum* is more gracefully and pleasingly displayed. Considerable difference of opinion exists with regard to the respective merits of the two stocks named; but the balance of evidence is in favour of the *Pereskia* as a long-lasting and free-growing support. The principal points advanced on behalf of the *Cereus* is that its stems are stouter and stronger than the *Pereskia*, and that *Epiphyllums* worked on it endure a much lower temperature than those on the accepted stock. Against this must be taken the fact that the scion does not grow so freely or so quickly upon the *Cereus* as it does upon the *Pereskia*, for the absorptive powers of the latter seem to be much greater, and in respect to endurance no better evidence of the merits of the *Pereskia* is required than is afforded by the fact that there are many large specimen *Epiphyllums* upon that stock fully a quarter of a century old, and still showing no signs of decrepitude.

The *Pereskia* is propagated by cuttings 5 or 6 inches long, which form roots quickly in an ordinary stove or propagating frame. When struck they must be potted singly in 60-size pots and grown on quickly, transferring the plants into 48-pots when the smaller size is filled with roots. When they have reached a sufficient height to permit the stem being cut back to well-developed wood, a foot to 18 inches above the rim of the pot, they may be prepared for grafting. Cut the stems straight across at the desired height, then making a downward incision at the top, either removing a small wedge-shaped portion or simply splitting it, the former being preferable. The scion, which may be 3 to 6 inches long, either a simple stem or branched, should have the base pared to a wedge shape, very gradually sloping, and then inserted in the stock. It may be secured either with a small thorn thrust through the stock and scion, or by binding a little moss round the juncture with matting. The *Pereskia* stem should be tied to a small stick to prevent damage to the scion, and in a few weeks a union will be effected, when the moss and ties can be removed. The same system is adopted with taller standard specimens, say from 2 to 3 feet high; but when an extra large head is desired, two or three scions are inserted at the side of the stock in addition to that at the top, simply by making a downward sloping incision, in which the end of the scion is placed as in the first-mentioned mode. For pyramid specimens the practice is similar, except that scions must be inserted at intervals of 9 to

12 inches from the base to the summit of the stock, regulating them so that the specimen will have a uniform appearance. As to the time when grafting should be performed it matters little, as with care a satisfactory union can be effected at any season ; the spring is, however, preferable, and it is a good plan to keep the stocks rather dry for a few days before the operation is commenced.

SPECIMEN PLANTS.—When grown to a large size *Epiphyllums* make magnificent specimens either as standards or pyramids, and their value cannot be too highly estimated. Probably the finest examples of the kind in the country are those at Orwell Park, near Ipswich, the residence of George Tomline, Esq., where these plants have for some years been admirably grown by Mr. J. Wallis. During the winter months—namely, from November until February, these produce a never-failing display of brilliant flowers, and have awakened the admiration and surprise of many horticulturists. Writing in reference to his mode of culture, Mr. Wallis has favoured me with the following remarks, which possess especial value as the result of such successful practice :—

“The *Epiphyllums* here are grown for flowering in the conservatory, and are usually gay from the first week in November till February. During the remainder of the year they occupy a three-quarter span-roof house in which an intermediate temperature is maintained. All our *Epiphyllums* are grafted on the *Pereskia aculeata*. We graft a few at intervals of two or three years, so if any of the older plants become sickly or shabby they are thrown away and the younger ones grown on. Some of the stocks are worked to form pyramids and some to make standards. The height of the pyramids is 6 feet, and to form these six or eight scions are inserted. The heads of the standards are on stems ranging in height from 4 feet 6 inches down to 18 inches. To form these heads only one scion is put on the stock. Some of our oldest pyramids are 4 to 5 feet through at the base, and the heads of standards quite as much. When in bloom some of the heads of the taller standards droop almost to the pots. Much larger dimensions could easily be obtained, but we have to keep our plants of a manageable size on account of moving them to and from the conservatory. The pyramids occupy No. 2 and No. 4-sized pots, the standards 8's and 12's. Each plant is secured to a strong iron stake, with three prongs fitting the inside of the pot, so as to stand firm and erect, and the *Epiphyllum* is kept well supported to the stakes by ties of stout wire. After the plants are well established they are easily managed, and go many years without repotting ; but of course we top-dress annually, previously removing as much of the old soil as will come away easily. We grow these plants with plenty of ventilation on all favourable occasions, and they are never shaded. During active growth water is given

freely, occasionally liquid manure, they are also syringed daily. After the season's growth is completed water is given more sparingly and syringing is dispensed with."

Another excellent mode of growing Epiphyllums is in baskets, which have a most imposing appearance when well filled and the plants are in flower. Some care is needed in preparing these, but the task is not a difficult one, and the result amply repays for the labour bestowed upon it. The plants employed should be either raised from cuttings or be grafted upon *Pereskia* stocks 3 or 4 inches long, but the former are preferable, as the others are very liable to be injured. The baskets should be of semi-globular form, constructed of ordinary stout wire, strong and plain in design. In preparing the baskets for the plants a thick layer of moss must be placed next to the wire, then the Epiphyllums may be turned out of their pots and inverted, the stems being drawn through the moss and the meshes of the wires. This must be continued until the basket is sufficiently clothed, employing a little light soil to render the plants firm; then above these to fill the upper part larger specimens may be planted to impart a general finish. When covered with flowers these baskets will be superb ornaments for any house, as is proved by the beautiful examples at Chatsworth, where they constitute a feature of great interest during the winter. The cultural requirements of such specimens are the same as for others, but a slight additional attention is necessary to insure the whole of the soil being thoroughly moistened. To keep the baskets uniform any excessively long shoots can be taken off at a convenient joint, and this will induce a branching habit, which will furnish the surface with growths quickly. It will be evident that the baskets must be suspended sufficiently high to permit the whole under surface being readily seen.

Far from the least effective system of utilising Epiphyllums is the following, which is nowhere practised so successfully as at Old Sneyd Park, Bristol, the residence of F. Tagart, Esq. This consists in growing the *Pereskias* to a height of 12 feet or more, training the stems up the back wall or up the roof of the house, and grafting them at intervals of a foot with Epiphyllums. These in time form good heads, and have a very handsome appearance, clothing the roof with their richly tinted flowers. The gardener, Mr. E. Miller, has the back wall of the stove covered with a wire netting, packed with moss, and planted with Ferns, *Begonias*, &c.; behind this the stems of *Pereskia* are taken from the border at the base, where they are planted, up to the roof, and they are then trained over the path. This portion of the stems, which are about a yard apart, were grafted thickly with Epiphyllums of different varieties about twelve years ago, and have formed dense pendulous heads 2 to 3 feet

in diameter, which during the concluding months of the year form quite, a canopy of flowers. This method might be advantageously employed much more extensively, and the roofs of many houses could by such means be rendered far more pleasing than they usually are, particularly at the season when *Epiphyllums* flower.

Some remarkable specimens were grown at Eartham, Chichester Sussex, several years ago, and one of these is represented in fig. 12 (kindly lent by the Editor of the *Gardeners' Chronicle*). These were about 4 feet high, two having single heads of *Epiphyllum*, and two were double-grafted, like the specimen illustrated. The slender shoots seen in the figure are stems of *Cereus flagelliformis*, which were worked on the stock with the *Epiphyllum*, and the pendulous habit renders it well suited for this purpose. The effect produced is very striking, and is suggestive of other similar modes of grafting, as any of the drooping *Cereus* might be employed in the same way.

SPECIES AND VARIETIES.

As a genus *Epiphyllum* is distinguished by the following characters. The narrow numerous petals and sepals of similar colour are in two of the three species known—viz., *E. truncatum* and *E. Altensteini*, arranged in a two-lipped manner—that is, on one side of the flower the petals are straight, and on the other they are bent back. In *E. Russellianum*, however, the petals grow equally as in other *Cactææ*, but are nearly straight with the flower tube, which is formed by the combination of the inner petals at the base. The stems are slender, succulent, leafless, and jointed, the branches somewhat flattened, from 2 to 3 inches long and 1 to 2 broad, bearing the flowers at their points and not on the margin as in *Phyllocactus*. They are natives of Brazil, where they are chiefly found as epiphytes growing upon the branches of trees, their slender stems attaining the length of 3 or 4 feet.

