

A decorative, ornate frame with a central shield-like shape, featuring intricate scrollwork and floral motifs at the top and bottom. The frame is embossed or engraved into the cover material.

CASSELL'S
POPULAR
GARDENING

ALBERT R. MANN
LIBRARY

NEW YORK STATE COLLEGES
OF
AGRICULTURE AND HOME ECONOMICS



AT

CORNELL UNIVERSITY

Cornell University Library

SB 453.F53

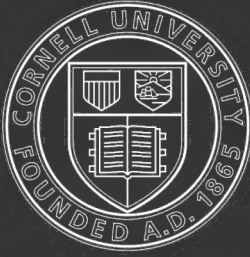
v.2

Cassell's popular gardening.



3 1924 002 871 238

mann



Cornell University Library

The original of this book is in
the Cornell University Library.

There are no known copyright restrictions in
the United States on the use of the text.

<http://www.archive.org/details/cu31924002871238>

THIS EDITION

Is specially prepared for
Subscription only, and is not
obtainable through the general
Booksellers.

CASELL & COMPANY, Limited.



Printed
by
W. & A. G. & Co.
London

PORTION OF THE ROCKERY AT THE ROYAL HORTICULTURAL SOCIETY'S GARDENS, CHISWICK.

CASSELL'S POPULAR GARDENING.

EDITED BY

D. T. FISH,

ASSISTED IN THE PRESENT VOLUME BY

MR. EDWARD W. BADGER, F.R.H.S.

MR. JAMES BRITTEN, F.L.S., *British Museum.*

MR. WILLIAM CARMICHAEL, *late Gardener to H.R.H. the Prince of Wales.*

MR. WILLIAM COLEMAN, *The Gardens, Eastnor Castle, Ledbury.*

MR. RICHARD DEAN, *Ealing, W.*

MR. WILLIAM EARLEY, *Ilford, Essex.*

MR. WILLIAM HUGH GOWER, *Nurseries, Tooting.*

MR. JAMES HUDSON, *The Gardens, Gunnersbury House, Acton, W.*

DR. MAXWELL T. MASTERS, F.R.S.

MR. WILLIAM WILDSMITH, *The Gardens, Heckfield Place, Winchfield, Hants.*

With numerous Illustrations.

VOL. II.

CASSELL & COMPANY, LIMITED:

LONDON, PARIS, & MELBOURNE.

[ALL RIGHTS RESERVED.]

INDEX OF CONTENTS.



COMMON GARDEN FLOWERS :	PAGE	GLASS STRUCTURES AND APPLIANCES :	PAGE
The Rock Rose—Lychnis—Globe Flower—Poppy—Potentilla	100	Bell-glasses, Cloches, and Hand-lights—Glass and Earthenware Protectors	43
Barrenwort—Gentian—Geranium—Geum—Gypsophylla—Achillea—Campanula or Hare-bell ...	139	Garden Frames	135
Sweet Peas—Scabious—Megasea—American Cowslip—Jacob's Ladder—Evening Primrose—Sunflower	253	Pits	221
The Feverfew or Pyrethrum—The Dropwort or Meadow-Sweet—The Catch-fly—The Ragwort (Senecio)	343	 GREEN-HOUSE PLANTS :	
 THE DECORATIVE USE OF FLOWERS :		Clianthus—Cobœa—Coronilla—Corrœa—Crinodendron—Crowea—Daphne—Dillwynia—Dracophyllum—Dryandra—Eccremocarpus—Eutaxia ...	51
Introduction—Materials—Management and Preservation	125	Epacris—Erica	115
Dinner and other Table Decoration	204	Eriostemon—Eucalyptus—Gasteria—Genetyllis—Genista—Gnidia—Gompholobium—Grevillea—Habrothamnus—Haworthia—Heliotropium—Hovea—Humea—Hydrangea	168
Drawing-room and Boudoir—Entrance Halls and Corridors—Single Plants for Rooms	275	Imantophyllum—Knightia—Lapageria—Leschenaultia—Leucopogon—Lisianthus—Lomatia—Luculia—Macleanea—Magnolia—Mandevilla—Mesembryanthemum—Mitraria—Mutisia ...	244
Personal Decorations—Bouquets	336	Myrsiphyllum—Myrtus—Nerium—Passiflora—Pentapterygium—Phœnocomia—Phormium—Pumelia—Plumbago—Polygala—Primula—Psammisia	315
 FERNS :		Pultenea—Rhododendron—Richardia—Solanum—Statica—Stenocarpus—Tacsonia—Tecoma—Testudinaria—Tetratleca—Thibaudia—Vaccinium	361
Alsophilas—Actinopteris—Anemias—Todeas—Acrostichums—Lomarias	61	 THE HARDY FRUIT GARDEN :	
The Cheilanthes—Gleichenias—Pteris	194	Importance of Fruit—Site, Soil, and Shelter ...	26
Hymenophyllums—Trichomanes	286	Arrangement	122
The Onocleas—The Lygodiums	372	The Apple: Propagation	162
 FLORISTS' FLOWERS :		Apples—Planting	249
The Dahlia	35	Apples—Pruning and Forming	320
The Fuchsia	70	 THE KITCHEN GARDEN :	
The Gloxinia—The Hollyhock—The Pansy	188	Salsafy—Scorzonera—Sea-Kale—Spinach ...	56
The Pelargonium—The Pentstemon	292	New Zealand Spinach—Tomatoes—Turnips ...	105
The Petunia—The Phlox—The Pink	361	Simultaneous Cropping	185
 THE FLOWER GARDEN :		Monthly Calendar of Work to be Done	238
Vases and Baskets	48	Monthly Calendar (<i>continued</i>)	309
Winter Bedding	85		
Spring Bedding—Spring Flowers	174		
Keeping and General Culture	202		

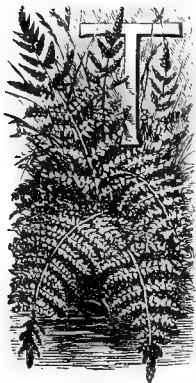
THE LIFE-HISTORY OF PLANTS :	PAGE	THE PINE-APPLE (<i>continued</i>) :	PAGE
Cells and Vessels	40	Cultivation (<i>continued</i>)	261
Roots and Root-stocks	92	Insects which affect the Pine — Varieties of	
The Leaves and What They Do	158	Pines	349
What the Leaves Do—The Sap... ..	214		
Growth	367		
ORCHIDS :		ROCK, ALPINE, FERN, AND WILD GARDENING :	
Introduction—Acanthophippium—Acineta — Acro-		General Principles of Construction	1
pera—Adda—Aerides	18	Alpine Plants	75
Anetochilus—Angræcum—Anguloa	88	Alpine Plants (<i>continued</i>)	154
Ansellia—Arpophyllum—Barkeria — Batemanina—		List of Alpine Plants	268
Bletia—Borbophyllum — Bollea — Brassavola—		List of Alpine Plants (<i>continued</i>)	326
Brassia—Broughtonia—Burlingtonia	178		
Calanthe—Catasetum—Cattleya—Chysis—Cirrhop-		THE ROSE AND ITS CULTURE :	
petalum—Cœlogyne	228	Pruning Roses	9
Colax — Comporetia — Coryanthes — Cynochoes—		Training	109
Cymbidium—Cypripedium... ..	299	Roses on Walls, and Walls of Roses	282
Cyrtopodium—Dendrobium	375	Roses for Pillars, Pyramids, Arches and	
		Arbours	352
THE PINE-APPLE :		THE VINE AND ITS FRUIT :	
Introduction—Pine-houses	30	Diseases of the Vine — List of Remarkable	
Propagation—Cultivation	146	Vines	58

CASSELL'S POPULAR GARDENING.

ROCK, ALPINE, FERN, AND WILD GARDENING.

GENERAL PRINCIPLES OF CONSTRUCTION.

By D. T. FISH.



O imitate nature so closely as to be mistaken for it, while providing all the most fostering growing conditions possible to the highest art, may be described as the perfection of rock building and furnishing. In the majority of rockeries there is an excess of stone or other hard material, and a sad scarcity of suitable soil for the culture of the plants. The rock is too often made the main thing, the earth and the plants the secondary. This is a structural error that can hardly be remedied afterwards, and has smitten thousands of artificial rockeries with a barrenness that has robbed them of the major portion of their interest and beauty. An excess of stone, lava, or other hard material is as improvident as it proves unsuccessful. It costs money, as well as invites or insures failure. Not seldom tons upon tons of rock material have been purchased and carted from long distances, and piled up into mounds or raised into spiky pinnacles, at enormous cost, while far more effective and suitable base-lines could have been formed on the spot. Earth of some sort—soil or subsoil, chalk, gravel, or rock—is always present, and this can be thrown into the most erratic forms, and disposed into an irregularity of surface that shall render repetition or monotony impossible.

The Base.—The earth is at once the cheapest, most stable, and suitable base for rock-work of all

sorts and for all purposes—whether for Alpines only, mixtures of Alpines, herbaceous plants and shrubs; ferns; or a mixture of ferns and flowering plants. As a rule, not only is there too much rock used, and visible—alike on artistic and cultural grounds—but the effect is frittered away in a multiplicity of tiny elevations and depressions that degrade the rock-work into the depths of puny insignificance. Too much is attempted in the limited area. A few bold smaller mounds and deeper depressions, a little rolling ground, and a few rugged rough rocks, would give dignity to the smallest rockery, and raise the larger to somewhat of the grandeur and sublimity of nature. But the attempt to crowd the rich variety of a hill or country-side into a few square yards converts the most imposing attempts at the sublime into the actually ludicrous. One tiny hill or rugged cliff well formed and furnished, gives more satisfaction than a hundred little goes, each as like to the other as two peas, and all resulting in a rockery that is a mockery of nature and a burlesque on art.

The Rock.—Instead of piling up stones, brick-bats, clinkers, or lava in cart or barrow-loads, as the base of rockeries, no hard materials should come on to the ground till the general outline of the rockery is already well and truly laid. Of course, where very large stones are used, some of them may be placed during the process of laying the earthy bases of the rockery. But these and the whole of the so-called rocks should be so placed as to crop out of, rather than form the substance or base of the rock-work. It is astonishing how far the rocky matters will go when thus treated and managed. Each piece carefully posted may go farther than several cart-loads on the higgledy-piggledy, hap-hazard style.

But it is not all who begin thus with the earth that manage to finish an artistic rock-work. On the contrary, some of the worst samples seen by the writer have been so formed that the earth and every step of the process can be traced for all future time. A regular or irregular earth-bank or series of tiny mounds

resembling Brobdingnagian mole-hills, are covered with a series of rocky pockets, as nearly as may be of one uniform size, shape, and character. These hideous pockets, as a rule, are far more conspicuous than the plants that are supposed to fill them. In many examples they are far too shallow; in others much too large for their occupants. Not a few of these rockeries haunt our memory as we write—they look as if a shower of slaty pieces of rock or sandstone had fallen down on the semi-even ground-line of the rockery, and had arranged themselves into squares of equal or unequal sides nearly all over the area occupied. Seen from a distance, the rock-work somewhat resembles the worked-out ground-line of a worn-out quarry. Approach nearer, to see the pockets, if any, and all the hideous deformity of the pocket system run to seed becomes painfully manifest.

A perfect rockery, be it large or small, should more resemble the sides than the floor of a quarry, exhausted or otherwise. The rocks should rise boldly—project here, recede there, and in places boldly assert themselves. For though the chief use of artificial rockeries is to afford picturesque-growing sites for beautiful plants and flowers, yet the rocky character of the base should be more prominently apparent here and there. The attempt to utilise each foot or yard of space, and to cover the whole of the rocks with flowers or foliage, is as great a mistake as the opposite one of having ten times more rock than vegetable covering.

Regularity of form and of clothing is the ruin of the majority of artificial rockeries. Nature, by her various tiltings, upheavals, and depressions, varies to infinity the rocky foundations of the earth. And one of the chief charms of artificial rockeries consists in choosing for our imitation specimens of her most erratic performances. And yet where any particular strata is chosen for imitation, in most cases sufficient variety may be obtained in the dips or tiltings of that particular formation, without travelling far beyond it. But of course this is more applicable to rockeries of great extent, and such as are seldom attempted in this country.

Most of our garden rockeries are a mixed lot, formed of all sorts of odds and ends that can be collected in the demesne or neighbourhood. Where these are not available, spar, iron clinkers, slag, spoilt brick, fused pottery, cement, and various compositions are employed. As a rule, the greatest variety of rocky substances will be found in the smallest rockery, and the absurd mixture of stone, spoilt brick, flints, spar, refuse of glass works, old gas retorts, clinkers, suffices to rob such rockeries of any pretence to propriety or artistic taste.

Many of the evils arising from the use of excessive variety of materials in rock-work may be hidden or

mitigated by the simple expedient of coating the whole over with Portland cement, after being placed in position. This converts the whole into rock of one colour and character, and effectually hides up the commonplace character of the materials employed.

But rock-work of artistic and imposing character may be formed without any hard materials at all. The base of the rockery may be formed of earth only, and these earthy masses cased over on the spot with cement. This can be moulded into any desired form, and pinnacles and stalactites worked in or on for effect where desired. It can also be faced, just before setting, with smashed spar or ground stone, of any desired sort or colour. How much can be very well done in this way with a very slender expenditure of time and money, cannot be known without making trial of the system.

This mode of converting mere earth into rocks, large or otherwise, at will, needs considerable knowledge and experience. But these acquired, it is comparatively easy, and becomes one of the most fascinating of all horticultural pursuits. The rocks grow up, as it were, under the hand of the master, and are fashioned into endless varieties of form and style, as he lists.

Solidity.—This is of especial importance: the earth should be moulded into the desired shape several months or a year before the rocks are fashioned on its surface. The necessity of great solidity of base is of course apparent, and notwithstanding all that may be done by ramming and treading, time, after all, is the great consolidator. Earth-banks, hills, and dales—even overhanging ledges and rugged ravines—will stiffen into permanent shape more thoroughly under a year's shine and shower, frost and thaw, than by any possible amount of mechanical pressure in their making or afterwards. Carefully made and moulded, and left so for a year to settle, the earth will seldom subside much afterwards; and should it slightly give way, most of the artificial rocks of some two inches or more thick will have strength sufficient to stand alone.

Other advantages arise from waiting, besides the gain of solidity. The surfaces of the mounds will thus be mellowed into greater sweetness and enriched into a higher fertility. It is almost impossible to over-estimate the importance of this: for the surface that forms the bases of our rocks also furnishes the plants with deep, rich, and amply sufficient root-runs. For it must be observed that, as a rule, the pockets made in the rocks are bottomless; at all events, they are not bottomed with rocks, but with soil of such quality as shall sustain the vigour and fully develop the beauty of the plants grown on or beside the rocks.

Depth of Soil.—It is absolutely needful that the soil should be deep and suitable; a depth of two feet or a yard is by no means excessive for Alpine plants. One of the most mischievous fallacies in regard to these is that they need but little soil. As they are found apparently clinging to the sides of hard, hot rocks, it is too readily assumed that their root-runs are shallow, hot, and dry. The very opposite of all this is more generally true. The roots run deep, into deep fissures and seemingly unfathomable crevices, and these are cool, as a rule, as well as deep. The fact of their being crevices keeps them cool, for they are full of air or water, both of which conduct heat slowly, and though the sun may beat on the rock, a few inches or a foot distant the roots in the crevices are cool as the bracing air of morning in the early spring-tide. Another cooling agency of great force is almost constantly at work to preserve the roots of the plants cool. Many of them are denizens of mountain ranges, inhabiting regions less or more removed from the snow-line. And thus it happens, while their tops may be blooming against the heated rocks, their roots are growing in snow-water, that is, in a temperature but little removed above 32°. It is of course impossible to mete out all these exact conditions to the roots of Alpine plants under cultivation; but the nearer we can approach them in regard to the depth and coolness of the root-runs, the better the plants will thrive.

Finally, the roots must be kept moist, as well as cool. No doubt, even under natural conditions there are exceptions to this rule. Not a few Alpine plants not only "lay their beautiful cheeks against the thick-ribbed ice, and bid the dewdrops nurse them," but have little better or more liberal fare for their roots. These will hold on to the barren rock, or live in what seems mere stone, dust, or rocky *débris*. But these are exceptions, and the rule is far otherwise. The flow of water over the surface or through the hidden fissures of rocks is seldom wholly arrested, unless in climates where the dry seasons wither into forced rest all vegetation. The natural sites of most Alpine plants insure a constant supply of water for their roots, and it is almost impossible to over-water the majority of such in dry weather, provided always the drainage is ample and perfect. The water must be kept in motion—moving water in plenty and pure air, as far as may be obtained, being the breath of life to these wild and free children of nature. Stagnant water and sooty, stuffy air is the touch of death to them; and yet not a few nice collections of these plants may be found in or near London, Manchester, Birmingham, Liverpool, Glasgow, Edinburgh, Dublin, York, and other large towns.

With proper root-runs, at once deep, cool, moist,

and the tops frequently washed clean with garden engine, syringe, or sponge—for cleanliness is the parent of health in the garden as well as in the home, the workshop, the counting-house, foundry, or mine—the whole distance between the health and beauty and disease and deformity of many plants is included in the one word sanitation, or cleanliness. It may almost be said that all things are possible to the cultivator who keeps his plants clean. How often this truth finds forcible illustration in the homes of the poor! In one home dirt reigns supreme, and the plants are jaundiced and their leaves stricken, killed by the suffocating incubus of dirt. Next door the boards of the floor, though rotten and rickety, shine through sheer scrubbing, and the plants in the broken window look as bright and healthy as those in the duchess's boudoir.

So vitally important is cleanliness to the health of plants, that even Alpines may be successfully cultivated wherever a bit of blue sky can be seen, provided always that they are liberally fed and kept scrupulously clean. Dirt and drought are their greatest foes, and not a few rockeries are so constructed as to intensify to the uttermost the evils of both. Set in the teeth of the sun and of every wind that blows, with cramped root-runs that hold only a pinch of soil on an excessively pervious or wholly impervious bottom, the roots are either in a state of flood or of absolute want, and the plants droop and die of necessity.

Never was the art of judging by appearances farther from the truth, nor the cause of more absolute failures, than in the case of Alpine plants. Comparatively few of them are even rock plants; accidents of stature or of character have placed them where they are found, that is, as a rule, in a well-watered garden, with rich and varied root-runs, composed of the denudation of rocks and the decomposition of their own remains through a long series of years. Hugging the snow-line for coolness and for moisture, and to escape the shade of taller or what is termed superior vegetation, they form a fringe of verdure and of colour, and a connecting link of matchless beauty between the vegetable and mineral kingdoms. Within their zone they reign supreme over nature—veritable vegetable queens, alike superior to the rocks among and above them, and the taller herbaceous plants, grasses, shrubs, and trees lower down.

All this is most suggestive to the would-be successful cultivator of such plants. The plants themselves, and not the artistic piling up or æsthetic effects of the rocks, must be the chief points. In the design and execution of the majority of rockeries not only are there far more rocks than plants, but

the former dominate or dwarf the latter. The highest art in this form of garden architecture or landscape—for it is both—is so to introduce and dispose of the rock as to improve the setting, enhance the beauty, or add to the vigour or robustness of the plants. The plants are nature's jewels; the rocks—at least the artificial ones—are the setting used to throw them up or out to higher purpose or vantage.

Starting and holding on with vice-like tenacity to this general principle would revolutionise many, and improve nearly all, of the artificial rockeries in the kingdom. And there would be this tangible benefit, that whatever else failed, the plants would thrive

did to the gems of art which they well-nigh extinguished by their enormous weight and gaudy glitter of golden gilding. No more rock than is needful for the setting, and our Alpineries and ferneries would become gems of art, sensibly adding by their verdure, brilliance, and grandeur to the artistic enrichments of the garden, instead of, as now, so often being the one unpleasant blot that mars its whole character, and drags it down to the low level of sheer vulgarity.

The Soil for Rock Plants.—Be its quality what it may, its depth is of more importance than its width, the roots of many Alpines boring more

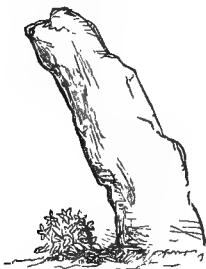


Fig. 1.

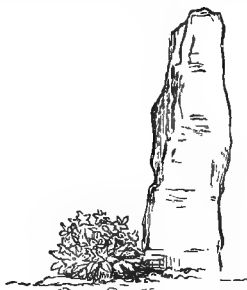


Fig. 2.



Fig. 3.

In Fig. 1 the plant is considerably overhung by the rocks, and is dwarfed in size in consequence. But by placing the plant slightly in advance of the rock, these evils are less apparent than if the plant had been placed directly against its base. In Fig. 2 the upstanding rock is placed almost vertically, and the plant grows the better on that account. Fig. 3 shows the rock tilted over away from the plant.

and be in health. It is not given to every one—only, in fact, to very few—to observe and appropriate to artificial uses nature's tit-bits of rockscape; but almost any one who starts on the firm, safe ground that every plant must have good soil and plenty of water to grow it to perfection, is on the high road to cultural success. So vitally important is the latter, and such horrid abortions are many rockeries, that one is ready to exclaim, "Perish the rocks, if the plants will only live, thrive, and flower!" Some of them will do far better without rocks than with, on, or among them; and some of the most effective banks, mounds, borders, and beds of Alpine plants have been wholly rockless.

But this is written not to discourage rockeries, but to give emphasis to the advice to consider the plants first and last. If this is always done, rocks may be introduced among them with less injury, and probably to the improvement of the general effect. But so many rockeries bear the same relation to the plants, ferns, &c., with which they are facetiously said to be clothed, as the enormously heavy and monstrously gilded frames, once so common,

than spreading. A yard deep should be looked upon as the minimum needed to grow these to anything like perfection; the deeper, in fact, the better. Even the quality of the soil is of less moment than its depth, for its function in not a few cases is more of a water-holder than a plant-feeder. This holds out good prospects of success to those who would try water-culture for Alpines. Hence, too, almost any soil that can be kept moist without becoming sour may be used for them. In a state of nature, the earth they grow in is very much mixed. The *débris* of rocks and decomposed grasses, mosses, leaves, stems, with particles of soil or silica, these form the natural compost for Alpines; and the nearer this mixture can be imitated by artificial means the better. The nearest practical approach to this natural mixture is sandy loam, with a third of leaf-mould and a liberal addition of smashed sandstone or other stone. A few prefer peat, but these are comparatively few. Where leaf-mould is not obtainable, peat may be substituted for it. Some cultivators even recommend a slight addition of thoroughly decomposed manure, but this is

wholly unnecessary, and generally injurious. The mere fact of its being utterly unnatural is strong presumptive evidence against its use, while experience shows that it does far more harm than good.

The rage for rough turfy loam, though right in the main, is not seldom carried to extremes in the cultivation of particular plants. For example, in the cultivation of Alpines the necessity for thorough drainage is so apparent that this object is sought to be obtained through excessive looseness and roughness of the soil; but any one who has dug up an Alpine plant in its natural habitat must have been struck with two features of its root-run, its hardness and its fineness. The soil is mostly the slow and gradual accretion of ages, formed a few grains or particles at a time; and time, the great consolidator, compacts it into hard

are essential to their life, vigour, and luxuriance, and hence the importance of so placing the rocks as in no way to interfere with those natural refreshers and invigorators. Figs. 1, 2, and 3 give illustrations of the different modes of placing rocks so as to avoid the evils of overlapping, and get all the advantages of a free sweep and full exposure to atmospheric influences.

The proper disposal of rocks under the roots of plants is of equal or more importance than their skyline. As a rule, all the pockets or artificial fissures should cleave boldly downwards rather than spread out horizontally, and they should never on any account run upwards, unless they have an opening at the top into the external air (see Fig. 4, B, C). But the best form of fissure is that shown at E, in Fig. 4, while the worst is illustrated by A, in the same figure, which may be described as a trap

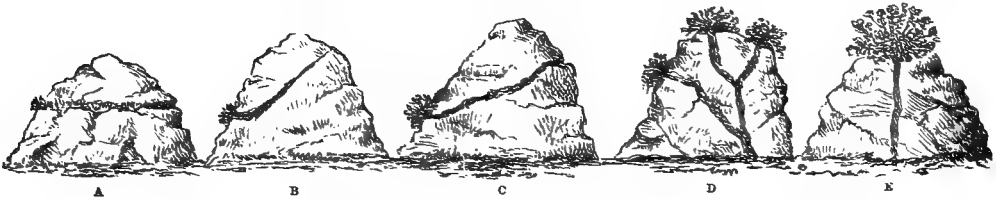


Fig. 4.—CREVICES FOR ROCK PLANTS.

masses. The porosity of the soil is maintained by the addition of rocky *débris* or other matters—semi-imperishable matter—to it. The same rule should be observed in the artificial formation of root-runs for rock plants. Fresh turfy loam should be laid up for a year or more before use, as fresh vegetable fibre can hardly be at once utilised by the roots. It would also be benefited by one or more turnings and by the addition of fifteen per cent. or so of pure silica, or clean sharp silver sand, if not sufficiently sandy; five or so of leaf-mould, sweet and well rotted, and from fifteen to twenty per cent. of smashed stone. The latter is to be preferred to crocks, potsherds, shells, or charcoal. The soil in all cases should be on a layer or base of drainage from two to six or more inches in depth. In cases where plants are grown in pockets in rocks, it is essential to success that these should either be bottomless, or have one or more free outlets from their lower sides or bottoms, for it cannot be too often repeated that stagnant water means disease or death to all such plants. They cannot well have too much water during the growing and flowering periods, if it is kept in constant motion. This suggests a point of great importance. In planting choice plants among rocks, the latter must on no account be so tilted over as to overhang the plants. The sun and the rain

to kill plants, as no moisture can reach the roots in such a crevice. Of course, between A and E there may be a great variety of gradation, and so long as the line of the fissure is sufficiently downwards to convey moisture freely from top to bottom, it may diverge widely from the vertical line without injury to the plants. For example, a crevice or fissure like C might answer almost as well as E, for the successful culture of rock plants.

Drainage and Water.—Assuming that the major portion of the rockery—all its base, in fact—is formed of soil, and that the top of the earth-mound provides a dual surface, one of drainage from four to six inches in depth, and the other of good soil, such as that already described, a yard or so in thickness: it is necessary for the outlet for the drainage, where the base of the rockery is greatly varied, to be at the lowest point.

In Fig. 5, for example, the lower portions at *a, b, c* would be converted into swamps, unless outlets for the water were provided at the lowest points of these rolling valleys or ravines. Unless this were done, semi-aquatic plants would have to be planted in such positions; but the combination of a bog-fermy, and Alpinerly in one is seldom very effective. The one very properly succeeds

the other in tolerably close proximity, as thus the effects of all will be heightened alike literally and figuratively, for from the water-line to the top of the tallest rock is of necessity the greatest possible difference of altitude within reach. The smooth water also contrasts sharply with the rough and rugged rocks, and the contrast would be heightened were the rocks to plunge rather abruptly from the highest point to the surface of the miniature pond or lake, however small. The effect would be still more striking were the rocks crowned with such stiff and formal plants as *Echeverias*, *Yuccas*, *Dracænas*,

within the limits of a few yards. All that is needful is to place the sun-loving subjects on the southern and the shade-loving ones on the northern sides of the up-towering rocks, such as those shown in the illustrations.

In planting into the soil itself, as here recommended, great care must be taken in the placing of the rocks afterwards, to afford the free access of rain to the roots. With sufficient drainage beneath, there is no fear of any excess of rain from above; but if stones are so placed as to throw it off the roots, the Alpine plants must needs droop and suffer in consequence.

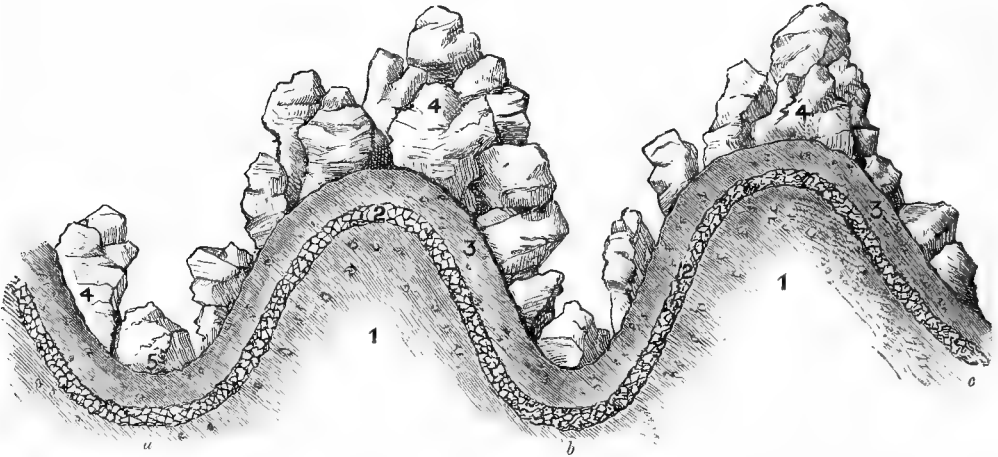


Fig. 5.—BASIS OF ROCK-WORK.

1, Original earth base; 2, drainage; 3, strata of good soil; 4, rocks.

Palms, tall Ferns, or Aloes, and the latter furnished with Water Lilies, Irises, or Musk Marigolds. But mere swamp—that is, neither good rock, bog, nor clean water—at such points as *a*, *b*, and *c* would be alike objectionable on grounds of taste and culture.

Shade and Shelter.—The system of forming the bases of rockeries of earth-mounds of considerable boldness, also affords the utmost possible diversity of site and aspect within a limited area. This is of great importance in the cultivation of Alpines as well as of ferns. It is too generally assumed that the former thrive best in full sunshine, and the latter in the shade; but the fact is that not a few of both families of plants thrive best in the sun and others in the shade. With a rolling-bank running north and south, sun and shade may be provided at pleasure, and thus each family of plants be provided with, as far as possible, its natural conditions. Even where mere pieces of rock are set up, as in Figs. 1, 2, and 3, shade and shine may each be commanded

Keeping the Crowns well above the Soil.

—Though most of these plants enjoy an abundance of moisture, few of them can endure water resting on their crowns. The crowns are not only the chief centres of beauty in rock plants, but also their source of weakness. They are keenly susceptible of cold, and easily injured by any excess of water. Considering from whence they come, it may seem absurd to affirm that any of these plants should succumb to the cold of our climate; but they do. They miss their snow coverlet, which seldom sinks much below 32°, and their slightly warmer bath of snow-water a few degrees above it; and hence, when exposed to five, ten, or fifteen degrees of frost, not a few of them perish from cold. They suffer all the more if the frost comes down upon them in a very wet state; hence one powerful reason why the crowns should be slightly elevated above the surrounding surface.

One great objection to common pocket-planting is that, as a rule, the sides of the pocket must of

necessity be elevated somewhat above the soil they contain. When formed of cement or other composition, these sides are generally waterproof; hence the water at times floods the crowns of the plants. This is sufficiently injurious in favourable weather, but absolutely fatal to health or life during prolonged spells of frost. But with their crowns elevated slightly above the surrounding level, and the soil in which they are growing thoroughly drained at all points, most of them bear the severities of our climate with impunity. Those that do succumb to it are killed by the sudden changes from cold to heat and drought to saturation, more frequently than from any absolute want of heat.

We have nothing, however, equivalent to the snow covering to which Alpines have been accustomed in their native habitat. Perhaps the simplest and best substitute for this is a thickish sprinkling of roughish cocoa-fibre refuse over their crowns during frosts of unusual severity. This is at once light and porous, and hence most efficient as a heat-preserver, while doing but little injury to the plants. Instead of harbouring slugs, its semi-harshness and roughness is a partial antidote to them, while its decomposition adds a useful ingredient to the feeding properties of the soil.

Slugs and Woodlice.—One might almost suppose that rock plants were unnatural food for these. It seems impossible for many slug pests to live in the hard and sterile soils and regions where such most do congregate and thrive; but if so, the British slugs betray a wonderful fondness for such exotic fare. They pounce upon and devour choice plants with such avidity as if to the manner born; and a water-cordon, which is often practicable, is the best of all barriers to external attacks. But slugs seem to spring up out of the very earth with extraordinary rapidity. To prevent this, and in cases where Alpines are grown on a small scale, the soil used might be charred or burnt before use. This would get rid of the slug pest from within, from whence it is most troublesome; and thus, with a water-cordon—the wider the better, though a few inches will suffice (the writer has seen a common roof-trough on its back prove effective)—the rockery can be made pest-proof. On larger scales, the lake around the base of the rock-garden may be made the most interesting part of it; but watchfulness will still be needful. Though these pests can neither crawl nor fly over the water, they enter the rockery nevertheless, and a slug-hunt at early morn and dewy eve will mostly result in a few finds, and is the surest means of preserving choice plants from being unseasonably devoured root and branch.

Simpler Means of forming Small Rockeries.—In many gardens and demesnes natural banks by the sides of streams, mounds, and dells are to be found. Nothing can be easier than to convert such into rockeries by the insertion of stones, brick refuse, boulders, and other rock-like materials. These should be erratically grouped rather than regularly placed or planted all over the surface. It is the latter that imparts that monotony to rockeries which has done so much to bring them into contempt. Not only must every yard, or even foot, of ground have its plant, but its rock likewise. This is a huge mistake. Let there be soil without rocks, and rocks with little or no soil. Unless in her regular strata, we never find nature scattering her detached rocks about with any regularity; neither should we in our artificial rock-making. The less regular, the more artistic and effective.

Another simple way is to throw up the earth, and build in and up the rock-work simultaneously. This is perhaps the best way where such rock-materials as brickbats, clinkers, &c., are used. Heaps or masses of these worked in with the soil—taking care to leave sufficient spaces for soil, and to coat all over-head with a layer of cement, coloured and finished to taste by additions of stones or smashed spar—produce strikingly beautiful masses of rock-work at a cheap rate.

Again, it is very easy to throw up mounds of earth at different angles and of various forms against walls, and to face such with rock-work, varying the breadth and height of these at pleasure. Perhaps in no position can rock-work prove more useful than in hiding straight walls, and substituting for them flowing or irregular lines of verdure and beauty. Rocks may often be thus disposed against walls so as to convert the boundary-lines of gardens into features of the most absorbing interest and scenes of the most surpassing loveliness. The whole character of a house or garden may be changed and marvellously improved by the use of a few loads of stones, and fifty or a hundred choice plants and ferns.

Rocks and Water.—The margins of water, woods, and shrubberies form admirable sites for rockeries, clothed with either Alpines or ferns, or, better still, a mixture of both, and other herbaceous and foliage plants. Naturally as rocks seem to associate with water, yet one seldom sees the two combined to good taste or purpose by art. The most common mistakes arise from the attempts constantly made to force the water over rocks when the two are placed together. Few things are more pleasing and imposing than natural waterfalls. The music of falling water is also among the softest as well as the stormiest notes in nature; and the sight of its gentle

trickling over rocks, or of its wild, leaping, headlong plunge that converts the stream and river into a mere cloud of spray, are among the most pleasing and thrilling that can be imagined. But just because these sights and sounds of falling water are so satisfying, the mere squirts, or ledges, or stairs of waterfalls that one meets with even at Chatsworth and the Crystal Palace, and in so many other places, are grievously disappointing. Unless, in fact, nature can assist art with a waterfall, this imposing feature had better be dispensed with, or confined to a mere dripping fountain or trickling of water among the rocks.

But rocks are quite as effective in water at rest as under or beside it in motion. And where rockeries are placed against a lake or stream, they should rise boldly out of the water at certain points, and the coast-line, however limited, should be distinguished by the utmost possible variety—now boldly advancing into the water, and anon retreating into a cosy recess landwards.

Instead of this artistic disposition of rock and water, one often meets with lakes, long and straight as a canal, with smooth grass banks on either side, and, beyond the banks, rockeries or ferneries formed on the grassy base. Such arrangements tempt one to wish that an earthquake might swallow up the long straight lines of turf, and allow the water and the rock-work to become mixed up together in the irregular mode of procedure common to those great upheavers and disturbers of nature. What would thus be lost in symmetry would be gained in artistic fitness and variety.

Foreign Robbers.—By planting rockeries in secluded nooks and corners in front of shrubberies and woods, much might be done to break up the monotony of boundary-lines, by no means, as a rule, overflowing with beauty, and to add new interest and beauty to the scene. One great practical difficulty presents itself here at starting, and that is, the entrance of the roots of the trees and shrubs into the rockery, and the consequent exhaustion of the soil and starving of the plants. So imminent and so great is the danger, that some strong measures must be taken to prevent or mitigate it. The roots of an Ash or an Elm will travel a hundred yards, and form a perfect mat of roots at that distance, in any good soil it penetrates. How the roots scent out the new larder remains a mystery; but that they do, and make great speed to empty it, is patent to any one who has either disturbed old ground or placed new anywhere near to established trees or shrubs. Not that all roots travel so fast or so far as those of the Elm or the Ash. But the roots of all plants make

vigorous and mostly successful efforts to reach and exhaust any new soil laid over or placed near them.