E. TRUNCATUM, *Pfeiffer*.—This is the principal species, and has been cultivated in English gardens for about sixty years, having been introduced from Brazil early in the present century, though it is said to have been known in continental gardens many years before. It is especially abundant on the Organ Mountains, where also its relative *E. Russellianum* is found, but the former does not grow at so great an elevation as the latter, *E. truncatum* being rarely found above 4000 feet. The original form had dark crimson flowers with a white throat, but several varieties were subsequently imported, amongst the earliest being one of a uniform rich crimson hue, which was figured in the "*Botanical Magazine*" in 1825, and later still—*i.e.*, about 1840, the variety *violaceum*, with a distinct tinge of violet, was introduced by Messrs. Rollisson & Sons of Tooting. The principal variations now in cultivation are seedlings raised from *E. truncatum* or from crosses between that species and *E. Russellianum*, which have greatly increased the value of

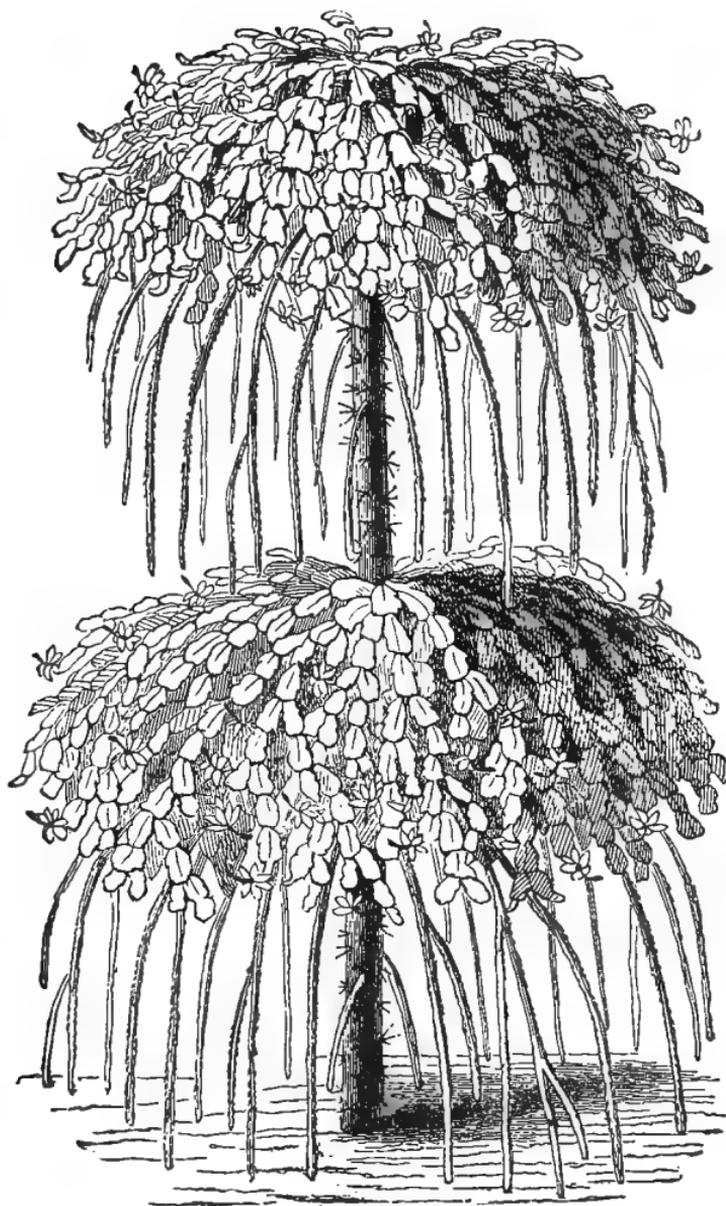


Fig. 12.—Specimen *Epiphyllum truncatum*.

the plants in a horticultural point of view, as the colours have been improved and multiplied considerably. One of the most successful raisers of Epiphyllums in recent years was Mr. W. Buckley of Tooting, who succeeded in obtaining some very distinct and beautiful hybrids between the species already named. These have not been surpassed, and the list as given by the raiser in the "Florist and Pomologist" (page 14, January, 1868) is well worth reproduction here :—

"The varieties of *E. Russellianum* were *E. R. rubrum*,* flower double the size of *E. Russellianum*, and of a bright rosy red ; *E. R. cupreum*,* not so large as the last, of a coppery tinge, slightly suffused with purple ; *E. R. superbum*,* in which the purple of *E. Russellianum* and the reddish tinge of *E. truncatum* are beautifully blended. Added to these, a very pretty hybrid of the *Russellianum* section was raised by Mr. Snow, gardener to the Earl De Grey, called *E. R. Snowii*. The following are the best and most showy varieties of the *E. truncatum* section :—*E. truncatum majus*,* larger than the species, and of a deep rose colour ; *albo-lateritium*,* petals silky white, margined with brick red ; *amabile*, white and purple ; *aurantiacum*, reddish orange ; *bicolor*, white and rose-edged ; *coccineum*,* deep scarlet ; *cruentum*,* dark, purplish red ; *magnificum*, large, bright rose and white ; *purpureum*,* deep purple, nearly self-coloured ; *roseum*,* bright rose ; *rubro-tinctum*, white and purplish red ; *Ruckerianum*, purplish red, tinged with violet ; *splendens*,* deep rose ; *spectabile*, white with purplish margin ; *spectabile carminatium*, white with reddish margin ; *salmeoneum*, salmony red ; *tricolor*, deep reddish purple and white ; *violaceum*, silvery white, with light purple margin ; *violaceum grandiflorum*, like the last, but larger ; *violaceum superbum*, deep purple and white. Those marked with an asterisk are hybrids, raised at the Tooting nursery."

E. RUSSELLIANUM, *Hooker*.—By some writers this has been, and still is, regarded as a variety of *E. truncatum*, but it is clearly distinguished by several well-marked characters. The flowers are 3 to 4 inches long with straight narrow petals, not reflexed as in *E. truncatum*. The branches are much more slender and not so distinctly truncated or cut at the ends of the joints. The time of flowering, too, is quite different, being in May or June ; and according to Mr. Gardner, who discovered the plant on the Organ Mountains, it is found up to an elevation of 6000 feet, or nearly 2000 higher than *E. truncatum*. The flowers are of a rosy crimson colour, very clear and pretty, and they are produced with great freedom. Mr. Gardner's account of the discovery of this plant is interesting. "Through dense masses of large Bamboos with stems often more than half a foot thick and 60 to 70 feet high we had to cut our way up the Organ Mountains till we came, after a toilsome day's journey, to a small waterfall where we encamped for the night. On the trunks of the large trees growing near this spot I saw abundance of *Epiphyllum truncatum* beautifully in flower ; and higher up the Mountain the next morning I found a lovely new species belonging to the same group as *E. truncatum* and much resembling it in many points, equally

large, but with a more graceful mode of growth and lighter-coloured blossoms, the stamens, too, being uniformly pink." The plants found were sent to the Duke of Bedford's celebrated collection at Woburn about 1839, and in honour of the Duke the species received the name it now bears. The time of year at which this *Epiphyllum* flowers has enabled hybridisers to extend the flowering period of these plants fully two months—a most important advantage, and if it were for this alone *E. Russellianum* has been a valuable introduction.

E. ALTENSTEINI.—Though not wanting in attractions this is rarely seen in gardens, and is usually regarded as a variety of *E. truncatum*. It differs, however, in its more slender branches being much longer, and the flowers are of a rosy colour. The flowering period is the same as the better-known species, and, like that, it is a native of Brazil.

TRIBE 2

OPUNTIÆ, THE INDIAN FIG TRIBE.

This division of the *Cactæ* includes the genera *Rhipsalis*, *Nopalea*, *Opuntia*, and *Pereskia*, which are characterised by branched and jointed stems, and by the calyx tube not extending beyond the ovary.

RHIPSALIS, *Gaertner*.

(The Mistletoe Cactus).

About thirty species of plants are assigned to the genus *Rhipsalis* as now constituted, the majority being natives of Tropical America, though one is found in South Africa and the Mauritius. They are epiphytal in habit, like the two preceding genera, have much-branched, slender, round, angular, or flat leafless stems, small flowers from a quarter of an inch to an inch in diameter, with oblong spreading white or yellow petals and greenish sepals, and a small white globular berry-like fruit resembling the Mistletoe. Under these characters are now included what have been regarded as four distinct genera—namely, the true *Rhipsalis* (*Eurhipsalis*) *Lepismium*, *Hariota*, and *Pfeiffera*, the three last being little known in gardens. In fact, the whole of the species are interesting chiefly for their structure and distinctness from other *Cactæ*, as they are of little horticultural value.

They all need a light sandy soil, and being of drooping habit several of them appear best when suspended in pots or small baskets, and some of

the slender species are pretty when grown in this manner. A warm dry position is required either in the stove or intermediate house, but the best known Mistletoe Cactus, *R. Cassytha*, can be grown under a glass case in a room, where it will produce its little white berries freely. The dwarf *R. mesembryanthemoides* and the yellow-flowered *R. salicornioides* can be grown in the same way.

R. CASSYTHA, *Gaertner*.—This is the true Mistletoe Cactus, and as such has been known for considerably over one hundred years, as it was introduced by Phillip Miller in 1758 from the West Indies, and some old writers have even mentioned the plant as a *Viscum*. In Miller's "Gardeners' Dictionary" (Martyn's edition) it is described under the title *Cactus pendulus*, a name which was also adopted by several other writers (Swartz, Brown, and Aiton), though a few have probably referred to the same plant under the name of *Cactus parasiticus*. The stems are cylindrical and pipe-like, producing their branches in whorls of three to six, upon the sides of which the small white flowers are produced, and are followed by the white semi-transparent berries that have gained the plant its popular name. These certainly bear a remarkable resemblance to Mistletoe berries in form, colour, and substance, and it appears to be one of those peculiar cases of mimicry that occur in certain families of plants, some of which have been so interestingly described by Mr. Leo H. Grindon in his "Echoes of Plant Life." It is strange, however, that though many plants assume a more or less striking resemblance to the *Cactææ* there are comparatively few of the latter that mimic other plants. Yet amongst the *Rhipsalises* we have four or five remarkable examples of this kind in addition to the one already noted; for instance, *R. salicornioides*, which, as its name implies, is much like our British Glasswort, *Salicornia herbacea*; *R. mesembryanthemoides*, which resembles some of the Figwort family; while several species, as *R. crispata*, *R. pachyptera*, and *R. Swartziana*, have flattened crenated leaf-like stems exactly of the *Phyllocactus* form. On the other side *Euphorbia mauritanica* has cylindrical pipe-like branches precisely similar to *Rhipsalis funalis*.

R. MESEMBRYANTHEMOIDES, *Decandolle*.—A dwarf much-branched plant with trailing stems, bearing small cylindrical branches, covered with tufts of fine hair. The flowers are about half an inch in diameter, with five or six greenish white semi-transparent tapering sepals and petals, and are borne singly near the apex of the short branchlets. The fruit is similar to that of *R. Cassytha*, but smaller. This plant was described by Haworth as a variety of *R. salicornioides*, from which, however, it is quite distinct, and it was first flowered by W. Christy, Esq., Clapham, in 1831.

R. (HARIOTA) SALICORNIODES, *Haworth*.—The division or genus *Hariota* was founded by Endlicher upon this species, the chief distinguishing characters relied upon being the position of the flowers—namely, at the points of the branches, instead of being produced at the sides as in the other *Rhipsalises*, and in their colour being yellow instead of white. Though very

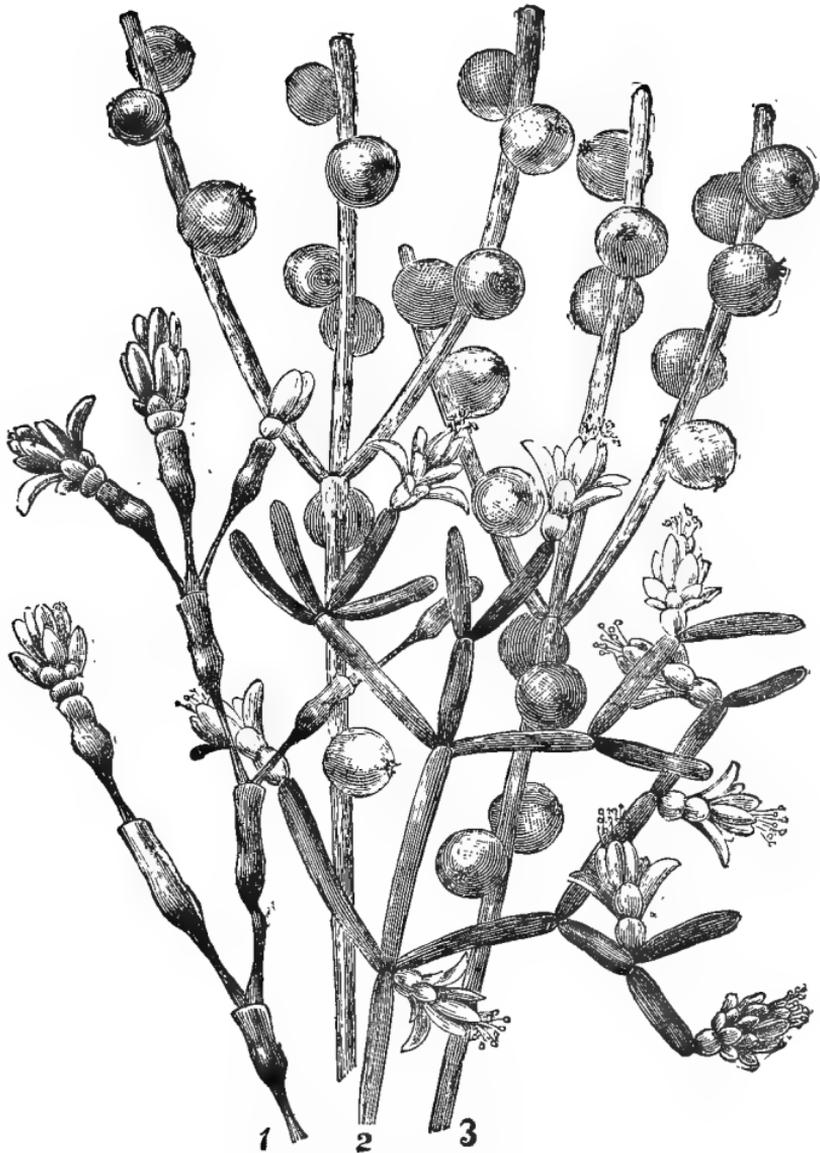


Fig. 13.—1, *Rhipsalis salicornioides*; 2, *R. penduliflora*; 3, *R. Cassytha*.

distinct it is not considered sufficiently so to be separated as a genus, and is easily recognised as one of the Mistletoe Cactuses. It has slender stems alternately swollen and contracted like the Glasswort, as already noted. The flowers are orange yellow, wax-like, and shining, half an inch long, with twelve or more oblong sepals and petals which do not expand fully. A variety is grown at Kew named *stricta*, more upright than the species and almost fastigate or bunched, while in some collections a form is grown named *ramosior*, which is rather more freely branched than the type.

R. SARMENTACEA, *Otto*.—In 1858 Mr. W. Christy sent this very distinct and pretty species to Kew, which was probably its first appearance in England, though it had been known on the Continent for some years. It has slender cylindrical stems, densely covered with small black spines not unlike *Cereus flagelliformis*. The flowers are large, over an inch in diameter, star-like in form, with eight petals, and creamy white in colour. It is a native of Buenos Ayres and South Brazil.

Many other species could be named, but the following are the most remarkable:—*R. funalis* (*R. grandiflorus*), a strong-growing form introduced to Kew by Bowie and Allan Cunningham in 1816, has greenish white flowers more than 1 inch across, and cylindrical pipe-like stems a quarter inch in diameter, long, and much-branched. *R. paradoxa* is a strange Brazilian plant, with long pendulous three-angled branches, jointed, the space between the joints being 1 to 2 inches long, and the stem is half twisted at each juncture, giving a most peculiar appearance to the plant. A specimen at Kew is trained up the roof of the succulent house, and its branches hang in a dense cluster 2 feet or more in length. *R. penduliflora laxa* is a slender drooping plant, very graceful, and suitable for a suspended pot. *R. pentaptera* has trailing five-angled stems nearly half inch in diameter, very distinct from its relatives. The principal flattened and *Phyllocactus*-like species are—*R. crispata*, *R. rhombea*, *R. pachyptera*, and *R. Swartziana*.

LEPISMIUM, *Endlicher*.—The few species arranged under this head are chiefly botanical curiosities, and are denoted by slender triangular or quadrangular stems, with flowers produced from the sides of the branches in fascicles of five spines, the petals being erect, and not spreading as in *Rhipsalis*. *L. Myosurus* [also known as *Cereus tenuispinus* and *Cactus tenuis*] is a Brazilian plant with small weak stems, which reach the length of several feet, and produce yellowish flowers 1 to 1½ inch across. A pretty graceful variety named *Knighti* has pretty reddish-tinted stems. *L. commune* [*Cereus squamulosus* and *C. elegans*] also from Brazil, has triangular jointed stems half to 2 inches in diameter and 1 to 2 feet long, the flowers small, white, tinted with purple.

PFEIFFERA, *Salm-Dyck*.—This was founded as a genus to honour a celebrated German botanist, Pfeiffer, who has written several works upon Cactæ, and whose name is mentioned as an authority for the titles of many of the plants noted in the preceding genera. It only contains one species *P. cereiformis*, a Mexican plant, somewhat resembling a *Cereus* with tri-

angular or quadrangular stems, and white or rose-tinted flowers. The fruits are globular, half inch in diameter, semi-transparent, and of a violet hue. It is interesting botanically, but is seldom seen in collections.

NOPALEA, *Salm Dyck*.

(The Nopal or Cochineal Cactus.)

As regards their economic value the true Indian Figs—namely, the Nopaleas and the Opuntias, are by far the most important of the whole family, and they are the only ones which have ever been cultivated on a large scale as commercial products. They therefore possess considerable interest, though with a few exceptions they are much less ornamental than numbers of their allies, and are in consequence not greatly appreciated as garden plants. They have strangely grotesque and frequently formidable stems, armed with long and powerful spines, meriting in more than one instance the name “horrida,” which is very aptly applied to a particularly spiny Opuntia. It is this character that renders many of the plants useful in tropical countries as hedges or barricades, which are absolutely impassable to wild animals, and form most durable marks of division between estates or even the possessions of different nations. The genus Nopalea, however, only contains three species of Indian Fig, all of which are comparatively free from spines; and two of these—viz., *N. dejecta* and *N. Auberi*, are not marked by any qualities of especial value, but the third, *N. cochinellifera*, is the widely known and highly important Cochineal Cactus. All these have been described as Opuntias, but were separated from that genus by a few characters which to anyone but a botanist would appear of little consequence. These are chiefly the erect petals slightly approaching each other at the apex, the stamens longer than the corolla, the red or crimson flowers, and the nearly spineless branches. In other respects they closely resemble the Opuntias, the stems being succulent, flat, leafless, and branching, the branches roundish or elliptical, and bearing the blooms upon their margins.