There are two means of preventing foreign roots from using up and exhausting the soil of the rockery. The first is to make the original surface root-proof before building the rockery upon it; and the second, by planting in pockets in the rocks, the base of such not to open into the soil. In the former case the roots could not rise into the new material, and in the latter, though they would rise and hug closely the base of the rocks, they would be unable to get into the pockets that supported the rock plants. Though bottomless pockets are best for general purposes, those with impenetrable bases may be used when needful to balk the roots of trees, but they must be pervious to the outlet of water or the plants will die.

A layer of common or gas-tar concrete over tree-roots will prevent their coming through, and likewise form a barrier against worms and slugs. Neither is it found that such root-coverings, unless carried too close to the plants, greatly injure established trees or shrubs. But where this is feared, and large stones are abundant, either these or artificial stones may be used, that have no further connection with the ground than merely resting upon it. Into the pockets of these all the more choice and delicate plants should be placed, while the spaces between the rocks could either be left vacant or furnished with stronger-growing ferns or other plants, that could hold their own in the struggle for existence with the roots of trees and shrubs.

Rockery against Dwelling-houses.—It is often convenient to place it here, alike for ready access and for purposes of shade, shelter, or verdure, or the shutting out of unsightly buildings or other objects. The one thing wanting in not a few gardens is shade. The smaller villas and suburban gardens are the hotter, as a rule. Their glitter and glare at times are wellnigh intolerable. A raised bank six or more feet high, covered with rocks and foliage or flowering plants, might be so placed as to afford shade at any time desired. If a rustic alcove arch could be worked into the rockery, so much the better. Such a cool and welcome retreat could be commanded at all seasons, that would often combine more taste, and prove more conducive to health and comfort, than the whole garden besides.

Rock-work also affords a short and easy cut to the solution of the most difficult problem that is ever pressing urgently for solution, viz., the best mode of shutting out unsightly objects, or of insuring as much privacy and seclusion as possible. In thousands of spots, where neither shrubs nor trees can be grown to any effective purpose, rockeries might be run

up, and clothed with verdure and beauty at once. This last is a wonderful point in their favour. No hedge nor screen-plants, nor trees and shrubs, ever grow so slowly as those wanted at once to screen out the east winds, or the prying eyes of inquisitive neighbours. But a rockery may be built in a day, and furnished on the morrow, that shall for ever shut out all such annoyances, and itself be converted into a thing of beauty and a joy for ever into the bargain.

It is not only an effective but a substantial barrier. A screen of leaves may be pushed aside, or fall at the touch of winter, but the rockery abides, even should its verdure and beauty fade; its substance as a screen and blind and shelter remains. The ladies of the house, even invalids, can see or visit these home rockeries in all weathers; and if well furnished and skilfully managed, their clothing plants are ever unfolding some new feature of interest and beauty; they never pall by their sameness nor weary through their monotony.

Rockeries may often form convenient connecting links of interest and beauty between the garden and stables, or other parts of the demesne. In conservatories attached to the dwelling-house or dining-room windows, they form the most effective furnishing for the end or other wall in view of the window. In larger houses, one end of the conservatory is often connected with a rockery, clothed with ferns and other plants, through which a passage may be led into the external air, as is done with admirable taste at Wolverstone Park, Suffolk. The outside fernery there is on a cliff of the Orwell, a natural site commanding almost every merit needful, and these have been utilised to the utmost by the highest art and most cultured taste, the result being such as is seldom or never met with elsewhere.

Beware of climbers on rockeries, especially those devoted to the culture of Alpine plants. A few Ives, Periwinkles, Clematis, Honeysuckle, Virginian Creepers, &c., are so strikingly beautiful, they clothe the rocks so rapidly! Yes; but they cripple and ruin most of the more delicate and rare plants in the end.

Do not be afraid of showing bare rock. This is directly opposed to the advice usually given, but long experience confirms its soundness. The chief feature of not a few of the most famous rockeries is that no rock is visible; this may be picturesque, but it does not seem sensible. Why go to great expense in making, moving, and placing rocks; and then hasten to cover up every inch of surface, and fill every nook or cranny with one or more plants? The latter can be done as well, or better, on mere ground or banks of earth, with never a rock at all. It is a glaring waste of force and time, as

well as an artistic blunder, to hide up all the rocks with plants, be they never so beautiful.

The painter of landscapes never makes this mistake. In those in which rocks appear, they show up boldly from the earth, and pierce high into the sky as such. He never allows the Grape-vine or the Ivy so to mantle them o'er as to conceal their character or destroy their identity. The maker of rockeries in gardens cannot do better than follow the painter of landscapes in this respect.

But neither must he fall into the opposite and worse extreme of leaving an excess of rock obtrusively apparent. The plants must be the picture, the rocks the frame to set these off to higher and more artistic purposes. As a rule, the worse the rock-work the more barren. This order should be reversed. The best thing that could happen to eighty per cent. of rockeries would be to let the plants cover up and hide their hideous structural deformities. But of the twenty, ten, or five per cent. of good rockeries, a fair proportion of them will bear looking at, alike on their own merits and also as setting off to higher advantage the exquisitely beautiful Alpine or other plants that nestle at their feet, ruin down showers of beauty over their rugged sides, or cluster like golden and silvern gems in their tiny crannies and crevices.

THE ROSE AND ITS CULTURE.

By D. T. FISHER.

PRUNING.

THE pruning of Roses, though less severe than it used to be, is far more complicated. Only a few years since, the pruning of Roses was as simple and easy as that of Gooseberries or Currants. So soon after the fall of the leaf as might be, the pruning was set about and completed; the times as well as the modes were regular and monotonous in the extreme; the knife followed promptly the fall of the last leaf, and went straight to within a single, or at the furthest, three buds of the base of the shoots. A good deal of thought and skill were bestowed on the character of the cut, whether it should be up or down, or side-ways, at a long or acute angle, or as nearly straight across the shoot as possible. But the time to prune was irrevocably fixed by cultivators, and the extent of it stereotyped by custom into an unalterable law. Close and severe pruning was also all but universal, and the more plants were cut the better they were supposed to thrive. All this is marvellously changed now; pruning, from being almost wholly a mere mechanical operation, has been

exalted into the dignity of a science, and the old canon—cut deep or hard to find health or bloom—is absolutely reversed by the modern dictum—the less pruning the better. Prevention better than cure has also been applied to the pruning of Roses with the happiest results; growth is now directed into more profitable channels than the production of fagots for the oven, or the making of charred refuse or burnt earth for the roots of Roses. It is moulded into blooming or furnishing shoots from the first. All this, however, adds very much to the difficulties of pruning; from a single action at a set time, it has spread out into several distinct interferences at different periods or conditions of growth. From



Fig. 30.—*a*, Rose-shoot, with all its buds intact; *b*, same shoot, with part of its buds removed.

being confined to the tops only, it has descended to the roots as well; at one time resorted to chiefly as a handy means of limiting the area of plants, it has now become a mighty force in the hands of cultivators in moulding their forms, and controlling the quantity and quality of their produce. Roughly divided, the pruning of Roses resolves itself into disbudding, pinching, summer, autumn, winter, spring, and root pruning.

Disbudding.—This is one of the most important and newest arts in modern Rose-culture. The term here does not apply to the thinning of blossom-buds, which is common enough, but to the thinning out of the wood-buds of Roses, during the autumn, early spring, or summer. This is often practised on vines and such-like plants, and there is no objection to its application to Roses, excepting the time that it takes. It is obvious, however, that if every alternate bud is removed from the shoot, it will be so much the less hard to prune at any future time. (Fig. 30.) More than this, if these buds are removed in the autumn during the process of bud-filling, those left will be the better filled in consequence. The leaves should on no account be removed with the buds, as if left intact, and finding no bud to nurse up at their base, they will speedily begin to pass on their supplies to the next bud nearest to them. These disbuddings, while the buds are yet in embryo, need clever manipulation and a sharp knife. Practice, however, renders the process comparatively easy. A mere touch with a hot wire is the quickest mode of

killing the buds; and a small movable furnace, with half a dozen such heaters, would enable one expert to virtually disbud enormous quantities of Roses in a day without injury to the bark, leaf, or wood left.

Spring Disbudding is, of course, far more easy. The majority of Roses would vastly benefit by the carrying of this very much further than it is now; the majority of Rose-plants would be finer far, in foliage as well as bloom, were half of their buds rubbed off in the spring. All the weakest and the worst-placed should be removed first, and then should they still seem too closely placed, a portion also of those which remain.

Summer Disbudding.—By the introduction of Hybrid Perpetual, Tea, and other Roses, the growth of Roses does not by any means run parallel with the seasons. On the contrary, they grow on and on, if not for ever, at least as if there were no winters nor other arresting contingencies ahead of them; and, of course, with each fresh bursting of buds, and new development of growth, the necessity for disbudding may arise. By this simple process, we husband force, and perfect our produce, whether of wood or bloom. By the practice of disbudding we may place growth just where we want it most, and also expose it more thoroughly to light and air. The consumption of plant-food is husbanded, and all of it is turned to more useful purpose. No more waste of vital power nor plant-food, are virtually the highly satisfactory results of disbudding. Huge shoots are no longer grown for knife-food, but to give symmetry or size to the Rose-bushes or trees, and to crown them with fragrance and beauty.

Pinching or Stopping the Young Shoots.—So soon as the one bud on the worked briar, or the several buds on the grafted plant, or the vigorous buds left on the disbudded ones break into shootlets, and have made from four to six leaves, stop them by pinching their top off between the finger and thumb. This pinching may be designated the second easy step in pruning, and if skilfully performed just when and where wanted, little more or other pruning may be needed. (Fig. 31.)

It may seem strange to the uninitiated that a chapter on pruning should open with paragraphs tending to throw doubt on its necessity or usefulness. But only thus can its theory and practice be understood. Prevention in regard to pruning is infinitely preferable to cure. No one with any sense prunes for the mere love of cutting off Rose or other shoots. Hence, if we can gain our object through gentler methods, these are surely preferable to those surgical amputations that savour of cruelty and barbarism, and look marvellously like blunders.

The object of pinching is to break up and distribute growing force, so that instead of one channel or shoot, there shall be several, or many. Such changes of form in the development of Roses improve their form and enhance their usefulness. Were Roses grown for their wood, their vital force could hardly be too much concentrated. The one-shoot system would be the perfection of culture. But as they are grown for bloom, and also in a secondary sense for their form, their growths should be moulded towards these objects from the first. Possibly, as the art of pruning is better understood,



Fig. 31.—Rose-shoot, pinched or stopped at different lengths.

the practice of it, so far as that consists in the mere lopping off of wood, will almost cease. The pinching and stopping of growing shoots is the first step towards this desirable end. Pinch in time, and intelligently, and but little more or different wood will be made than is needed for the rosarian's purposes. Most of our prunings are but clumsy efforts to rectify previous mistakes. Each useful shoot removed represents a waste of intelligence as well as a waste of force. But we have not yet arrived at that perfect knowledge of Rose-life and ways, as will enable us to quite dispense with pruning, and practise pinching in its stead. On the contrary, perhaps no plant is subjected to more pruning than the Rose. The tendency, however, is to prune

less, and with more discrimination; though the art of a pinch in time to save nine, or any number of cuts afterwards, is as yet in its infancy.

The Pinching of Newly-worked Plants.

—This is often resorted to for other reasons than those already advanced. It prevents the most promising shoots of buds and grafts from being wrenched out or off by the wind. Means of preventing this by the use of supports have been already pointed out, but the best means is to pinch the strong shoot back within three or four or more buds of its base. The wind is thus deprived of its purchase, and, better still, the vital force is forced back or concentrated in the base of the shoot. It then performs dual functions of the utmost moment to the future welfare of the Rose. The embryo buds are filled up,

developed, forced into shoots in an incredibly short time, and the shoot itself is fixed on or into the stem with far greater tenacity and strength. Hence, in consequence of the compound benefit of pinching, these secondary shoots are seldom or never blown out or wrenched off.

Another great advantage arises from the close pinching back of newly-worked plants. Rose-buds, like Peach and several other buds, are mostly produced in threes. True, one bud only, as a rule, is developed; but, nevertheless, that one is flanked on either side by a smaller one, which, under ordinary circumstances, are seldom developed into shoots. But stop the central shoot hard back towards its base, and these two lateral buds are developed, and three Rose-shoots spring forth from the one bud instead of one, and these independently of the shoots that may also break forth from the base-buds of the central or chief eye or shoot. Thus, the material of a Rose-tree is produced at once, and is forced back to grip the stock or stem with a firmness and tenacity that mostly proves wind-proof.

Root-pruning.—This of necessity has always been more or less practised. Unless Roses were sown or budded in their permanent quarters, it is obvious that they could not be placed there without more or less root-pruning. The hedge-row briars, too, have their roots roughly enough slashed about with mattock and spade in lifting, and they are further pruned on the block, with axe, bill-hook, saw, or secateur; and as if that were not enough, their lacerated root-stocks are not unfrequently tossed about and exposed to sun, frost, and biting winds as if they were lifeless things, and so not a few of them are before they get back to earth.

Some such cuttings and carvings of roots may be unavoidable, but the fewer and the less of these the better, as these are not what are here meant by root-pruning, nor is transplantation, though that often necessitates root-pruning in its severest form. Suckers should be removed, bruised roots cut off with a sharp knife, leaving a short clean cut; but all good healthy roots should be left intact. The detachment of the roots from the soil will prove a sufficient check to growth without reducing their numbers, though as a fact they are greatly reduced in the process.

But all this is compulsory. By root-pruning here is meant special and voluntary pruning for specific purposes. The first of these is to prevent the need of so much top-pruning. A Rose-plant runs to wood chiefly. The old remedy was to cut the wood back severely. The result was mostly

more wood still, and of greater strength than before. The modern remedy for excessive top growth is root-pruning. (Fig. 32.) Search out for and find a few of the strongest roots, cut them back to within a foot or so of the root-stock, and any excess of top growth will begin to cease from that moment.

Another result of root-pruning is an increased amount of bloom. Moderate-sized wood is generally more floriferous than that which is more robust. But, in addition to that, a reduction of the number of

posts. These will largely assist in the formation and rapid development of a better class of—that is, more fibrous—roots.

Amateurs and tyros in Rose-culture are apt to think that with the fall of the leaf their labour and duties to their Roses alike come to an end. There could hardly be a greater mistake. It is just then that the cultivator can do the most and best for his Roses. During the summer, as a rule, he can only work upon or manipulate their tops. The autumnal and winter seasons throw the

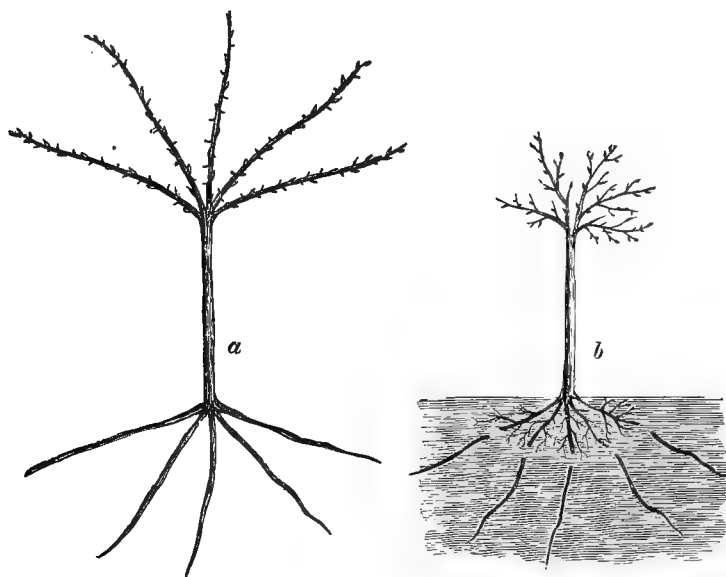


Fig. 32.—*a*, Rose-tree, with roots unpruned; *b*, the same Rose, with roots pruned, showing how the root-pruning modifies root and top growth, as described in text.

the roots, and their disturbance, favour bloom and discourage growth.

Method and Times of Root-pruning.—

These, as we have already seen, are indirect and direct. The mere moving of the roots to see if pruning be needful is an example of the former, and even were none cut or destroyed, some of the benefit of pruning would result from it. The extent of the direct pruning will have to be determined on the spot, and will depend on the number, size, and health, fleetness or otherwise of the roots, and the vigour of the tops. One-half or two-thirds of the stronger may generally be cut with safety. The uncovering of the roots also affords an excellent opportunity of removing the whole of the underground stems or suckers, and of applying fresh soil or com-

posts open to his free and safe interference. October is the best on the whole for root-pruning. Wounds made then heal almost on the heels of the knife. Roots (see chapter on PLANTING) are formed at that season with extraordinary rapidity. Sufficient time also intervenes between the root-pruning and the growing season, to enable the roots to minister to the wants of the branches soon after starting in the spring.

Summer Root-pruning.—This, where a more severe check is desirable, may be given in June or July. Just as the first blooming is over, the first growth almost matured, and before the second growth, on such Roses as Perpetuals, starts, is a good time to root-prune the over-vigorous. The process must not be carried too far, nor indeed is it necessary, as far less root-pruning in summer will prove as

efficient as a more severe pruning in winter. Carefully remove the surface soil down to the roots, trace out the main portion by proceeding to uncover from the bole to the extremity, and cut off one or more of the strongest within a foot or so of the root-stock; pull out the severed roots if possible, fill in with soil, and should the weather be dry, water home, and the root-pruning is finished. As the roots removed may probably have formed the main supports of the Roses, it will be most desirable to see to re-staking and tying them if needful; and should they show any signs of distress, an overhead watering in the evening will speedily revive them.

Summer and Autumnal Thinning.—This is another expedient for lessening the amount of wood cut out at what we shall presently describe and illustrate as the general pruning, and also for improving the quality of the wood left. Assuming that disbudding, pinching, and root-pruning were carefully attended to, there should be little useless wood in the Rose-bush or tree. Nevertheless, there is mostly an abundance of it, and hence this section. Any such growth may be removed at almost any time, nevertheless July and October are the best seasons for thinning out superfluous or useless wood; the wounds heal more rapidly than at other seasons, and the removal of superfluous wood perfects the maturity of that left on the plants. It also affords more space and imparts more strength to the second breaks of Hybrid Perpetual, Tea, and other autumnal-blooming Roses. The more light, air, and food these have, the more and better they bloom, and for a longer period. Early autumnal thinning out of superfluous wood is desirable for the same reasons, and also gives a completeness of maturation to the Rose wood that enables it to withstand with more certainty the severities of the winter. Thus, not a few of the more solid advantages of autumnal pruning are gained, while all the main shoots that contribute to next year's harvest of Roses are left intact, and consequently, as shall be explained presently, in safety.

The General Pruning of Roses.—This, notwithstanding that the way has been considerably cleared to a comprehension of its principles and practice by these preliminary sections, is still one of the most difficult and delicate operations in Rose-culture. The great family of the Rose includes within itself plants of the most varied stature, character, form, and modes of growth. Some are deciduous, others evergreen; some tender, others hardy; some have a spreading, others a vertical habit; some make one growth a year, others two or many; some reach to six inches, others are twenty feet in height. And

hence arises the necessity for different times and modes of pruning. To cut all to one pattern at one time would ruin nine-tenths of our Roses. This short and easy method of pruning was only practised when most of the Roses pruned were very much alike. They made one growth a year, ripened their buds, and shed their leaves in the autumn; spread abroad their bare boughs to the pruner, were cut back to within two or three eyes of their base, broke into shrublets in the spring, bloomed, ripened, were pruned again, and so on and on for a lifetime, never missing a season, and growing but little in bulk for ten or even twenty years. Delightfully simple, is it not? Yes, and the most of our summer, Moss, Scotch, and several other Roses, may yet be pruned and treated thus, with equally certain results.

But as to other Roses, and starting with modes of pruning, the common division into long and short pruning imparts but a vague idea of the difficulties of deciding that point. Long pruning may mean a foot, a yard, six feet, or even more; short pruning, anything from one inch to twelve. And thus, in general terms, it may be affirmed that long pruning is best for the stronger-growing Roses, and short or "sharp" pruning, as it is often called, for the weaker ones.

But what an endless latitude the words strong and weak growers introduce into the matter of pruning! These are but samples of the difficulties in pruning Roses; and our object will be, as far as possible, to show every reader how to avoid or overcome them.

Long Pruning.—It must be borne in mind that the term is a technical one, and does not, as might be supposed, mean that the portion pruned off is long, but the reverse. A branch long-pruned is left almost intact, with little more than its points removed; and it is in this that the modern pruning of Roses completely reverses the older and more primitive ways. The more a shoot grew, the more should be cut off it, was their short rule of theory, and code of practice. But the plants would not submit to it, though forced upon them at the point of the knife and the sharp teeth of the pruning-saw. The harder they were cut back, the faster and stronger they grew. After a vain struggle for centuries against the laws of nature, the combat has been given up, and long pruning generally accepted as the most efficient check to overgrowth, and the surest receipt for abundance of bloom on strong-growing Roses. The faster and stronger and further a Rose grows, the less it should be pruned, and *vice versa*. Hence the converse of long pruning is

Short or Close Pruning.—In this case the part removed is long, and the spur left on the tree is

short. This is the best way of pruning weakly-growing Roses. Notwithstanding what is advanced in this chapter, and in previous sections, on the importance of breaking up and diffusing vital force into many rather than one channel, yet it is equally needful at times to concentrate force, for concentration of vital energy is power. And it is found in practice that the easiest way to strengthen weakly-growing Roses is to short-prune them to a single or very few buds. The force that would otherwise have been diffused through six or a dozen buds and shoots, is thus concentrated into one, two, or three as the case may be. See the illustrations of long

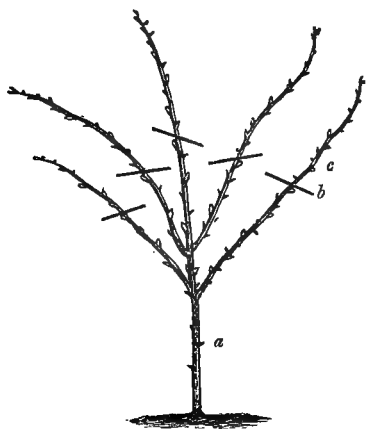


Fig. 33.—Long Pruning.

Roses under glass to another occasion—there are three general seasons for the pruning of out-of-door Roses, with various times for disbudding, pinching, and root-pruning abreast of or between these pruning times. These are autumn or winter, spring, and summer.

The Autumnal Pruning of Roses.—The two months of October and November are the most suitable for this. Not only is the frost, if any, less severe, but the wounds get partially healed over before the severities of the winter strike, injure, and hinder from healing the newly-made wounds. Not

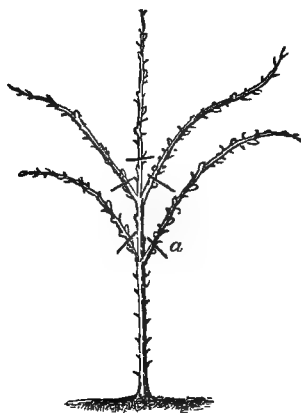


Fig. 34.—Short or Close Pruning.

and short pruning, and their results, which make all this plain.

But of course there are endless gradations between these two extremes, and only practice among the Roses themselves will teach the whole art of pruning. And not only the quantity of bloom, but its quality, is largely dependent on the mode of pruning adopted, and the extent to which it is carried. Prune too little, you may have many blooms of inferior character; prune too much, you may have a few fine ones or none at all. Those, however, who prune for the highest quality of flowers only or chiefly, must prune harder—that is, cut closer—than those who prune for size or form of plant, as well as quality.

The Time to Prune Roses.—Those cultivators who grow quantities alike out of doors and under glass, prune every month in the year, perpetual pruning being in fact the surest receipt for continuous blooming. But—leaving the pruning of

only this, but having pruned off the superfluous wood, the buds left for bloom have the whole of the so-called dead season before them, and fill up into larger size and firmer substance. For the fluids of plants are by no means stagnant, nor the forces of growth at rest, during winter. Hence, as already pointed out, for all really hardy and non-excitables Roses—such as the Cabbage, Moss, Provence, Alba, Gallica, Scotch, Ayrshire, and other climbers—autumn or winter pruning is the best. All these Roses also, except some of the two last, thrive and flower best short or close pruned. Prune early, and cut hard, are also good rules for hastening the blooming season the following year.

The Austrian Briar, or Persian Yellow, is, however, an exception to this close pruning of once-a-year blooming Roses. Some of the more excitable Roses, such as the Hybrid Perpetuals, may also be partially pruned in the autumn to insure their safety from high storms of wind that not unfrequently break, bruise, or destroy such. These

may be shortened back one-third or so of their entire length without causing serious injury to the base-shoots by forcing them to break prematurely. All the weakly shoots may also be removed, as already advised, to admit more light and air to the shoots left. These thinning processes not only enable the shoots to resist the frost better, but keep their buds longer dormant, for the riper the wood the less susceptible the buds, and *vice versa*.

Spring Pruning.—As the once-a-year flowering Roses are disappearing rapidly before those that flower twice or oftener, so autumn or winter pruning is dying out among the Roses. The wide difference in character and constitution necessitates quite a different time of pruning. Were we to prune Hybrid Perpetual, Tea, Noisette, Bourbon, and China Roses in the autumn, and in mild winters almost without frost till the end of February, the buds left for bloom would be from four to six inches in length, and become tender food for March frosts, instead of gems of beauty in the garden next June. All this is much aggravated by the dangerous excitability of the modern race of Roses. The infusion of Indian and Chinese blood is so great, its potency on constitution so marked, that the best strains of modern Roses seem never at absolute rest. Hardly has one flower faded when another treads on its heels, nor one shoot ripened before its buds break into fresh ones, and so on throughout the season. Fresh developments may be suppressed by cold, but the growth, frozen into inaction to-day, is quickened into greater speed by the thawing and quickening sunshine of to-morrow.

All this complicates the time of pruning Roses so much that the wisest and most experienced stand and hold, as it were, knife in hand, longing yet fearing to prune. The unpruned shoots burst into growing shoots along almost their entire lengths; the waste of force and of time seems most extravagant. But our hopes of success lie in those semi-dormant buds at their base, and hence pruning is mostly deferred until March, and for Teas, April or even May.

Those early-growing shoots are the rosarian's safety-valves. They carry off the earliest and the strongest current of life, and while it flows through these, the base-buds sleep on and take their rest.

And yet the late pruning is at best only a compromise, a choice of the lesser evil out of two. Were it possible to be assured that no severe frosts would come after February, Roses of most sorts might be pruned in November. But the winter seems every year to come less and less in winter, and then to make up for its absence it chases the rosarian far into the summer. Hence, it is no

uncommon thing to have Tea Roses blackened in May. And, humiliating as it may appear, it must nevertheless be admitted that the date of what is called spring pruning must be largely determined by that most capricious of all potential elements in horticulture—the weather. As nothing is certain in regard to it, but that the most unexpected is the most likely to occur, the best-laid schemes of rosarians, as of other men, are often upset by it. On the whole, however, and in the average of seasons, about the middle of March is the safest month to prune all the Hybrid Perpetual Roses, leaving Teas and tender Noisettes until April.

What Growth shall the Pruner Cut to P

—This is a modern question arising out of the character and conditions of the growth of modern Roses. The majority of these make two growths a year, the one ripening in June or July, the other in September or October. The tendency of this double growth is to remove the plant by a compound process of extension very rapidly from its base or starting-point, the root-stock, or, in standards, the point of union of the scion with the stock. One of the objects of pruning is to keep the plant, of whatever form, within reasonable distance of its base. Distinctions in the qualities of the flowers and of the shoots have also been drawn between those produced on summer and on autumn-made wood. As a rule, however, it is best for the future form and health of the tree to cut boldly back to the summer wood (*b*, Fig. 33), as it is called; that is, the ripened shoots of the previous spring. Were the opposite course adopted, and the autumn shoot only pruned back to *c*, the probability is that the major portion of the buds on the lower portion of the shoot between *a* and *b* would remain dormant. The Rose-tree would thus become thin at its base, and soon have a lanky, scarecrow appearance. There is another advantage in cutting back to the summer-made wood. This being, on the whole, more mature, and possibly partially emptied of its fluids to produce the second shoot or shoots on its crown, its buds are longer in breaking than those on the younger shoot above it, and every day's delay in the bursting of Rose-shoots in the spring gives an additional chance of safety. The retarding of the buds is, in fact, the chief vindication of spring pruning. In pursuit of this object, the growing buds on their extremities are allowed to run away freely with sap and growing force, and the pruner refuses to use his knife until the advancing season and the bursting buds at the base of the shoots compel him. In pruning for bloom chiefly, there is another safe rule of pretty general application, and that is—prune to the best buds on the shoot, no

matter where found. The largest and roundest buds are mostly the best, if these are thoroughly matured; and such buds may be found at times at various portions of the growing shoots. For example, they will mostly be found at the base of such short and sturdy-growing Roses as Baroness Rothschild, about the middle of such vigorous growers as Duke of Edinburgh, and towards the summit of such sorts as Coupe d'Hébé. Hence the first should be short or close-pruned, the second to a moderate length, and the third long-pruned. And so the principle of gradation of length, as well as time, must run along and through the entire art of Rose-pruning.

The Summer Pruning of Roses.—The term is here confined to Tea Roses and the pruning of the spring or summer shoots of the Hybrid Perpetuals so soon as their first blooms have faded. It is hardly safe to prune Tea Roses in the open air until the end of April or the first week in May. These, as they vary so greatly in vigour, must also be pruned differently, such strong growers as Gloire de Dijon, Climbing Devoniensis, Marshal Niel, and Belle Lyonnaise being pruned much longer than Niphotos, President, and Marie van Houtte. But, unless carefully protected, the severity of the winter mostly takes a good deal of the pruning of Tea Roses off our hands. It not seldom degenerates into a mere mechanical removal of dead or dying wood, or the cutting off the frost-bitten, slain plants to the level of the ground. But where all is well, and the Roses have passed safely through the winter months, no hard and fast lines can be laid down for the pruning of Tea Roses; for in these we may have not only two, but many successional growths to take into account, not a few of the Teas being virtually perpetual bloomers, because they never cease growing. Hardly has one set of Roses opened fully when the buds on the flowering shoots are showing a succession of peeping buds, as though the in-comers were anxious to see the old flowers before they disappear. Hence the careful thinning out of the weakest and equal distribution of the stronger shoots is not seldom the only pruning possible, or indeed desirable, for Teas. Their recuperative force, however, is so great that, whether pruned lightly or heavily by art, or yet more ruthlessly by the heavy and ruthless forces of nature in her bleakest, hardest moods, the Teas, if alive, are sure to recover and spring forth into new life and beauty with the advent of genial weather.

The Summer Pruning of Spring and Summer Shoots.—Some years ago the practice was more common than it is now to go over the Hybrid Perpetual, and other twice-blooming Roses,

directly the flowers faded, and cut back the flowering shoot more or less closely to its base. This forced the second shoots out nearer home than if they had sprung from the head of the shoot. By cutting to the most likely bud, and disbudding most of the others, a stronger second shoot was also secured. Fewer shoots and finer being thus obtained, the autumn bloom was, on the whole, finer in consequence. The tops of the shoots were also used for scions or cuttings, as well as the weaker ones that were thinned out; the latter being cut off with a heel formed the best cuttings. This summer pruning not only favoured a better autumnal growth of blossom, but simplified the practice of winter or spring pruning by settling beforehand, as a rule, the dual claims of the two classes of growth already referred to. As a rule, the base or some part of the second growth was generally cut back, too, either in the autumn or spring. But as the rush of sap is always to the top, this summer pruning made some of the second growths later than they would have been. Hence, partly, and also on account of the considerable labour it involved at a busy time, it is not now very common.

Another Kind of Summer Pruning.—This is mostly applicable to Banksian, Marshal Niel, and a few other Roses. It consists in the close cutting off the flowering shoots so soon as the flowers fade. The plants almost immediately break into fresh growth, and this growth is left intact until it flowers next year, when the process of pruning, growing, and flowering is repeated *ad infinitum*. One constantly hears complaints of the Banksian Roses—of which the small white, so deliciously fragrant, and the small clustered yellow, are by far the best—not flowering, or blooming but scantily. How can they when their flowering shoots are spurred off wholesale in the spring? Planted on the south or west side of a house or outbuilding, they will climb up fifteen or twenty feet, and extend to quite as great a breadth, and literally smother the building every May with their drooping wreaths or pendants of bloom, many of them extending from one to three yards in length. There is no richer or more pleasing sight among all the Roses, rare and sweet, than these charming Daisy Roses without a thorn treated and pruned thus. It is most important that they should be pruned early, not a day being lost between the fading of the bloom and their severe pruning, to allow as much time as possible for their growth to be made and matured before the winter. This thorough ripening of the wood is essential to enable such semi-tender Roses to endure the severities of winter, as well as to insure a profuse profusion of bloom.

Pruning as a Means of Renovation.—

The increased vigour of a grazed vine is said to have first directed attention to the merits of pruning. Be that as it may, there is no doubt that the removal of weakly or superfluous wood has a stimulating influence on Roses. This is most marked often in the case of tall standard or climbing Roses. These, from their wide area, and the enormous amount of foliage and bloom, naturally become exhausted sooner than others. Hence the necessity of exceptionally severe pruning at times to renew their health and vigour. Branches may not only be shortened, but entire limbs or parts of the Rose may be removed bodily. Sometimes the entire head may be cut off. The best season for these radical prunings is the autumn or winter. Such very extreme measures are seldom needful, unless in the case of previous neglect. They are mostly, however, when adopted, quite effective in re-invigorating the Rose-trees. Huge adventitious—that is, forced or unnatural—buds are formed in the bark, nurtured into size and strength during winter, and burst into vigorous growth in the spring, and these renew the strength and the growth of the Rose-tree. In other cases such buds show and break before the plants are cut back. In all such it is well to take stock of the condition of the plant, and act accordingly. If its general health is all that can be desired, rub off these buds at once; but if not, carefully cultivate them, and cut back as much and as far as possible, to give them a better chance.

Strong-growing climbing Roses, mostly on their own roots, very often throw up such shoots from their root-stocks, or the base of their main branches. One or more of these succession shoots should be preserved almost every year, and some of the older shoots cut out. By such skilful manipulations the health and vigour of such Roses are preserved, and they continue to be objects of verdure and beauty for a life-time. In fact, by this system, all that is partially exhausted, or wholly worn out, is removed annually, and new wood, full of youthful force, is brought forward in its stead. Nor is this all, for the new wood above has its counterpart in fresh roots below, so that the entire plant is rejuvenated by these methods of pruning. Perhaps this plan of resuscitating partially worn-out Roses is less practised than it used to be. The life of individual plants is less prized now that the art of budding, and other means of propagating Roses, are better understood and more widely practised. Still sentiment and common sense suggest the wisdom of saving old Roses, and virtually making them young again, by such simple modes as those here described. Roses thus treated not only renew their youth, but frequently far eclipse all their earlier beauty.

The Pruning of Different-shaped and Sized Roses.—As these must first be formed before they are pruned, and as in their formation training must run abreast of or overlap pruning, it will be most useful to explain the two processes together in our next chapter on the TRAINING of Roses, which will therefore open with a section on the efficacy of pruning in moulding Roses into shape.

Pruning Implements.—A sentence or two on these will fitly conclude this chapter. The knife for pruning Roses may either have a straight or curved blade. It matters little, so long as it is sufficiently strong and sharp. Both these qualities are essential. Hence, unless for small plants and the mere cutting of the current year's wood, budding-knives are of little use. The point should also be rather narrow, very sharp, and specially strong. Dead Rose snags, as they are called, are hard as stags' horns almost, and when not too large for the knife should be whipped off with one clean cut.

When large, or for the removal of big branches, the handiest implement is a small-toothed, narrow, specially sharp saw. The saw-cuts should, however, always be trimmed over afterwards, to make them smooth and clean, and thus facilitate their rapid healing. It is a fact that vegetable tissues will hardly close over a saw-cut, but heal rapidly over a smooth cut of the knife.

The same remark applies to the cut of shears, or the secateur, so popular as a Rose and other pruner in France, which may be most succinctly described as scissors with one cutting edge. These, and especially the latter, bruise the wood and the bark; neither is the cut so clean as that of a sharp knife. Both shears and secateurs are often used on climbing, pillar, pyramidal, and tall standards to save time. But neither equals the knife, and it is astonishing how rapidly this does its work in skilful hands.

Dressing the Wounds.—This is quite a mistake, though not a few rosarians practise it. It is like the old plan of dipping a cut into Friar's Balsam to make it heal the sooner. It did just the reverse, and increased the pain tenfold to boot. Bind it up in the blood, and it begins to heal at once. And so in a measure with the growing bark and the sap of Roses. Make the wounds as small, cut them as smooth and clean as possible, and leave the healing to nature, and it will be done well, and as speedily as possible. Dress them over, no matter much what with, and you hinder the process of healing, and render the perfect soundness of the wound impossible.

ORCHIDS.

By WILLIAM HUGH GOWER.

INTRODUCTION.

THE name Orchis, or Orchid, is derived from the two peculiar pendulous tubercles which form the root of many of the terrestrial species. The beautiful colours and singular shapes of the flowers found in this order have always attracted special attention; and this, combined with the length of time the blooms continue in perfection, has caused them to become general favourites.