NOPALEA COCHINELLIFERA, *Salm Dyck*.—There is not much to recommend this plant to attention beyond its product the cochineal, as its flowers are not particularly handsome, and the general aspect is ungainly in the extreme. It attains a height of 10 or 12 feet, is much branched, of a dark green colour, the surface smooth and free from any but very small spines. The flowers are of moderate size, crimson, and are followed by a fruit similar to the Prickly Pears which are imported to this country and sold in the London markets. The plant has been long known to botanists, having been described by most of the earlier travellers in Mexico, the West Indies, and other parts of America, though it has been to some extent confounded with *Opuntia Tuna*. In Mexico these plants have been cultivated for a great

many years, long previous, it is said, to the conquest of that country, and thence it was introduced to other districts of America and to India. The exact date of its introduction to England is unknown, though it is said to have been received at the Chelsea Botanic Garden before the year 1688, where it was cultivated at that time. It was certainly included in the Eltham collection in 1732, for a figure and description of the plant are given in the "Hortus Elthamensis" under the name of *Tuna mitior flore sanguineo cochinellifera*. Since then it has been grown in most botanical gardens as a curiosity.

COCHINEAL.—Though obtained from several species of *Opuntia* as well as the *Nopalea cochinellifera*, a notice of this product may more appropriately accompany the description of the plant with which its name has been principally associated. It is now generally known that ordinary commercial cochineal consists of minute dried insects of the order Hemiptera, related to the mealy bug and the Vine scale, which are far too familiar pests in gardens. It bears the name of *Coccus cacti*, deriving its second title from the plants upon which it lives, and to which it is peculiar in the same way that other species of the genus are peculiar to the Vine, the Pine Apple, the Orange, and the Oak. Several of the Coccidæ yield useful products, as the Lac insect, *Coccus lacca*, the Kermes or *Coccus ilicis* that causes the galls upon *Quercus coccifera*, and which furnish a well-known and ancient dye. The most important of all is, however, the cochineal insect (fig. 14), the cultivation and exportation of which has been an extensive trade in many tropical countries for a considerable period. The male insect is furnished with two wings, and has two long filaments proceeding from the tail; it is very minute, and few in numbers compared with the female, which is wingless, and stationary upon the plant during the greater portion of her existence. Before producing its eggs the female increases to three or four times its normal size, and the legs and antennæ being then invisible except on very close scrutiny, they have much the appearance of small projections upon the surface of the plant, or they might be readily mistaken for fruits or berries. It is in this way that so many erroneous statements have been originated with regard to the true nature of cochineal. Gerarde mentions them as "Certaine excrescences which in course of time turn into insects." Dampier also gives a circumstantial account, in which it is stated that when the fruits open they are found full of red insects, and these being disturbed take to flight, but hover about the plant until killed by the sun, when they are collected in cloths. The value of cochineal as a brilliant red dye was, however, early ascertained, and the cultivation gradually extended in various districts of tropical America. It is related that in 1777 great efforts were made to introduce the insect and the *Nopalea*

to St. Domingo, which after much difficulty was accomplished by M. Thierry de Menonville; and so successfully was the cultivation carried on, that twelve years later a large quantity was produced, as

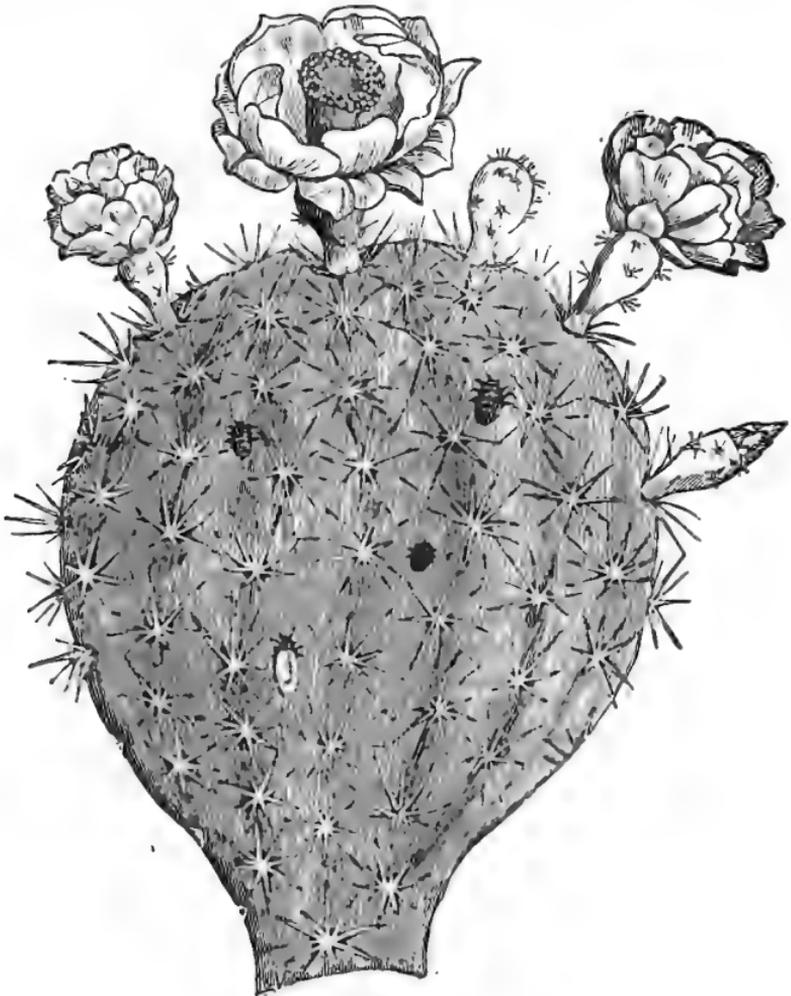


Fig. 14.—Opuntia with Cochineal Insect.

many as 4000 plants being grown on one estate. It extended to some other West Indian islands, and to the East Indies, but a considerable time elapsed before it was introduced to Teneriffe, the Canary Islands, and Algeria, whence a large amount is now exported.

The estates where the Cochineal Cactus is grown are termed Nopaleries, and the usual method of cultivation is to have the plants in rows, kept to the height of 4 or 5 feet. In Mexico, what is termed the sowing takes place in August or September—that is, the placing of the female insects upon the plants to produce their young. They are placed on with a piece of rag or the soft leaves of some plant, and if necessary this is secured by means of a thorn from one of the *Opuntias*, *O. Dillenii* being employed for that purpose in Teneriffe. In three or four months from the sowing the collection of the cochineal commences, women being employed in this work removing the insects with a blunt knife or squirrel's tail, which it may be readily imagined is an extremely tedious task, when it is stated that about 70,000 of the insects are required to make a pound. The insects are then killed by immersion in boiling water and afterwards dried in the sun, that being the state in which they are usually imported to this country. The insects are killed by being heated in an oven. There are, however, two kinds named—the *Grana fina* and the *Grana sylvestra*, the former being much larger and superior in every way to the latter. So great a difference is there, that the East India Company are reported to have offered a reward of £6000 for the introduction of the *Grana fina* into India, where the other was only then known. In the Kew Museum may be seen samples of what are termed the black and white Cochineals from Oaxaca in Mexico, and a small inferior sort named *Granilla* from Vera Cruz and Honduras. The white Cochineal is also known commercially as Silver Grain, and consists of the oven-dried insects, the black being the insects killed by immersion in water.

The cochineal trade in Teneriffe has been incidentally mentioned, and in connection with the subject the following letter recently addressed to the London *Times* is of especial interest:—"The old proverb that 'What is one man's meat is another man's poison' was never better exemplified than in the cochineal trade, which has been nearly ruined since the discovery of aniline dyes. Until very recently this trade was the mainstay of the island of Teneriffe, the cochineal depending upon the cultivation of the Cactus plant, which, since the supersession of the trade by aniline, is no longer the remunerative business that it formerly was. Cochineal consists of several kinds and qualities, the first and second qualities being called black *aconchada*, the others being *madres buenos* and *plateada*. The export trade is principally in the latter kinds, the first being less abundant and having to be more carefully picked and sorted. The *madres buenos* is seldom exported, but is principally used for propagating the cochineal insect by sprinkling them on the thick fleshy leaves of the plant, which flourishes equally well in indifferent and rocky soil and

requires little or no care or irrigation. The season of sowing or sprinkling the insect on the plants is the month of May or June, and the gathering is made in October, when the commercial operations commence and continue until the following May. During 1882 the shipments of cochineal were 4,840,316 lbs., showing a diminution of 791,339 lbs. on the export of the previous year. Of this quantity England took 2,715,983 lbs., America 868,813 lbs., and France 952,460 lbs., the remainder going to Germany, Spain, and Morocco. That the trade was of great value is shown by the price in 1880 of 2*s.* 4*d.* per lb. in England and 3*f.* the kilo in France, which produced a return of £600,000, or four-fifths of the whole trade of Canary Islands. The trade might have continued in a better state had not the cochineal farmers glutted the markets and refused to see the necessity of lowering their prices, in consequence of the discoveries of fresh colouring matter.' It may be added, however, that it is very probable the cochineal trade will revive, as it has been proved by Mr. James Startin of St. John's Hospital, London, that the now frequent employment of aniline dyes for articles of clothing causes many skin diseases, and he has strongly advocated the substitution of vegetable dyes.