The flowers of Orchids derive their fantastic shapes from the fact of their being irregular—that is to say, they are not simply made up of calyx and corolla, each of which is easily defined by its shape and colour, or as in the case of other flowers in which both calyx and corolla are alike (perianth). But in Orchids we have a flower made up of several parts, each different in shape, and in some instances all differing in colour. The illustration here given of a Phalenopsis flower will fully illustrate our meaning, whilst the various figures we shall give to illustrate the genera, will serve to show some of the extraordinary forms which the flowers of this order assume. Again, the peculiar stems of Orchids are called pseudo-bulbs, or false bulbs, on account of the swollen and often bulb-like appearance of their growth.

In the early days of our acquaintance with these plants, their high prices and the extreme difficulty which apparently attended their cultivation, made them the exclusive property of the very wealthy few. Now, however, we have increased our knowledge of the conditions under which they thrive in their native habitats, and the ease and rapidity with which they can be transferred is so great, that thousands of plants arrive in this country every month; and thus prices have been reduced to such an extent as to bring them within the reach of every one having a glass-house. Not that there are no high-priced Orchids even in these days. On the contrary, any new species, or an extra good variety of an old and well-known species, is more eagerly sought after than ever, and numerous instances occur every year where amateurs are found who willingly give fifty, eighty, or a hundred guineas to become the happy possessor of some special or unique form. Nevertheless, for the comfort of those who are about to commence the fascinating pursuit of Orchid-growing, we can assure them that some of the most beautiful kinds in this grand family of plants are those which are the most reasonable in price.

Temperature.—With the information brought as respecting Orchids by those who have collected

them in their wild state, coupled with rational treatment at home, these plants are now found to be as easily managed as any others. One great objection to Orchid-growing in the earlier days was the enormous consumption of fuel, which had a rather formidable appearance on paper when the cost was added up at the end of the year. These were the days when, because a plant came from the East Indies or South America, it was supposed to require as much heat as a cook's salamander—the fact of the vast mountain ranges of both hemispheres being densely clothed with verdure up to many thousand feet elevation being completely ignored. This fact is now fully recognised, and it is found that comparatively little expense is incurred in keeping these mountain plants supplied with sufficient heat. There are, however, some kinds which do require a strong heat to maintain them in health and develop their beauties, such as the *Angræcums*, from Africa and the African Islands, the *Aerides*, *Vandas*, *Phalenopsis*, and *Saccolabiums* from the low mainland of India, and from the Indian islands, &c. These undoubtedly do require a large amount of artificial heat. For those who have large collections, therefore, we advise three separate houses, or one house divided into three, by which means the peculiar temperatures necessary for the well-being of the plants can be easily maintained. Those who have but a single house for their pets must endeavour to keep one portion of it cooler than the other by means of ventilation. The temperatures should be about as follows:—

1. *The East Indian House*, as its name implies, should be used for all the plants from low elevations in the East Indies, as well as any other hot countries. The summer temperature of this house should range from about 75° at night up to 90° with sun during the day. A free circulation of air should be maintained, but the atmosphere should be well charged with moisture, so that it does not become arid. The winter temperature, 60° to 65° by night, running up to 70° or 75° by day.

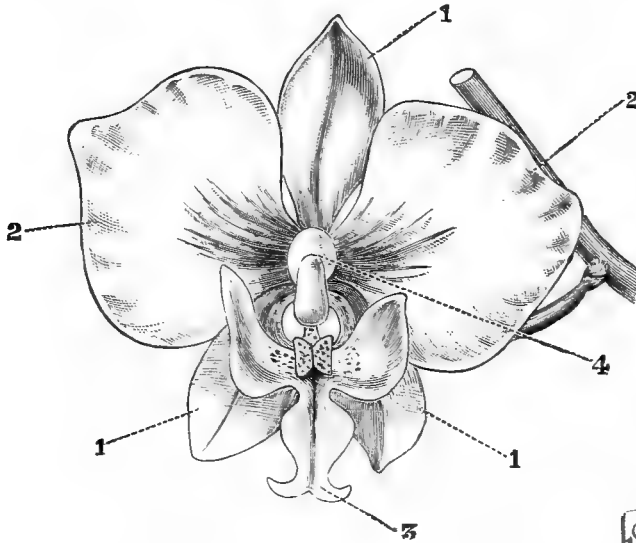
2. *The Brazilian House*.—This will accommodate all the plants from the low regions of the Western Hemisphere. Summer temperature, 65° to 70° by night, up to about 80° or 85° by day with sun-heat. Winter temperature, 60° by night, up to 65° or 70° by day with sunshine. In this house a certain space should be left entirely without shade, in order to accommodate such plants as some of the *Lælias*, *Coryanthes*, and similar plants, which thrive best close to the glass, and love full exposure to the sun's rays. This we designate the *Mexican* division.

3. *The Peruvian House*.—This will include all the mountain plants from the Western world, and also some of those from the Himalayas. Summer tem-

perature, 60° by night, up to about 70° or 75° by day; indeed, unless this house faces the north, it will be found sometimes extremely difficult to keep it sufficiently cool. Winter temperature, 45° or 50° by night, up to about 60° by day.

Our readers will quite understand that these figures are not intended as hard and fast lines, but are simply given as a general guide. There is no royal road to the cultivation of Orchids, and nothing but practice will enable the cultivator to arrive at success. By constant attention and careful observation, the eye will soon detect any falling off in health of a parti-

in an artificial manner when they are grown by themselves. It does not require much thought or practice to become fully aware that it would be extremely difficult to cultivate Orchids in our stoves with a general collection of plants, but the effect of an Orchid-house is greatly improved by the introduction of some of the slender-stemmed Tree Ferns from the tropics; also by some of the beautiful-leaved climbing Aroids, which may be trained to cover pillars and rafters. These latter plants are not much infested with insects, and, being so amenable to the pruning-knife, can always be kept



FLOWER OF AN ORCHID. (*Phalanopsis Schilleriana*.)

1, The sepals; 2, petals; 3, labellum or lip; 4, the column.



cular plant; and the snuggest and warmest corner, or a more airy situation, as the requirements may be, will soon be found for it, the reward of which will be increased vigour in the previously sick plant.

Arrangement of Orchid-houses.—The prevailing fashion is to devote a house or houses to the cultivation of Orchids exclusively, but this practice, taking into consideration the natural habits of the plants, we consider entirely erroneous. Growing as they do, surrounded by the luxurious tropical vegetation, many of them high up in the branches of the forest trees, why are they, when brought to this country, deprived of the company of other plants? Indeed, there cannot be the slightest doubt that other plants with thinner leaves tend to produce an atmosphere more congenial to the requirements of Orchidaceous plants than it is possible to produce

within proper bounds; then the curious and beautiful genus of *Nepenthes*, or Pitcher Plants, of which we have now so many choice forms, are fine adjuncts, either as basket plants or trailed up the rafters. Indeed, there is no lack of material. Such plants as small-growing Palms, of which *Geonoma*, *Cocos*, *Chamædorea*, *Rhaphia*, &c. &c., produce many specimens of great beauty, are admirably adapted for the purpose. Standing up above the Orchids, their graceful leaves form a genial shade, and, as their stems are so slender, no obstruction is formed to the full view of the beautiful flowers below. These plants we should confine to the ornamentation of the East Indian House, and recommend vines to be grown in the Brazilian House, but not planted so close as in an ordinary vinery, treated upon the spur system, and the leaves kept thinned. Under these conditions the vines will produce a good crop of

grapes, which every one knows full well how to utilise, while the leaves will afford an agreeable shade to the plants. In the Peruvian House, in addition to cool country Ferns, we advise the roof to be thinly covered with the shoots of the red and white forms of Lapagorias. The temperature will suit these plants exactly, and their beautiful pendulous bell-shaped flowers will produce an effect not often realised, but never to be forgotten.

Potting.—It will not be necessary to enlarge upon the potting or basketing of Orchids, as the details will be given in treating of each genus separately. Suffice it to say that the material used for the epiphytal kinds should be living Sphagnum, and the fibrous portion of peat which is left after all the fine soil has been beaten out. Such plants, however, as Vandas, Aerides, Angræcums, Saccolabiums, &c. &c., do not like peat-fibre, but should have Sphagnum only.

In potting epiphytes with pseudo-bulbs, the material should be raised above the rim of the pot into the form of a little cone, and the base of the pseudo-bulbs must sit upon the summit. This system is necessary in order to prevent decay to the eyes, which spring from the base. The same also will apply to Dendrobiums, &c., which have stem-like pseudo-bulbs, but is not material in the case of the distichous kinds, such as Aerides and Vandas, which continue to grow from the summit.

Orchid-pots have already been treated upon, the perforated ones being the most preferable, because they allow the roots to push into the air, and thus, instead of the roots dying, as they too frequently do in close pots, they continue healthy and give proper nourishment to the plants. With the terrestrial kinds, however, the case is very different. Here the ordinary pots must be used, and the soil required is much closer, in some instances even stiff loam being the most suitable. With these plants the soil does not require elevating above the rim of the pot, but in all and every case the drainage must be perfect.

The plants grown upon blocks require but a very small quantity of moss; this should be fastened on with fine copper wire. There is no doubt that this is the most natural mode of treatment, but very much more care is required in their culture, it being almost impossible to keep the atmosphere sufficiently charged with moisture for their sustenance.

Rest.—Orchids for the most part require a period of rest which corresponds with the dry season of their native habitats, although some of the mountain species from New Grenada and Peru would appear to have no season of repose. We

often read of the terrible drought which vegetation has to endure in many parts of Asia, and no doubt hundreds of plants never survive the ordeal; but as the Orchid-grower at home wishes every one of his plants to awake, the trial must not be too severe. Resting is an operation which requires discretion. After growth is completed and well set up, the temperature should be lowered, and the supply of water gradually withdrawn. When the plant appears to be quite dormant, the supply may be stopped, and unless the leaves or pseudo-bulbs show signs of distress by shrivelling, no more should be given until the time comes round for again starting it into growth.

Diseases.—These plants like all others are subject to disease, which in some instances is brought about through the agency of insect pests. A disease called the "spot," from the canker-like blotches which show themselves on the leaves, and which in many instances spreads rapidly, causing destruction to the symmetry of the plant, and even death, has to a very great extent disappeared lately from our collections. This we attribute to the more rational treatment which these plants now receive, the disease arising from a superabundance of moisture during winter, combined with a foul and stagnant atmosphere. But even this is not a disease brought about by cultivation, for we have seen marks of it on the leaves of newly-imported plants, thus proving that the plants may meet with uncongenial surroundings even in a state of nature.

Orchids, especially the kinds with two-ranked leaves, are very much disfigured at times by their young leaves turning a dirty rust-colour, instead of bright green. These have had all the colour drawn out of them by an insect called the red-thrip. It is perhaps the worst pest the cultivator has to contend with. Some advise fumigating as the best means of destroying them. We are, however, opposed to fumigating Orchids, having found that such plants as Vandas invariably lose some of the lower leaves a few days after the operation, which of course destroyed the symmetry of the plants and reduced their value. Our experience with the red-thrip proves that dusting the parts affected with tobacco-powder, allowing it to remain on for a day or two without becoming wet, completely exterminated them without injury to the plant. The other pests which attack Orchidaceous plants are yellow-fly, green-fly, black-thrip, white and brown scale, and mealy-bug. For all these we prefer washing the parts affected with a sponge, using a mixture of soft-soap and tobacco-water, to applying any violent remedy, which may perchance prove more detrimental than

the disease. In the case of slugs or snails, these oftentimes get brought in with the Sphagnum Moss. This is frequently the case with the little Onion-snail (*Zonites allavria*). These must be watched for at night after dark, traps of Lettuce-leaves, sliced Turnips, Potatoes, and such-like things being also laid about for them. The cock-roach (*Blatta orientalis*) is the great destroyer of the roots of Orchids. There is, however, no reason why this beetle should be more plentiful amongst these plants than any others, and if almost any of the numerous pastes, which are offered for sale to destroy them, be used persistently, the house can easily and speedily be cleared.

Acanthephippium.—The name signifies "Spiny-horse," but how it bears upon the plants comprising this genus we are unable to say. They are terrestrial in habit and love the shade, and although not appreciated by Orchidologists of the first water, they are sufficiently interesting to deserve a place in the most *recherché* collection.



ACINETA HUMBOLDTII.

As a genus, *Acanthephippium* is nearly allied to *Bletia*, and is characterised by its short stout pseudo-bulbs, and large broad-plaited leaves. The flower-spikes seldom exceed the pseudo-bulbs in height, but are very numerous. These bear from three to seven or eight large, fleshy, ventricose flowers, which are more or less bluntly spurred at the base. They thrive best when planted in a somewhat closer soil than is usually considered suitable for members of this order. Pot in rough peat, leaf-mould, and loam. During the period of growth water abundantly, but afterwards a good season of rest will tend to the production of an

abundant supply of their curious flowers. East Indian House.

A. bicolor.—Pseudo-bulbs ovate, leaves oblong-lanceolate, ten to eighteen inches long, and two to four inches broad, sharply tapering to a point at both ends; flowers three to seven, yellow, streaked and spotted with red near the mouth; petals narrowly oblong, acute; middle lobe of lip bluntly tongue-shaped, furnished with three fleshy, warty protuberances along the centre; side lobes obtuse, incurved. May and June. Central Provinces of Ceylon.

A. javanicum.—This species is easily distinguished by its obtusely four-angled pseudo-bulbs. Flowers three to six, yellow, stained and spotted with purple; petals somewhat spatulate; middle lobe of lip ornamented with four fleshy plates on the centre; side lobes truncate. April and May. Java.

A. striatum.—Pseudo-bulbs slender; the flowers bluntly spurred at the base, white, slightly streaked with red; petals oblong, acute; the

middle lobe of lip small, fleshy, and acute, furnished with numerous rough protuberances along the centre, side lobes bluntly oblong. April and May. Nepal.

A. sylhetense.—The flowers of this species are creamy-white, streaked with purple inside; petals oblong-lanceolate, acute; middle lobe of lip thick and fleshy, tongue-shaped, ornamented on the centre with three toothed protuberances; side lobes very narrow. April and May. Sylhet, Sikkim, and Khasia.

Acineta.—A genus of singular and most interesting epiphytal Orchids, originally included with

Peristeria. The name comes from *akineta*, immovable, and refers to the lip, which is jointless.

Acinetas are characterised by their angular pyriform pseudo-bulbs, from the summit of which are produced two or three large, erect, membranous-plaited, dark green leaves. The racemes spring from the base of the pseudo-bulbs, and grow straight downwards, bearing numerous globose, thick, and fleshy flowers. The lip is three-lobed, united to the column, and furnished with a peculiar fleshy process in the shape of a spur or horn.

The whole of the species are found in the dense forests of Tropical America, chiefly in deep and dark ravines. Cultivators may, therefore, learn from this that these plants delight in shade, and should not be so placed as to receive the full influence of the sun.

These plants are extremely ornamental when in bloom, but from their peculiar habit of flowering, it is absolutely necessary to grow them in open baskets suspended from the roof. These baskets should be filled with rough peat fibre and Sphagnum. Some pieces of charcoal mixed with this will be found most advantageous, for although Acinetas require an abundant supply of water during the growing season, the compost should be sufficiently open to allow it to pass away freely. After growth is completed, a moderate season of rest should be given by withholding the water supply, but this must not be carried to such an extent as to shrivel the pseudo-bulbs, or the plants may be permanently injured in health. Brazilian House.

A. Barkerii.—Pseudo-bulbs large, deeply furrowed; leaves one to two feet high, racemes bearing numerous sub-globose, waxy flowers; sepals and petals rich orange-yellow; lip deeply three-lobed, full orange, spotted with crimson. May to July. Xalapa.

A. chrysantha.—Pseudo-bulbs ovate, furrowed, bearing large, plaited, dark green leaves. The pendulous racemes are somewhat laxly set, with rich golden-yellow flowers; lip white, furnished with a curious blunt spur-like process; column crimson. May to July. Mexico.

A. Humboldtii.—This is the *Anguloa superba* of Humboldt. Like the preceding, the leaves are large and plaited. The racemes are some two feet long, and densely crowded with thick, fleshy, globose flowers; sepals bright purplish-chocolate, spotted and blotched with purplish-crimson; petals deep claret-colour, spotted like the sepals; lip yellow, column winged. April and May. La Guayra.

A. Humboldtii, var. *fulva*.—This variety produces flowers of a tawny-yellow, spotted with purplish-brown; lip bright yellow. May to July. Central America.

A. Humboldtii, var. *straminea*.—Flowers light

yellow or straw-coloured, sparingly spotted in the interior with purplish-brown. June and July. New Grenada.

Acropera.—A small genus of curious epiphytal plants, having much the habit of growth of *Maxillaria*, now merged into *Gongora*. The name is derived from *akros*, the end, and *pera*, a pouch, from the curious pouch-like terminations of the labellum.

Acroperas are not very showy, but their singular flowers are very charming, and will well repay any space which may be devoted to them, more especially as one species bears the name of such a great enthusiast in all relating to plants and plant-lore as the late Mr. George Loddiges, proprietor of the once famous nursery at Hackney.

These plants produce pendulous racemes of flowers from the base of the pseudo-bulbs, which hang round them in dense clusters. They may be grown equally well in pots or baskets, but in either case the base of the pseudo-bulbs should be well elevated above the soil, which should be rough fibrous peat and Sphagnum Moss. Mexican House.

A. armeniaca.—Pseudo-bulbs ovate, obtusely furrowed, bearing two broad, plaited, dark green leaves, some ten inches in length; racemes pendulous, as long or longer than the leaves, many-flowered; sepals and petals clear apricot-yellow, dotted with reddish-brown. May to July. Nicaragua.

A. Loddigesii.—In habit this species resembles the preceding, but it is not so large a grower, and the pendulous racemes do not bear so many flowers; sepals and petals brownish-yellow; lip reddish-brown. May to July. Xalapa.

Ada.—As a genus, this is characterised by the sepals spreading at their apices only, nearly equal acuminate, the lateral ones somewhat oblique at the base; petals similar, but smaller; lip elongate, undivided, parallel with and adnate to the base of the column, crested with two membranous plates, which are afterwards confluent; column wingless. One species only has hitherto been introduced of this genus. It should be potted in peat and Sphagnum Moss in about equal parts; drain well, and water freely during the summer months, and even in winter it must be supplied in moderation, and never be allowed to suffer from drought.

A. aurantiaca.—An epiphyte with the habit of *Brassia*. The pseudo-bulbs are narrow, nearly cylindrical, about four inches long, and bearing one to three leaves, which are about six inches long and sheathing at the base; racemes terminal, drooping, nearly twice as long as the leaves; flowers somewhat two-ranked, bright reddish-orange colour,

and about an inch long. It thrives well with *Odontoglossums* and *Masdevallias*. Winter and early spring months.

It is a native of the province of Pamplona, in New Grenada, growing in the mountains at an elevation of 8,500 feet. Peruvian House.

Aerides.—From *aer*, the air, in reference to the epiphytal habit of the plants. They are epiphytes with mostly simple rooting stems, and two-ranked or distichous, coriaceous, somewhat fleshy leaves, and long racemes of showy flowers; sepals spreading, the lateral ones oblique at the base, and connate with the prolonged foot of the column; lip continuous with the column, spurred and three-lobed; column recumbent on the ovary, short, wingless; pollen masses two, obliquely two-lobed behind.

This genus contains very many of the finest members of the order, their symmetrical growth rendering them extremely ornamental, even when not in flower. They are all natives of the tropics of the Old World, and thrive well under cultivation either in pots or baskets. For the smaller-growing kinds blocks of wood may be used, but extra care is required to keep the atmosphere sufficiently moist when this system is adopted.

The wooden baskets formerly used for the reception of plants of this order have now to a great extent lost favour, on account of the rapidity of their decay. Consequently, perforated pots and pans are now more common. These should be well drained with charcoal, and the plants secured in position with sweet and living Sphagnum. During the growing season supply abundantly with water, both to the roots and overhead with the syringe in the form of falling spray, and not with all the force possible to use, as is too frequently the case.

When the season's growth is complete, do not withhold water entirely. It is quite necessary to keep the atmosphere much drier during winter, but the object being to maintain the plants in as fine a condition as possible, the resting system must be carried out in a careful manner. *Aerides* are sometimes dried up in the winter until their leaves shrivel. This will cause many of them to fall off, and the plant is permanently disfigured and reduced in value. It behoves the cultivator, therefore, to watch carefully, and never allow shrivelling. Our experience goes to prove that lowering the temperature a few degrees is of greater benefit to the plants than a severe drying, and equally efficacious in producing flowers.

The blooms of *Aerides* will last many weeks in perfection with ordinary care. By this we mean that water must on no account be allowed to touch them, but it should not be entirely withheld from

the plant. When the plants are in bloom, they should be removed to a rather cooler and drier atmosphere than that of the growing-house.

Aerides are sometimes infested with a small scale. When these appear, carefully remove them with a sponge and soft-soap and warm water. The red-thrip sometimes attacks them in the heart of the young growth, and if neglected, will soon disfigure them. This, however, may soon be exterminated by dusting with tobacco-powder. East Indian House.

A. affine.—This is a very elegant species. Leaves truncate at the apex, sometimes toothed, about a foot long, and bright green; racemes somewhat stiff, many-flowered, dense; flowers pink and white, spotted with rose; sepals and petals about equal, rounded at the apex; lip rhomboid, acute, and somewhat three-lobed; spur short and conical. There are numerous varieties of this species, which are more or less strongly marked, and in some the racemes are much branched. May and June. Sylhet and Nepal.

A. affine, var. *roseum*.—An exceedingly fine form of the species; it is more robust in habit of growth, and produces a very long, much-branched, and dense raceme; flowers deep rose, profusely spotted with purple. May and June. Sylhet.

A. crispum.—A charming species; the leaves are flat, broad, oblique, and obtusely two-lobed at the apex, about five inches long and very deep green, the sheathing base being purplish-black; racemes erect, many-flowered, nine to twelve inches long; flowers very large, one to two inches in diameter, waxy-white, tinged with rose; lip purplish-rose; upper sepal and petals equal, ovate, acute, lateral sepals larger and blunt-pointed; lip ovate; lateral lobes small and erect; middle lobe large, notched in front, having two teeth at the base and an incurved spur. May and June. Bombay.

A. crassifolium.—A very fine and still rare species; the leaves are set very close, thick and fleshy, about eight inches long, and bluntly two-lobed at the apex; raceme twice as long as the leaves, many-flowered; flowers large, white and rich purplish-rose. As a species it is allied to *A. falcatum*, but differs from that plant in having a bent spur to the lip, the side lobes of which are much larger. May and June. Moulmein.

A. falcatum.—Although an old inhabitant of our gardens, this species is still far from plentiful. The leaves are coriaceous, obtuse, and mucronate at the apex, some ten inches in length, and deep green, with a peculiar bloom upon the surface; racemes pendulous, many-flowered, dense; sepals and petals white, speckled with crimson at the points; lip crimson in the middle, and white barred with rose at the edge; lateral lobes of lip falcate; middle one

obovate, fringed at the edge; spur short and straight. This species first flowered in England in the collection of Lady Larpent, and was named provisionally *A. Larpente*, by which name it is even now best known in gardens. June. East Indies.

A. Fieldingii.—A robust, bold-growing, and handsome species, bearing long and densely-flowered racemes, which has suggested the name of "the Fox-brush *Aerides*." Leaves leathery, drooping, broadly lanceolate, and obliquely two-lobed at the apex, some eight to ten inches long, and deep green; racemes one to three feet in length, in some instances simple, in others much branched; flowers dense, large, and rich bright-rose colour; sepals and petals oblong, obtuse; lip flat, ovate, and tapering to a point. June and July. Upper Assam.

A. Lindleyanum.—This is frequently called a variety of *A. crispum*, but it differs somewhat in the form of the flower. It is a bold-growing plant, producing a large branched pannicle of bloom; leaves very stout, oblique, and obtusely two-lobed at apex; flowers very large; sepals and petals white, obtuse; lip ovate, acute, serrated in front, plicate, with acute fleshy auricles at the base, and a pair of large fleshy incurved tubercles between them; spur short, incurved. May and June. Neilgherry Mountains.

A. Lobtii.—A beautiful free-flowering species; leaves distichous, ligulate, obliquely bi-lobed at the apex, broad, thick, and fleshy, about one foot long and light green; raceme cylindrical, dense, pendant, longer than the leaves, and much branched; sepals nearly equal, with a rounded or somewhat spatulate apex; petals narrower, spatulate, incurved, and, as well as the sepals, bright rose, slightly spotted with violet, white towards the base; lip bright rose, tinged with deep violet, with a streak of white along the centre; spur curved and somewhat compressed. May and June. Moulmein.

A. maculosum.—A somewhat stiff and compact plant; the leaves are oblique and obtuse at the apex, eight to ten inches long, and dark green; racemes drooping, generally slightly branched; flowers large; sepals and petals obtuse, pale rose, much spotted with bright purple; lip ovate, obtuse, flat, and undivided, with a sharp tooth on each side at the base, and an undivided tubercle between them; the colour is deep rich rosy-purple, lighter at the edges. June and July. Bombay.

A. nobile.—A rare and handsome kind, nearly related to *A. suavissimum*, but still differing from it in many essential points; leaves arcuate, strap-shaped, obliquely emarginate at the apex, with a small tooth between the lobes, bright green above, paler beneath; flowers very fragrant; racemes two to three feet in length, and branched, many-flowered, and pendant; sepals and petals oblong, obtuse, spread-

ing, white, stained with rose at the base, becoming paler towards the tips; lip three-lobed, the front pressed against the column; side lobes large, somewhat oblong, dentate at the tips, and creamy-yellow; middle lobe tongue-shaped, slightly bifid, white dotted with rosy-purple; spur incurved, yellow, dotted with red. June and July. Indian Archipelago.

A. odoratum.—This species is sometimes found under the name of *A. cornutum*, and though now a common plant in collections, it is one of the most beautiful and fragrant. There are numerous varieties of this species, of which *A. odoratum majus*, *A. odoratum longiracemosum*, and *A. odoratum purpurascens* are the most distinct and best. The normal plant has flaccid, oblique leaves, which are obtuse and mucronate at the apex, coriaceous in texture, and dark green; racemes pendulous, dense, many-flowered, usually longer than the leaves; flowers waxy and very fragrant; sepals and petals fleshy, somewhat ovate, creamy-white, tipped with pink; lip cucullate, funnel-shaped; lateral lobes erect, cuneate; middle lobe ovate, acute, and inflexed, same colour as the sepals; spur conical, incurved. May to July. East Indies. Widely distributed.

A. quinquevulnerum.—A splendid species, but of very slow growth and stiff habit; the leaves are strap-shaped, obliquely notched at the apex, with a small point between the lobes, tightly clasping the stem at the base, about twelve inches long, and bright shining green; racemes longer than the leaves, pendulous, many-flowered; flowers large, dense, yielding a delicious fragrance; sepals and petals nearly equal, rounded, white, speckled with crimson and stained with purple at the tips; lip cucullate, funnel-shaped; lateral lobes erect, middle lobe oblong, incurved, and denticulate, same colour as the sepals; spur conical, incurved, green. July and August. Philippine Islands.

A. quinquevulnerum, var. *Farnerii*.—This is an extremely rare variety, differing from the type in having pure white flowers. July and August. Philippine Islands.

A. roseum is a beautiful but slow-growing species. It does not root freely, and thrives best when grown upon a block of wood and suspended; leaves coriaceous, channelled, and recurved, ten to twelve inches long, and bluntly two-lobed at the apex; racemes pendulous, dense, twelve to fifteen inches long; sepals and petals acute, the latter longer and narrowed at the base, pale rose, with darker spots; lip flat, rhomboid, acuminate, entire, deep rose, freckled with spots of a darker hue; spur short, conical, and incurved. June and July. Moulmein, Sylhet, and Assam.

A. roseum, var. *superbum*.—A much stronger

and more robust-growing plant than the type; racemes very long and dense, and the flowers are much larger, colour deep rich rose, profusely spotted. June and July. Upper India.

A. Schröderi.—This is one of the most beautiful and, at the same time, one of the rarest of the whole genus. By some authorities it is considered a hybrid between *A. maculosum* and *A. crispum*, and by others as a variety only of *maculosum*. It, how-

ever, is very distinct in its growth, and exhibits considerable differences in the structure of the flower from either of the species it is supposed to be related to. It would appear to be very rare in its native country, one plant only having been brought to England. Leaves ligulate, obtuse, obliquely emarginate at the apex, about ten inches long, and intense deep green; racemes erect or arching, much branched, and nearly two feet in length; sepals and petals nearly equal, obovate and obtuse, spreading, white tinged with lilac, and profusely spotted with lilac-rose; lip triangular-rhomboid; lateral lobes small, middle lobe large, flat, the sides deflexed, pale lilac, with a stain of deep rose along the centre, furnished with two small incurved teeth at the base, the intervening tubercle bifid; spur incurved, yellowish-green. June and July. Bombay.

A. suavissimum.—A species of which many beautiful varieties exist, the most noteworthy being *pallidum* and *maculatum*, from Malacca, and *aurantiacum*, from Borneo. In the typical plant the leaves are flaccid, nine to ten inches long, light green, profusely dotted with brown near the sheathing base; racemes horizontal, oblong, many-flowered, sometimes branched, loose; flowers very fragrant;

sepals and petals oval, obtuse, very much spreading, white or bluish, tipped with rose; lip three-lobed, pressed to the column; lateral lobes oblong, slightly toothed; middle lobe dwarf, linear, bifid, not at all serrated, pale lemon-colour; spur pale yellow, tipped with red. July to September. Malacca.

A. Thibautianum.—When first this beautiful species flowered, it passed under the name of *A.*

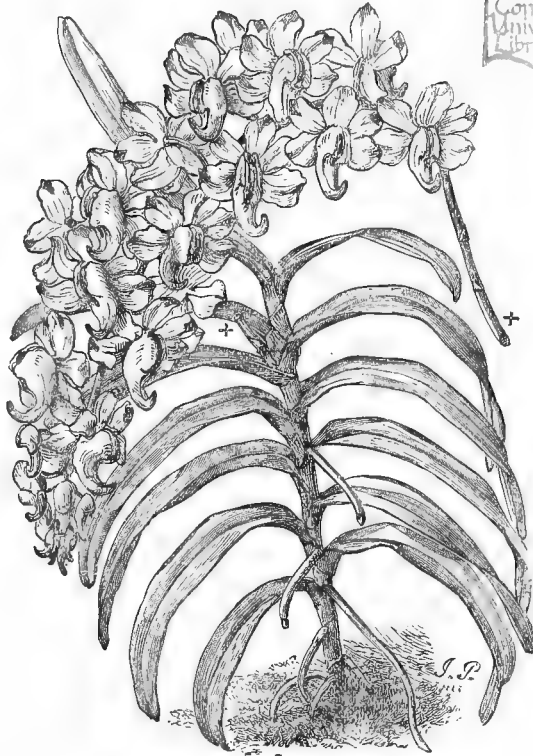
Huttoni, and was

afterwards figured as *Saccolabium Huttoni*; upon better acquaintance, however, it was found to be a species already named and described. It much resembles *A. quinquevulnerum* in habit of growth; leaves six to eight inches long, unequally two-lobed at the apex, and full deep green; racemes pendulous, slender, longer than the leaves, and many-flowered; flowers large, erect, very fragrant, and soft deep amethyst in colour. August and September. Java.

A. virens.—There are many varieties of this fine species, and all are beautiful; amongst them may be noticed *Dayii*, *Ellisii*, *grandiflorum*, *superbum*, and *quinquevulnerum*. The typical plant has broad oblique leaves,

lobed at the apex, eight to ten inches long, and very bright green; racemes longer than the leaves, drooping, many-flowered; flowers very fragrant; sepals and petals ovate, obtuse, soft, white, stained with rosy-purple at the points; lip three-lobed; side lobes white, dotted with crimson; middle lobe broad, crimson. April to July. Java.

A. Warnerii belongs to the *crispum* section, but is a thoroughly distinct-looking plant. The stem is slender and the short coriaceous leaves are ascending and dark green, almost black towards the base, where they clasp the stem; racemes erect, twice as long as the leaves; flowers large and fra-



AERIDES ODORATUM.

Cornell University Libraries

grant; sepals and petals white; lip large, soft rich rose-colour. June and July. Bombay.

A. Wightianum.—A very beautiful small-growing plant, sometimes called *A. testaceum*, and also *Vanda parviflora*; leaves strap-shaped, oblique, and obtusely two-lobed at the apex, with a tooth between the lobes; racemes straight, erect, longer than the leaves, simple, few-flowered; flowers fragrant; sepals and petals oval, lateral sepals largest, soft apricot-yellow; lip funnel-shaped; lateral lobes obtuse, adnate to the foot of the column; middle lobe subcuneate, rounded, and two-lobed at the apex, deep violet, dotted with lilac, the disk crested with several elevated lines; spur short, incurved, obtuse. May and June. Neilgherries and Ceylon.

THE HARDY FRUIT GARDEN.

By D. T. FISH, ASSISTED BY WILLIAM CARMICHAEL.

FRUIT being such an important article of food, as well as a universally appreciated luxury, one might naturally expect to find fruit gardens pure and simple as common as vegetable or flower gardens; and yet the fact is very much otherwise. Fruit gardens are comparatively rare, whilst those devoted to flower and vegetable culture are so common as to be looked upon as the necessary adjuncts to our advanced state of culture and of civilisation. And they are. Any retrogression in the growth of vegetables or the culture of flowers would indeed be a step backwards towards barbarism. But without growing fewer of either, it would be quite possible in most gardens to grow more and finer fruit. And one of the first steps towards this, in not a few places, would be the setting aside of a certain area expressly for this purpose. So long as fruit-growing is tacked on, as it were, to vegetable culture as a mere embellishment to the culinary department, so long will it hold a secondary place in the care, thought, and skill of the cultivator.

Fruit is so important for food, pleasure, health, that it is worthy of the best place that nature and art combined can provide for it. Its consumption is increasing day by day, and were railway rates lower, and the means of distribution more simple, rapid and efficient, there is literally no limit to the fruit that would be consumed by the workmen in mines, factories, mills, and workshops.

Under present circumstances the consumption is so irregular and irrational that it often does more harm than good. Thirsty men, tired women, and fruit-famished children, that may hardly have had a taste of fruit for months, have suddenly a cheap lot of inferior quality brought within their reach.

They naturally eat to excess, suffer from their imprudence, and lay the blame on the fruit. But were more and better fruit eaten as food, fewer pills and digestive-aiding mixtures would be swallowed. A Manchester merchant, who used to be a martyr to indigestion, took to dining upon any fruit that might be in season; Cherries, Strawberries, Gooseberries, Currants, Plums, Apples, Pears—nothing came amiss to him. The one fruit meal a day cured his chronic indigestion, and he waxed fat, worked hard, and continued strong on his fruit mid-day meal. A quart of Cherries disappeared before him like snow in summer, but then he ate nothing with them but a slice of dry bread or a stale roll. His maxim was, bread agreed with fruit, but hardly anything else did, and hence his never mingling savouries with his fruits.

The cry of fruit for food has scarcely yet arisen amongst us, and the suggestion that Apples and other fruit are in a special sense food for the brain, has hardly as yet gone further than a philosophical speculation. Only a little over one hundred and fifty thousand acres are under fruit-culture in Great Britain. True, the area is extending, but very slowly, and what are those few acres to supply the fruit-wants of over thirty millions of men, women, and children? It is true that here and there bold and successful attempts are being made to enlarge fruit gardens, or to expand them into farms ranging in extent from fifty to five hundred acres; but these are rare exceptions; and it is as true now as it was fifty years ago that a large proportion of our fruit supplies reach us from abroad. At home one of the most cheering signs of the times is the bold enterprise initiated by Lord Sudeley, at Toddington, in Gloucestershire. He has recently planted five hundred acres of land with nearly half a million of fruit-trees and bushes. So far the prospects of this gigantic fruit garden are cheering, and the area is about to be extended. As big things are infectious, no doubt this example will have many imitators on a smaller, and possibly a few on a yet larger scale. Such enterprises will be fostered by Mr. Gladstone's suggestion to try jam-growing as one means of mitigating the present agricultural distress. As it is now said that the profits of wheat-growing are *nil* to the British farmer, it is surely worth while to try fruit, that realises a profit varying from ten to a hundred pounds per acre per annum.

Useful, however, in a national point of view, and profitable as these gigantic fruit gardens or farms may prove to their proprietors, the increase of fruit-culture among all classes of gardeners would have a far greater effect in increasing our home supplies. If those who never grew any fruit would only grow one Apple, Plum, Pear, or Cherry tree, and those

who grow one would grow five or ten, then might our home supplies prove sufficient, or at least bring an abundant supply of wholesome fruit within reach of all.

The Choice of a Site.—Very much of success or failure turns on this. The altitude and aspect should first be considered. It should neither be too high nor too low, on the crown of a hill or the bottom of a valley. If the former the trees will suffer from exposure, the fruit will be blown down—the trees bent or broken with the winds. If the latter, the trees will suffer from excess of heat as well as cold. It will be almost too hot for some of the hardier fruits in summer, and so cold on bright clear nights in the spring, as to wreck the crops by frosts. About half-way up a gently-rolling hill is perhaps the best possible site for a fruit garden, so far as the altitude is concerned.

Now, as to aspects: south and west are undoubtedly the best. But these may be extended to include a few points of east at one end of the scale, and of north at the other, in warm localities. In colder places it is safer to avoid these extensions, and choose southern and western aspects, pure and simple.

These may seem small matters, but it is upon a series of such that success in fruit-growing, and indeed most of the operations in horticulture, depends. The difference in temperature in different sites within a few hundred yards of each other often amounts to five or even ten degrees, and fruit crops are saved or ruined within a far narrower range than that involved in such variations of temperature. Besides, other influences work against the trees in valleys. There moisture accumulates, and though the moisture of the world is on the whole one of the most efficient preservers of its caloric, yet its accumulation in valleys intensifies the destructive energy of the frost to blight and destroy the blossoming fruit-trees in the early spring. The testimony of experience is uniform on this point. Fruit gardens in the trough of valleys are constantly blighted or blasted, while those on rolling grounds or hills escape. Simultaneously with these facts, the readings of thermometers in valleys constantly reveal a depression of temperature of several degrees, varying with their depth, from three to even ten degrees between that of higher ground in the immediate neighbourhood.

Other causes work towards the destruction of fruit-tree blossoms in the troughs of valleys. Among these the stillness of the air is the most potent. It is this stillness that gives such destructive force to the energy of radiation on clear nights, so that the whole atmosphere from bank to sky is converted into a plant-cooler of most destructive energy. On rising ground or undulated positions the air moves,

and in its shifting the trees find their safety. Its mere motion baulks the energy of radiation; the heat of the plants is thus preserved, the blossoms escape destruction, and a crop is insured.

The opposite extreme, however, must be avoided, and no one in his senses would attempt to post a fruit garden or orchard in the teeth of the wind. In that, the heat lost by the rude entrance of every wind that blows would far exceed any that might be husbanded and conserved by modifying the energy of radiation, through the gentle and constant motion of the air.

Necessity of Shelter.—An elevated site for the fruit garden does not necessarily mean an unduly exposed one, and the more elevated the site the greater the need of shelter, natural or artificial. There is no shelter so efficient as that of a hill or mountain, rising up to some considerable elevation above the highest point of the fruit garden. If such barriers are so disposed as to shut out the north and east winds, little more can be desired. Extended slightly in both directions to exclude north-east and north-west winds, the shelter would be perfect, especially if the hills were clothed with trees as well. For barren mountains have a trick of rolling down the cold air from their summits in mighty waves of irresistible depression, that chill, perhaps destroy, fruit trees or anything else that may lie in their course. And just as sand is the best barrier to the waves of the ocean, so trees and shrubs form the most powerful shelter against the inroads of cold into our fruit garden.

Fortunately, too, for cultivators, though but few can commend uprising hills as barriers to the cutting blasts of the north and east winds, nor the sunny sides of the same as the most perfect sites for fruit gardens, yet all may raise up a barrier of living trees, fringed with lower shrubs, against such mischievous and destructive visitants as the north and east winds.

Shelter without shadow must, however, be the rule in all such matters as planting trees for shelter. The higher and thicker the shelter needed, the further it must be removed from the fruit garden. No vigorous-growing trees should approach nearer to fruit trees than from twenty to fifty feet.

Two dangers have to be guarded against with regard to such—the shade of the top, and the stealing of the food of the fruit-trees by the roots of the sheltering ones. Possibly the latter evil is the greater and more dangerous, for wherever there is a good larder fairly filled with good things, the roots of wilding trees will be sure to find it, and to use it up with alarming rapidity. Nature in this respect seems ever struggling to establish her dominion over

art, and hence the wildings of the shelter seem ever bent on starving out the fruit-trees so soon as they get a footing in the richer larder of the fruit garden. While any over-sheltering that has been exaggerated into injurious shadow, at once becomes apparent, and can be easily remedied, the roots of the sheltering trees commit their robberies in the dark, and their presence is often as unsuspected as mischievous.

The surest mode of avoiding this danger is to keep the shelter sufficiently far off. Another mode which also answers well—gives immediate shelter and keeps the rambling, roving roots at home—consists in throwing up earth-banks or mounds on the cold sides of fruit gardens. This gives the elevation of several years to the shelter at starting; a greater depth of soil for the roots, that fosters rapid growth, and if tolerably rich soil is used, it will keep them at home, instead of roaming all over the fruit garden, seeking what fruit-tree food they may devour.

Finally, in regard to shelters, evergreen or coniferous trees or shrubs are to be preferred, not only on account of their denser, thicker shelter when it is most needed in the early spring, but likewise inasmuch as their roots remain nearer home. On no account must Ash, nor Elms, nor Beeches be used; the first two especially will run any distance in search of food, and starve out the roots of any other sort of shrub or tree whatsoever.

Hedges for Shelter.—To avoid the possible injuries from a tree shelter, hedges are often used; and these are in some respects better, and if planted or allowed to grow sufficiently thick and tall, are very efficient. Beech, Hornbeam, Privet, Holly, Yew, and Scotch or Silver Fir, kept cut so as to force them to continue clothed to the bottom, are among the best plants for such hedges. They should be planted in the best possible soil and permitted to grow into dense masses from a foot to a yard through, and from six to ten, or even more, feet in height. Such living barriers are almost wholly impenetrable to cold winds, waves or currents of ice-like air. Like the sand on the sea-shore, they yield slightly to the impact of the blow, but their very yielding breaks its force, while the density of the mass is so great, and the process of yielding to gain new powers of resistance is repeated so often, that little or none of the cold air escapes through to the warmer side.

Walls for Shelter.—Walls are a necessity for the better sort of fruit gardens. They enable the cultivator to grow such fruits as Peaches, Nectarines, Apricots, Grapes, in the open air, which the cha-

racter of our climate prevents him from growing without them. Their heat-absorbing, cold-resisting properties—to use popular terms—are so great as to create and sustain an artificial climate in their immediate vicinity far superior to the average of that in which they are placed. The facility they afford for the display of semi-skeleton trees over their surface, also fully exposes each leaf, flower, and branchlet to the full force of the sun, thus accelerating and heightening growth, maturity, and fertility.

But as mere shelters they are inferior to those already described. For such purposes their very strength becomes their weakness. They often merely change the direction, rather than break the force, of waves of cold air. The mobility of the movable screen furnished by a belt of stunted trees or a thick hedge, holds fast, as it were, the power of the wind, and sifts out or tones down its force by its firm network of small twigs and leaves.

A Dry Bottom.—It is impossible to exaggerate the vital necessity for this. (See article on **DRAINAGE**.) It is not only essential to the health of the fruit trees, but also to their fertility. Whether drainage will be needed or not, can readily be tested in a very simple manner. Dig out a space a convenient size, from a yard to four feet deep; if the water stands in for weeks or a month at a stretch, the land must be drained, and the drains in a fruit garden should not be less than four feet deep, as fruit-trees, like most others, seem to have a mania for hunting for and finding drains. Hardly are they found when the roots revel along in them to such bad purpose as to block them. Hence the need of deep drainage in fruit gardens. However, there are large tracts of country where drainage will not be needed, and the open test-holes, as already suggested, will soon determine the question of drains or no drains to the satisfaction of the cultivator.

Suitable Soil.—Almost any soil resting on a dry bottom, having a favourable aspect, will grow, or can be made by the aid of stimulants to grow, fruit-trees in the open air. Hence, no amateur, artisan, mechanic, or labourer need be deterred from making the attempt to grow fruit in any or all sorts of soils. The land that will grow good Oaks will, with a little care, grow good Apples, Pears, Cherries, or Plums, and almost any kind of soil may be made to grow either. Even sheer clay, with a liberal addition of cinder-ashes and road-sand, and a bushel or two of cocoa-fibre refuse to start the trees in, may be made to grow tolerably good fruit; and mere sand, enriched with house-slops, may be forced to do likewise. It is a

safe rule to look round before planting, and observe what sorts of fruit thrive best in the neighbourhood. We may save much time and expense and future disappointment if such only or chiefly are planted. Not only certain fruits, but even special varieties of Apples, Pears, Cherries, Plums, thrive best in certain neighbourhoods. Thus guided by results, and led aright by the irresistible logic of facts, it would be impossible to go far astray.

While much of this is written that no one, however unfavourably placed, need despair of fruit-growing, the writer would indeed be sorry to find that such remarks about soil led any to suppose that no special preparation need be made. For no soil can possibly be too good for the fruit garden. This is obvious on the face of it, for fruit-trees are a permanent crop. Once planted, established, and skilfully treated, they go on bearing for ten, twenty, thirty, fifty, or more years at a stretch.

Hence the reasonableness and necessity of starting with the best possible soil, and plenty of it. The phrases are vague, and it is needful to be more definite. For example, most readers will be more or less well acquainted with at least two very distinct varieties of good soil—viz., that found on old and well-worn, cropped, manured kitchen gardens, in which the tilth is rich and deep; and that of old meadow-land that has been under grass for scores of years—it may be a century. Each of these two widely-differing kinds of land is good, perhaps equally good, in its way. The first is full to overflowing of the elements of growth—a normal mixture, to borrow a phrase from the water-culturist, in which the plants can get enough and to spare of all they need. The latter, through the annual growth and decay of the grasses, and the residuum of enrichment that each leaves to the soil, is also rich in plant-food. Still no two soils, of probably nearly equal growing strength, could well be more unlike. The old kitchen garden soil is fine as an ash-heap; the meadow is full of fibre, and yet so tenacious as to bind all firmly together, lifting in whole spadefuls, and retaining their form as if they had been set in a mould.

And then these typical soils differ almost as much in quality as appearance. Either is best for certain purposes. For example, for the production of sweet, crisp vegetables, or the rapid willow-like growth of forest trees, the old kitchen garden earth would beat the other, especially at starting. But for forming a fruit garden, the soil of the old meadow is infinitely to be preferred.

Such land is grass-land in a double sense. It not only grows but is largely made from grass, and notwithstanding all that has been written of the potency of worms as surface soil makers, and the

science and practice of manuring, the growth and decay of the grasses is, nevertheless, still the slow and sure process by which most of our finest surface tilths are formed. Nor only this, but soils so made are by far the best for the growth of fruit-trees. This was one of the discoveries made by the first gardeners, and which is not likely to be superseded. The craving of gardeners throughout all ages for maiden loams, their use of them for all purposes at all seasons, and especially their determination to have them pure and simple, of the best quality, for their fruit-trees, is one of the most striking instances of uniformity of faith and practice to be found within the wide domain of physics or of morals. In this matter there is no dissent from orthodox opinions among skilled horticulturists, whose cry ever is, and ever will be, for maiden loam, and more of it, for most of their plants and all their fruit-trees.

Loams.—What is loam? how and where shall we get it? and how are we to distinguish between those of different sorts? Leaving details for more special treatment, the term “loam” is used here in a general sense, and is applied to the top spit of meadow or pasture land, the older and the longer fed with sheep, bullocks, and deer, the better. Pastures, however, allowed to run up into hay, are spoilt as regards good diggings of loam for horticulturists. The term loam in this wide sense necessarily includes soils of widely differing localities and different qualities. Quality is largely determined by geological formation, original soil and subsoil before being laid down to grass, watershed, climate, and the length of time it has been under pasturage without being broken up. The longer it has been under grass the better; for the growth and decay of the grasses, as we have already seen, is the chief agent in the formation and growth of good loam. For practical convenience, loams are mostly classified thus: sandy, clayey, calcareous, hazel, and mixed. The first are called light, the second heavy, the third chalky, the fourth fibrous loam. The fifth, which is composed of all the other four, and many sub-varieties of each, is most appropriately designated mixed, and for many purposes it is the best of all. All of these general classes of loams have many varieties in nature, and are yet more widely varied by the infinite mixings and compoundings practised by horticulturists. But the age of the latter is almost past, and there is a strong tendency in modern horticulture to revert to more simple soils for most cultural purposes.

Sandy loams may be described as those consisting of from seventy to eighty per cent. of sand, with from ten to twenty per cent. of clay, and very little lime. Clayey loam contains about equal portions of sand and clay, and from five to ten per cent. of lime.

Calcareous loams have from eight to fifteen or even twenty per cent. of lime, from forty to fifty of clay, and the remainder made up of sand. Under the head of hazel loams are included most of the light loams, fibrous loams, containing over five per cent. of humus or vegetable matter, and about equal proportions of sand and clay, with little or no lime.

These descriptions are designedly brief, as the subject will be freely treated in other articles; and all that is intended here is to give a few hints that may be useful as a guide in choosing the best loams for fruit-culture. Sandy loams, as a rule, are too light for fruit-growing, unless stiffened and fortified by additions of clay or marl. Hazel loams will grow good Apples, but are rather light, as well as rich, for most hardy fruits; they have a tendency to force the trees into timber rather than fertility, and fail to sustain the vigour and fruitfulness of trees through a series of years. On the whole, what are called clayey or calcareous loams are the best all-round soils for fruit-culture. The first, however, must not have too much clay, nor the second too much chalk, as either in excess is objectionable. But a considerable moiety of both seems indispensable to impart that stability, holding power, and staying property of soil so needful to support fruit-trees, and to establish and maintain their fertility. Hence the origin of the practice of mixing marls, burnt earth, and strong loams with the lighter ones for the culture of stone fruits.

THE PINE-APPLE.

BY WILLIAM COLEMAN.

INTRODUCTION.

THE Pine (*Ananas sativa*), so named from its fruit resembling the cone of the Pine-tree, was first discovered by Europeans in Peru, and was by them introduced into the West and afterwards into the East Indies, where it has long been extensively cultivated; but the highest authorities are of opinion that it is not indigenous to those countries. From the West Indies it is probable that it was brought to Holland, and was introduced into this country about 200 years ago by an ancestor of the noble house of Portland, and has been more or less successfully cultivated in the gardens of the wealthy down to the present time. In the "Hortus Kewensis" the Pine is said to have been introduced to that establishment in 1690, most likely as a botanical specimen; and forty years later numerous Pine-stoves were in existence in England and Scotland, where the plant was grown for its fruit; but nothing is said of the size or quality of the examples of those early days, con-

sequently it may be assumed that they fell far short of those productions of which English gardeners are now so justly proud. It was not, however, till after the removal of the vexatious tariff on glass, and the general introduction of hot-water pipes and improved boilers, that Pine-cultivation became general and profitable. When the enterprising growers for market, who do everything well, took it in hand, they very soon reversed the order of things by growing large fruits on small young plants, where formerly, under the old system of forcing in summer and starving in winter, small fruits were produced by large old ones.

After a time, spirited caterers for the increasing demand sought a more genial climate for Pine-culture in the Azores, whence steamers during the Orange season regularly ply, laden with thousands of large, perfectly fresh, well-swelled fruits of the smooth-leaved Cayenne, but little inferior to the produce of English Pine-stoves. This sudden change, which took place about 1870-72, soon brought down the price of the fruit; growers for market gave it up, and its culture once more became confined to private gardens, where the finest and best Pines in the world are still grown. In many old establishments, pits and houses not altogether well adapted are frequently brought into use; but as these are fast giving way, it will be our endeavour to keep the reader abreast of the times, by devoting a few words to the selection of the site and the construction of houses most suitable for the production of a constant supply of good fruit throughout the year.

The Pine-ground and Pine-houses.—In the selection of a situation for the erection of a set of Pine-pits or houses, which will afford the greatest facilities for high-class cultivation, the following important points should be kept in view. The ground should be well drained, slightly elevated, and if possible sheltered from north and north-east winds, provided such shelter can be obtained without producing shade, or in any way interfering with full exposure to sunshine and light.

When it is borne in mind that the Pine in all its stages of growth rejoices in a tropical temperature, and nothing so quickly reduces the heat in hot-houses as exposure to high winds, it will at once be seen that conditions, including shelter, which favour the maintenance of a steady temperature, without having recourse to hard firing, should have full and careful consideration before building is commenced. In its native habitat, as well as in the Azores, which lie twenty degrees south of England, the Pine gets an abundance of light, an important element in keeping the plants dwarf and sturdy; while in this country, during two-thirds of the year, the days are

dark and the atmosphere is dull. As, however, we cannot change our climate, we must do our best to counteract its enervating influence through the winter months, by constructing our Pineries so as to admit and diffuse as much light and sunshine as can be obtained. During the summer months it is just possible that the sun may be too powerful at times; the roofs should therefore be provided with fixed rollers, to which light blinds can be attached for running down during the hottest part of the day, when shade is absolutely necessary; but on no account should systematic shading be resorted to.

Assuming that the north side of the Pine-ground is enclosed by a wall, and a good lean-to house is required for starting the plants into fruit in January and February, as well as for swelling off fruit in winter and early spring, Fig. 1. will be found an economical structure, as the substantial north wall will afford great protection from cold cutting draughts, and being near the boiler, which can be conveniently placed in a covered stoke-hole on the north side, the high temperature which it will be necessary to maintain throughout those dead months can be secured at first hand. The size of the

house can be regulated by the demand for ripe fruit, and as houses of this kind are as well adapted to the culture of Cucumbers and Melons as of Pines, it will be false economy to mar the proportions of the structure by making it too small, when, by the introduction of a division, two medium-sized houses can be secured for two sets of plants to succeed each other, in the order of starting and ripening off their fruit. The width of the house may vary from 16 to 18 feet, and the length from 20 to 40 feet; but for private growers two houses of 20 feet each will be found more useful than one of 40 feet. Mr. Miles, of Wycombe Abbey, the champion grower of Queen Pines, has a set of three houses, similar to Fig. 2. for successions and fruiters in their different stages of growth. They are about 20 feet each in length, with only one entrance at the west end; they are abundantly supplied with hot-water pipes, and the plunging-beds being thrown well up to the light, the plants under his skilful management are at all times a picture well worth looking upon.

For the summer growth of Queens, Cayennes, and Rothschilds, preference is now generally given to the

span-roofed house (Fig. 3), which should be placed in front of the lean-to, with one end facing due north, and the other south. It should not, however, be placed so near or erected so high as to throw any shade upon the lean-to in winter, when the sun does not rise many degrees above the horizon, otherwise the plants in the latter will become weak and what is termed "drawn," a condition from which no future management can restore them. Ventilation in such a house being liberally provided in the side walls and at the apex, the roof may either be fixed or composed of loose sashes running in rafters. The fixed roof is most economical, and admits most light, but the sash and rafter house also has its advantages, and looks more imposing where the surroundings, in

a first-class garden, are of the highest order. In houses of this kind, while enjoying all the light that it is possible to receive, the plants in the morning and afternoon have the full benefit of the sun, and are partially shaded from its scorching influence during the hottest part of the day. Moreover, when plunged with their leaves nearly touching the glass, with an abundance of light on every side, they soon assume a stiff, sturdy, com-

compact growth, quite different to plants which we sometimes see with their elongated leaves struggling to the light, and hardly capable of bearing their own weight. From such plants, the sap being so highly concentrated, it is scarcely necessary to say that large fruit with small crowns are invariably produced; while the young stock raised from these robust parents is infinitely superior to that grown from plants which have not had these advantages.

From the foregoing it must not be inferred that the span-roofed house is at every point superior to a well-arranged lean-to; for while the latter is warmer, and receives quite as much sun through the winter months, the span-roof with its larger radiating surface of glass is more liable to sudden depressions of temperature in our uncertain climate. To counteract these depressions it is always necessary to put in an abundance of hot-water piping, while to avoid over-heating and to economise fuel, every span-roofed house should be fitted with rollers for carrying light blinds in summer, and heavy non-conducting material in winter. It will thus be seen that each house has its advantages and

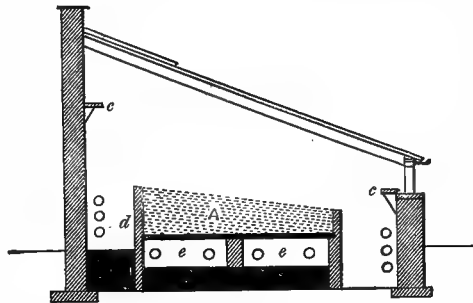


Fig. 1.—LEAN-TO-HOUSE.

A, Plunging-bed; B, drainage; cc, shelves for Straw-berries; d, passage; oo, pipes; ee, hot-air chamber.

disadvantages; and as every private garden has its own peculiar belongings and requirements, this part of the subject may now be dismissed for the consideration of the arrangement of the best houses and pits for feeding the fruiting department with properly-prepared succession plants.

Succession houses need not be so large or so high as fruiting houses; but light, as has already been pointed out, being such an important element, the greatest care should be observed in making arrangements for its free admission to the plants, through every stage from the sucker to the finish. For general purposes there is nothing better than the unequal span-roofed house running east and west (Fig. 2) from twelve to fourteen feet in width, with movable lights for the convenience of plunging the plants, and the introduction of Oak-leaves or tan for affording the necessary bottom heat. A passage runs along the back, and hot-water pipes are present in sufficient quantity to secure the requisite degree of heat without having recourse to hard firing, which is objectionable in forcing-houses in general, and pine houses in particular.

In addition to the succession house, a pit, for propagating or rooting suckers as they are detached from the fruiting plants, is essential to the complete arrangement of the Pine-ground. An ordinary brick pit fitted with hot-water pipes answers very well, and is generally used for this purpose. It, however, lacks the important convenience of a passage along the back, by means of which the plants can receive attention without exposing them to the elements in bad weather. As the passage (Fig. 4) need not be more than two feet in width, a pit eight feet in the clear will give five feet of plunging-space, which is quite sufficient for the purpose, as a greater width would place the front rows of plants beyond the reach of the attendant when external conditions render the opening of the lights objectionable if not injurious. In its erection, the first consideration should be a pitch or angle that will not only carry rain-water off the external surface of the glass, but also condensed moisture from the lower sides of the sash-bars. Many successful Pine-growers have recommended very flat roofs for Pine-pits; their reasons given being the

more even diffusion of heat and atmospheric moisture; but with modern appliances at command, it is easy to steer clear of drip, by erecting roofs at an angle that will modify if they do not entirely prevent this pernicious evil.

Next, as to the arrangement of the plunging-bed. The surface should be kept so near the glass as to admit of the plants being placed therein with the points of their leaves almost touching it; and as all Pine-growers admit the invigorating influence of fermenting materials for rooting or growing them, the depth should be sufficient to admit of the introduction of at least two feet of Oak-leaves or tan above the hot-air chamber. But as many existing Pine-pits are not provided with hot-water pipes for giving bottom heat, and its steady maintenance is so important, extra depth should be allowed for the plunging material to produce the desired effect independently of the pipes.

The suckers from winter fruiter, which are usually taken off in the spring, can be rooted in a very short time, by being plunged in Oak-leaves in an ordinary garden frame of the old MacPhail build: that is to say, a frame with hollow sides and ends,

hermetically closed at the top to keep in steam, placed on a hot-bed at a temperature of 90°. Indeed, in this way many good growers, who have to contend with inconveniences, root all their suckers, and transfer them to the hot-water pits later on.

Boilers.—The Pine being a plant which revels in high temperature through all its stages of growth, a few words as to the means of supplying fire-heat may not be out of place. In large gardens, where the Pinery forms only one section of the forcing department, a set of boilers may do all the work from a central stoke-hole, the different houses being heated separately or together from mains conveniently placed for that purpose. But assuming that the Pine-ground is detached, then the most convenient situation for the boiler would be at the back of the fruiting lean-to (Fig. 1). A main would be carried direct to the span-roof, thence to the succession houses, and last of all to the sucker or propagating pit. As every professional gardener has his own favourite boiler, it may be considered unnecessary or

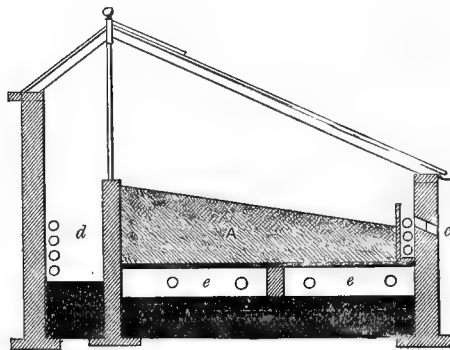


Fig. 2.—HIP-ROOFED SUCCESSION HOUSE.

a, Plunging-bed; b, drainage; c, ventilator; d, passage; oo, pipes; ee, hot-air chamber.

invidious to recommend any particular maker or kind of boiler to those who are quite capable of choosing for themselves. But for the benefit of amateurs and others who are bewildered by the endless variety now in commerce, it is only fair to say that, after many years' experience, the old saddle boiler in its improved form—that is to say, welded, not cast—with its terminal water-way end, still stands unbeaten.

Equal in durability, and perhaps superior in power where the work is very heavy is Stevens' Trentham or improved Cornish boiler. This, too, is made of wrought-iron, and, like the saddle boiler, can be obtained in almost any size; but as it is bad policy to trust all the eggs in one basket, so is it a great mistake to trust the contents of a range of hot-houses to one boiler, as the very best are liable

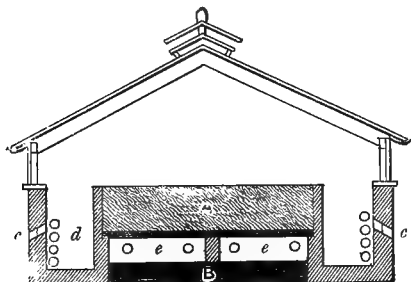


Fig. 3.—SPAN-ROOFED HOUSE.

A, Plunging-bed; B, drainage; c c, ventilators; d, passage; o o, pipes; e e, hot-air chamber.

to accidents, and a break-down on a frosty night means the destruction of valuable property. To provide against such mishaps, the prudent engineer will put in two boilers of moderate size, to work separately or together, in preference to having one large boiler, which is not economical in fuel when a minimum of heat is required in summer. In low, wet situations, where floods or back-water cause trouble, boilers which require deep stoke-holes should be avoided: a powerful point in favour of the boilers in question, as each of them requires only a very shallow setting.

Next in importance is a liberal supply of hot-water piping, for keeping up the proper degree of heat, without forcing the boilers or overheating the pipes in severe weather. It will therefore be wise to put in as many pipes as will answer the purpose without putting on high pressure, and so endangering the health of the plants by subjecting them to a dry scorching atmosphere. Hot-water pipes four inches in diameter are the best for horticultural purposes, and they should be plentifully supplied with evaporating troughs for giving off atmospheric

moisture, either from pure water, clear liquid manure or guano-water, when a stimulating vapour is considered necessary. The bottom heat pipes, as shown in the sections, run parallel to each other in a confined chamber, covered with slate for bearing the weight of the plunging-bed. Some growers prefer laying them in a bed of rough gravel, and so dispensing with the hot-air chamber, while others lay them in shallow brick troughs, which are lined with cement, and by being kept full of water, form what is termed the "tank" system of heating. Where the pot system of growing Pines is strictly adhered to, and tan or, better still, sound Oak-leaves are used as a plunging medium, the tank system answers very well. It is not, however, so well adapted for giving the necessary bottom heat to Pines when they are planted out in a bed of soil resting imme-

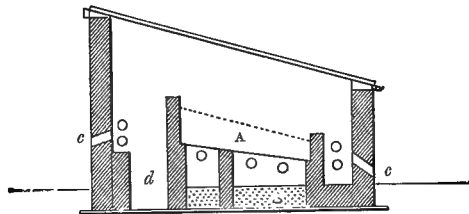


Fig. 4.—PROPAGATING PIT.

A, Plunging-bed; B, drainage; c c, ventilators; d, passage; o o, pipes; e e, hot-air chamber.

diately above the open tank, as the vapour which is constantly rising in course of time produces a wet, pasty condition in the lower part of the bed, quite unfavourable to the roots, if it does not positively kill them. If hot-water pipes alone are used, they should be fitted with stop-valves for shutting off and regulating the heat, and tanks require an inlet and outlet tap for filling or emptying at pleasure. In days gone by, the necessary bottom heat was obtained from fermenting materials alone, and notwithstanding the fact that sudden fluctuations and frequent renovation added considerably to the expense of Pine-growing, it is still a question whether the conditions produced by constant fermentation and the decay of vegetable matter did not meet the requirements of the plants in a manner and to an extent which hot water alone cannot supply. With these facts before me, it has long been my practice to combine the two systems, by placing the pipes in chambers, and using Oak-leaves as a plunging medium.

Covering.—Economy combined with high pres-

sure being the order of the present day, the thoughtful cultivator will endeavour to produce and preserve a maximum of heat at a minimum cost. Double glazing has been brought forward, but has never been successful; indeed, it has proved baneful to the plants placed under its coddling influence. Blinds, on the other hand, attached to rollers for running down at night and during severe storms, form the best covering, as they can be drawn up when not wanted, to give the plants the full benefit of light and sunshine. Stout canvas or Frigi-domo answers very well, as the last is an excellent non-conductor when properly fixed and judiciously used. In the arrangement of blinds, either for shade in summer or warmth in winter, the rollers should be sheltered from wet under the ridge-capping, and a thin stratum of air secured between the blinds and the glass by running the former on laths raised a few inches above the roof. Where winter-swelling or ripening Pines have to be kept in a night temperature of 70°, with nothing but a thin sheet of glass separating them from a bright starlit sky, the thinnest covering will be found of immense value in reducing the necessity for hard firing, as well as for preventing the loss of moisture, which must be constantly used to counteract its drying influence.

Ventilation.—In its naturalised habitat, the West Indies, where the mean temperature ranges about 80°, and the plants are exposed to the open air, a much higher degree of heat during bright sunshine does no harm; but when tropical plants are confined within the limits of a hot-house, the conditions are very different; hence the importance of providing for the constant admission of fresh air to prevent the elongation and scorching of the foliage when the atmosphere is not properly charged with moisture, as well as to allow of its escape at the apex after they have absorbed a portion of the carbon which it conveys. As a rule, Pine-growers are averse to a draught even on the hottest days we experience in these islands, and many never give front air at all; but it is well to provide for so doing should it prove necessary. It is therefore a good plan to have ventilators fixed in the front wall immediately opposite the hot-water pipes, for opening on very hot days, when the shading is down, and the top ventilators are nearly closed to prevent the too rapid escape of moisture.

Water-tanks.—The only other item to which attention may be drawn in the arrangement of the Pinery is the provision for watering and syringing with pure soft water. In some places the ordinary supply of water suits the plants very well; in others, in proportion to its purity for domestic purposes, it

is useless or injurious to the roots of plants. Therefore on no account should the formation of commodious tanks for the reception of soft water from the roofs of the houses, as well as any of the surrounding buildings, be neglected. It is usual to make large collecting tanks under the floors of the houses, but it is perhaps better to have one large central tank in the open air, whence smaller tanks or cisterns in every house can be fed by means of pipes with ball-taps attached. In course of time the water becomes as warm as the mean temperature of the house, and is then in the best possible condition for use. In order to render the water arrangement as complete as possible, a coil of piping supplied direct from one of the boilers or mains through the tank is strongly recommended. In some gardens the mains from the boilers are made to pass through the soft-water tank; indeed, within fifty yards of the room in which these lines are now being penned such an arrangement exists, where water for every purpose can always be had at a temperature ranging from 80° to 100°. In forcing-gardens where there is a constant demand for hot water, a few pounds laid out in this way will be found a very profitable investment.

Soil.—With every other convenience for producing good fruit at his disposal, the modern Pine-grower will make but poor progress where the soil at his command is unsuitable. If a strong healthy plant, which has been grown in a pot, is examined, the greatest quantity of active roots will be found coiling round the extremity of the ball, and revelling in the rough, lumpy pieces of turf placed over the crocks, and even in the crocks themselves, where it is quite impossible that water can gain a lodgment. If amongst a set of vigorous plants one is found which has gone wrong, the chances are ten to one that the drainage has become impaired, or a drip from the roof has saturated the soil, and the natural conclusion is strengthened by two negative examples—that a close heavy soil, through which water cannot pass freely, or which becomes sour and pasty after it has been watered a few times, is not the compost for Pines.

All the highest theoretical and practical authorities agree in showing that soils having a tendency to hold water are strongly condemned, while friable, fibry, and sandy loams, peat, and sandy peat are recommended. Now, as these writers founded their theory on the nature of the family to which the Pine belongs, and the conditions under which it is found growing, and all successful Pine-growers are proving every day by their practice that this theory is correct, we have satisfactory proof that a sweet fibrous loam which does not readily decompose is the best that can be used for plants in pots or turned out into open beds.

In its early stages a light, rich soil, abounding in vegetable matter, with a fair proportion of sharp road or river sand, may be used with advantage, as a compost of this kind favours the formation of roots. In its later stages decaying vegetable matter should give way to rich fertilisers such as bone-dust, burnt earth, or crushed charcoal, as being less liable to get out of order when the fibre of the loam begins to decay.

The staple of the compost in which my own Pines are grown is a fibrous turf from the foot of a range of hills of igneous formation. This is taken off very thin, and stacked for a short time to kill the herbage, a reserve being placed in an open shed in September, to be ready for the general potting in the spring. When the time arrives for making the necessary preparations for spring potting, the sods are chopped into squares with a spade; the fine portion of the soil is rejected, and the foundation of the compost is secured. As this particular turf does not contain calcareous matter, old lime rubble or plaster is broken up and sifted, and one barrowful of the rough part is added to five of turf. An equal quantity of rough charred refuse and two pecks of bone-dust complete the compost, which is kept dry, and made warm before it is used. Animal manures are never used, as they only encourage worms and facilitate the decay of the fibre of the turf; but a liberal sprinkling of soot is placed over the crocks, and clear liquid manure in a diluted form is used when the plants require stimulating.

In a soil of this kind fresh white roots push rapidly, and the broad sturdy foliage soon shows that the plants are enjoying the provision that has been made for them.

In cold calcareous districts, where the soil soon loses its fibre and becomes close and heavy, a dry elevated knoll in an old sheep pasture, where those animals spend the night, should be selected as being the best for giving a supply of turf. This should be taken off very thin, not more than an inch in thickness, rolled up as if for turfing a lawn, and stacked in narrow ridges, where it can be exposed to the air and protected from wet. When required for use it should be pulled to pieces with the hands, the small portions being rejected. After it is thoroughly dry and friable, add one-fifth of drift or road sand in lieu of the lime rubble, the same quantity of charred refuse also in a rough state, and a liberal allowance of bone-dust. If at hand, a little rough peat may be added. When potting, the rough only should be used for the fruiting and succession plants, and the finer will come in for potting up suckers. From the foregoing the amateur will learn that a light fibrous loam, free from all animal excrement, which only hastens decomposition

and retards the free passage of water, and the liberal use of such porous stimulating materials as bones, charcoal, old plaster, and a little soot, are considered the best ingredients for forming a compost in which, all other conditions being favourable, the Pine will grow freely and swell off fine fruit.

FLORISTS' FLOWERS.

BY RICHARD DEAN.

The Dahlia.—This has been for many years past a favourite subject among Florists' Flowers; and it is still largely grown, though not so extensively as it was fifteen or twenty years ago. The merit of first carefully attending to and cultivating Dahlias belongs exclusively to the Continental gardeners; for although we received them almost as soon as the French and Germans, yet, if not lost, they had nearly gone out of notice with us, whilst in France and Germany the varieties had increased as much in numbers as in beauty, and persons fond of gardening who visited the Continent on the return of peace in 1814 were surprised with the splendour and the number of varieties of the Dahlia in foreign collections. In the winter of that year the roots of some of the finest Continental varieties were imported to this country, and then began the work of improvement of the Dahlia by English cultivators and raisers, which has continued to this day.

The original introduction of the Dahlia to this country is ascribed to the Marchioness of Bute, who brought the first species from Spain in 1789; but it is stated that this plant was soon afterwards lost. Other species also found their way here, and they were bloomed in due course. The progress of the Dahlia from a single to a large, full, and symmetrical double flower commenced almost immediately on its being introduced. Count Lelieur began to direct his attention to Dahlias in 1808. He successfully hybridised the few varieties he possessed, until he obtained purples, dark reds, cherry-reds, buffs, and pale yellows; and, by continued attention, the seedlings raised under his care at St. Cloud made rapid advance in perfection. He also succeeded in raising some striped and shaded varieties, and these are stated on the authority of *The Florist* to have been the origin of what are now known as "Fancy" Dahlias. In 1818 the English collections contained several double varieties; and these, from their superior beauty, form, and size, soon banished the single sorts from our gardens. During the next thirty years English Dahlias made such rapid strides in the march of perfection and variety, that now

hardly anything else is desired in the way of symmetry, doubleness, and colour.

There are now in cultivation five distinct classes of Dahlias: viz., Show, Fancy, Bedding, Bouquet, and Single. These distinctions are somewhat arbitrary, and it is difficult to define them in popular terms. The Show varieties comprise all self-coloured flowers, and those having dark-coloured tips. To the composition of a Fancy Dahlia, two or more distinct colours are essential.