As to the total amount of cochineal imported it was estimated in 1827 that about 150,000 lbs. were annually sent to this country, the value being £275,000, while in 1882 the total imports were 24,934 cwts.

OPUNTIA, *Miller.*

(The Indian Figs or Prickly Pears.)

The ordinary type of *Opuntia* is one of the most familiar forms of Cactus. The peculiar flattened, oval, or elliptical branches destitute of leaves, but armed with abundant spines, constitute the distinguishing characters of the Indian Figs as they are known to most people, and that, in fact, is the predominating form in this large genus. There are, however, many very striking departures from these prevailing characters: for instance, several species have irregularly cylindrical stems and slight elevations of the surface, similar to but not so prominent as the tubercles in other genera, and identical with them in structure. Some of these species have very slender stems, such as *O. leptocaulis*, and when not in flower could scarcely be recognised as a member of the Indian Fig group. In one respect the *Opuntias* are especially peculiar, and this is in the production upon the younger branches, particularly of the flat-stemmed kinds, of small thick fleshy appendages, which are regarded as leaves, or, at least, as their representatives. These appear below the clusters of spines, and are

very prominent upon the young growth of *O. vulgaris* and others, but they either become shrivelled and scarcely perceptible as the stem increases in age, or they fall off, and they never advance beyond the rudimentary state mentioned. Structurally this is interesting, as it is a step towards the leaves which we find so strongly developed in the next genus, *Pereskia*. The intermediate gradations appear to have been lost, for the transition is a very sudden one from the grotesque *Opuntias* to the comparatively slightly modified *Pereskia*, which makes the nearest approach to the ordinary characters of flowering plants.

The floral structure of the Indian Figs does not present any strongly marked variations. The sepals and petals are very numerous and indistinguishable, the outer generally narrow, the inner broader and spreading. The stems are shorter than the petals in a dense central cluster, above which the five to seven-lobed stigma is slightly raised. A large proportion of the species have yellow or orange-coloured flowers, and though some of these are exceedingly handsome the majority are not very imposing and of little value in gardens. The fruits, which have given the popular name to this genus, are comparatively large, 3 to 4 inches long and 2 to 3 inches in diameter, egg-shaped, or in a few cases somewhat Pear-like in form, covered with clusters of minute spines, and containing a sweet or sub-acid pulp of a rather agreeable flavour. Over 150 species are known, all natives of America, principally California, Mexico, Chili, and Peru, but two or three have been so long naturalised in South Europe, North and South Africa, and other widely separated portions of the globe, that they have become as abundant as native plants, and are often regarded as such by travellers.

One highly important service the *Opuntias* render to man in the districts where they thrive—they make admirable live fences or natural barriers, and for this purpose they are largely employed, not only in America, but also in South Africa. In one remarkable instance it is recorded that when the Island of St. Christopher in the West Indies was divided between the French and English, three rows of *Opuntia Tuna* were planted to mark the boundary. As an effectual protection against depredators of all kinds the *Opuntias* are indeed useful "hedge" plants, as they form a dense growth, the branches closely interlacing and bristling with spines—a veritable *chevaux de frise*—absolutely impassable. The value of such a defence can be fully appreciated in the countries where it is most employed, and where, without its aid, man would be almost powerless to prevent the devastating inroads of many enemies. When employed in this way portions of the branches are broken off and placed in trenches of a suitable depth, and there ends the attention afforded to or needed by

the plants. They grow in any dry sandy soil, and will subsist where scarcely any other vegetation is found—namely, on the porous lavas of volcanic districts. In Sicily a striking instance of this is seen, for there the *Opuntia vulgaris* grows and thrives in what would otherwise be sterile districts; and in this power of preparing sterile soils for other vegetation, the *Opuntias* strangely resemble the Mosses, Lichens, and similar minute cryptogamic plants.

In so large a genus as *Opuntia* it would be unnecessary to enumerate many of the species as, except in a botanical point of view, a good proportion are of little interest. A few of the best may, however, be noted.

O. VULGARIS, *Miller* (*Cactus Opuntia*, *Linnaeus*).—In Gerarde's "Catalogue of Plants," published in 1596, this *Opuntia* is mentioned, and it also appears in the "Herball" under the name of *Ficus indica*, the Indian Fig Tree, so that it has been grown in this country for nearly 300 years, and is, therefore, the patriarch of the *Cactææ*. It had, however, been then grown for some years in South Europe, and Gerarde obtained his plants from Zante through his servant Marshall; but the exact time of its introduction does not appear to be known, though it probably occurred shortly after the Spanish expeditions to America early in the sixteenth century. Gerarde states that he was unable to fruit the plant, although he had "bestowed great pains and cost in keeping it from the injury of our clymat." In Johnson's edition of Gerarde's "Herball" (1633), a fairly accurate figure is given of the plant, and from that it is evident that he succeeded in flowering it as freely as could be desired, and we cannot do much more now without protection. Having been so long cultivated in Europe it has extended into most of the warmer districts of Spain, Italy, and the Mediterranean Islands and North Africa, and there, under the influence of a higher temperature, the fruit ripens readily. Large quantities of these are consumed in those countries, and some are imported to England, where, with the fruits of a few other species, they are sold under the name of Prickly Pears. They are esteemed by some persons, but they are more usually employed as a curiosity in dishes of dessert, as the minute spines which cover the skin render the fruit in some degree dangerous if not very carefully peeled. At one time they were sold at from 4*d.* to 6*d.* each, but in recent years they have been so abundant that they occasionally appear on street stalls and barrows in London at the popular price of two for a penny. In Sicily it is very abundant, and during three months of the year it is said to form "an important portion of the inhabitants' diet, though generally considered insipid by strangers."

The common Indian Fig is rather dwarf in habit, with flat, rounded, spiny branches, upon the edges of which its rich golden yellow flowers are freely produced, and the plant is then decidedly ornamental. It is one of the best of the *Cactææ* for culture on a rockery, and is often left quite unprotected, though a handlight is beneficial to throw off excessive rain, and the plants so treated always have a better appearance than those constantly

exposed to the weather. In reference to the culture of this plant out of doors Mr. D. Dewar, Superintendent of the herbaceous department, Royal Gardens, Kew, writes me as follows :—

“ Although the cultivation of hardy Cacti in the open air has not been so successful as desired in some gardens, where artificially constructed positions have been given them, the result has been fairly satisfactory. Exposed on the open rockery they will live, but our moist climate tries them severely, especially in winter. Under projecting ledges, as seen at Floore, Weedon, and where there is little chance of their being exposed to too much rain, they flower with remarkable freedom, but this plan requires material not within the reach of all lovers of hardy plants. The best method of growing these plants that I have seen, and which I am now practising, is simply placing a small handlight in a specially dry and sunny position, placing inside 2 inches depth of broken bricks, stones, and lime rubbish, planting the *Opuntias*, or other *Cactææ*, and leaving them unattended. *Opuntia vulgaris* grows vigorously under this treatment and flowers freely, and needs scarcely any attention from January to December. The lights are never taken off winter or summer. No water is given at any time after they are established, and yet they are as healthy as possible. *O. vulgaris* is the most common and the easiest to procure, but we have also *O. missouriensis*, *O. Rafinesquei*, and others, all of them perfectly hardy and easily managed as described. *O. vulgaris* grows more rapidly than the others; the joints are oval, flat, covered with small leaves which come out in knots on the branches and which soon fall, leaving a number of short bristly hooked spines. The branches spread near the ground, or trail upon it snake fashion, putting out new roots at every joint as they go, and thus facilitating progress, seldom rising more than 6 inches in height. As the plant begins to grow old the first-formed joints begin to get hard and dry, of a tough texture, and inclined to be fibrous or woody. Blank spaces are easily averted by pegging over some of the younger branches.”

O. RAFINESQUEI, *Engelmann*.—Quite a recent introduction is this handsome hardy *Opuntia*, for it is within the past twenty years that it made its *début* in England. It has, however, become an established favourite in gardens, as when in flower its beauty is amply sufficient to recommend the plant to the most fastidious. It somewhat resembles *O. vulgaris*, and the latter is occasionally seen under this name; but *O. Rafinesquei* has more elongated branches, fewer smaller spines, and the flowers, though about the same size, are slightly paler and softer in colour. It is very floriferous, and being perfectly hardy it grows well on a rockery or a dry raised border, where, during July and August, it will bear a succession of blooms each 3 to 4 inches in diameter. If a position is prepared for it the soil should consist of loam, sand, and plenty of finely broken bricks, as too much moisture about the roots will do the plant more injury than will moderate frost. The stock can be quickly increased, as the branches form roots if placed in sand under a frame.