There are Fancy Dahlias, and striped Fancy Dahlias: if the variegation is in the form of stripes or flakes, whether the light or the dark preponderate; if the variegation consists in the edges or tips of the florets differing from the general or ground colour, then the *relative position* of the colours determines whether a bloom is a fancy flower or otherwise. Thus a white, yellow, or any pale variety, edged, tipped, or laced with a dark colour, after the manner of the Picotee, is denominated simply an edged, tipped, or laced Dahlia; but when this disposition of colours is reversed—*i.e.*, when the florets of a dark flower are tipped with a light colour—the variety so marked is termed a *tipped Fancy Dahlia*.

But of late years Show and Fancy Dahlias have approximated so closely together, that it will soon be difficult to set up an intelligible distinction between them.

The Bedding Dahlias are dwarfed free branching varieties, flowering freely, and bearing their flowers well above the foliage upon erect stems. The Bouquet varieties are also known as Pompon Dahlias: they have quite small and very double flowers; they are produced with wonderful freedom, and last well when used in a cut state. Some are of rather tall, some of quite dwarf growth. The Single varieties being now so popular, are too well known

to need description, and they are now a very numerous group.

Culture of the Dahlia.—Propagation.—This is almost entirely done by means of cuttings. The Dahlia is a tuberous-rooted perennial, and when the roots are lifted in autumn, the earth adhering to them is cleaned off, and they are put away in a dry cool place out of the reach of frost for the winter.

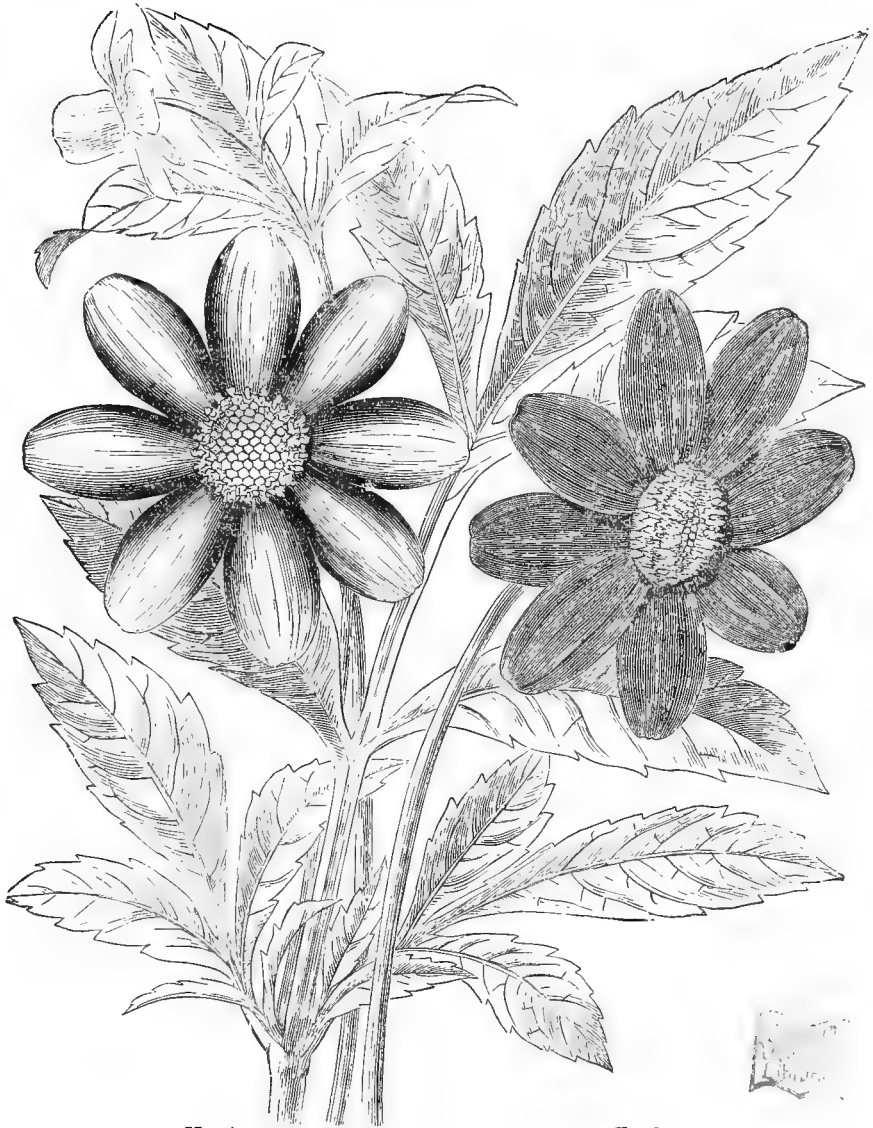
In March the roots are placed in an ordinary hot-bed, or in a propagating frame, and partly covered with soil, and by means of a brisk and moist bottom heat cuttings are put forth, and as soon as they are three inches or so in length, they are taken off with a sharp knife, placed in cutting-pots filled with a fine light soil, and plunged in a hot-bed. Here they soon strike root, and they are then potted singly into small pots, and gradually hardened off, and finally planted out at the end of May or beginning of June, according to the weather. Some persons who require but a small number of plants divide their roots, but pot each divided piece so as to encourage it to make a good plant.

New varieties are raised from seeds, but

it is a practice followed almost exclusively by those whose particular business it is to raise and send out new varieties. It is not an easy matter to procure good seed, and the method usually adopted is to remove all the blooms from a plant in the month of September with the exception of those left to mature seed. It is in the nature of the plant to mature seed as soon as the growth and production of bloom is checked. It is well to leave the flowers on the plants as long as possible, but as soon as it is unsafe to risk danger from frost, they should be cut off, each with a stem six or eight inches long, tied up in bunches, half a dozen together, and hung



SINGLE STRIPED DAHLIA (UNION JACK).



Magpie.

Freedom.

SINGLE DAHLIAS (STELLATE CHARACTER).

up in a green-house, putting on a little fire to dry up any moisture that may be in the pod; in due time the seeds must be rubbed out, put into bags and cleaned at leisure ready for sowing in spring. In March the seeds should be sown in pots, and put into a cucumber frame, where they will freely germinate; then potted off, and grown on to put out of doors early in June to flower.

The Dahlia is a gross feeder, and if fine flowers are required the soil in which the plants are to grow must be made very rich. The soil should be deeply trenched and thrown up rough during the winter, or as soon as it can conveniently be done. It is not necessary to dig in manure then. At planting-time, which should not be earlier than June, the ground should be marked out for each plant, and they

should be at least four to six feet apart; three or four spadefuls of soil should be taken out, and the same quantity of rotten manure added, mixing it thoroughly with the soil. Then planting should be done, placing some fine soil about the roots, and pressing the whole firmly about them. At the time of planting a centre stake should be placed against each plant, and three short stakes at a triangle, about a foot from it, as by tying the matting to the centre stake, thence to the plant, and fastening to the shorter stakes, it is made quite secure against harm from winds. It is a great advantage to grow on the plants in pots before planting out, giving them two or three shifts if necessary, and so encouraging them to root strongly.

During the month of July they should make considerable progress, and if the cultivator desires fine blooms, the principal things to attend to are to keep the plants well watered, which should be done at night with soft water, over the foliage, and looking well after insects. Earwigs eat the young foliage as well as the blooms of Dahlias, and the old plan of placing a small flower-pot with a little moss in it inverted on the principal stake is a good one, as earwigs find a place of refuge in it, and can be easily trapped. The surface of the soil between the plants should also be raked over occasionally and made loose. In August, those who want some blooms of fine quality, thin out superfluous shoots, doing it with judgment so that much foliage be not cut off at a time. There is a great difference in the varieties; some require to have all their wood and buds reserved for some time; others require to have a great deal of the wood cut away early. These are matters of experience which cultivators of Dahlias for exhibition purposes have to find out in the course of their practice. Even in growing Dahlias for ordinary border purposes some thinning out is requisite, or the flowers will be small and unsatisfactory. As the plants make growth it is necessary to keep the branches securely tied to the stakes; and during hot dry weather the plants will be greatly benefited by having the soil about them slightly loosened, and a mulching of short well-rotted manure placed over it. A good soaking of water at the roots should be given twice a week, and a little over the foliage every night.

"Thinning out" and "disbudding" are terms employed by cultivators of the Dahlia for show purposes; let us try and ascertain what they mean. How many main branches may remain? The larger the flowers, the greater the number of branches allowed to a plant. In the case of varieties producing large and moderately-sized flowers, six should be left; in the case of those producing smaller flowers, four only. Which of the shoots are to be

pinched off? The centre of the plants should be kept free and unencumbered; and therefore lateral growths may be pinched off the shoots nearest to the main stem; but seeing that leaves exercise an important function in maintaining the health and vigour of the plants, the leaf at the axil from which the shoot proceeds should be allowed to remain. The pinching off of young shoots is to be preferred to the removal at a later period of large stems, by which the plant cannot fail to lose large quantities of sap, to the manifest detriment of the coming flowers. And in pinching out shoots those should be reserved that help the formation of a well-proportioned plant. These principles are general in their application, which varies according to the characteristics of the variety.

Then as to the "disbudding" of the clusters of blossom-buds on various parts of the plant: which are to remain, and which to be removed? Buds are generally formed in groups of three; of these, the one occupying the centre is earliest, and generally produces the largest bloom. Ordinarily, the two side buds may be removed; the exception to this rule, with regard to very uncertain varieties, is in the case of a sort that produces flowers in plenty, but few good ones. In these cases a little patience is necessary to enable the cultivator to ascertain which buds must, from their formation, produce faulty flowers, and these should be removed as soon as their true character is ascertained, but not until then. In sorts producing large flowers the removal of the two side buds can be done, except in the case of very free bloomers; but in the case of varieties habitually yielding small and compact blooms, especially where buds are produced in enormous quantities, whole clusters may be cleared away without remorse, and only those single buds left which point outwards.

Writers on the cultivation of the Dahlia for exhibition purposes are found recommending the free use of stimulants, and especially liquid manure. But they should not be applied until the plant has nearly completed its growth, say three weeks or a month before flowers are wanted. The object in applying this is to get large, full blooms. Manure-water may then be applied twice a week, taking care not to wet the foliage, and it is best applied in wet weather. Though recommended by some, it is not a good practice to put soot into water before using it for watering overhead; only pure, clear water should be so used.

The time for lifting the roots in the autumn must depend upon the weather; if the tops are quite destroyed by frost, the roots should be lifted on the first dry day; but should the season be favourable and there be no frost, two objects will be gained by allowing them to remain in the ground for a time,

viz., more seeds, and a shorter winter to preserve the roots in. One danger in storing Dahlia roots has to be guarded against. It is the practice to cut away the main stem to within six inches or a little more of the root. This stem will be found to be hollow, and it is apt to become filled with moisture, which, if allowed to remain, is likely to cause rot to set in. When wet appears the roots should be turned upside down to allow the moisture to run out. The roots must be covered up securely during frosty weather.

In the cases of the bouquet and the single Dahlias, these being grown mainly for the flowers they supply, the act of cutting constantly, operates in much the same way as thinning and disbudding does with the show varieties. But the plants should be well cared for, mulching with manure about the roots, and keeping them well watered, and tied securely to stakes to prevent them from being blown about by the wind.

The Cactus Dahlias so called, of which the Mexican *D. Juarezii* is the original type, are becoming very popular, and appear likely to take the place of the single varieties for cutting and general decorative purposes. It must not be supposed all are seedlings of *D. Juarezii*: indeed, it would appear that anything of a semi-double character has been regarded as a Cactus Dahlia; but of late there is being introduced a number of varieties of attractive appearance, that are remarkably free of bloom, and afford great quantities of flowers. They need similar culture to the single varieties. The best sorts are *Empress of India*, crimson; *Constance*, white; *Flambeau*, scarlet; *Lady E. Dyke*, yellow; *Lady Marsham*, bright salmon; and *Mrs. Hawkins*, sulphur-yellow. There is no necessity for disbudding the Cactus Dahlias; cutting the blooms answers the same purpose.

At present, perhaps, the greatest danger in the cultivation of single Dahlias is that of getting them too large, which seems to destroy the refinement of the flower. The efforts of florists are therefore devoted to the perpetuation of a race of small or moderate-sized compact flowers. These again differ in their character in various ways. Some have petals highly reflexed or curled back, while others are flat; in some the petals fill up a disc, while in others they are narrower, and give a more stellate character to the blooms. There are also self-coloured, "fancy," and striped flowers. Some of the choicer and smaller flowers are much sought for cutting purposes. Our illustrations represent two of Mr. Ware's fine varieties, the striped variety being a small flower, with petals white, beautifully edged with scarlet.

Not a few lovers of the Dahlia prefer the pretty bouquet or pompon varieties, with their compact,

symmetrical double flowers, to the single types, because they are more durable in a cut state, and produced with greater freedom. The single flowers are much used in the way of decorating epergnes, vases, &c., for table and house work; but they should always be used sparingly, and especially such as are of bright and striking colours.

The bouquet and single varieties are in some instances tall growers, but their height can be reduced by giving the stems a slight twist when the plants are eighteen inches or so in height, which will cause them to recline on the ground; a peg should then be placed to each plant to keep them in position, and they will soon take on an upright growth, bloom as freely, and be as effective as if they had not been dwarfed in their proper stature.

The bedding varieties, being of dwarf growth, very profuse of bloom, and having the habit of throwing their flowers on erect stems, are very useful for filling beds, and for placing singly in borders. It is necessary to keep the decayed flowers removed to encourage the production of fresh ones, and to make the plants look as attractive as possible. The height of any tall-growing varieties of either section can be shortened by gently bending down the stem when the plant is young, and pegging it securely to the ground, as recommended in the case of the single varieties. This tends to bring the lower branches to the earth, covering it, and forming a dense growth. In planting a large bed the tallest should be put in the centre and the dwarfest at the outer edge, pegging down the plants where necessary.

SELECTIONS OF DAHLIAS.

Show Varieties.

Bendigo (Turner).	Joseph Ashby (Turner).
Burgundy (Turner).	Joseph Green (Keynes).
Buttercup (Fellowes).	Lady Gladys Herbert (Keynes).
Clara (Rawlings).	Miss Cannell (Eckford).
Colonist (Keynes).	Mr. G. Harris (Rawlings).
Constancy (Keynes).	Mrs. Foster (Turner).
Flag of Truce (Wheeler).	Mrs. Gladstone (Hurst).
Georgiana (Keynes).	Mrs. Glasscock (Rawlings).
George Rawlings (Rawlings).	Mrs. Harris (Harris).
Goldfinder (Fellowes).	Mrs. Langtry (Keynes).
Harry Keith (Keynes).	Mrs. Shirley Hibberd (Rawlings).
Henry Walton (Keynes).	Prince Bismarck (Fellowes).
Herbert Turner (Turner).	Prince of Denmark (Fellowes).
J. B. Service (Keynes).	R. T. Rawlings (Rawlings).
James Cocker (Keynes).	Sunbeam (Fellowes).
James Stephen (Keynes).	William Rawlings (Rawlings).
John Neville Keynes (Keynes).	
John Standish (Turner).	

Fancy Varieties.

Annie Pritchard (Keynes).	James O'Brien (Keynes).
Charles Wyatt (Keynes).	John Forbes (Keynes).
Fanny Sturt (Pope).	Laura Haslam (Fellowes).
Gaiety (Keynes).	Mrs. H. Halls (Rawlings).
George Barnes (Keynes).	Mrs. Saunders (Turner).
Grand Sultan (Keynes).	Peacock (Turner).
Henry Eckford (Rawlings).	Professor Fawcett (Keynes).
Henry Glasscock (Keynes).	Rev. J. B. M. Camm (Keynes).
Hugh Austin (Keynes).	W. G. Head (Turner).

Bedding Dahlias.

Carl Mendel, bright crimson.	Marguerite Bruant, white.
Cloth of gold, yellow.	Rising Sun, scarlet.
Crimson Gem, crimson.	Royal Purple, purple.
George Thompson, pale yellow.	Yellow Pet, pure yellow.
John Wyatt, crimson-scarlet	Zelinda, crimson-purple.

Bouquet or Pompon Dahlias.

Comtesse von Sternberg, yellow and white.	Lady Blanche, pure white.
Coquette, orange.	Little Duchess, white, edged crimson.
Dora, primrose and white.	Louis Rodani, deep shaded lilac.
E. F. Jungker, amber.	Mabel, bright lilac.
Favourite, dark maroon.	Nymph, yellow, tipped with red.
Fireball, orange-red.	Prince of Lilliputians, very dark maroon.
Gazelle, yellow, edged magenta.	Princess Sophie Sophie, shaded lake.
Gem, rich scarlet.	Titania, yellow, tipped with bronze.
German Favourite, crimson-lake.	Wilhelm Nitsche, red, tipped with white.
Grass an Wien, shaded buff.	
Hedwig Polwig, orange-scarlet.	
Isabel, bright orange-scarlet.	

Single Dahlias.

(The following are well-known and serviceable varieties, but many new ones are being raised every year.)

Alba, pure white.	Mrs. Bowman, purplish magenta.
Amos Perry, shining maroon.	Mr. Kennett, striped.
Cocinea, bright scarlet.	Norah, bright pink.
Dorothy, white and peach.	Paragon, rich maroon and purple.
Firefly, pale crimson.	Rosmond, bright rosy pink.
Harlequin, rose and purple.	Sunset, bright crimson.
Maive Queen, pale lilac.	Yellow Dwarf, yellow.
Miss Mary Anderson, crimson scarlet.	Yellow Queen, deep yellow.

The rich semi-double Cactus Dahlia, *D. Juarezii*, should also be included in this collection.

to the cultivator, leaving those who desire to pursue the subject further to consult some of the more recently published text-books.

Cells, their Structure and Office.—For our present purpose it suffices to say that the cell exists in various forms and phases, but that in its perfect condition it consists of an outer bag of membrane called the "cell-wall," and of certain contents, of which the most important is the substance known as "protoplasm." The other contents—the cell-sap, the vacuoles, the nucleus, &c.—cannot be advantageously treated of in this place. The cell-wall is, as has been said, a bag of membrane, for the most part closed, so that one cell is isolated from its

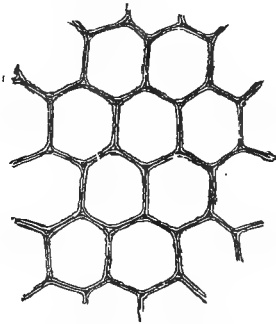


Fig. 31.—Aggregation of Cells constituting Cellular Tissue, shown cut across.

THE LIFE-HISTORY OF PLANTS.

By DR. MAXWELL T. MASTERS, F.R.S.

NUTRITION.

WE have now passed in review the principal reserve organs in which food is stored for the use of the plant when growth begins. In a general way we have indicated the nature of the change from the insoluble reserve-material, useless as such, to the soluble food capable of being utilised in the growth of the plant. We are, therefore, now in a position to follow up the life-history of the plant, to see in what growth consists, what circumstances promote it, what the plant feeds on, how it obtains its food, and what it does with it. Growth consists essentially in the formation of new "tissue" or substance, and this is effected at the growing points before mentioned. This new tissue or substance is composed of aggregates of minute bladders called "cells" (Fig. 31), generally more or less globular, but subject to great variations in form. The study of cells demands the exercise of the keenest powers of the trained botanist and chemist. In this place it is proposed only to deal with a few leading facts and phenomena concerning them of special importance

neighbour, but not so much so as to prevent all passage of some of the contents of one cell into the cavity of another. That passage may be effected either by endosmosis, which is the most ordinary method, or by the direct passage of the protoplasm of one cell into another.

Endosmosis is the term applied to that process by means of which a thin fluid, say water, passes through an intervening membrane, even though there be no visible pores in it, to mix with a thicker fluid, say syrup. This process may easily be exemplified by stretching a piece of bladder over the broad end of a funnel (A, Fig. 32), inverting it and pouring into it through the narrow tube (B) some sugar and water. This done, the funnel may be placed, with the broad end downwards, in a vessel of water as in the figure, the tube of the funnel being secured by means of a ring and screw to a stand. After a short time, varying according to temperature and the strength of the syrup, it will be found that the water from the vessel will pass through the bladder, causing it to be distended, and the fluid in the funnel, becoming more abundant and more and more diluted, rises in the tube. It is, therefore, by

osmosis or *endosmosis* that the water outside a cell passes through the membrane into its cavity. And so if the thin watery contents pass out by exudation or by pressure from one cell, they may pass by osmosis into another adjacent cell with thicker contents. This passage of fluid from cell to cell is manifested principally by the "cell-sap," which is of a thin watery character.

The "protoplasm" differs from the membranous cell-wall, and from the cell-sap, in being a thick viscid fluid containing a proportion of nitrogen, and sometimes a little sulphur and phosphorus, in addition to the carbon, oxygen, and hydrogen, of which cell-membrane is composed. The protoplasm is by far the most important part of the plant. Though seemingly a mere translucent, jelly-like substance, it is the seat of all the life-work done in and by the plant. With it and by it the plant lives; without it, it is dead. The essential part of animal structure is practically identical with vegetable protoplasm, so that in this wonderful combination all the phenomena of life, vegetable or animal, are manifested. Until recently, it was supposed that (with a few exceptions) the protoplasm of one cell, in the adult condition, was absolutely cut off from that in the adjoining cell by means of the walls of the two cells; but it has now been shown that there is frequently a passage of minute threads of protoplasm from one cell to another through apertures in the cell-walls of extreme minuteness. The passage is revealed by treating the protoplasm with some chemical re-agent which stains it, and thus renders the threads visible under the highest powers of the microscope. In this manner, the "continuity of the protoplasm" has been demonstrated in so many instances as to lead to the inference that it is a general phenomenon; and, if this prove to be so, many other points of physiology, at present obscure, will be rendered intelligible.

have seen, essentially consists in the increased formation from the old material of protoplasm and cell-membrane, and to insure this new formation certain conditions must be complied with, and complied with, too, at the proper time. These conditions are, a favourable amount of temperature and light, and an adequate provision of suitable food, especially of water.

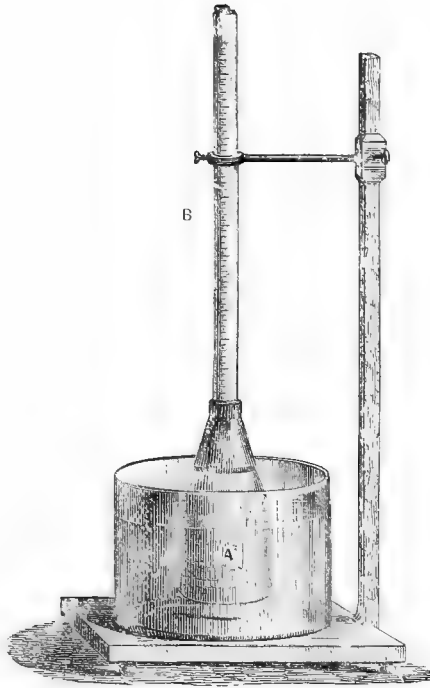


Fig. 32.—Endosmometer.

As to the amount of heat required, that varies within wide limits. Arctic snows do not absolutely banish vegetation; tropical heat does not destroy it (provided water be supplied). On the other hand, excessive cold or excessive heat will either of them destroy the protoplasm. Each plant thrives best at a certain temperature, and is destroyed by too high or too low a temperature, the exact degree being determined only by practical experience in each case. Even the separate functions of the plant are regulated in the same way, as has been mentioned at an earlier page (vol. i., p. 23). The general principle is easy to understand, but when the gardener wishes to reduce the principle to practice in individual cases, nothing but experience and observation can guide him satisfactorily, because "circumstances alter cases" so very materially. Fortunately, in most cases the range is so

wide that comparatively little difficulty is experienced; but in other cases great nicety is demanded, and in plants which have but little power of adapting themselves to circumstances, in forcing-operations, in the proper ripening and colouring of fruits, and the like, practical instruction and personal observation are matters of primary importance to the cultivator.

We may, however, point out that while a knowledge of the climatic conditions may be, and often is, of the highest importance to the cultivator of a plant derived from a particular locality, yet it does not necessarily follow that the gardener will obtain the best results by imitating, or even attempting to imitate, in this country, those particular natural conditions. In fact, plants are very

Conditions of Growth.—Growth, then, we

accommodating—some much more so than others—and hence they are enabled to thrive under circumstances very different from those which are natural to them. Again, while it is easy to imitate some of the natural conditions, say temperature, it is often quite out of our power to reproduce the attendant phenomena of brilliant light or abundant atmospheric moisture. The home cultivator, while thankful for any climatic indications with which the meteorologist and traveller can supply him, must study rather to insure the particular combination and adjustment of circumstances which will enable him to grow the plant *here*. It is rarely possible to secure the same combination of propitious circumstances as exist in the native country of the plant. For these reasons we refer to the practical articles in this volume, for indications as to the effect of temperature on growth more directly useful than can be obtained from a discussion of the matter from the point of view of the physiologist or meteorologist. It may suffice to repeat in general terms what has been said under the head of germination, that heat and moisture are the two principal factors in promoting growth. Light is less directly beneficial, its most potent influence being exerted in other directions, more especially in the nutritive processes. It is obvious that, if growth is to be continued, something more than heat and moisture will be required, because the reserve stores of food will sooner or later be used up, and heat and moisture alone will not suffice to build up new protoplasm or to accumulate fresh stores of food. The moisture supplies only two ingredients of the protoplasm (hydrogen and oxygen); the heat itself supplies none, but simply acts as a stimulant. It becomes necessary, therefore, to consider the food of plants, its nature and sources, and this will involve the consideration of the work done in the cells in general, and in those of the root and leaf especially.

The Work of the Cell.—The general structure of the cell has been already alluded to. The work it does may be briefly summarised. As all plants and all parts of plants are aggregates of cells, it follows that the work done by the plant as a whole is merely the sum of that done by individual cells. The cell absorbs and exhales moisture and gases, but it is incapable of absorbing solid matters, at least no such material can pass the cell-wall. It changes and modifies the substances it absorbs; under the agency of heat and light it effects changes at once more subtle and more vast than the chemist has yet been able to bring about in his laboratory; it contracts and expands; the old cell divides and develops new ones. All this is effected by the agency of the protoplasm. The cell-wall does

indeed act the part of a membrane in the purely physical process of osmosis, and it may serve as a shield and a protection; but all the more important work of the cell is done in and by the protoplasm. Some of the cells remain unchanged, or at least comparatively so, while others in course of growth develop into fibres, vessels, and other elements of plant structure which are told off, as it were, for various offices, and correspondingly equipped.

It is not consistent with our plan to go into detail as to the form of cells; but as we shall have frequent occasion to mention them hereafter, we must allude to one or two modifications.

In the first place, we must again remind the reader that the cell may exist without any membranous cover at all, that at one stage of its existence a naked and separate mass of protoplasm constitutes the whole cell—the whole organism, in fact. Masses of protoplasm of this character do not, as a rule, long remain in this condition. They contract, or they throw out long “feelers,” as it were; they become, moreover, clothed with hair-like processes of extreme tenuity, called “cilia.” By these means they are enabled to move from place to place. At other times masses of this character run together and become incorporated into one mass, as invariably in the reproductive process, and sooner or later each one becomes clothed with a membranous covering, as above mentioned. When this happens the cell is perfected, and its activity is in a measure arrested.

Chlorophyll.—The first is the cell with “chlorophyll.” Some cells contain no green colouring matter at all, such are the cells constituting the fungi at all periods of their life. Others, especially those exposed to the light, contain in greater or less proportion the green colouring matter called chlorophyll, the exact chemical nature of which is still a matter of dispute, although no such difference of opinion exists as to its extreme importance. We shall have to allude to it at greater length in considering the subject of leaf-action, and may, therefore, now confine ourselves to the general statement that the special office of the cell containing chlorophyll is to absorb carbonic acid gas from the atmosphere, to break up that combination of carbon and oxygen, to utilise the carbon, and set free the oxygen. The cell without chlorophyll retains the oxygen and gives out carbonic acid gas, as in the act of breathing.

Wood-cells.—Another cell, to which we must here allude, is the wood-cell. It is generally elongated in form and thickened in the interior with woody deposit. Aggregations of such cells go to form the skeleton, as it were, of the plant, stiffen it, and enable it to support itself, and to resist the

influence of wind. Cells of this character form the bulk of timber and of fibrous matter like hemp or flax. (Fig. 33.)

Vessels.—Vessels constitute another modification of cells, generally elongated, and with one or more fibres coiled up in the interior. These fibres are deposits from the protoplasm, similar to the woody matter, but not spread in layers over the whole inner surface of the cell. The fibre

GLASS STRUCTURES AND APPLIANCES.

BELL-GLASSES, CLOCHES, HAND-LIGHTS.

THE fickleness and severities of our climate compelled the horticulturist to have recourse to protecting structures of some sort or other at very early times. The higher the culture and the more beautiful and valuable the plants grown, the greater



Fig. 33.—Woody Fibre, magnified.

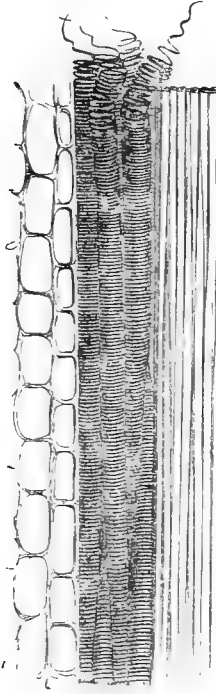


Fig. 34.—Spiral Vessels between Pith-cells and Wood-cells.

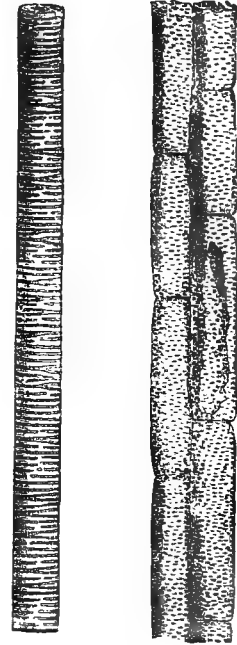


Fig. 35.—Striated and Punctated Vessels of Melon.

may readily be seen by breaking across a leaf-stalk of the Strawberry, when the fine fibres may be pulled out. They either form complete coils, or are broken up into separate fragments, producing an appearance of more or less regular bars, or pits, the pits being really the interspaces between the ends of the bars. All true flowering plants have spiral vessels (Fig. 34). Ferns are remarkable for the possession of scalariform vessels, in which the bars are so regularly arranged as to resemble the rungs of a ladder. Usually they require the aid of the microscope to render them visible. The vessels vary in character in different cases, but it is not necessary for our purpose to go into further detail.

the need of such structures to protect them from sudden destruction. Hence the growing demand for more "glass," and better glass, may be said to have run parallel with the advancement of horticulture. Several counter-influences, however, checked that demand. Among these the more potent were, that its use was but imperfectly understood, its price was high, its quality inferior. It was not until the excise duty on glass was swept away that it was set free and made fit for horticultural purposes. Long before the era of Crystal Palaces, however, glass—albeit it was mostly green rather than white—was more or less freely used for horticultural purposes. The vital importance of shelter without shadow was

then but very imperfectly realised; it can hardly be said to be yet perfectly understood. Any glass, the thicker the better, was gladly welcomed by the cultivator to protect his plants from the injurious and destructive influences of cold. As these plants were from the necessity of the case generally or invariably in the open ground, it followed that the glass had to be carried to the plants—not the plants to the glass, as is now so generally done.

Hence the origin of bell-glasses, hand-lights, glass boxes, frames, and all the smaller glass protectors and appliances now so common and so useful in horticultural practices. They carried protection to the

unless unusually well made, mostly admits more or less of the surrounding air to the atmosphere it encloses. Hence, for purposes of propagation, in which the production and maintenance of a semi-saturated atmosphere is indispensable, bell-glasses are best; while for the mere purposes of protection, hand-lights are generally equally good, and even in more general use.

However, the distinction here made between bell-glasses and hand-lights is not always found to exist in practice, for though bell-glasses as a rule are mostly cut or moulded in one piece, considerable ingenuity and expense have been expended on them to

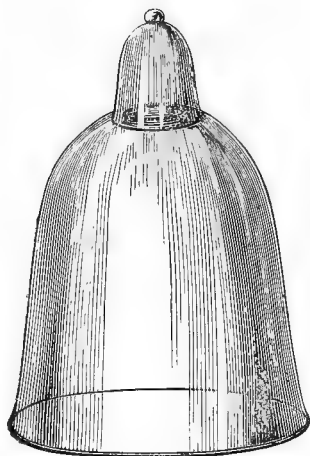


Fig. 1.—Movable Top.

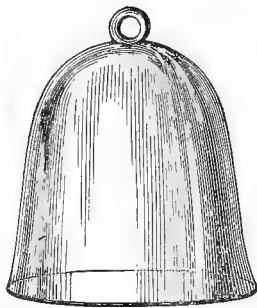


Fig. 2.—With Knob.

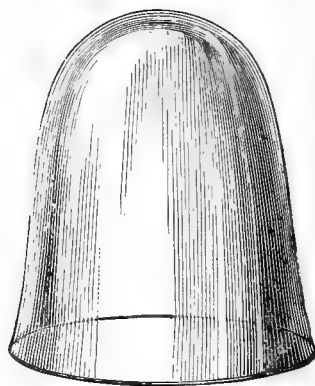


Fig. 3.—Without Knob.

BELL-GLASSES.

plants, and enabled them to bridge over climatic severities in safety, thus earning the well-merited description of portable green-houses and conservatories in miniature; and they are such, if function rather than area is to be accepted as the basis of our descriptive names. Hence it may prove as logical as convenient to begin our notes on green-houses and conservatories with these more humble glass structures and appliances.

Bell-glasses.—Horticultural history is silent on the point of whether the bell-glass or the hand-light was the first in the field as a plant protector. Most probably the former. The most vital difference between them is that the one is run or moulded in one piece; the other is formed or made of several. This is not a mere distinction without a difference. The bell-glass seals the enclosed atmosphere hermetically, cutting off all contact with the external air. The hand-glass, on the contrary,

make the top movable at will (see Fig. 1) for purposes of ventilation and the moderating of extremes of temperature. By removing the super glass that seals the opening in the crown, the enclosed temperature can be adjusted to a nicety and any amount of air admitted. This obviates the necessity of moving the glass bodily, which is objectionable on the ground of inconvenience in the case of large glasses, and also because, when frequently moved, the glass seldom sits so closely on its base as to render it wholly air-proof at that point, a matter of more importance in propagation than for protective purposes.

The major portion of bell-glasses have, however, always been, and are still, made in one piece, and hence, if placed on an even and level base, hermetically seal the enclosed area. They are made of different sizes, from two inches to twelve inches or more in diameter. They may also be had with or without knobs (see Figs. 2 and 3). We had almost

written that the former are bell-glasses and the latter cloches. But this would hardly be correct, though the majority of cloches are knobless. They are more easily made and consequently cheaper, and take far less space to pack and store, without knobs. Against this must be placed the greater convenience for lifting and removal furnished by the knobs.

Hitherto in this country the use of bell-glasses has been chiefly confined to purposes of propagation (see Fig. 4) and the protection of tender plants. Useful and indispensable as they are in regard to these, they are still more valuable as stimulants to cultivation. In France and other parts of the Continent they are so generally used, and that in so wholesale a way, that it is no exaggeration to say that in certain seasons and localities each cauliflower,

They not merely protect seeds from the ravages of birds, but hasten their germination and carry the young plants through the danger period with a rush.

Hand-lights.—Of these we furnish illustrations of several varieties (Figs. 5, 6, 7), all used for similar purposes to cloches and bell-glasses, and very frequently as substitutes for them. For the purposes of fostering growth and the protection of semi-tender plants they are equal or superior to either, while their larger size enables them to cover larger plants and enclose wider areas. Unless particularly well made and carefully used they are never so close as the cloche or bell-glass, and hence not so well adapted for purposes of propaga-

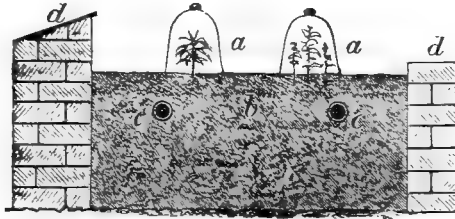


Fig. 4.—CUTTINGS UNDER BELL-GLASSES.

a a, Bell-glasses; b, hot-bed; c, hot-water pipes to heat b; d, walls of the pit.



Fig. 5.—Copper Frame in one piece.

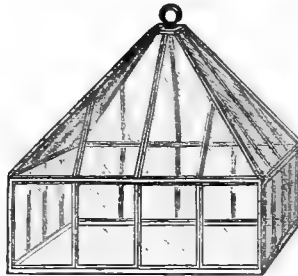


Fig. 6.—Iron Frame in one piece.

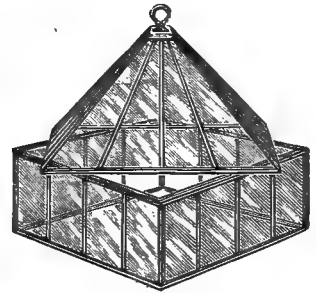


Fig. 7.—Movable Top placed to admit air.