O. TUNA, Miller (*Cactus Tuna*, Linnæus).—This is a very strong-growing species, and is one of the principal of those employed for fences and hedges, as already mentioned. It is also one of the Cochineal plants, and in some districts is more largely grown for that purpose than the *Nopalea*, particularly in Mexico, its native country, but in many other parts of America it is nearly as abundant. The branches are long, flat, and elliptical in form, with numerous yellowish spines. The flowers are large, pale yellow, or with a rosy tint, and are followed by the characteristic "Prickly Pears" of the genus. One interesting peculiarity of the stamens in this species was long ago observed by Dr. J. E. Smith, then President of the Linnean Society, and published by him in a volume of "Tracts Relating to Natural History" in 1798. In one of these the author discusses the various phenomena connected with the "Irritability of Vegetables," especially referring to the stamens of *Berberis communis*. In connection with this he mentions, "The Barberry is not the only plant which exhibits this phenomenon. The stamina of *Cactus Tuna*, a kind of Indian Fig, are likewise very irritable. These stamina are long and slender, standing in great numbers round the inside of the flower. If a quill or feather be drawn through them, they begin, in the space of two or three seconds, to lie down gently on one side, and in a short time they are all recumbent at the bottom of the flower." I have tested this, and find that the rapidity of the response to the stimulus varies greatly with the condition of the weather at the time, and the age of the flower. In some cases the stamens appeared to have quite lost the property ascribed to them, and in others several minutes elapsed before there was any perceptible motion. The peculiarity is, however, not confined to *O. Tuna*, some other species exhibiting a similar sensitiveness, but the case is not quite analogous to that of the *Berberis*, the arrangement in that flower being more of a mechanical nature.

O. SALMIANA, *Parmentier*.—One of the most attractive of the slender-growing species with cylindrical stems is that upon which has been bestowed the name of a celebrated patron of the Cactus family, Prince Salm-Dyck. It is a native of Brazil, and was introduced about 1850, having been received at Kew from the continent about that time, and it has since then become one of the most favourite forms of the group in cultivation. As shown in fig. 15, which is a very slightly reduced representation of a portion of the plant, the stems are very slender and cylindrical, with numerous little tufts of small spines, and bearing near the summit dense clusters of very pretty neat open flowers. These are $1\frac{1}{2}$ to 2 inches in diameter, creamy white, the buds and outer surface of the petals being tinted with red, which gives a most pleasing appearance to the plant. It requires to be grown in a warm position, and needs a light soil, loam and leaf soil in equal parts having been found to suit it admirably. It is well worthy of more extended cultivation.

O. ARBORESCENS (the Walking Stick or Elk-Horn Cactus).—This species, which grows in Colorado and contiguous districts, has a narrow much-branched

stem, which often rises to a considerable height. These stems are cut, and after the fleshy substance has been removed there remains a hard woody network of thick fibres, which is converted into walking sticks. Specimens of this kind from Colorado, presented by E. G. Loder, Esq., are included in the collection at the Kew Museum. The same gentleman has also sent me some beautiful photographs of the scenery where this plant abounds, one view of the Grand Canon of the Arkansas being especially remarkable.

Amongst other notable species the following especially deserve brief mention:—*O. aurantiaca* (*Cactus aurantiacus*), a Chilian species, with bright orange flowers and irregularly terete stems. Introduced in 1824. *O. brasiliensis*, with irregularly flattened and branching stems, bearing scattered solitary dark spines 1 to 2 inches long, and pale yellow flowers 3 inches in diameter. The odour of the ripe fruit has been thought to resemble the leafstalks of garden Rhubarb. *O. candelabriformis*, a remarkable plant, with flat almost circular branches about 6 inches long by the same in width, and closely covered with white spines. *O. curassavica* (*Cactus curassavicus*), the Pinpillow or Minion Prickly Pear, deserves notice for its historical interest. It was one of the few Cactæ figured in Bradley's work on Succulent Plants, where it is named *Opuntia minima Americana spinosissima flore sulphureo*, and is said to have flowered and fruited in the Duchess of Beaufort's garden at Badminton, and on the authority of the "Hortus Kewensis" we learn that it was introduced from Curaçoa in 1690. The flowers are greenish-yellow, not very handsome. *O. cylindrica*, a very distinct species, with cylindrical stems and spindle-shaped tubercles, each bearing a tuft of spines at its summit. The flowers are red, 2 inches in diameter, and the plant was introduced to England in 1799.

O. DARWINII.—This species is interesting, as having been discovered by Mr. Charles Darwin in Patagonia, and it is mentioned by him in his "Naturalist's Voyage Round the World" as follows (p. 165):—"I found here a species of Cactus which was remarkable by the irritability of the stamens when I inserted either a piece of stick or the end of my finger in the flower. The segments of the perianth also closed on the pistil, but more slowly than the stamens. Plants of this family, generally considered at tropical, occur in North America in the same high latitude as here—namely, in both cases in 47°." In the volcanic islands of the Galapagos Archipelago the same writer found an *Opuntia*, which was afterwards named *O. galapageji*, a tree-like species 6 to 10 feet high, and this is probably the plant mentioned in his account of these islands as "a great odd-looking Cactus, which, with some of the Euphorbiaceæ and an Acacia, are the only trees which afford any shade. After the season of heavy rains the islands are said to appear for a short time partially green. The volcanic island of Fernando Noronha, placed in many respects under nearly similar conditions, is the only other country where I have seen a vegetation at all like this of the Galapagos Islands." *O. decumana* is an extraordinary plant, represented

in the Kew collection by a specimen 12 feet high and of considerable age. It has huge elliptical flattened branches 12 to 20 inches long and 8 to 10 broad, with a few spines, the lower older portion of the stem being cylindrical, woody, and about 8 inches in diameter. It is a South American plant, has orange-coloured flowers, and has been described by various authors under the name of *O. maxima*, *Cactus elongatus*, and *Cactus decumanus*.



Fig. 15.—*Opuntia Salmiana*.

O. DILLENII (*Cactus Dillenii*).—One of the species cultivated at Eltham in 1732, being described and figured in Dillenius' work as *Tuna major spinis validis flavicantibus flore sulphureo*. It has flat stems with strong yellow spines, and bears yellow flowers 3 to 4 inches in diameter. This plant is grown in Teneriffe for its spines, which are employed to secure the clusters of cochineal insects to *O. Tuna* at the "sowing" period already noticed. In a group of flowers painted by Miss North at Teneriffe, and now in the North Gallery at Kew, this species is well represented, several views of the cochineal

gardens in which it is employed being also given. In England this *Opuntia* flowers very freely, its large yellow blooms being very attractive. *O. horrida* well deserves its name, for it is a most formidable plant, the spines 2 to 3 inches long, very strong, of a peculiar tawny colour, and in clusters of seven or eight each. *O. imbricata* has irregularly cylindrical branching stems and tufts of white spines. *O. Kleinia*, also with cylindrical stems, receives its name from a slight resemblance to some of the *Kleinias*. *O. leptocaulis* is one of the most slender-growing *Opuntias*, the stems often not exceeding one-eighth of an inch thick. *O. leucotricha* has a curious appearance, owing to its oval flat branches being closely covered with long white spines, which are deflected towards the base of the plant and almost level with the surface. *O. microdasys* is a rather pretty dwarf and much-branched species, which with its variety *rufida*, has numerous small tufts of reddish-brown hair-like spines covering the elliptical flattened branches. *O. monacantha*.—This is one of the best known of the flat-stemmed Prickly Pears, as it is largely grown for sale with the miniature Cacti. It has dark green stems, with scattered solitary spines, and bears neat bright orange-coloured flowers. *O. nigricans*.—This is another of the largest specimens at Kew, one old example there being of corresponding dimensions to *O. decumana*—namely, 12 feet in height, the branches 12 inches long by 6 inches broad, and bearing very dark spines 2 to 3 inches long, the flowers orange-red, and the fruits pear-shaped and rich crimson when ripe. This has been described as *Tuna major* (Dillenius), as *Cactus Tuna var. nigricans*, as *Cactus Tuna*, and as *Cactus nigricans*, and it appears to be one of the species upon which the cochineal insect lives.

PERESKIA, *Miller*.

(The Gooseberry Cactus.)

In all the preceding genera of the Cactus family we have been reviewing a form of vegetation widely different in appearance from the ordinary characters of flowering plants, particularly as regards the stem structure, but in the *Pereskia* by a sudden transition we come to a group of plants evidently connecting the family with several orders. The stems have lost the bulkiness of many *Cactea*, and though still fleshy in a certain degree, and armed with clusters of spines, they are cylindrical and more shrub-like in form, while they bear normal leaves veined like the majority of *exogens*, and often with a distinctly developed stalk (petiole). The flowers, too, are very distinct, the petals being rotate—that is, spreading like the spokes of a wheel, and in several cases they bear a close resemblance to single *Roses*. The flowers are produced in a form of inflorescence, which is not found in any other member of the family—namely, clustered or paniculate at the sides or points of the branches, and this alone gives the *Pereskias* a unique appearance, and

renders them easily recognised. Thirteen species are known, all natives of tropical America and the West Indies, but few are in cultivation, and these are in England chiefly employed as stocks for other kinds of Cactææ, such as the Epiphyllums.

The genus was named in honour of N. F. Peiresk, a senator of Aix, who is said to have "collected a considerable library and herbarium, but published nothing." The name is sometimes spelled Peirescia.