HAND-LIGHTS.

lettuce, and endive or salad plant has its cloche; and the large, sweet, crisp produce from under them affords the highest possible testimony to their fostering power in accelerating and enlarging growth. Their effect on quality is equally striking, perhaps even more so, while they reduce the time from the start to the finish to the shortest possible limits.

Hitherto the stimulating influences of cloches and bell-glasses have been mostly confined to the cultivation of salads and such vegetables as Cucumbers and Cauliflowers in the open air. Probably they have a yet greater field of usefulness before them in the future, in connection with the fostering of early spring flowers and the protection of semi-tender plants, and perhaps the culture of hardier varieties of Melons in the open air. Their usefulness in raising seeds in the open has long been recognised.

tion, unless for such common things as Pinks, Cloves, and Carnations, pipings of which root rapidly under hand-lights.

The old-fashioned hand-lights (Figs. 5 and 6) were made in one piece, the ribs being formed of iron, copper, zinc, or lead. On the whole, iron is best as being the most durable, but copper was generally used at one time, the base and the upper side of the vertical portion being formed of iron. Now the entire framework is generally formed of iron, the upper side of the sash-bars being rebated so as to receive the glass. But dry glazing in horticulture was first applied to hand-glasses, and is still practised in the formation of such caps or hand-glasses as those illustrated in Figs. 5 and 6. In all these, and several other forms that might be described, the whole of the hand-light, when finished,

is in one piece, and hence it must be lifted off bodily to give access to the plants, or partially from its base to admit air to them.

To prevent the trouble and inconvenience of this, the hand-light in two pieces (Fig. 7) was invented, the base or vertical portion being in one part and the roof or sloping portion in another. This form insures that the base of the light shall always be air-tight, a cultural point of great importance, as chills there seriously affect growth. Air can be freely admitted by tilting up one side, and that the sheltered one of the top, or by turning it slightly or boldly out of the square, as in Fig. 7. By lifting the top off wholly, free access is had to the plants for purposes of top-dressing, culture, training, &c. The tops are held firmly in position

Marrow, and many other purposes, such as the fostering and the growth of seeds and plants; and no garden can be properly furnished with horticultural appliances without several hand-lights. In large gardens the supply ranges from two to five or even twenty dozen.

MISCELLANEOUS PROTECTORS.

Glass and Earthenware.—Various other contrivances have been adopted to run abreast with or

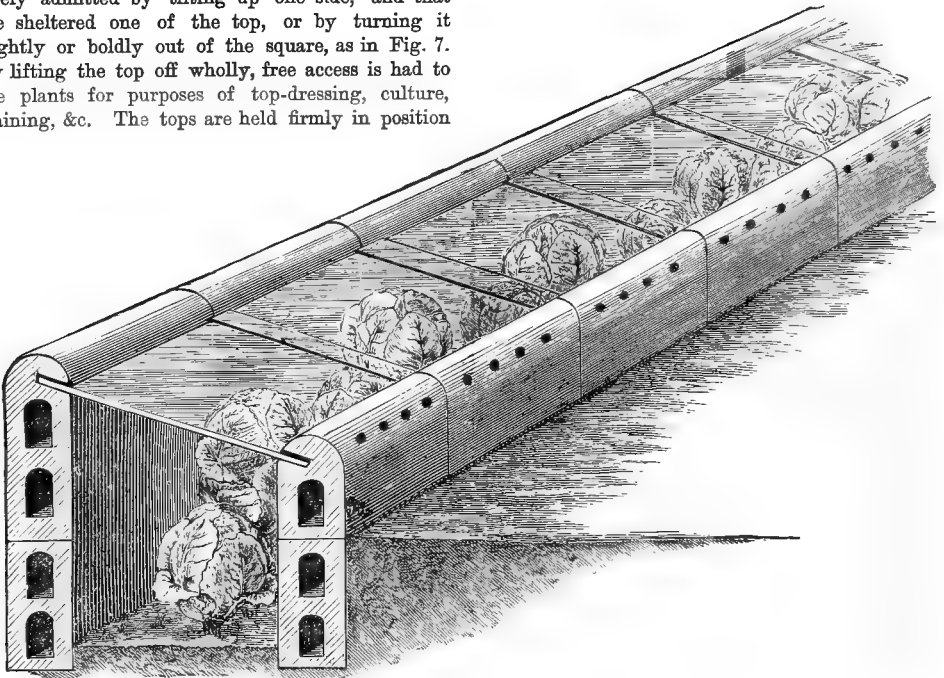


Fig. 8.—Glazing combined with Hollow Bricks or Tiles.

by their own weight; but in very windy or exposed positions, projections proceed from the cap or covering part of the light, that overlap the bottom portion. These hold the two together as in a vice, and render any displacement quite impossible, while the specific gravity of the top insures its vertical security.

Hand-lights are made of different sizes, and are of the greatest possible use in horticultural practice. Perhaps the most useful are those of fifteen or eighteen inches square, with a height of level side of six or nine inches, and a total height of fifteen or eighteen inches. These are admirably adapted for the wintering of Cauliflower plants, each light holding five; placing over ridge Cucumbers or Vegetable

supersede cloches and hand-lights. These have all been useful in assisting cultivators in their incessant warfare against climatic severities. One of the simplest of these is an inverted flower-pot. Being opaque, these of course have to be removed or tilted up in the day-time. They are, however, extremely useful for the protection of such plants as Dahlias, Cauliflowers, &c., in the early summer, as they resist all the late spring frosts with perfect ease and success.

Attempts used to be made to render them more useful and to convert them into day protectors as well as night, either by enlarging the holes in the bottom, or by knocking the bottom out and placing a sheet of glass over it, keeping the latter in posi-

tion in windy weather by placing a pebble or other stone or weight on the top of it. These partially transparent pots proved very efficient protectors, with far more cold-resisting powers than either cloches or hand-lights.

This probably led the late Mr. Rendle, the author of the tank system of heating—and now chiefly known in connection with a new method of dry glazing—to his successful attempts to combine the cold-resisting qualities of earthenware with the transparent properties of glass in a new and more ambitious method of protecting fruits, flowers, and vegetables in the open air. Hollow or solid tiles were used for the sides, which could be built up of any height, finishing with a groove on the inner

shows the glass overlapping where it joins, thus making the whole almost waterproof.

It is obvious that, by heightening the sides and increasing the width, sufficient area may be provided for the culture of Roses, fruit-trees, dwarf shrubs, Peas, French Beans, or other plants or flowers. In such cases bricks on the flat do well for the base, the groove-tiles being merely reserved for the top.

Of course, as the area is extended, the strength of the glass must also be increased, to enable it to bear the weight and wear-and-tear of use; but the most useful sizes range from four to twelve inches deep in front, from six to twenty-four at back, and from nine to thirty in width.

By curving the back tile in the form of a C, as in

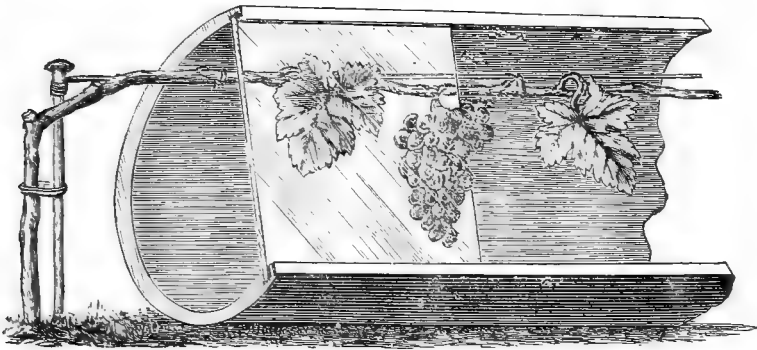


Fig. 9.—Large Protector for Vine or Cordon Fruit-trees.

side of the top tile for the reception of a square of stout glass. This system enables areas of any needed size to be enclosed with the utmost facility and safety.

The system has now been in use for some years, and though it has not superseded bell-glasses nor cloches, has proved most useful in the culture and protection of salads, the earlier maturation of French Beans and Tomatoes, the growth of Cucumbers, the forwarding of bulbs and other spring flowers, the efficient protection of Plum and other cordon fruit-trees, and even the growth of Vines in the open air (see Fig. 9).

For most purposes the tiles are merely straight or hollow ones, terminated with a groove upon their upper edge (Fig. 8), which are admirably adapted for the protection of Cauliflowers or the culture of Lettuces or other salad plants. The hollow tiles are certainly lighter, and are said to be warmer than the solid ones.

Fig. 8 gives a full illustration of those most useful appliances, and explains how the stout square of glass is fitted into the groove of the tiles; it also

Fig. 9, more space, as well as more warmth, is provided. These have been used most successfully for the growth and ripening of Grape-vines, and, as already remarked, are equally well adapted for the protection and successful cultivation of cordon fruit-trees, Maréchal Niel, and other rather tender Roses. Fig. 10 is a special protector, not unlike a section of a large sewage or water-pipe, only that it is furnished around a considerable portion of its upper side with a groove for the reception of a square of glass; being, in fact, a great improvement on the inverted flower-pots with their bottoms knocked out, already adverted to. This is a most useful form for placing over tender trees, shrubs, or other plants, such as Fuchsias, Tree Peonies, Hydrangeas, &c., to carry them safely through severe winters in cold localities. This form is also admirably adapted for placing over the crowns of Rhubarb in the open, after the more severe frosts of the spring have passed away. The heat of the sun passes freely through the glass, and that heat is retained by the thick earthenware case, the result being a rapid production of edible produce. One great advantage of

these protectors over cloches and hand-lights arises from the opacity of their earthenware sides. This, and the enclosed atmosphere well stored with caloric, render them frost-proof in ordinary weather. In seasons of severe frost the semi-level or gently sloping surface of their roof may readily be covered with litter, mats, boughs, or other cold-resisters, thus insuring the safety of the plants. Bell-glasses and hand-lights are not only sooner cooled down to the standard of the surrounding atmosphere, but their peculiar forms render it difficult, almost impossible, to cover them effectually, unless indeed sufficient litter is used to reach as high as their crowns.

Protectors with wooden sides, grooved on their upper inner edges for the reception of glass, have also been very successfully used. These absorb less heat than the earthenware ones, but they also part with it more slowly, so that virtually the sides of such are proof against the ingress of cold. The chief objection to the use of wood thus placed on or in the damp earth is that it very soon rots; otherwise no protectors can be more simply made, put up, or used. A six-inch-wide board in front, one inch thick, a foot-wide one at the back, placed a foot apart, the distance being spanned with a sheet of 21-oz. glass, will carry numbers of salad and other plants safely through the winter. The sides of old packing-boxes, without top and bottom, placed on the soil with one or more sheets of glass over them, form rough-and-ready, yet very safe and useful protectors, that must be within reach of all. We have even heard of old hat, bonnet, and ribbon boxes—those made of paper and of shavings—deep punnets, and other forms of basket and of wicker-work, doing good service as protectors in the early spring and autumn. Calico, canvas, and felt protectors, tightly strained on any sort of rough wood or wire frames, are also very efficient.

But these last-named contrivances bring us in close proximity to the one-light frame, itself perhaps the most useful appliance within the whole range of horticultural practice, and the germ of all our magnificent glass-houses for horticultural purposes, which will form the subject of our next chapter.

THE FLOWER GARDEN.

BY WILLIAM WILDSMITH.

VASES AND BASKETS.

AS adjuncts to the various styles of flower gardening, and of summer bedding in particular, vases are indispensable; but, like everything else connected with gardening, good judgment is requisite, as to what number, size, or shape shall be employed, and what positions they are to occupy. All of these conditions can only satisfactorily be dealt with according to the *standpoint* or style of each garden. Thus, the question of vases and baskets becomes to a large extent a personal matter. But for all that it may be well to indicate the line of

procedure to best insure a good result; and first as to the extent to which this form of floral decoration should be carried.

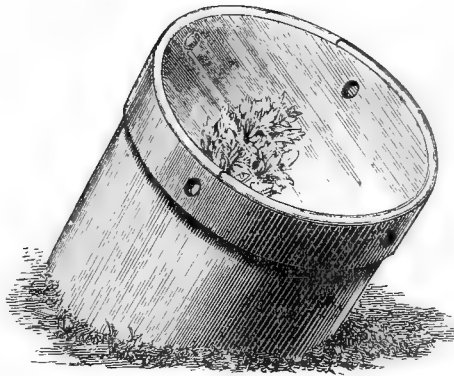


Fig. 10.—Special Protector of Glass and Earthenware.

Number.—A severely formal parterre may most appropriately have the largest number of vases, but even in this connection their use may be, and often is, excessive. On the pedestals of steps, and principal angles of balustrades, and also on the turf as *dividing-marks*, so to speak, between the varying

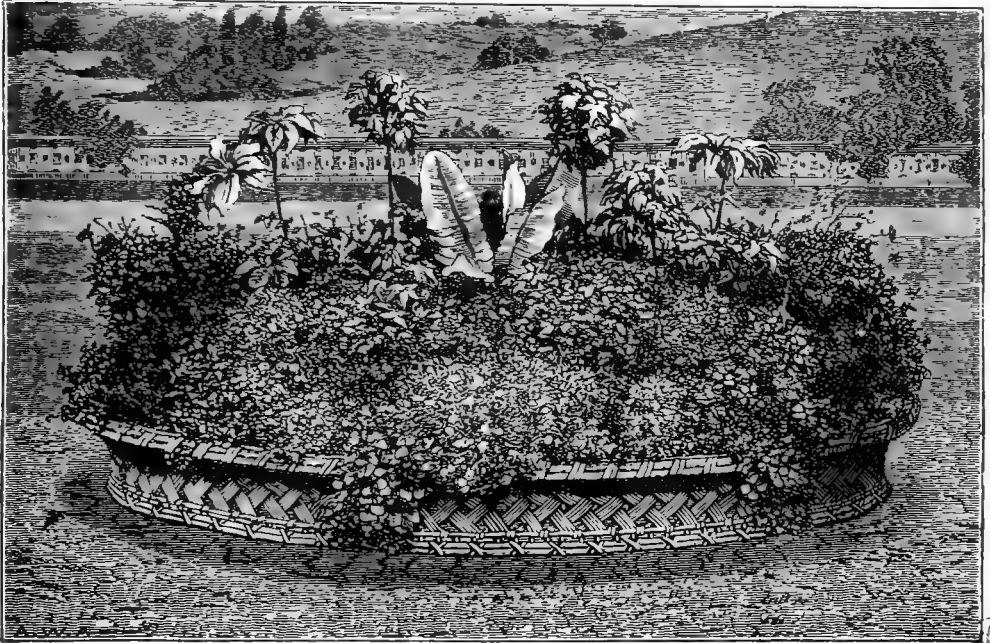
designs of beds—to this extent only ought they to be used. Those having any doubt as to whether more or less should be employed, may soon decide the point by temporarily placing either vases, or their representatives in the form of blocks of wood or large flower-pots; and if, after surveying the garden from all points, it has the appearance of being over-weighted with ornament, or if the vases cut up or intersect the view of the beds, their number should be reduced till such appearances are imperceptible. In small gardens their number should be confined to the pedestals of steps at the entrance to the house, and as centres on the grass-plot.

Size and Shape.—These points also are only determinable after taking into account the character and surroundings of the garden. Obviously vases of large size would look quite out of place in a small garden, and *vice versa*; whilst as to shape, the simplest designs are ever the most pleasing, and—what is of greater importance—are generally better

adapted to the growth of plants than the more fanciful shapes. Utility rather than ornamentation should be a prime consideration, if the growth of plants is to be of a satisfactory nature.

Baskets.—These may be said to be forms of vases on a large scale, and are better suited for certain positions than ordinary vases are. A basket-formed bed, in fact, looks well in almost any spot where a flower-bed does not look out of place; and—

constructed of wicker or strong wire according to the taste of the operator. Baskets of this character are most appropriately placed in quiet nooks among shrubs, or as a terminus to walks where it is desired to have flowers. On a small scale they look exceedingly well in old-fashioned gardens of hardy flowers, and being just as appropriately filled with this class of flowers as with summer bedders, there is no reason why they should not be assigned a place in such gardens; certainly they ought to



BASKET-BED AT HECKFIELD PLACE, WINCHFIELD.

Winchester
Library

what to some is a great consideration—such can be constructed of home materials. The stump of an old tree hollowed out, and handles of wicker or wire-work over it for climbers, makes a basket-vase equal in appearance to the finest stone or cement work, and is certainly preferable to the latter for placing in distant parts of the pleasure-grounds, or indeed in any part except in a “dressed” garden which abounds in stone-work.

Another kind of basket-bed that looks exceedingly well is that formed by cutting up Larch or Spruce Fir poles into regular lengths of, say two feet, which, after being pointed, are driven into the ground close together, to the form the bed is desired to assume (round looks best), then to be filled in with soil to the height of the wood, and handles

be far preferred to vases of a dressy and formal pattern.

Basket-beds intended for the parterre, as a matter of course, must be of a more elaborate description. The one shown in the illustration is made of Portland cement, in imitation of stone, the design being of a true basket description. It stands two feet six inches above the ground-level, is sixteen feet long, and eight feet wide at the middle, and gradually tapers to five feet at the ends, the shape being what may be described as a well-balanced oval. The position this bed occupies is the centre of the turf on a terrace-garden, on each side of which there are beds of geometric design; this, and smaller baskets of similar design, allowing when necessary of such beds being planted after the most

rigidly formal pattern, without their really appearing so, solely by reason of the informal style of planting the baskets.

These large basket-beds are well suited to occupy the most conspicuous positions in any type of geometrical garden, and are every way an advance on what may be termed the "stone and statuary gardening," which is a far too invariable accompaniment to gardens of this character. The latter, viewed from an architectural point of view, may be in good taste, and quite proper, but so far as gardening is concerned, deserve entire exclusion in favour of the useful yet appropriate substitutes here named. This same description of basket-bed may be of any desired shape or size to suit any given spot. We have them oval, round, and square, and of various sizes. The round occupies a central position on turf, surrounded with beds of circular outline; the square, the like position surrounded with beds square in outline; and the ovals serve really as a set of beds to divide two other sets of beds—oblongs and rounds—which without such division would present a depressingly formal appearance.

Soil and Planting.—It is almost needless to add that good soil is of greater importance in vase and basket culture than for flower-beds, the confined space, exposure to sunshine, and other artificial conditions, rendering good soil an imperative necessity. A good holding loam and well-rotted cow-manure is the best description of soil for nearly every kind of flowering plant; but all cannot obtain this description of soil, and it must therefore suffice to say, use the best at command. If light, press it the more firmly together; if poor, add a greater quantity of manure; and, above all, well drain.

As to planting, or arrangement of plants, personally we prefer mixtures both for vases and basket-beds. A departure from this rule may, perhaps, be desirable in regard to small vases, though even with these we would never have less than two kinds of plants—one for upright growth, and the other to droop over the sides. This latter is a much-neglected point in the furnishing of vases, but only requires a very moderate amount of thought, or, better still, a practical comparison of the two modes—with and without drooping plants—to make the practice general.

The following are given as fair samples of mixtures we would advise for the generality of vases: a tall Fuchsia, surrounded with Pelargoniums, flowering and variegated alternate, and edged with Ivy-leaved Pelargonium to droop over the sides. Another: a central plant of *Grevillea robusta*, surrounded with scarlet and rose-coloured Pelargoniums, edged with blue Lobelia and *Pelargonium Manglesii variegata*

alternate. Another: a central plant of variegated Abutilon, surrounded with dark-flowered Fuchsias and tall, variegated Pelargoniums alternate, and edged with scarlet *Tropæolum Lobbianum*. Another: a central plant of *Albizia lephantha*, surrounded with variegated Pelargonium (Lady Plymouth), and pink Pelargonium (Christine), and edged with variegated Ivy-leaved Pelargoniums and Viola Blue-bell.

Basket-beds being so much larger, the variety of mixtures can be of unlimited extent, only great care should be exercised in the disposition of the plants, that when full-grown they may present a somewhat even balance as to height over the whole basket, the highest point being at the centre. The planting of the basket shown in the illustration is as follows: the tall plants are Abutilons, Cannas, Marguerites, and single Dahlias; the intermediate size being Pelargoniums, Fuchsias, Marvel of Peru, Petunias, and Heliotropes; the smaller and outer line of plants are Lobelias, Verbenas, Violas, Stocks, Asters, variegated Pelargoniums, &c. The drooping plants are *Tropæolum*, Ivy-leaved Pelargoniums, Japanese Honeysuckle, *Cobæa scandens*, *Maurandiana Barclayana*, and Clematis.

These examples will suffice to show the manner of arrangement of dressed vases and baskets; that of rustic vases and baskets may be of a simpler description and of hardier plants, with a view to permanence of effect. Shrubs of the *Retinospora* or *Cupressus* order may be used as centres, and the edgings of Ivy, Periwinkles, Japanese Honeysuckle, and Violas, whilst the handles may be climbing Roses, Clematis, and *Tropæolums*; scarlet Pelargoniums intermixed with these in the summer season are really all that is needed to make an excellent summer arrangement. Should it be wished to plant these rustic-formed beds with flowering plants, the same as the more dressy baskets, they may of course be so planted, but a few small shrubs dotted over them, and variegated Ivy and Periwinkle as droopers, ought to be used with the flowers, to bring them into greater harmony with the surrounding shrubs, which position, we repeat, is the best for beds of this description.

The winter arrangement of vases and baskets must necessarily be done with shrubs of suitable size and description, and by following out the same rule of arrangement as for the summer, particularly in regard to overhanging plants; Ivies, Periwinkles (*Vincas*), Japanese Honeysuckles, and *Cotoneasters* being excellent plants for that purpose.

Watering and Keep.—Good soil and perfect arrangement are valueless if after-attention be wanting. The first requisite, after planting, is a good watering to well settle the soil about the roots; next,

a mulching or surfacing of leaf-soil, decayed manure, or cocca-fibre refuse (this last the neatest), which prevents cracking of the soil, and renders it unnecessary to water so frequently, though when this is done it should be thoroughly, and not in daily driblets. Of course in hot dry weather the smaller vases require watering daily, and even twice a day; yet it should not be forgotten that frequent watering is an evil, often an unavoidable one; but to some extent surface-mulching prevents this, and therefore ought to be renewed whenever it is needed.

Next to watering and mulching, is the necessity of picking off all seed-pods and decayed flowers. These quickly exhaust the plants, growth is checked, and continuous flowering becomes an impossibility. The effort therefore should be made to pick over the plants at least once each week, and to apply manure-water once in the same period.

GREEN-HOUSE PLANTS.

BY WILLIAM HUGH GOWER.

Clianthus. — Pea-flowering plants of noble aspect, well deserving a place in every green-house. The soil should consist of loam and peat in equal parts, with a little sand added. All the kinds require an abundant supply of water, but it must not be allowed to stagnate about the roots, and in summer the syringe must be freely used in order to prevent the attacks of red spider.

C. puniceus—the first species introduced to culti-

vation—is a native of New Zealand, where, from the appearance of the flowers, it gets the name of Parrot's-bill. The pinnate leaves are some six inches long, and dark green; above, paler, and slightly hairy below; flowers produced in large pendulous clusters from the axils of the leaves; deep reddish-crimson, the individual flowers being upwards of three inches in length. This plant requires frequent pinching in order to produce a bush, as from its natural habit it is more adapted to train upon a pillar or trellis-work. In many places the Glory Pea, as it is sometimes called, forms a beautiful object planted out and trained upon a wall in the open air, but in very severe weather it should have protection. Cuttings and seeds. May and June. 1831.



CLIANTHUS DAMPIERII.

C. Dampieri
(Dampier's Glory Pea) is a less

robust-growing plant than the last-named kind. It is a native of the arid desert regions of Australia, and, like so many plants from such habitats, proves very troublesome to cultivate; nevertheless, the flowers are so gorgeous that when brought to perfection it well repays any amount of care. Hitherto this plant has only been increased by seeds, and appears to be more of a biennial than a perennial species. The seeds should be sown singly and should be re-potted in the large flowering-pots at once, as it cannot suffer repeated shifting. The stems and leaves are all covered with long grey hairs, which gives it quite a hoary appearance. Flowers larger than in *C. puniceus*; produced in drooping racemes of five or six in a cluster; vivid scarlet, with a large black blotch at the base. It flowers during the summer months.

Cobæa.—A genus of climbing plants belonging to the Phlox-worts. In appearance, however, they have nothing in common with the other members of the order. Cobæas are perennial plants of very rapid growth, it being recorded that a plant of *C. scandens* has been known to make two hundred feet of growth in a single season, so that if any one requires the roof of a green-house or conservatory to be rapidly covered, this is by all means the best plant to use for the purpose. They thrive best in a somewhat stiff soil. Propagation either by seeds or cuttings.

C. scandens.—It is about a hundred years ago since this rapid-growing and beautiful climber first opened its flowers in this country; in its native country it is called the "Violet Ivy." Its leaves are pinnate, usually being three pairs of pinnae, the midrib terminating in a long tendril, by which it becomes firmly fixed to anything within its reach. Flowers large, bell-shaped, on long foot-stalks, from the axils of the leaves; when young, green, changing to rich deep violet-purple when fully expanded; stamens much exerted. It blooms during the entire season. Mexico.

C. scandens variegata.—An exact counterpart of the preceding species, but the leaves are all beautifully margined with creamy-white, which renders it very attractive. These plants are valuable as green-house climbers on account of their freedom from all kinds of insects. Summer months.

C. macrostemma.—A smaller-growing species than *C. scandens*, but very similar in appearance. The flowers, however, are much smaller and far inferior

in beauty. When young they are green, but they change to yellow with age. Summer months. South America.

Coronilla.—The plants comprising this genus derive their name from the arrangement of the flowers, which form a corona or crown on the points of the branches. The species here quoted is invaluable for green-house decoration. The soil should be two parts loam and one part peat, with a little sand added. During the growing season give plenty of air, and if removed outdoors after growth is finished it will be very beneficial. Cuttings in sandy soil.

C. glauca.—A fine growing shrubby plant, with pinnate glaucous leaves; flowers Pea-shaped, bright yellow, and fragrant. There is a variety with variegated leaves, which affords a pleasing contrast to the normal form. South of Europe. 1772.

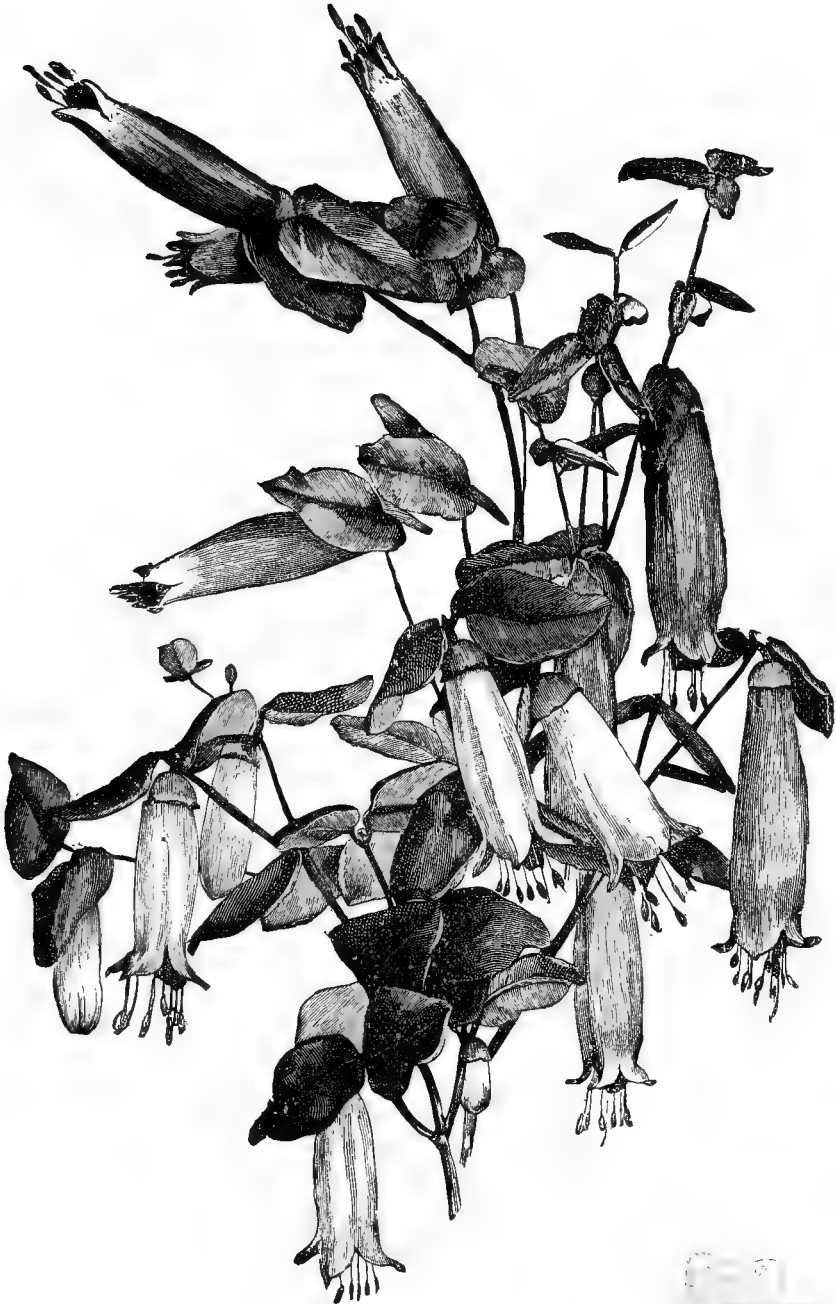


COBÆA SCANDENS.



Correa.—

These are often called Australian Fuchsias, although they are not related in any way to that popular genus of plants, the habit of growth and drooping tubular flowers no doubt giving the first settlers at the Antipodes a pleasant reminder of the flower they had left behind in the old country. There are numerous species, but many new and handsome forms have originated in English gardens from cross-breeding. The usual method of propagation is by cuttings, but some of the kinds are weak rooters, and hence to improve the constitution these are frequently grafted upon a strong-growing species called *C. alba*, the flowers of which are not showy.



GROUP OF CORREAS.



A mixture of two parts peat, one of light loam, and one of sharp sand suits them admirably; drain well, and water abundantly, but carefully. Correas soon grow into handsome specimens if a little care is bestowed upon them. Re-pot before the shoots begin to start, or when the young growths have made one or two joints; look carefully over the plants and pinch out the points in order to encourage laterals, by which means bushy plants will be obtained. When somewhat established in their new pots, they will be much benefited by removal to the open air, choosing a position in which they can be protected from rough weather, and where the full power of the sun is tempered with a little shade. In autumn remove them in-doors, where their beautiful flowers will enliven the green-house throughout the dull months of winter. All are natives of Australia, chiefly in the southern and eastern parts.

C. Brilliant.—Flowers bright crimson, very fine.

C. cardinalis.—One of the finest and most showy kinds. Flowers bright scarlet, tipped with green. This plant naturally makes but few leaves, and requires frequent stopping in order to obtain laterals, or it will present a somewhat naked appearance.

C. Jardin d'Hiver.—Flowers bright scarlet. A very desirable plant, and one that is well furnished with foliage.

C. magnifica.—A robust kind; flowers large, white.

C. pulchella.—A twiggy-growing species, and very handsome. Flowers crimson. 1824.

C. speciosa.—Flowers crimson, tipped with green. 1806.

Crinodendron.—A family belonging to the Lindenblossoms or *Tiliaceæ*. There is but one species known, and this appears to be rare, even in its native country, where it is called "Chequehue." It should be grown in a mixture of good rough peat and loam, with some sharp sand added. Drain the pots well, and supply liberally with water during the growing season.

C. Hookerianum.—This is the only species, but is also known by the name of *C. Patagua*. The leaves are opposite or alternate, oblong lanceolate, and acute, slightly toothed on the edges, bright green above, paler below. The flowers are produced singly or in pairs, on long pendulous foot-stalks. They are bell-shaped, thick and fleshy in texture, and rich rosy-crimson in colour. It is a very handsome dwarf-growing shrub, well deserving a place in every collection of green-house plants. Spring months. Southern Chili. The correct name of this plant is *Tricuspidaria hexapetala*.

Crowea.—A small family of Rue-worts, all natives of Australia. And, as so many of the plants from that country are spring bloomers, it

behoves the cultivator to encourage such plants as the various species of Croweas, which follow them, and continue to maintain a succession of these handsome flowers right into the autumn. Croweas are not, however, as a rule, seen in our plant-houses in the happiest condition, for the reason that too many cultivators treat them more as stove plants than green-house subjects. This system never fails to produce a lax growth and sickly yellowish-green foliage; but give them a situation in the green-house where they are not overcrowded, free ventilation, and full exposure to the light, and Croweas will grow into handsome specimens, which in due time will contribute their share to the beauty of the garden.

The soil should consist of good peat and light loam, in the proportion of three of the former to one of the latter, with a liberal addition of sand; drain well, and water carefully. To form good bushy and shapely specimens, the points of the shoots should be frequently stopped and any gross shoot cut quite out, or the symmetry of the plant will be spoiled. This stopping, however, should not be carried to excess, or the points with the flowers will also be destroyed.

C. elliptica.—Leaves simple, ovate, and dotted, dark green. The flowers are produced in whorls of five, star-shaped, and beautiful bright pink in colour. June to end of autumn.

C. latifolia.—Leaves narrowly ovate, and bright green, like all the family prettily dotted on the upper side; flowers purple. Summer to end of autumn.

C. saligna (the Willow-leaved Crowea) has bright pink flowers, produced all through the summer and autumn months.

Daphne.—A widely-distributed family of plants, most of which are distinguished for the delicate fragrance their flowers emit. It is rather remarkable that, although the various species are distributed over most of the temperate and tropical parts of the world, none have been found in Africa. Daphnes will thrive and flower well under similar treatment to, and in the company of, Camellias; indeed, the largest and best we have seen have always been growing with them. When established they produce an enormous quantity of flowers.

These plants thrive best in soil composed of two parts good turfy loam, one part fibrous but not spongy peat, and one part sharp sand. The pots must be well drained, and a liberal supply of water given during the growing season. These plants are usually slow-growing, and are generally grafted upon other stronger-growing kinds.

D. indica alba.—Leaves oblong lanceolate, smooth, and bright shining green; racemes terminal, many-

flowered, white, and deliciously fragrant. Winter and early spring months. China.

D. indica rubra.—A more robust grower than the preceding, but in other respects it is similar to it; the heads of flower are reddish-pink on the outside instead of pure white; they are very fragrant. It blooms during the winter and early spring months. China.

Dillwynia.—This genus contains many handsome species; they are Pea-flowered plants, and require about the same treatment as *Chorozemas*. They bloom during spring and early summer, and continue in full beauty for a considerable time. All are natives of Australia.

D. ericifolia.—Flowers yellow, in short racemes or clusters; frequently found in collections under the name of *D. floribunda*. 1794.

D. parvifolia.—Flowers borne in terminal clusters, pale yellow, stained with red at the base. 1800.

D. pungens.—Flowers bright yellow. 1825.

D. sanguinea.—Flowers deep red and yellow.

D. scabra.—A fine species, producing terminal corymbs of bright red flowers. 1850.

D. speciosa.—Flowers yellow and crimson. 1838.

D. splendens.—Flowers orange and red.

Dracophyllum.—Nearly related to *Epacris*; the various members are distributed throughout New Zealand, New Caledonia, and Australia. The solitary species we quote here is a handsome and very desirable green-house shrub; it is a slender-stemmed and somewhat straggling-growing plant, and is seen to best advantage when trained upon a trellis. It should be potted in a compost of nearly all peat and sand, but a small portion of light loam added will be found advantageous; in potting, press the mould down very firm, as the plant will not touch root in loose soil. Cuttings root tolerably free inserted in sandy soil and placed under a bell-glass.

D. gracile.—Leaves small, subulate, dark green; stems slender, the points bearing a compact head of snow-white flowers; these are produced about the month of May, and last a month or six weeks in full beauty. Australia.

Dryandra.—A genus of *Proteaceæ* containing many species, the majority of which are more to be admired for the beauty of their leaves than their flowers. These, like many other *Proteaceous* plants, have not found so much favour of late years in the horticultural world as they did in the earlier part of the present century, but they well deserve the attention of those having large collections, as they afford

a beautiful contrast of foliage, which is particularly delightful during winter when there is a scarcity of flowers to divert the eye. The genus commemorates the services of Dr. Dryander, a celebrated botanist and librarian to Sir Joseph Banks. They are nearly allied to, and require the same treatment as, *Banksia*. All are natives of the south and south-western parts of Australia.

D. armata.—A small-growing shrub with deeply pinnatifid leaves, which are about three inches long, with sharp-pointed triangular lobes, dark green; flowers yellow, not conspicuous.

D. arctoides.—A pretty little species, seldom exceeding two or three feet in height; leaves three to four inches long, pinnatifid, divided almost to the base; lobes linear, deep green above, clothed with a white silky tomentum beneath; flowers yellow, small.

D. nervosa.—A dwarf plant, with deeply pinnatifid leaves, segments linear, lanceolate, sometimes inclining to falcate, deep green above, reddish-brown beneath, where the veins are very prominent.