P. ACULEATA, Plumier (*Cactus Pereskia*, Linnæus), THE BARBADOES GOOSEBERRY OR BLAD APPLE.—Though this plant is rarely seen in England except as a stock for Epiphyllums, or in course of preparation for that purpose, it is decidedly ornamental when trained to the roof of a house and allowed to flower. Its white blooms are much like a single Rose, or some form of Rubus, are produced in panicles of a dozen or more, slightly drooping and very graceful, the narrow white petals and similar green sepals contrasting rather pleasingly. The leaves are ovate or elliptical, 3 to 4 inches long, 2 to 3 inches broad, dark shining green; and the stems, which attain the height of 10 to 12 feet, and 1 to 4 inches in diameter, have numerous dense clusters of strong spines. As the popular name implies, the fruit is much like a Gooseberry, the similarity being observable not only in the form and size, but in the colour and flavour also, and in some of the West Indian Islands, especially in Barbadoes, a much-valued preserve is prepared from the fruits, and is said to possess expectorant qualities. The use of this plant as a stock has been described under Epiphyllum, and it need only be added that it can be raised from seeds as well as from cuttings, the latter being, however, the quicker method. The time of flowering varies, sometimes occurring in the summer months, July, August, or September, and at others in early spring.

This species has been an inhabitant of English gardens for a great number of years, as it is recorded as included in the Hampton Court collection in 1696, and is mentioned by Dillenius thirty or forty years subsequently. When it was first used as a stock for Epiphyllums is uncertain, but it was employed in that way early in the present century. Several varieties have been described differing in the leaves, such as lanceolata, rotundifolia, and rubescens, the names indicating the characters.

P. BLEO, Decandolle.—An extremely distinct and bold-looking plant, with strong cylindrical stems, clusters of long formidable spines, and large dark green obovate leaves, 4 to 6 inches long, and 3 to 4 inches broad. It attains considerable size, growing rapidly, and soon reaching under cultivation a height of 10 feet, frequently requiring to be cut down to keep it within bounds. The flowers are round, 1 to 2 inches across, the petals similarly placed to those in *P. aculeata*, but broader, and of a rich rosy crimson colour, varying slightly in depth of tint, being sometimes more delicate in hue; but all are pretty, as the flowers are borne in clusters or close panicles on the upper part of the branches, and are produced about the same time as in

P. aculeata, varying like that species. It is one of Humboldt's discoveries, having been found on the banks of the Magdalena in New Grenada, but it was first received in Britain from Mexico, whence it was sent to the Glasgow Botanic Gardens in 1827. In America the native name for the plant is Bleo, and in some parts the leaves are said to be used as a salad.

Owing to its quick growth, and the stem being stronger than *P. aculeata*, this would probably make a good stock for large specimen Epiphyllums; but no instance of its being so employed has come under my notice, though it would be well worth a trial.

Few of the other Pereskias are cultivated, but one, *P. calandriniaefolia*, is used on the Continent as a stock for Epiphyllums, though I am not aware that it is superior in any way to *P. aculeata*. Several are named after the resemblance of their flowers to other plants, as *P. lychnidiflora*, *P. opuntiaeflora*, and *P. zinniaeflora*, most of the others having names referring to the form of the leaves, the flowers being generally rose-coloured, while in a few cases the leaves are small and almost as rudimentary as in some of the Opuntias.

CACTUSES OUT OF DOORS AND IN COLD FRAMES.

In the preceding notes some reference has been made to species that can be grown out of doors in England, but the following summary of Mr. E. G. Loder's practice as described by him at the evening meeting of the Royal Horticultural Society in Burlington House, May 8th, 1883, will indicate what success may be expected under this system. When planted out of doors a dry sloping border is selected, or a position near the rockery where the plants are protected from rain by projecting ledges of stone, where some fifty species of Cactæ and other succulent plants have endured 16° of frost without injury. Of the Cactæ the following have been so treated:—*Echinocactus Simpsoni*, *Echinocereus phœniceus*, *E. viridiflorus*, *Mamillaria vivipara* var. *texensis*, *Opuntia arborescens*, *O. missouriensis*, *O. missouriensis* var. *humilis*, *O. m.* var. *trichophora*, *O. erinacea*, *O. Rafinesquei*, and *O. vulgaris*. No doubt many others could be given in the same way; but a preferable mode of cultivating even these hardy species is in a cold frame, as the plants always have a better appearance. Mr. Loder's method is to place the pots on planks raised slightly above the soil, and cocoa-nut fibre refuse is packed between the pots. No water is given throughout the winter, but in the spring and during the summer the plants are watered and syringed freely, closing the frames early in the afternoon. By this means a quick healthy growth is induced, which is well matured in the autumn by removing the lights except in wet weather, and the plants flower even more readily than some of those grown in

heated houses. The principal species that have been grown in such frames are *E. chloranthus*, *E. Fendleri*, *E. gonacanthus*, *Opuntia camanchica*, *O. hystricina*, and *O. Whipplei*; but, as was observed in the earlier chapters, a large number of *Cactææ* are benefited by being so treated during the summer months.

DISEASES AND INSECTS.

Cactaceous plants are subject to few diseases, and the only one which gives any trouble to the cultivator is a decay of the stem, which is sometimes very rapid. It is occasioned by excessive moisture in the soil, or more frequently perhaps by a drip from the roof of the house, and can be guarded against by the exercise of a little care. If a decay spot is observed it is a good plan to rub a little lime on it or cut the piece out, and fill the hole with lime; but very often when the injury is first noticed it is too late to effect a cure, so that preventive measures are in this, as in many other matters, much the best. Numerous insects attack these plants—green fly, red spider, mealy bug, and various kinds of scale, but the two last-named are the most troublesome and difficult to eradicate. The mealy bug in particular harbours in the clusters of spines, and is not easily removed by syringing, a small stiff brush being the most useful and ready means of cleaning the plants. Scale can be removed in a similar way, or with a small pointed stick, and green fly can be easily destroyed by moderate fumigation with tobacco. An excessively dry hot atmosphere causes the appearance and rapid increase of red spider, which soon effectually injures the plants. Cooler quarters, with frequent syringing, or sponging with softsoap and water, will soon diminish their numbers, while diluted petroleum is strongly recommended by some persons for the same purpose, Mr. Wright, who has charge of the Cromwell House collection, relying exclusively upon this as an effective insecticide.

PORTRAITS OF CACTACEOUS PLANTS.

To aid those who may be desirous of identifying any plants they have in their collections the following list has been prepared of portraits published in works which are readily accessible in English libraries. The names given are those under which the plants are figured, and in cases where the same plant has been represented in several works under different titles the name most generally accepted has been selected. The following abbreviations are employed to indicate the works containing the plates, and where two figures are given the first is the number of the volume.

ABBREVIATIONS.

A.R.—Andrews' Botanists' Repository. B.M.—Botanical Magazine. B.R.—Botanical Register. B.S.—Boundary Survey, Cactaceæ of the United States and Mexico; by Dr. George Engelmann. E.M.—Report of Explorations for a Railroad from the Mississippi River to the Pacific Ocean; by Dr. George Engelmann. J.M.—Jardine's Magazine. L.C.—Loddiges' Botanical Cabinet. P.C.—Pfeiffer's Cactæ. P.F.G.—Paxton's Flower Garden. P.G.—Decandolle's Plantes Grasses. P.M.—Paxton's Magazine of Botany. R.C.—Decandolle's Revue des Cactæes.

CACTUS—

alatus, B.M. 2820
 cochinelifer, B.M. 2741
 Dillenii, B.R. 3. 255
 flagelliformis, B.M. 17
 gibbosus, B.R. 2, 137
 hexagonus, A.R. 8, 513
 mammillaris, P.G. 111
 Melocactus, P.G. 112
 Opuntia, B.M. 2393
 parasiticus, P.G. 59
 phyllanthoides, B.M. 2092
 Phyllanthus, B.M. 2692
 polyanthus, B.M. 2691
 speciosissimus, B.M. 2306
 speciosus, B.R. 4, 304
 Tuna, B.M. 1557

CEREUS—

Berlandieri, B.S. 58
 Bigelovii, E.M. 4, 4
 cæspitosus, B.S. 43
 coccineus, P.C. 1, 15
 cærulescens, B.M. 3922
 conoideus, E.M. 4, 4
 crenatus, B.R. 30, 31
 Crimsoni, B.R. 19, 1565
 etenoides, B.S. 42
 Curtisii, P.C. 1, 11
 dasyacanthus, B.S. 39
 dubius, B.S. 50
 Emoryi, B.S. 60

CEREUS (Continued)—

Engelmanni, B.S. 57
 enneacanthus, B.S. 48
 eriophorus, P.C. 1. 22
 extensus, B.M. 4066
 Fendleri, B.S. 51
 fragriformis, P.C. 1, 12
 grandiflorus, B.M. 3381
 " Maynardi, P.M. 14, 75
 giganteus, B.S. 61
 gonacanthus, E.M. 4, 5
 Greggi, B.S. 63
 hexædrus, E.M. 4, 5
 Hookeri, P.C. 1, 5
 latifrons, B.M. 3813
 Leeanus, B.M. 4417
 leptophis, R.C. 12
 leucanthus, B.R. 26, 13
 longisetus, B.S. 45
 MacDonaldiæ, B.M. 4707
 Martianus, B.M. 2768
 multiplex, B.M. 3789
 Napoleonis, B.M. 3458
 paucispinus, B.S. 56
 pentalophus, B.M. 3651
 peruvianus, P.C. 2, 5
 phœniceus, E.M. 4, 4
 phyllanthus, P.C. 1, 10
 Pitajaya, B.M. 4084
 polyacanthus, B.S. 54
 procumbens, B.S. 59
 reductus, B.M. 4443