D. nivea.—One of the most elegant members of this family, seldom exceeding one or two feet in height; leaves densely set, three to six inches long, linear and pinnatifid, divided into small triangular segments; they are dark green, but the under surface is of a uniform pure white, which renders it very attractive.

D. plumosa.—Whole plant very elegant and feathery; leaves six to eight inches long, pinnatifid, with obtuse triangular lobes, deep green above, white beneath.

D. seneciifolia.—A dense compact species, some three feet in height when mature; leaves about three inches in length, linear in outline, and divided into narrow segments, which are dark green above, but white beneath.

Eccecmocarpus.—A small family of climbing plants belonging to the *Bignoniaceæ*, natives of the cooler parts of Chili and Peru, and although sufficiently hardy to grow in the open air in this country during the summer months, they must nevertheless be looked upon as green-house plants, as under such treatment their beauties are displayed to the greatest advantage.

The requirements of these plants are very few, and their management very simple, as they will grow in almost any soil. When grown as border plants *Eccecmocarpus* are usually treated as annuals, and raised from seed every year, the best time for sowing being about the middle of February or beginning of March, but when grown from cuttings they flower both earlier and more profusely.

E. longiflorus.—A handsome plant with tripinnate leaves, the segments being oval and entire; raceme drooping, bearing three to four long tubular flowers; calyx large, bright red; tube orange-yellow tipped with green. Summer months. Peru.

E. scaber.—known in some collections by the name of *Catampetis scabra*—is a very ornamental plant, attaining a height of about twelve feet; leaves bipinnate, segments somewhat cordate, toothed at the edges, bright green; flowers tubular, orange and scarlet, very showy. Summer months. Chili.

Eutaxia.—A small family of Pea-flowered plants nearly allied to *Pultenaea* and *Dillwynia*, but, independent of the slight differences in the formation of their flowers, they may at once be distinguished from them by their opposite leaves. All are natives of Australia. The soil and general treatment are the same as for *Chorozema*; doing best in a mixture of about two parts peat, one of sharp sand, and one of loam. Like those also, they are chiefly propagated

by cuttings, and require careful pruning back as soon as the flowering season is over. If these points are attended to, no difficulty will be found in their cultivation.

E. myrtifolia.—A shrubby plant with slender stems; leaves somewhat Myrtle-like; flowers yellow, situated in the axils of the leaves, in pairs, and producing long racemes of bloom which are very effective. Spring and early summer.

E. pungens.—A slender-growing plant, with narrow verticillate sharp-pointed leaves; flowers bright orange and yellow, crowded into dense terminal corymbs. Spring and early summer.

THE KITCHEN GARDEN.

BY WILLIAM EARLEY.

Salsafy (*Tragopogon porrifolius*). French, *Salsifs*; German, *Hafer-Wurzel*; Italian, *Scorzonera bianca*; Spanish, *Astra vegetal*.—This plant is a hardy perennial, and a native of England, sometimes called "Oyster plant," as the Spanish name shows. The

roots are long and tapering when well grown, of a white, fleshy nature, although, as the result of indifferent culture in rich soil, it is often produced as a mere bundle of small roots, knotted together, and is then little short of useless for culinary purposes.

To grow the root well a light mellow soil should always be chosen, at least ten inches deep. When preparing such soil for the reception of the seed, so treat it, either by means of shallow trenching or very deep digging, as to place a layer of good manure at a depth of at least eight inches below the surface. This can be easily done by having a very open trench in process of deep dig-



DRYANDRA ARCTOIDES.

ging, and placing the manure at the bottom of each trench as the work proceeds.

Seeds should be sown in drill-rows during the month of April or May, such drills to be drawn moderately shallow, and about nine inches asunder. Rake the seeds in neatly by drawing the rake transversely across the rows. During the month of June, when the plants have attained to three or four inches in height, thin the rows out, so that five or six inches space exist between each plant. Occasional deep hoeings are alone requisite during the remainder of the summer. The crop is generally sufficiently advanced for drawing, commencing during the month

of August, such a quantity only being drawn as are required for use each time. The plant, being so thoroughly hardy, will be best left in the open ground throughout the winter.

The young spring-formed shoots are used as a green vegetable. Cut them off so soon as they attain to sufficient size, and before seed-stalks are formed, after which the plants are useless, and should be removed to the rubbish-heap.

Scorzonera (*Scorzonera hispanica*). French, *Scorzonère*; German, *Scorzoner*; Italian, *Scorzonera*.—This plant, known also as "Viper's Grass," is a hardy perennial, a native of several distinct parts of Southern Europe. The roots are pure white within, the rind or coating of a black colour, some of the points of the extreme roots being enlarged, or tapering, though the general diameter is the same throughout. Owing to this peculiarity it has received the name of Viper's Grass, as the roots alone are supposed to resemble that reptile.

It thrives best in a deep sandy soil, having manure placed at the depth of ten or twelve inches below the surface of the ground only. Sow the seed upon ground so prepared in drills about one and a half inches deep, and twelve inches between the rows, early in the month of April. So soon as the plants are large enough, thin them out to six or seven inches apart in the rows, keeping them well and deeply hoed during the whole summer subsequently. The roots are generally large enough for use early in the month of September. Such as remain in the ground until the month of December, take up, and store away for use in the same manner as carrots are stored for winter. This root is often found to be unduly bitter when cooked; to neutralise this, scrape off the outer rind, and place them in cold water for an hour or two before cooking.

Sea-kale (*Crambe maritima*). French, *Crambe maritime*; German, *Seekohl*, *Meerkohl*; Spanish, *Breton de Mar*; Italian, *Crambo*.—This is a hardy British perennial, found in many parts of the country, on the shores around our sea-coast. It is generally cultivated for the use of its young shoots in a perfectly blanched state, and it is a singular fact that it

has been found and collected for use in such blanched state by the inhabitants resident near our western shores, from a time anterior to any history we possess as to the origin of the practice. Buried beneath the sand blown upon its dormant roots during winter, it pushes up through such sand in the early spring, at which time the inhabitants referred to watch for its advent, and collect the blanched shoots so formed.

Its successful culture as a permanent crop depends greatly upon the proper preparation of the bed wherein it is to be grown, the site it occupies, and such perfect drainage as insures to the root-base immunity from excessive moisture during the winter months.

The best site for it is a fully-exposed one, facing the south, and if with protection from easterly and north-easterly winds so much the better. The soil should be trenched to a depth of at least two feet or more, preparatory for seed-sowing or root-planting, both being employed more or less, as may be most convenient.

An inhabitant of the sea-shores, it delights in a sandy soil. Where, therefore, sea-sand can be procured it should be used abundantly in forming the bed. And it is well to observe that a bed, well made and planted, will continue to give excellent crops for

eight and even twelve years. The writer has, indeed, maintained a bed, with its original plants, in full bearing for fourteen years, even though he forced the plants upon this bed by the aid of fermenting materials each year during that period.

Where sea-sand is not obtainable the existing soil must be treated more or less in accordance with its native lightness or tenacity, as the case may happen to be. Very light soils resting on gravel, or a porous subsoil, will certainly be benefited by the addition of stiff soil to it, and abundant manure buried at the bottom of each trench, and in successive strata, though intermixed with the soil as much as possible throughout. Such soils, even when they have been prepared thus far, being naturally poor and light, should also have a good dressing of decayed manure spread over the surface, and forked in, even after the trenching work has been finished.

Heavy, tenacious soils will be benefited by the addition of road-scrappings, any kind of sand obtained locally, and old dry mortar rubbish, along



SEA-KALE.

with manure in plenty. Especially is it necessary, in connection with these latter, to place sandy material, old mortar rubbish, or such lightening material, near to the surface, so that the plants are more or less embedded in it. If this be not done, and the "stools," with their crowns, lie with an excess of moisture enveloping them throughout the winter, they are liable to canker and its attendant decay, one of the greatest enemies the plant is subject to.

Sea-kale is propagated both by means of seeds and division of the growing roots. To raise it from seeds, select a warm aspect and soil similar to that recommended. As it is usual, and often most convenient, to sow nursery beds whereon plants are to be grown for ultimate transplanting on to the more permanent bed, the most convenient plan to follow is to sow in drill-rows, for which purpose a generous and free soil will generally suffice without such an amount of preparation as is needful for permanent beds. Draw shallow drill-rows with the corner of the hoe one foot apart, and drop the seeds, which are large, therein in such manner as to insure germination and plant-formation at distances of not more than eight inches apart. The first week in the month of April is the best date to do so. So soon as the young plants are well through the soil, hoe carefully and well between them, doing so periodically throughout the summer months, so as to insure the soil being loose and free around them. Liquid manure given to them during the month of July is a great aid to free and fine growth. These young plants, having remained in the ground through the winter months, may be carefully taken up in the spring, and transferred into permanent plantations, at distances apart, &c., in all ways similar to that recommended below for bed-formation by means of direct seed-sowing. Or they may be permitted to remain in the rows to perfect a second summer's growth, aided by a nice dressing of decomposed manure, occasional waterings of liquid manure, deep hoeings, &c. By these means they form nice crowns for forcing during the following winter, and should be taken up carefully, and transferred to such proper places to insure this as are recommended below.

To form permanent plantations by means of direct seed-sowing, the site intended for permanent plantation, having the soil trenched and prepared as recommended, should be carefully levelled and raked over towards the end of the month of March. During the first week in April mark out the whole space into rows two feet asunder. Stretch the line along the first row, and sow, at distances of two feet apart in the rows, three pairs of seeds. These must be inserted at a uniform depth of two inches, in pairs about seven inches apart, at angles with each other. Again stretch the line across the ground for the

second row, sowing in precisely the same way as for the former triple pairs of seeds, but in such manner that the sowings in this row be sown at angles with the sowings in the previous one. The third row, being at angles with this latter, will occupy a similar place transversely to what the first-sown row does. By continuing thus the whole bed will be furnished with separate "stools," at equal distances apart throughout, giving to all the greatest possible amount of space whereon to make repeated permanent summer growths.

As, however, "Sea-kale pots" vary in dimensions in different places, and sowing seeds in triples, as advised, is intended to form as many crowns as possible, to place each pot over for forcing and for blanching, it may be convenient to take the measurements of the pots on hand, and to sow the seeds at angles apart in such manner as to insure that the plants, when grown in the future, can be properly covered by them, which may vary the measurement given.

When the young plants have formed, remove each duplicate one in all instances where more than one seed has germinated, giving all attention during the following summers in regard to hoeing, neatly forking the surface of the ground over during the following spring, &c.

Propagation by means of division of the roots, a method often followed by growers for market who are anxious to make the most of things, is very simple. When the main roots are dug up for forcing, a system generally followed by them also, every portion of broken root, from the size of dry straight-stick macaroni upwards, is preserved for this purpose. These are cut into uniform lengths of about five inches, and dibbled, or laid in drill-rows chopped out for them, with the thick ends just level with the surface of the soil, in such manner that they form buds, grow, and ultimately, after a summer or two, perfect crowns, which in turn are used for forcing.

To make a plantation which shall give quicker results than by means of seed-sowing at angles, as advised above, or by waiting to grow and perfect the needful crowns for so doing in the home garden, it is only necessary to prepare the bed, as advised, during the winter months, and to purchase a hundred or two crowns about the month of February for planting therein. These are always obtainable from seedsmen, and at a very reasonable rate, and are far more economical than seed-buying, sowing, and waiting the result.

Preparing Sea-kale for use, whether this consist of forcing, blanching, or retarding, is very simple, though generally expressed under the term "forcing" only. The original practice was to grow the plants in beds or plantations, as recommended above, to then place pots over the crowns, covering them with stable

litter, or fallen tree-leaves, &c.; such materials in process of ferment giving heat for the earlier supply about Christmas, bringing it on gradually about the months of March and April without fermentation, and, in the same way, retarding it during the month of May. To insure the latter, however, it is only necessary to place such cold materials over it before signs of growth occur.

The all-important considerations connected with this process are as follows:—For early forcing, to produce a supply during the month of December, a somewhat great heat will be requisite. To insure this with safety, the materials should be first thrown up into a conical heap, where they will, in process of fermentation, become very hot. Meantime, the surface of the bed should be neatly raked over, and small mounds of sandy materials placed over the materials; finely-sifted ashes will do, where the former does not exist. The object of this is to protect the more tender parts of the crowns from injury by any excessive heat or steam which arises. Then the pots must be fixed firmly upon the soil, so as to preclude steam from ingress beneath them over the crowns, placing the fermenting materials over as many of the pots as are likely to be needed in a state of production at one and the same time. Such materials should be about two feet in height during moderately temperate weather, and three feet high during very severe frost and snow-weather. It should not be of greater width at any one time than is requisite to cover over three rows of crowns, considering always that the outside pots within the material should have several inches against them on the outer sides. Place a test-stick or two centrally down to the bottom of the material, and should signs of heat beyond 80° to 85° exist in the mass, remove a few forkfuls from the centre, to neutralise such excess, returning such as need be subsequently to renew and maintain the heat when it begins to wane.

The maximum heat recommended is only necessary when forcing is undertaken during the months of November, December, and early in January. In a week or ten days the crowns will start into growth. So soon as this is observed reduce the heat to a maximum of 60° , maintaining it as nearly as possible at this uniformly. All fluctuations of temperature cause the produce to be tough and stringy. As cutting advances, remove the pots, and place them upon other crowns in advance, placing the fermenting material also thereon, with a little fresh added as required, to maintain the necessary heat. As the season advances, and the outer temperature rises, the natural season of growth of the crowns being nearer, less and less heat will be requisite, until during the months of April and May probably no heat will be requisite at all to insure excellent produce.

The other plan, most generally employed by growers for market, as well as many others, is to dig the grown and prepared roots up, shorten their extremities, and bury them in soil or other material, either in a Mushroom-house or other warm place, according to the season; the only necessity being the maintenance of such heat as previously suggested, a nice supply of latent moisture around them, with perfect exclusion of both light and air. The latter is most important, any departure therefrom producing red or green growth, in lieu of the necessary blanched and perfectly white state.

When gathering the crop, cut each growth off with a portion of the hard root-rhizome attached; this will not only assist in keeping it fresh until used, but enable its being pruned or trimmed with a better base for the culinary purpose. When the crop is all gathered remove the pots and materials, throwing a little light litter over the wounded crowns to protect them until about the first week in the month of May. This also should then be removed; all pieces of crowns which are above the ground-level cut down to such a level, and a little manure be placed between the rows and just pricked in. In other words, deep digging must not be resorted to, as the roots generally traverse the ground horizontally, and would by such a practice be cut in twain and injured.

One other important matter must be noticed. On no account must any of the plants at any stage be permitted to push up flower-stems. Immediately these are observed—and they should be periodically sought for—it is necessary to cut them out at the ground-line. Where these are permitted to form, the plant becomes blind as regards future produce, no young crowns being capable of forming; the result, a loss of the proper supply.

Particulars regarding varieties cannot be much depended upon in connection with this crop. There exists, however, a variety which, for convenience, we will name White variety, the young leaves, and old, upon which have no trace of that pink margining so characteristic of the plant. When forced, this white variety is of purer white, such pink traces being entirely absent; for which reason it were well to seed and otherwise increase such. To secure seeds, permit the first growth upon any cluster of plants to grow, when they will be formed abundantly. The seeds are invariably encased in a large outer case. Such case must not be removed; all seeds should be sown, therefore, entire as grown.

Dwellers in towns, possessing no gardens whatever, may, by purchasing two-year-old roots by the hundred or more, readily grow the crop in boxes or bins, in their cellars, or other dark, airless places, thereby producing annual crops of an expensive vegetable, cheaply.

Spinach (*Spinacia oleracea*). French, *Epinard*; German, *Spinat*; Spanish, *Espinaca*; Italian, *Spinaci*.—There exist several distinct types of *Spinach* or "*Spinage*," as written by old authors, a name derived from the peculiar prickly seeds. The present form, surnamed *oleracea*, or pot-herb, is, however, that most generally grown and, consequently, most popular. It is a hardy annual, sufficiently hardy, in fact, by a proper system of seed-sowing and culture to withstand the inclemency of British winters. Its original home is not known. It has, however, been cultivated in this country more than three centuries. The species under consideration consists of two distinct varieties, distinguishable by having a dissimilarity both in the form of their leaves and seeds. One, possessing round or heart-shaped leaves, has also round seeds; the other, oblong triangular-leaved, having prickly seeds. In other words, the remarkable fact exists that the leaves and seeds of the plant possess identical characteristics. The harsh or severer development of the leaves in the prickly-seeded variety goes even further than this. It has proved itself less profitable as a summer variety, is the more hardy of the two, and has, therefore, been termed the "winter variety," being that invariably sown in the autumn for the winter and earliest spring crop.

In the matter of culture, as the only real merit these peculiar comestibles can possess consists of extreme freedom of growth and its attendant succulency of leaf, it is impossible to accord them too generous treatment. Yet to insure this a really deeply-prepared soil is not always essential, beyond the consideration that the richer the soil is deep down below, so much greater is its capacity to retain latent moisture in uniform abundance, by which the whole is favourably influenced, to say nothing of the fact that the roots will work down in search of food during arid-weather periods, where it exists, though this plant is but of shallow root-formation. A free highly-enriched soil is essential. As the crop is of very quick growth and of short duration, during summer-time, it is well to exceptionally enrich the ground for it, even upon consideration that a succeeding crop may occupy the ground and benefit thereby.

The practice which gains precedence consists in growing the crop in drill-rows. This is not the best plan to follow, as it invariably leads to the plants being too thickly grown together; an error, this, which cannot be too severely condemned, and owing to which good produce is rarely obtainable. It should be quite needless to remark here the simple fact that to grow a plant well, to insure fine large leaves, it should grow singly; yet all but invariably is Spinach grown so thickly as to entirely controvert

such a fact. It is thereby hastened off to seed, wretchedly indifferent seed-stalk produce being the result. Wherever drill-rows are sown, therefore, seed should be sown very thinly, thinning the young plants out so soon as they have each two pairs of leaves, to four or five inches apart. Better is it, however, to sow broadcast upon rich soil, and to subsequently hoe out the plants to distances of about six inches apart, treating them in a similar way to what broadcast-sown turnips are treated. For the summer crops the first sowing should be made during such mild weather as may prevail about the first week in February; for this first sowing, a sheltered sunny situation. So soon as this sowing is up and thinned out, make another sowing, continuing after the month of March has arrived to make small sowings once a fortnight, according to the demand, until July, at which time it is not desirable to make any more until the winter crops are sown, as the plant succeeds indifferently only during the dry months of August and September.

About August 1st prepare a liberal space for the winter crop, choosing particularly for it a dry quarter of the garden, exposed and open to such winter sunshine as is experienced. Though even this is not all; the nominal or cloud-screened light of the sun even at such a season exerts its influence beneficially. To save the young plants from excessive ground-moisture during the winter months, a moderate quantity only of manure should be employed. A few wheelbarrow-loads of old mortar, rubbish, &c., could also be beneficially dug into the ground upon which it is to be sown. For convenience of hoeing, gathering the crop, &c., drill-row sowing will at this season be preferable. Draw shallow drills across the space to be sown, ten inches asunder, and make sowings as near to August 5th and August 11th as possible. Make the larger sowing at the latter date. When the young plants are large enough, thin them out to five inches apart in the rows. Hoe amongst the crop periodically at fine weather intervals; such a process is of immense aid. Should any make a good growth, continue to pick for use in accordance. This practice, whilst it furnishes supplies, also checks too robust growth, and assures in advance the hardness of the crop for severe weather, should it follow.

For the summer crop the most common practice is to sow rows of Spinach between the rows of Peas. Such space can only be occupied by a quick-growing and yielding crop, and as Spinach is such, the practice is good from an economical point of view. It is as important in this case as in all others to well thin out the young plants, or the produce will be of a very low order.

Under somewhat the same name we have the following:—

Spinach, Green Mountain or Orach

(*Atriplex hortensis*). French, *Aroche*; German, *Mel-dekraut*; Italian, *Atrepice*.—We possess herein a singular plant as a hardy annual, and indigenous in Tartary. It is a robust plant, growing rapidly to some feet in height, the leaves of which are gathered and used in the same manner as those of *Spinacia oleracea*. This variety is more esteemed on the Continent than it has been hitherto in this country. It delights in a deep, rich, and somewhat moist soil, fully exposed to sun and air. It may be cultivated both in rows and by broadcast sowings. A single row about ten yards long will afford a moderate supply. Seeds should be sown during the month of August, to insure a spring and summer supply up to the beginning of the month of July. Thin the plants out from this sowing to about six inches apart only, to insure a sufficient quantity in the spring, following the exigencies of winter, attention in the matter of hoeing, &c., being the only further aid needed to secure the crop. For the main summer supply, similar sowings should be made during the months of April and May, for which an additional supply of manure should be dug into the ground. The young plants which result from these sowings should be thinned out to nine or ten inches apart in the row. When the plants are well grown they give a successional supply of leaves as they progress in height, which only need to be picked off to be ready for use. As the plant tends to run very rapidly to seed in hot weather if neglected, and is only worth eating when the leaves are picked young and tender, it is very essential that the regular supply provided be regularly drawn upon and kept down. Disappointment will follow any want of this precaution to keep a succession of young leaves.



ALSOPHYLA EXCELSA.

FERNs.

By JAMES BRITTON, F.L.S.

The Alsophilas.—In point of number of species the genus *Alsophila* is the most important of the genera of Polypodiaceous Ferns, which are included in the tribe *Cyathea*. It stands alone, too, in that tribe, in the absence of any involucre to the sori. The *Alsophilas* have the general habit and aspect of the *Cyatheas* and *Hemitelias*, but both these genera are readily distinguished from *Alsophila* by the distinct involucre with which the sori are furnished. They are distributed principally throughout the warmer regions of both hemispheres, and nearly a hundred species are described in the "Synopsis Filicum." A goodly number of names, not given in the work just mentioned, occur in nurserymen's catalogues, but probably the great majority of these would, if studied by any competent authority, be referred to species previously described and cultivated under their correct appellations. From a garden

point of view a selection of half a score species is sufficient for all practical purposes; indeed, it is only in large establishments that space enough can be spared to allow even that number of individuals to develop and exhibit themselves in all their beauty. The largest collection of Tree-ferns existing in this country is to be seen in the Royal Gardens, Kew, and a visit to that famous institution is necessary to enable any untravelled gardener to form anything like an approximate idea of the splendid appearance presented by full-grown specimens in their native countries. Wallace, in his "Malay Archipelago," thus speaks of these beautiful plants in their tropical homes:—"But the greatest novelty and most striking feature to my eyes were the Tree-ferns, which, after seven years spent in the tropics, I now saw in perfection for the first time.

All I had hitherto met with seemed slender species, not more than twelve feet high, and they gave not the least idea of the supreme beauty of trees bearing their elegant heads of fronds more than thirty feet in the air. There is nothing in tropical vegetation so perfectly beautiful."

STOVE KINDS.

A. armata is one of the commonest species in cultivation, and in a wild state is found throughout the whole of tropical America. The large, firm-textured, tripinnatifid or tripinnate fronds, have densely pilose rachises and ribs, not scaly, as in some of its allies. *A. atrovirens*, from South Brazil, has tripinnatifid, somewhat leathery fronds, with glabrous, smooth or warted, dull straw-coloured rachises, both surfaces being green, glabrous, and without scales. *A. ferox* has tripinnate fronds, with brownish straw-coloured rachises, the main ones often covered with conspicuous, hard, but rather small excrescences; the texture is thin, not leathery, and both surfaces are bright green in colour, the ribs being slightly hairy. This species is spread through the whole of tropical America. *A. aspera*, from the West Indies, has the stipes and rachises armed with strong prickles, which impart a distinct aspect to the plant; the leathery fronds are bipinnate. *A. pruinata* is quite unarmed (that is to say, it does not possess either the hard excrescences of *A. ferox* or the prickles of *A. aspera*); the stipe is densely woolly at the base, and the leathery, distinctly glaucous frond is either twice or thrice pinnate. This extends from the West Indies and tropical America to Chili and Juan Fernandez. *A. sagittifolia*, a comparatively recent introduction from Trinidad, has rigid leathery fronds, four to six feet long, green and glabrous on both surfaces, the under side bearing, however, a few broad white scales on the ribs; the rachises are straw-coloured and warted, with a few pale-coloured adpressed scales beneath. *A. Tenitis* is a Brazilian species, with large, bipinnate, rather firm-textured fronds, with distant glabrous stalked acuminate pinnules.

GREEN-HOUSE KINDS.

A. Australia, a native of Tasmania and Australia, has large fronds, deep green above and somewhat glaucous beneath; the stipe measures about a foot and a half in length, and is clothed with very long, firm, subulate scales; the main rachises, which, like the stipes, are straw-coloured, are also armed with short, hard, prickle-like excrescences. This species was met with in profusion by Backhouse in Tasmania. That author describes it as having stems of all degrees of elevation, up to twenty-five or thirty feet, some of them at the lower part as stout as a man's body; the

whole length clothed with the bases of old leaves, which were rough, like the stems of raspberries, closely tiled over each other, and pointing upwards. Some of the larger fronds were thirteen feet long, making the diameter of the crest twenty-six feet. The New Zealand *A. Colensoi* is a beautiful species, of smaller stature than many of its allies, and therefore more suitable for general cultivation. The small stem rarely exceeds four or five feet in height, and the bases of the short, unarmed stipes are densely clothed with silvery subulate scales an inch in length, and the rest of the stipes, the rachises and ribs, covered with lesser dark brown ones. A New Zealand correspondent of *The Garden* thus wrote of *A. Colensoi* a few years ago:—"This is a sub-arboreous fern of great beauty. Though the fronds, which are of a soft and pleasing shade of green, are of a very large size, some three feet to four feet long, and ten inches to twenty inches broad, yet the trunk is rarely of any size, so that it is a fern particularly suited for cultivation in low fern-houses. The specimen which I came upon, on the edge of the beech-hollow, was a very luxuriant one, and yet the trunk was not a foot high. From its name, the *Alsophila* ought to be a 'lover of groves,' yet, though I came across numerous specimens, I observed they were all in the open. It seems to delight on the shady slope of an unwooded hill, and it grows by preference in the moist beds of the small runnels that drain such slopes. This fern cannot be too strongly recommended for pot-culture. It is a free-growing species, possessing no delicacy, except of tint, but of a bold outline, both of frond and plant, and very soft in the texture." *A. Cooperi*, from Queensland and New South Wales, is thoroughly distinct specifically from the larger-growing *A. excelsa*, under which it was until recently placed as a variety. It has bright green, nearly naked, tripinnate fronds, with straw-coloured, warted rachises. The Norfolk Island *A. excelsa* is probably the tallest grower of all the *Alsophilas*; it is stated by Captain King to attain a height of eighty feet. A trunk cut down by Allan Cunningham measured fifty-seven feet, without the fronds. The late Mr. James Backhouse, writing of this species, says:—"The fronds are from seven to twelve feet long, and are produced in such quantity as to make this noble fern excel the princely Palm-tree in beauty. It usually has its root near the course of some main stream, but as its trunk rises to fifty feet in height, and its top does not affect the shade, like many of its congeners, it forms a striking object in the landscape." The "heart," or so-called "cabbage," at the extremity of the trunk in this and some other species, affords a coarse kind of food, which is used by the natives as an article of diet. In substance it

is like a Swedish Turnip, but is too astringent in taste to be agreeable, and is not much altered by cooking. The leathery, bipinnate fronds are dark green above, and somewhat paler beneath, the stipes and main rachis being mucronate, or covered with small raised points.

Cultivation.—All the *Alsophilas* grow well in a strong soil, a good fibry loam being best suited to them. They can be readily grown to a considerable size in even small-sized pots, that is to say, small in comparison with those required for many other large-growing ferns. In case the fronds become pale-coloured, and the plant gets out of health for lack of nutrition, a top-dressing of perfectly fresh cow-manure is of great value; the stems, too, under such circumstances, should be syringed twice a week with weak liquid-manure water. Failures in the cultivation of these and other Tree-ferns are often to be attributed to neglect in keeping the stems moist, many of the species depending principally on the adventitious roots which clothe their trunks. A thoroughly moist atmosphere throughout the year is essential to the well-being of the *Alsophilas*; under cultivation, too, shading is as a rule necessary. The temperature during summer should not descend below 60° Fahrenheit for the stove species, and may rise to 80°. During the period of growth, and particularly when the crown of young fronds is being developed, the houses should be kept close, cold draughts of dry air turning the tender fronds black. The greenhouse species require practically the same treatment as those of the stove, with the exception of the lower temperature, in which the more tropical ones would not thrive.

Actinopteris.—The genus *Actinopteris* contains but a single species, which is at once recognisable from all the other genera belonging to the tribe *Asplenie* by its flabellate habit, like the Fan Palm (*Chamerops*) in miniature. *A. radiata* has densely-tufted stipes, two to six inches long, the fan-shaped frond being an inch to an inch and a half deep, composed of numerous dichotomous segments, which are rush-like in texture, not more than one-twenty-fourth of an inch broad, and the segments of the fertile frond longer than those of the barren one. The variety *Australis* has fewer segments, which are longer, and more subulate at the point; it is a larger, stronger-growing plant, and more readily cultivated than the type.

A. radiata is found around the mouths of old wells, and on walls and rocks, throughout India, Ava, Ceylon, Arabia, Upper Egypt, Abyssinia, the Mascarene Islands, Zambesi-land, Angola, &c.

Cultivation.—In a wild state, this fern is accus-

tomed to extreme drought for a portion of each year, and the fronds dry up, and the plants look quite dead. The small crowns, however, will retain their vitality for a long time, and, if collected during the dry season, can be forwarded by post, without injury, to any part of the world. Under cultivation, however, it is hazardous to try this drying-off process, and the plants succeed well if never allowed to die down at all. A mixture of pieces of brick and lumps of fibry peat is all that is needed, taking care to place the plants, after they are potted, close to the glass, in the stove, where plenty of light can be obtained. They must, however, be sheltered from the direct rays of the sun. Plenty of atmospheric moisture is essential, and, if carefully potted, the plants can hardly be over-watered during the height of the growing season. The variety *Australis* is an especially desirable plant, of more robust constitution than the type.

The Anemias.—*Anemia*, often erroneously written *Anemia*, is a distinct and well-marked genus, containing nearly thirty species, almost all of which are confined to tropical America. The small capsules are produced in great profusion, and form a copiously-branched panicle, quite distinct from the leafy part of the frond. Amongst the few species mentioned below are representatives of the sections—or, as some authors regard them, genera—*Anemodictyon*, *Coptophyllum*, and *Anemirhiza*. We follow the "Synopsis Filicum" in treating these as belonging to *Anemia*.

A. adiantifolia, which forms J. Smith's genus, *Anemirhiza*, is characterised by its elongated rhizome, from which the stems arise in a single row. *A. asplenifolia* and *A. carnifolia* are simply forms of this species, which is found in Cuba, Bahamas, and Florida, and from Mexico to Bahia. *A. collina* has firm erect stipes, densely clothed with fine ferruginous spreading hairs; the almost leathery barren segments are sessile, six to twelve inches long by two to three inches broad, with about twelve sessile pinnæ on each side. *A. mandiocana*, like the last-named, a native of Brazil, has decidedly villose stipes six to twelve inches long, and oblong-lanceolate barren segments a foot or more in length by from two to four inches in breadth; there are twenty or more close pairs of pinnæ, and the rachises and surfaces are finely pilose. *A. millefolia*, from South Brazil, has hairy barren fronds, in shape and cutting much resembling the leaf of our native Yarrow or Milfoil (*Achillea Millefolium*). *A. Phyllitidis* has straw-coloured stipes, six to eighteen inches long, and simply pinnate, subcoriaceous, sessile, barren segments, four to twelve inches long by two to eight inches broad; this is found from Cuba and Mexico

to Peru and South Brazil. Several varieties of this species are in cultivation, the most distinct being *angustata* and *frazinifolia*. *A. tomentosa* has strong erect stipes, clothed with deciduous ferruginous hairs, and ovate-deltoid bipinnate barren segments, six to twelve inches in length by about half the width; in texture they are subcoriaceous, and, as well as the rachises, are densely pilose.

Cultivation.—The *Anemias* are readily raised from spores, and rapidly form handsome little plants. They succeed best in an intermediate temperature, and require but little pot-room. Strong, well-drained loam suits them best, and they must have a plentiful supply of water during the growing season.

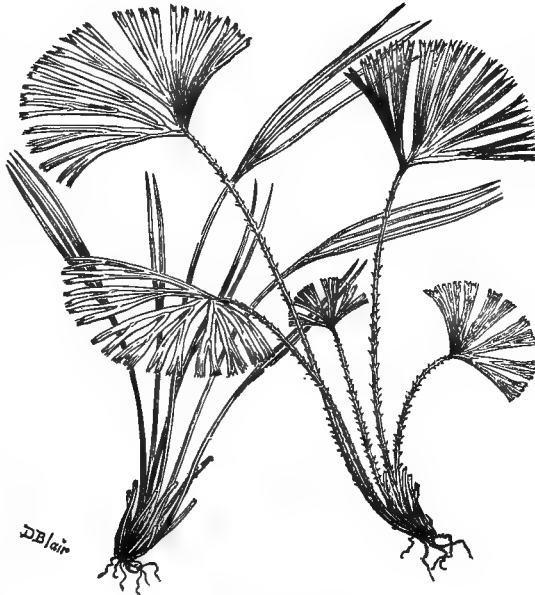
The Todeas.—

The genus *Todea* is closely related to *Osmunda*, the two genera forming the distinct sub-order *Osmundaceæ*. It differs from *Osmunda* principally in the sori being on the back of the leafy portion of the frond, and not forming a distinct panicle made up of dense thyrsoïd clusters. Only four species are known, and these are almost exclusively confined to temperate regions in the Southern Hemisphere. The genus readily divides itself into two very distinct sections, the one containing but a single species with leathery fronds, and the other three species with fronds of a pelucid membranous texture. The latter are deservedly amongst the most popular of all the filmy ferns.

T. barbara, from New Zealand, temperate Australia, Van Diemen's Land, and South Africa, has a caudex which often assumes somewhat of an arborescent character. Under favourable conditions, the aerial roots form a huge mass not unlike those seen in very old specimens of our native Royal Fern. In the Temperate House at Kew there is a remarkable specimen, which, when imported many years ago, weighed 14 cwt., and now, in all probability, is not

far from a ton in weight. The fronds, which measure three or four feet in length by about a foot in breadth, are borne on stout, erect, perfectly naked stipes, a foot or more in length. This grows freely enough in any cool conservatory, if planted in a damp spot amongst stones, &c., and freely supplied with water. It does not require shading from sunlight, and will bear several degrees of frost without the slightest injury. It is readily raised from spores, and the young plants are very useful for ordinary "furnishing" purposes, being quickly raised and not easily injured.

T. Fraseri, a rare species from the Blue Mountains in Australia, has an erect woody caudex, and fine bipinnate fronds, one to two feet long by eight to twelve inches in breadth. *T. Wilkesiana* is a variety of this species, with larger fronds, the deflexed lower pinnae being somewhat shorter than the others, and the rachises slightly hairy; it is a native of Fiji and the New Hebrides. *T. hymenophylloides* has firm, erect, naked, tufted stipes, six to twelve inches long, and tripinnatifid fronds, one to two



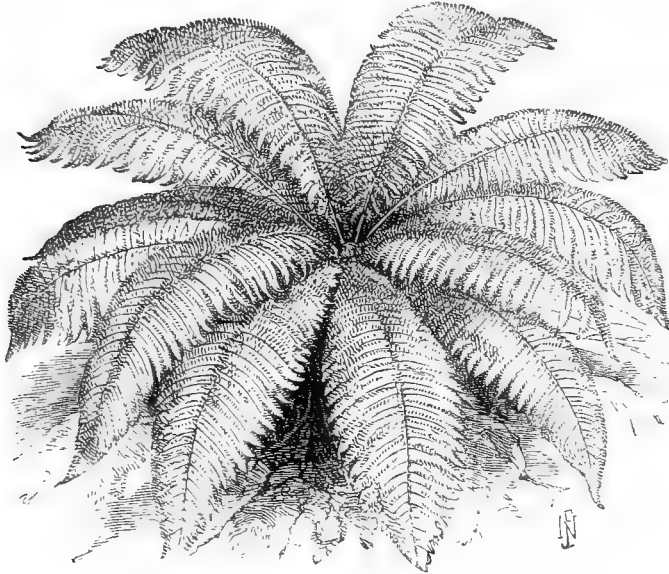
ACTINOPTERIS RADIATA.

feet long by eight to twelve inches broad; the rachises are either naked or slightly tomentose; this species is confined to New Zealand. *T. superba* is a truly magnificent fern, similar in many respects to the last, but readily distinguished by its greater size, its lanceolate fronds with deflexed lower pinnae, which become gradually smaller, and the ovate, narrower, more numerous and denser pinnae, with often crisped pinnules. This species, like the last, is also confined to New Zealand, whence large numbers of the woody crowns are annually imported to this country.