CEREUS (Continued)—

- repandus, B.R. 4, 336
- Royeni, B.M. 3125
- Schrankii, P.C. 1, 27
- serpentinus, B.M. 3566
- setaceus, P.C. 1, 16
- setosus, L.C. 1887
- speciosissimus, B.M. 3822
- speciosus, B.R. 4, 304
- stramineus, B.S. 46
- triangularis, B.R. 21, 1807
- trichlochidiatus, E.M. 4, 4
- truncatus, B.R. 9, 696
- Twedei, B.M. 4498
- undatus, P.C. 1, 23
- variabilis, B.S. 60

DISCOCACTUS—

- insignis, P.C. 2, 1
- tricornis, P.C. 2, 28

DISOCACTUS—

- biformis, B.R. 31, 9

ECHINOCACTUS—

- acutissimus, P.C. 1, 20
- arrigens, P.C. 2, 27
- bicolor, P.C. 2, 25
- brevihamatus, B.S. 18
- Bridgesi, P.C. 2, 14
- centeterius, B.M. 3974
- chloranthus, B.S. 37
- chlorophthalmus, B.M. 4373
- cinnabarinus, B.M. 4326
- concinus, B.M. 4115
- coptonogonus, P.C. 2, 19
- cornigerus, R.C. 10
- corynodes, B.M. 3906
- cylindraceus, B.S. 30
- Echidne, R.C. 11
- echinoides, P.C. 2, 29
- Emoryi, E.M. 4, 3
- Eyriesii, B.M. 3411
- fossulatus, P.C. 2, 13
- hexædrophorus, B.M. 4311
- horizontalonius, B.S. 31
- hybocentrus, P.C. 1, 21
- intertextus, B.S. 34
- Lecontei, B.S. 27
- Leeanus, B.M. 4184
- leucacanthus, P.C. 1, 14
- longihamatus, B.M. 4632
- Mackianus, B.M. 3561
- mamillarioides, B.M. 3358
- marginatus, P.C. 2, 30
- multiflorus, B.M. 4181
- myriostigma, B.M. 4177
- obvallatus, P.C. 2, 22

ECHINOCACTUS (Continued)—

- Ottonis, B.M. 3107
- oxygonus, B.M. 4162
- Parryi, B.S. 32
- pectiniferus, B.M. 4190
- Pentlandi, B.M. 4124
- Pfefferi, P.C. 2, 2
- phyllacanthus, P.C. 1, 9
- polyancistrus, E.M. 4, 2
- polycephalus, E.M. 4, 3
- rhodophthalmus, B.M. 4486
- Sandillon, B.S. 33
- Scheeri, B.S. 17
- Scopa, B.R. 25, 24
- Sellovii, P.C. 1, 1
- sessiliflorus, B.M. 3569
- setispinus, B.S. 20
- streptocaulon, B.M. 4562
- tenuispinus, B.M. 3963
- tetracanthus, P.C. 2, 6
- texensis, B.S. 33
- tubiflorus, B.M. 3627
- turbiniiformis, P.C. 2, 3
- uncinatus, P.C. 2, 18
- unguispinus, B.S. 35
- viridescens, B.S. 29
- viridiflorus, B.S. 36
- Visnaga, B.M. 4559
- Whipplei, E.M. 4, 1
- Williamsi, B.M. 4296
- Wislizeni, E.M. 4, 3

ECHINOPSIS—

- campylacantha, B.M. 4567
- cristata, B.M. 4521
- multiplex, P.C. 1, 4
- oxygona, P.C. 2, 4
- pectinata, P.C. 2, 10
- turbinata, P.C. 2, 7

EPIPHYLLUM—

- Altensteinii, P.C. 1, 28
- Russellianum, B.M. 3717
- splendidum, P.M. 1, 49
- truncatum, P.M. 8, 79

LEUCHTENBERGIA—

- principis, B.M. 4393

MAMILLARIA—

- affinis, R.C. 6
- atrata, B.M. 3642
- barbata, B.S. 6
- bicolor, P.C. 1, 3
- cirrhifera, P.C. 1, 7
- Clava, B.M. 4358
- conoidea, R.C. 2
- criniformis, R.C. 4

MAMILLARIA (*Continued*)—

- crinita, R.C. 3
 dasyacantha, B.S. 12
 discolor, L.C. 1671
 Echinus, B.S. 10
 elephantidens, P.C. 2, 20
 eriacantha, P.C. 1, 25
 fissurata, B.S. 16
 floribunda, B.M. 3647
 Goodridgii, B.S. 8
 Grahmi, B.S. 6
 gummifera, B.S. 9
 Heyderi, B.S. 9
 lasiacantha, B.S. 3
 Lehmanni, B.M. 3634
 longimamma, R.C. 5
 macracantha, R.C. 9
 macromeris, B.S. 14
 meiacantha, B.S. 9
 micromeris, B.S. 1
 nigricans, P.C. 2, 23
 pectinata, B.S. 11
 phellosperma, B.S. 7
 pulchra, B.R. 16, 1329
 pusilla, B.S. 5
 pycnanantha, B.M. 3972
 radiosa, B.S. 13
 Seitziana, P.C. 1, 8
 Sempervivi, R.C. 8
 simplex, R.C. 7
 tenuis, B.M. 3646
 tetracantha, B.M. 4060
 tuberculosa, B.S. 12
 turbinata, B.M. 3984
 uberiformis, P.C. 1, 13
 uncinata, P.C. 1, 19
 Wrighti, B.S. 8
 zephyranthoides, P.C. 2, 8

MELOCACTUS—

- communis, B.M. 3090
 depressus, B.M. 3691

OPUNTIA—

- acanthocarpa, E.M. 4, 18
 angustata, E.M. 4, 7
 arborescens, E.M. 4, 17
 aurantiaca, B.R. 19, 1606
 basilaris, E.M. 4, 13
 Bigelovii, E.M. 4, 19
 brachyarthra, E.M. 4, 12
 brasiliensis, B.M. 3293
 bulbispina, B.S. 73
 camancharica, E.M. 4, 9
 chlorotica, E.M. 4, 6
 clavata, E.M. 4, 22
 coccinellifera, P.C. 1, 24
 curassavica, P.C. 1, 6

OPUNTIA (*Continued*)—

- cylindrica, B.M. 3301
 cymochila, E.M. 4, 12
 Darwinii, J.M. 1, 14
 decumbens, B.M. 3914
 echinocarpa, E.M. 4, 18
 Emoryi, B.S. 70
 Engelmanni, E.M. 4, 8
 erinacea, E.M. 4, 13
 filipendula, B.S. 68
 foliosa, P.C. 1, 18
 frutescens, E.M. 4, 20
 fusco-atra, E.M. 4, 11
 fusiformis, E.M. 4, 12
 galapageia, J.M. 1, 14
 Grahmi, B.S. 72
 hystericina, E.M. 4, 15
 imbricata, B.S. 73
 macrorhiza, B.S. 69
 missouriensis, E.M. 4, 14
 mohavensis, E.M. 4, 9
 monacantha, B.M. 3911
 occidentalis, E.M. 4, 7
 procumbens, E.M. 4, 6
 Rafinesquii, E.M. 4, 10
 Salmiana, B.M. 4542
 Schottii, B.S. 73
 sphærocarpa, E.M. 4, 13
 stenochila, E.M. 4, 12
 stenopetala, B.S. 66
 Strigii, B.S. 67
 tessellata, E.M. 4, 21
 tortispina, E.M. 4, 8
 vaginata, E.M. 4, 20
 vulgaris, E.M. 4, 10

PERESKIA—

- aculeata, B.R. 23, 1928
 Bleo, B.M. 3478

PHYLLOCACTUS—

- Ackermanni, B.M. 3598
 anguliger, P.G. 34
 phyllanthoides, P.C. 2, 17
 speciosissimo-crenatus, P.F.G.
 62

RHIPSALES—

- bracheata, B.M. 4039
 Cassythra, B.M. 3080
 fasciculata, B.M. 3079
 grandiflora, B.M. 2740
 mesembryanthemoides, B.M.
 3078
 pentaptera, 1, 17
 salicornioides, B.M. 2461
 sarmontacea, B.M. 5136

There are several good works of reference on the Cactææ, but there is not one devoted to these plants in the English language. Dr. Engelmann's descriptions are extremely valuable. The majority are in Latin, but some useful additional particulars or duplicate descriptions are given in English. The plates, too, are most beautifully executed. A very full and useful work is the "Monographie de la Famille des Cactées" by J. Labouret, which, in 682 closely printed pages, gives an elaborate account of the family—descriptive, structural, and cultural. Decandolle's and Pfeiffer's works contain much information that cannot be obtained elsewhere; and several other Continental botanists have also contributed works of more or less importance to those interested in Cactaceous plants.



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