Cultivation.—No special instructions are necessary in the case of *T. barbara*, which, by universal consent, is looked upon as the true *Todea*. The three last-named species, however, are frequently regarded as belonging to a distinct genus, viz., *Leptolepis*, and

these require shade and shelter from direct sunlight and dry currents of air, and unlimited atmospheric moisture. No ferns are more easily grown if the necessary conditions obtain, and none make more beautiful objects. A house with a north aspect seems to suit them best; at any rate, given such a structure, they require far less attention than in the ordinary green-house or conservatory. A mixture of broken potsherds and sphagnum, with a little fibrous peat, from which all the finer portions have been removed by beating, suits them admirably; even this, however, is not necessary, as we have seen

rienced no ill results. Nothing could exceed the beauty of a house full of the species just named in one of the leading London nurseries, as we saw it a year or two ago. The cemented floor had a raised rim round the under side of the staging, and this was kept constantly filled with water; the plants, too, were watered overhead daily during the summer months. *T. hymenophylloides*, and the last-named species too, thrive in the open air with but little care and attention in many parts of England. There are sheltered nooks in many an out-door fernery where both would succeed well enough, with



TODEA SUPERBA.

plants thriving without potting material of any kind. Imported plants have been wedged into pots—of course, attended to in the matter of moisture, atmospheric and otherwise—and in a short time have clothed themselves with a mass of splendid dark green plume-like fronds. Sometimes thrips infest the delicate film-like fronds, and, unless these are got rid of, the plants soon become unsightly. The best way, and one which does not damage the tender fronds in the slightest degree, is to submerge the entire plants for, say, twelve hours or more in water, the same temperature as that of the structure in which they grow.

We have seen *T. superba* growing splendidly in absolutely unheated houses, where, during severe winters, the plants have been literally coated with ice for days at a time, and yet they have expe-

rienced no ill results. Nothing could exceed the beauty of a house full of the species just named in one of the leading London nurseries, as we saw it a year or two ago. The cemented floor had a raised rim round the under side of the staging, and this was kept constantly filled with water; the plants, too, were watered overhead daily during the summer months. *T. hymenophylloides*, and the last-named species too, thrive in the open air with but little care and attention in many parts of England. There are sheltered nooks in many an out-door fernery where both would succeed well enough, with

The Acrostichums.—In the somewhat comprehensive sense in which the genus *Acrostichum* is understood by the authors of the “Synopsis Filicum,” it contains above one hundred and seventy species, and embraces no less than a dozen genera which, by various other authorities, have been regarded as distinct. Indeed, in the work just mentioned, *Acrostichum* includes the whole group of polypodiaceous ferns belonging to the tribe *Acrosticheæ*, with the single exception of that remarkable and interesting genus, *Platycterium*, the various species of which are generally known in gardens as Stag’s-horn Ferns.

The Acrostichums are widely distributed through-

out both hemispheres, confining themselves principally to the tropics. They are readily recognised by the sori not being restricted to the veins only, but spread in a stratum over the under surface, and sometimes, but more rarely, upon both surfaces of the frond. Very wide divergences occur in size and habit, as well as in the veining and general character of the fronds. As it would be impossible to find space to give even a very condensed description and account of a large number of species, only the most distinct and desirable, from a purely garden standpoint, are mentioned in these pages.

A. aureum has an erect caudex, and tufted, strong, erect, glossy stipes, one to two feet in length, with leathery fronds, two to six feet long by one to two feet broad. This species is very widely spread over the tropical and sub-tropical countries of both hemispheres. In *A. crinitum*, a native of the West Indies and Mexico, the caudex is erect and woody, and the stipes of the barren fronds are densely clothed with long, slender, fibrillose, purplish-brown scales, the broad-oblong, rather leathery frond itself often measuring from twelve to eighteen inches long by six to nine inches broad. The entire edge is densely fringed, and both sides scattered over with scales like those of the stem. The fertile fronds are like the barren ones in form, but are smaller in size, and have a longer stipe. *A. cuspidatum* has a thick, woody rhizome, clothed with dense, linear-pointed, nearly black scales; the firm, erect stipes covered with deciduous, adpressed, dark-coloured scales, measuring from six to fifteen inches in length. The barren fronds are leathery in texture, and are from one to two feet long by three to four inches broad, the upper surface being nearly naked, and the lower densely matted with small, rusty-coloured, ciliated, brown scales. The fertile fronds are somewhat smaller than the barren ones, the stipes being about the same length in both. This species is found in a wild state from the West Indies to Peru. *A. graminifolium*, a recently introduced species from the West Indies, has narrow, grassy fronds, and is one of the most distinct of the smaller-growing kinds. In *A. heteromorphum*, from Columbia and Ecuador, the small, wide-creeping, filiform rhizome is clothed with small, brown, lance-shaped scales. The slender, slightly scaly stipes are from one to three inches long, and the barren fronds, of a thin but firm texture, measure one and a half to two inches in length by three-quarters to one inch in breadth, both sides being scattered over with dark narrow scales. The conspicuous raised veins, darker in colour than the rest of the frond, give this species a distinctive character. The fertile fronds are much smaller, and their stipes much longer.

A. latifolium, from Mexico and Cuba to Brazil and Peru, has a thick, woody, often creeping rhizome, clothed with crisped, lance-shaped, dark or light brown scales. The firm, erect, slightly scaly or naked stipe is from six to twelve inches long, and the very leathery barren fronds measure from nine to eighteen inches in length by two to four inches in breadth; the fertile frond, except in being considerably narrower than the barren one, otherwise resembles it. *A. angustifolium*, *A. callafolium*, *A. crassinerve*, and *A. conopodium* are varieties of this species.

A. osmundaceum, a large, strong-growing, handsome species from Tropical America, is the representative of a section in which the barren fronds are variously pinnatifid or pinnate, and in the ultimate divisions of which the veins are pinnate. This has a woody rambling rhizome, clothed with long narrow scales; the erect stipe is scaly only at the base, and the lower pinnæ of the tripinnate, dark green, somewhat leathery fronds are from one to two feet long by from four to eight inches broad.

A. peltatum is the representative of a small section in which the venation is fan-shaped, and the fertile fronds small, suborbicular, and uncut. It is an excellent garden plant, easily grown in any damp shaded stove, and especially suitable for a small fern-case. The slender wide-creeping rhizome throws up numerous slender scaly stipes, one to three inches long, surmounted by repeatedly forked, somewhat leathery, barren fronds, measuring from one to two inches each way. The fertile fronds, round and quite uncut, measure about half an inch in diameter. This is a native of Mexico, the West Indies, Peru, and Brazil.

A. Prestoni is a recently introduced species from Rio de Janeiro; it has a thick, short-creeping, woody caudex, clothed with dense, brown, lance-shaped, membranous scales; the moderately firm, lanceolate, barren fronds are from one to one and a half feet long by two inches broad, and are bordered by a dense persistent fringe of minute brown scales; the fertile fronds are much smaller, with longer stems. *A. quercifolium*, a native of Peninsular India, Ceylon, South China, and Cochin China, has a stout wide-creeping rhizome; the stipes of the barren fronds are one or two inches in length, and are clothed with soft, spreading, ferruginous hairs; the barren fronds measure three to four inches in length by one and a half to two inches in breadth. *A. simplex*, from Tropical America, is readily distinguished by its firm fronds very gradually narrowed to both ends; it has a short-creeping woody rhizome, covered with rather large, dark brown, lanceolate scales; the firm, erect, naked stipes are from one to four inches long; and the leathery barren fronds, quite glabrous on both

THE CALISAYA BARK-PLANT (CINCHONA
,CALISAYA).

A fragrant hot-house shrub, a native of Bolivia,
belonging to the natural order of Cinchonads.





THE CALISAYA BARK-PLANT
(CINCHONA CALISAYA.)

surfaces, from four to twelve inches long by three-quarters to one and a half inches broad. The fertile frond is narrower than the barren one, and on a longer stem. In a wild state the widely distributed tropical *A. sorbifolium* has a thick woody rhizome, often thirty to forty feet in length, and clasps the trunks of the trees on which it grows, like a cable. The simply pinnate, somewhat leathery fronds are from twelve to eighteen inches long by six to twelve inches in breadth. This makes a fine subject in the tropical fernery for training over tree-fern stems, or for clothing any piece of damp stone-work. *A. tenuifolium*, from the Mascarene Islands and Natal, is well distinguished from all the others by its compound fertile pinna; it has a widely rambling, slightly scaly rhizome, and simply pinnate barren fronds, three to five feet long by twelve to eighteen inches broad. The bipinnate fertile fronds have a longer stem than the barren ones.

Cultivation.—As nearly all the *Acrostichums* hail from tropical countries, few will succeed except in the stove or warm green-house. All like plenty of heat, atmospheric moisture, and a certain amount of shade. During dull sunless weather, they like almost as much light as it is possible to obtain; but during bright sunshine, the houses in which they are grown should be shaded. This serves a double purpose, for in addition to the intense light to which they object, the shading prevents rapid evaporation, and keeps the air from becoming too dry. The strong-growing kinds like loam, and those with smooth fronds should be frequently syringed. The species in which the fronds are densely clothed with hairs or scales should not be syringed or watered overhead, as they are apt to become discoloured under such treatment. Those with slender rhizomes can either be grown on raised hillocks of peat and sand with a little leaf-mould, pegging down and causing them to root wherever required, or allowed to creep at will round trunks of tree-ferns or over moist stone-work. Good drainage is an essential in every case. *A. aureum* will grow in almost any thoroughly-drained compost; if required to develop

very luxuriantly, place the pot to the depth of two or three inches in a tank of water, or stand it during the summer months in a saucer of water, which must be kept constantly replenished.

The Lomarias.—The genus *Lomaria* is a rather extensive one, nearly fifty species being described in the "Synopsis Filicum," although with narrower views as to specific distinction some authors increase that number to a very considerable extent. The headquarters of the genus is in the South Temperate zone, but there are outlying species all over the world. The close affinity between *Lomaria* and *Blechnum* is indicated by the fact that our native Hard-fern, *L. spicant*, was, and even now is still, regarded by some botanists as a *Blechnum*. The principal points of difference between the two reside in the different position of the sori and the different character of the involucre. All the *Lomarias* (with perhaps one exception) have dimorphous fronds—that is to say, the fertile ones are quite dissimilar in form from the ordinary barren ones. There is no great range of variation in the cutting, but the species vary not a little in size, colour, and habit. A number of excellent garden plants are furnished by the genus *Lomaria*, and, as a rule, they are certainly not difficult to grow.



ACROSTICHUM PELTATUM.

STOVE KINDS.

L. attenuata, a species widely distributed throughout Tropical and South Temperate regions, is a stately plant, with pinnate fronds of a leathery texture. The stipe measures from four to six inches in length, and the dark green mature fronds from one to three feet long by from six to nine inches broad; when young these are of a pleasing rosy tint. *L. ciliata*, a native of New Caledonia—from which country it was introduced nearly a score of years ago by Messrs. Veitch—is a general favourite on account of its rapid growth and distinct and elegant habit. The caudex attains a height of about a span, and the drooping fronds little more than six or eight inches. This species is allied to *L. gibba* in the swollen decurrent bases of the pinnae, but differs in its less numerous fronds, and in the much less crowded series

of pinnæ, as well as in their very apparent fringe of spinulose teeth. *L. Herminieri* has a slender elongated caudex, densely clothed with linear dark brown scales; the stipes, four to six inches in length, are strong, erect, dark brown, and covered with chaffy scales; the fronds when young are of a fine crimson colour, but change to a glossy green before they reach their full size, which ranges from nine to fifteen inches in length by three to four inches in breadth. The geographical range of this species is from the West Indies and Columbia southward to Chili. Like *L. ciliata*, it belongs to the *Attenuata* group, and is one of the few kinds which perhaps succeed better in the stove than in the cooler temperature of the green-house.

GREEN-HOUSE KINDS.

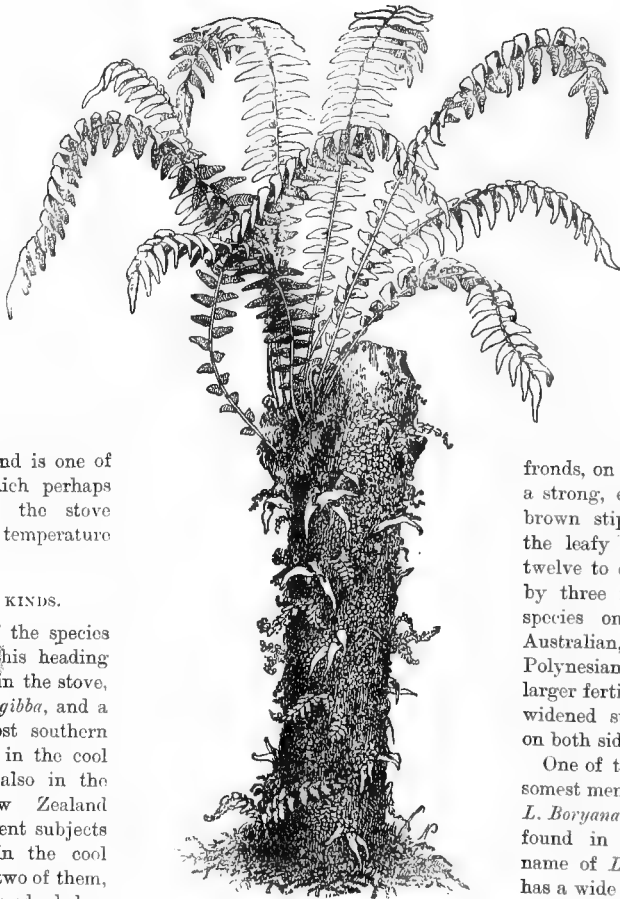
A good many of the species mentioned under this heading are quite at home in the stove, and some, like *L. gibba*, and a number of the most southern ones, do well even in the cool conservatory, and also in the stove. The New Zealand species make excellent subjects for planting out in the cool fernery, and one or two of them, which are mentioned below amongst the hardy members of the genus, can fairly lay claim to be considered hardy. Doubtless there are many favoured spots in the South and South-west of England, and in Ireland, where still more would be found to thrive out of doors with comparatively little care and attention. *L. Banksii*, a native of New Zealand, has a stout, woody, elongated caudex, the upper portion of which is clothed with lance-shaped, rust-coloured scales; the erect dark-coloured stipes, which are scaly below, are three or four

inches long, and the lanceolate barren fronds six to nine inches in length by about an inch in breadth. It is easily distinguished from all its allies by its oblong obtuse pinnæ, even the upper ones being more than half as broad as long. *L. blechnoides*, from Chili, somewhat resembles the New Zealand

Alpina, both in general appearance and manner of growth, and is especially suitable for fern cases of small or moderate dimensions. Its pretty leathery, dark green, short-stalked fronds are abundantly developed from the slender creeping caudex, and rarely attain more than six inches in length — the fertile

fronds, on the other hand, have a strong, erect, dark chestnut-brown stipe, six inches long, the leafy portion being from twelve to eighteen inches long by three inches broad. This species only differs from the Australian, New Zealand, and Polynesian *L. lanceolata* in its larger fertile frond, with pinnæ widened suddenly at the base on both sides.

One of the boldest and handsomest members of the genus is *L. Boryana*, which is frequently found in gardens under the name of *L. magellanica*. This has a wide geographical distribution, being found from the West Indies southward to the Falkland Islands and the Straits of Magellan; in Mauritius, Bourbon, Madagascar, Angola, and South Africa. Plants from the more southern localities do remarkably well in the cool fernery, and make strikingly beautiful objects if planted out and allowed to develop. As a pot plant, too, either for general decorative or for exhibition purposes, it is one of the best of all the Lomarias. Old plants assume an arborescent character, the stout, woody, erect caudex attaining a



LOMARIA ATTENUATA.

height of a couple of feet. The beautiful dark green pinnate fronds are, in well-grown specimens, about two feet long by six or eight inches broad, and the stout erect stipe is four to six inches in length.

Perhaps the most distinctive character by which to distinguish *L. Boryana* from *L. procera*—a more slender-growing species, with broader and less spreading pinnæ—resides in the very dense, long, and fibre-like scales which clothe the caudex and the lower portions of the stipes. *L. procera* is a handsome plant, with a wide distribution; in addition to some of the countries mentioned for *magellanica*, it is found in the Malayan and Polynesian Islands, New Zealand, South Australia, and Van Diemen's Land. As might be expected in such a case, a number of slightly varying forms are cultivated under specific names. Among these may be mentioned *L. capensis*, *L. chilensis*, and *L. Gilliesii*. *L. Germainii*, a charming little plant from Chili, bears at first sight a great resemblance to *L. alpina*; it is especially suitable for a small fern-case, or for planting out in an open corner amongst stones in the cool fernery. *L. discolor* is very similar to *L. attenuata*, already mentioned under the heading of stove kinds, but is usually larger, the fronds forming an elegant crown, red-brown below, the pinnules narrower, those of the fertile fronds often leafy at the base; this is abundant in Australia, Van Diemen's Land, and New Zealand. *L. nuda*, a variety of *L. discolor*, from Australia, only differs from the type in its more numerous acuminate pinnæ, in their less leathery texture, and in the chestnut-coloured, not reddish-black, stipe. *L. fluviatilis* is readily recognised from all the other *Lomarias* by the shape of its pinnæ, which are oblong, obtuse, and spreading. On account of the graceful arching character of the soft green fronds, which measure about twenty inches in length, this species is better adapted than most others for cultivation in hanging baskets; it is a native of New Zealand, Van Diemen's Land, and South Australia.

Certainly one of the most curious, as well as one of the most distinct and elegant members of the genus *Lomaria*, is the New Zealand *L. Fraseri*, which differs from all the others in the peculiar cutting of the frond. Briefly stated, it may be said to possess the frond of one of the Nephrodiums (of which our common native Male Fern furnishes a good example), with the fructification of a *Lomaria*. It is, moreover, perhaps the only species in the genus which presents fertile fronds similar in size and cutting to those of the barren ones.

Probably the most generally grown of all the species is the New Caledonian *L. gibba*, which is one of the most useful ferns for general decorative purposes, both on account of its symmetrical and graceful

habit and the rapidity of its growth. It requires, moreover, but comparatively little pot-room, and if the necessary attention be paid to watering, good useful plants may be kept in perfect health in small pots, an advantage which is appreciated by all who have to furnish large numbers of plants for indoor decoration, with at times but limited house-room. A number of garden varieties of this valuable fern have sprung into existence within the last dozen years or more; but, except as curiosities or collection plants, none can rival the ordinary wild type. *L. nigra*, from New Zealand, has a distinct and striking aspect; its fronds are herbaceous in texture, the lower pinnæ being quite separate, but a large terminal portion lobed only. Including the slender, erect, densely-scaly stipes, the blackish-green fronds altogether hardly measure more than six inches in length. This species is most at home, and appears to most advantage as well, between chinks of stone in the green-house, rockery, or fern-case. *L. onocleoides*, from the West Indies and Ecuador, is a much more rigid plant than *L. attenuata*, which it resembles in the cutting of the fronds, but the pinnæ are much shorter, and the fronds also. Although this does well in a green-house, it succeeds thoroughly as a stove plant, and perhaps might be with more justice classed as a stove fern. *L. Patersoni*, a native of Van Diemen's Land, South Australia, and the Philippines, is generally seen with simple sterile fronds about a foot in length; but when the plant is placed under favourable conditions in the green-house or conservatory rockery, its short-creeping rhizome grows freely amongst the moss-covered stones and on the moist surfaces, and fronds are frequently produced which are distinctly pinnatifid. The New Zealand *L. pumila* most resembles *L. alpina*, but it is much more delicate in texture, and the pinnæ are distinctly crenated; it is a dwarf-growing species, with slender-creeping rhizome, and is one of the best for fern-cases or rockeries of small size.

HARDY KINDS.

Foremost amongst the hardy species of *Lomaria* is our native Hard-fern, *L. spicant*, which is too well known to need any detailed description. It is abundant enough in Britain, except in easily accessible places near London and some other large towns, where, to minister to the very general love of ferns among town and suburban residents, the ubiquitous "fern collector" has cleared whole districts where once, and not very long ago, the species was to be found in profusion. Thousands of plants are annually sent to Covent Garden Market by some growers, and started in pots in a little heat, so as to form a crown of dark green fronds before any of the other outdoor, or rather hardy, ferns have com-

menced to make much growth. They form very attractive objects, and command a ready sale. Several crested forms are cultivated by specialists, and some of these are very pretty. They are, however, rather rare, as the "monstrosity" is not as a rule developed to any extent by plants raised from spores, and therefore recourse must be had to division of the parent roots, a somewhat slow process. *L. alpina* is a smaller plant than the last-named, with the pinnae, especially of the fertile fronds, broader and shorter. It succeeds admirably in pots, but planted out in the cool conservatory does still better. Under these conditions its dark metallic evergreen fronds remain perfect until after a fresh crop are developed. Now and then, when grown on the outdoor fernery, the changeable weather of the English winter discolours the fronds, but as soon as spring sets in a new set is quickly produced. The slender wide-creeping rhizomes run long distances over moss-covered stones or amongst low-growing, shade-loving plants, and no further care is required beyond establishing the plant between the crevices of cool absorbent pieces of rock.

Cultivation.—A good many of the stronger-growing kinds grow readily enough in good fibrous loam, though even some of these seem to prefer a good admixture of peat. Perhaps the safest and best plan for the more delicate species is to use a compost of loam and peat, to which should be added a little decayed leaf-mould and some sharp sand. Some authorities on Lomaria culture advocate special treatment with regard to the administration of water, and condemn unreservedly any syringing overhead. At Kew, however, where there is a large collection in excellent health, no particular care is taken to avoid syringing, and in the Palm House, where a number of species are planted out in the beds underneath the large Palms, they are being constantly wetted overhead without exhibiting any trace of injury from such a course. Stagnant moisture must, as a matter of course, be avoided, or the fronds soon become discoloured and unsightly. Due regard to ventilation is necessary, and also shading during hot and very bright weather. Taken altogether, the Lomarias are not especially shade-loving plants, and they will grow with but little care in this respect, provided the necessary atmospheric moisture be maintained. If kept too dry, red spider and thrip are almost certain to put in an appearance.

L. gibba, and the other subarborescent species, are very easily raised from spores. No difficulty will be experienced in this if the plan recommended for raising *Adiantum* spores be adopted. The ones with widely-creeping rhizomes may also be raised from spores, but they are perhaps more easily propagated by division.

FLORISTS' FLOWERS.

BY RICHARD DEAN.

The Fuchsia.—This plant is named after Leonard Fuch, a noted German botanist. It is found indigenous in several parts of South America. *F. coccinea*, one of the first, if not the first, introduced species, came from Chili. Up to the year 1823 there were but two kinds grown in this country, viz., *F. coccinea* and *F. lycioides*; the first-named remains with us to this day; the latter in all probability has passed out of cultivation. So much was *F. coccinea* admired and sought after when first seen in this country, that in a few years there was scarcely a green-house or conservatory but what was ornamented by it. In regard to the introduction of this Fuchsia to England, it is stated that Mr. Lee, then a celebrated nurseryman of Hammersmith—where his descendants still carry on their business—saw one day when he was in the neighbourhood of Wapping a pretty flower, which he purchased. It proved to be the Fuchsia, then unknown in this country. It soon became very popular, as the next year three hundred plants raised from it were sold at one guinea each. Other fine species were subsequently introduced to this country from abroad, such as *corymbiflora*, *fulgens*, *serratifolia*, and *splendens*; while some fine hybrids were raised in this country, such as *Riccartoni*, a hybrid from *F. globosa*, *Standishii*, *Dominiana*, and others.

It would be difficult to say who was the first raiser of seedling Fuchsias in this country, or what particular species were employed as seed-parents. Finding that the Fuchsia produced seeds somewhat freely, the early cultivators no doubt saved some, and discovered that the result was improved varieties. From these, other varieties of a still more advanced character were obtained. Then the art of fertilisation being better understood, this was employed, with still more satisfactory results; and so the work went on—the flowers increased in size, substance, form, and colour, until they attained to the splendid proportions we see in the present day. Up to 1855 Fuchsias were confined to what we may term two types of flowers, viz., varieties with red tubes and sepals, and violet, dark blue, and purple and plum-coloured corollas; and varieties with white or creamy-white tubes and sepals, and light scarlet, rose-coloured, and pink corollas. In that year a Mr. Story raised a variety named Queen Victoria, in which the tube and sepals were scarlet and the corolla white. This was considered a remarkable production at the time, and led to the introduction of other new varieties of a similar character. Later on there were obtained double varieties of both types, that is, in which the corollas are double instead of

being single. Both forms have their admirers, but we prefer the single varieties, both for decorative and exhibition purposes.

The Fuchsia is a plant of comparatively easy culture; during the summer months many of them can be grown in the open air. A few original species, such as *gracilis*, *globosa*, *coccinea*, and others, are nearly, if not quite, hardy, and live through the winter in the open air with little or no protection. Indeed, we may go the length of stating that the whole of those having the habit of the old *coccinea*, *gracilis*, *globosa*, &c., are well fitted for flower garden purposes, and are to be met with in many old-fashioned gardens. All the attention they require is to have the flowering wood cut away after the first frost, and a heap of ashes or any such material placed over the roots to exclude frost from them, removing it in April, and thinning out the young growing shoots in May. They grow very freely at that season of the year and soon make large specimens. In the South and West of England and in Scotland it is not unusual to see very fine examples of *F. gracilis*, *F. Riccartoni*, and others growing in cottage and villa gardens, and attaining to a great size.

The ordinary culture is by no means a difficult process. At the same time, as in the case of other flowers, much depends upon the close attention given to the plants when young and growing on into size. Except that new varieties of the Fuchsia are obtained from seed, it is propagated by means of cuttings, which can be had from the young growths at any season of the year, when they are about three or four inches long. Propagation is mainly done in early spring; old plants are placed in a brisk heat in February, when they begin to put forth young growths very freely. These are taken off and inserted in pans of silver sand, thoroughly moist, and placed in a brisk bottom heat. In three or four to six days these will be rooted; they can then be potted singly in small pots, using a light sandy soil, and when again placed in heat they soon grow into good size. By keeping them shifted and growing on, excellent plants can be had by the end of May. This is the plan adopted in nurseries where Fuchsias are largely grown. But as there are many lovers of the Fuchsia who do not possess bottom heat in spring, and who wish to propagate favourite varieties of Fuchsias, we may recommend these to place their plants in the warmest and sunniest part of their green-house in spring, and as soon as the young growths are four inches long, let them be taken off just below a joint, inserted in light sandy soil, six or eight cuttings in a pot, placed under a bell-glass, and shaded from the sun when necessary. In a fortnight or so these should have made roots,

and they can then be potted off as above directed, and grown on into size as fast as possible.

The Fuchsia is a somewhat gross feeder, and as soon as the plants begin to attain size they should be treated to a compost with which are mingled some good manure and leaf-soil; and when the plants are placed in pots five inches in diameter, and a good soil is employed, they will flower in July, and continue to do so till November; but the plants will be greatly helped by the occasional employment of a little weak manure-water, or by placing on the surface of the soil once a fortnight or so a slight dressing of Clay's fertiliser—one of the best artificial manures we can recommend to the attention of amateurs. During the time the young plants are making growth, if the weather be bright and sunny, the specimens will be greatly helped by syringing them overhead twice a day, as while it greatly assists the plants it also tends to keep the foliage clean. This is a matter of great importance. If green-fly be allowed to infest them they very soon cease to grow robustly, and therefore it is necessary this insect pest be kept under by means of syringing, and fumigating with tobacco-smoke. And on no account should the rapidly-developing plants be allowed to become root-bound; if this should happen and watering be not attended to, the leaves will turn yellow and fall off and the plants become spoiled. Therefore they should be re-potted as soon as the roots touch the sides of the pots, until they are placed in a size large enough for them to flower in, and then the closest attention should be paid to the matter of watering and cleanliness.

The Fuchsia requires a great deal of water when growing vigorously, and must not be denied it. In the summer time we have found it a good plan to stand our plants out in the open air, in some place, where they can be shaded from the sun at the hottest part of the day. Then in late summer, when Pelargoniums, Balsams, &c., are over, they will make a green-house very gay until the Chrysanthemums show their flowers. As to the shape of the plants, the pyramid style is the best that can be adopted, and by means of a judicious pinching back of the young shoots the cultivator can grow his plants into almost any shape he pleases. The pyramid or bush style is decidedly the best.

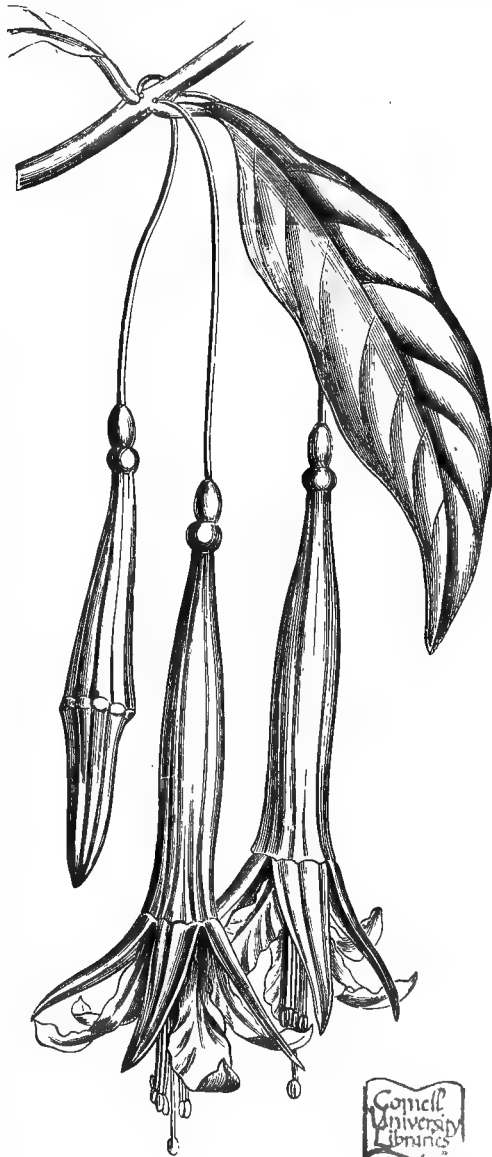
In some parts of the country, and especially in the West of England, Fuchsias are grown to a great size for exhibition purposes; we have seen specimens eight feet in height, the plants covered with luxuriant foliage, and overlaying this quite a sheet of fine flowers produced in large clusters. At Trowbridge, in Wilts; at Devizes, and also at Bath, as well as at other places, can these magnificent plants be seen; and to those who are accustomed to

see somewhat small and ragged specimens at flower shows, they come as an unusual revelation of the cultivator's skill. Some of the plants are four and five years old, and some as many as eight or nine. One of the most successful of these West of England exhibitors has furnished us with an outline of his culture, as follows:—"I consider the end of March or the beginning of April the best time to propagate the Fuchsia. I select some of the most vigorous cuttings I can and place them singly in thumb-pots, putting them in a cucumber-frame, where there is a brisk bottom heat; when the roots reach the sides of the pots I re-pot, and continue to do so until the first or second week in July, pinching out the leading and side shoots, in order to get the plants into the shape I want. Then I allow them to flower in the autumn. These plants I can exhibit the following summer. I have shown specimens at eighteen months' of age that were four feet through and eight feet high, well grown and freely flowered. As a rule the plants I exhibit are from one and a half to five years old, according to the variety; after that age I throw them away and replace them by young plants. About the end of October, when the plants go out of flower, I prune them all back to two or three joints beyond where they were pruned

the previous year. They are then placed in a house to winter and kept moderately dry. In January,

or the first week in February, the plants are turned out of their pots, the soil shaken from their roots and re-potted—the young specimens into pots known as 'fourteens,' and the larger specimens into 'sixteens,' which are somewhat larger. The compost I use is made up of two parts good fibrous loam, and the third part composed of leaf-mould, a little peat, some rough silver sand, and a fair amount of well-decomposed cow-manure. This is well mixed together before using, and when potted the plants are placed in a cold house, but from which frost is excluded, where they remain until the first week in June. Then they are placed out of doors on a surface of ashes, standing each pot on a piece of slate, and syringing the plants every day in hot weather to keep the foliage clean and fresh; and at this time I give the manure-water once a week. I make my manure-water by placing fresh cow-dung or horse-droppings, or soot, in a tub of water, and allow it to stand ten days before using, and then I give the plants a thorough good soaking

when it is applied. In this way I grow very fine plants for exhibition, which are the admiration of all who see them."



FUCHSIA VENUSTA.

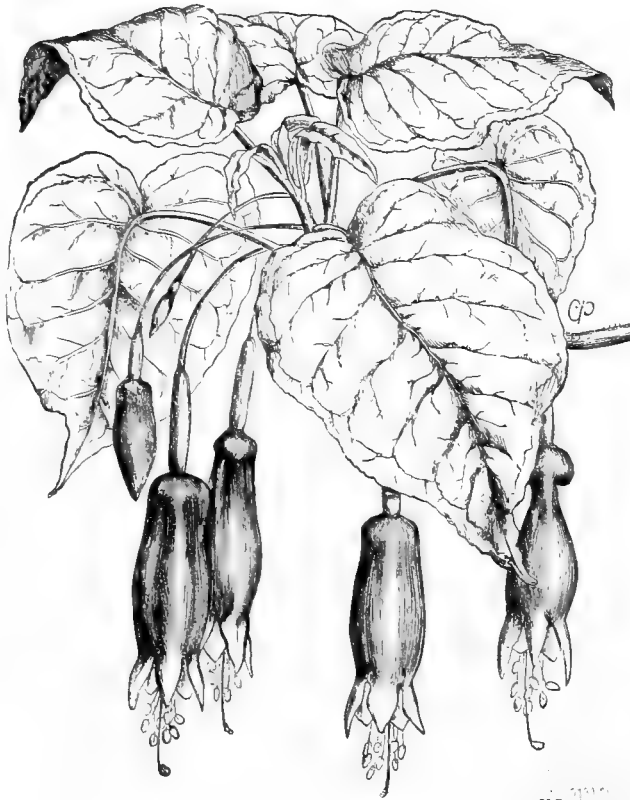


Some persons are very fond of Standard Fuchsias, and when these are on stiff stout stems, four feet in height, surmounted with free-growing heads of foliage and covered with flowers, they are very handsome indeed. Any one can form the Standard Fuchsia simply by taking a young plant with a straight main stem, and cutting away all side shoots, leaving only the leading one. When this reaches the height of four feet or so it should be stopped, and then encouraged to break out in side shoots only at the top, and with these a standard head can be formed. Standard Fuchsias are very effective indeed in a conservatory. Some gardeners place their old plants of Fuchsias in pots, and then stand them on the front stage of a green-house, training the shoots up on to the roof, where they spread out and form quite an inside covering, producing an abundance

of flowers for several months. Old plants can also be planted against sheltered sunny walls in the open air, where they have an excellent decorative effect, and unless a very severe winter happens, will last for years. Fuchsias can be used in many ways in the garden; beds of young vigorous plants have a very pretty effect and make charming masses when a number of varieties are placed in a group. They can also be used to grow in pots inside or outside windows; they do well planted out in boxes placed on the outside window-sill. In cottage windows many very

fine Fuchsias are grown, and they flower with great freedom. The Fuchsia does well in the crowded parts of cities and towns, when grown in pots, but owing to absence of sunlight it does not flower very freely. It is a plant that loves light and air, and especially the sunlight.

Thousands of Fuchsias are grown for market in the neighbourhood of London. They can be seen in Covent Garden and elsewhere, pretty little plants laden with blossoms. They are produced in a few weeks; it is rapid production that enables the plants to be sold so cheaply, and it is wonderful what charming plants a market grower can produce in quite a small pot. They are all from spring-struck cuttings, and they are ready for market in three months or less. There is no more instructive or interesting sight than a walk through



FUCHSIA SPLENDENS.



one of the large nurseries where plants are largely grown for market purposes. The energy of production is truly astonishing.

New varieties of Fuchsias are obtained from seeds. A few growers pay great attention to the production of seedlings, and from the best of these, our list of named varieties is augmented. The operation of fertilising the flower is very easily performed in the case of the Fuchsia, and if improved varieties are to be obtained it can only be by careful fertilisation. The pistil of the Fuchsia is always

prominent, and the pollen plentiful. In selecting flowers for crossing with each other, it ought always to be borne in mind that those bearing seed will communicate their habit of growth and general character to their seedlings. Having selected the flowers to operate upon, the stamens should be cut out as soon as they open; and when the blossoms are fully expanded, the pollen from the pollen parents must be applied, and the flowers so operated upon should have something tied round their stems to distinguish their seed-pods. When they are ripe, the seed can be separated from the pulp which surrounds them by washing them in clear water; the good seed will sink to the bottom.

The seed can be sown in spring, in a pan or pot of light soil, which can be placed in a green-house. A great deal of heat is not required to induce the seeds to germinate, and they do this somewhat quickly. As soon as the little plants are large enough to handle, they require to be potted singly in small pots, and placed in a light airy situation, and on no account should the plants be allowed to become drawn and lanky. The plants should be shifted two or three times into larger pots, but it will be found that pots four or five inches in diameter will be large enough to flower them in. Not a shoot should be removed until the plants bloom. The principal object of the raiser should be to mature the plants as quickly as possible so as to induce them to flower. This they will do in many cases the same season, and such of the seedlings as promise to be good should be saved for another season's growth, and the inferior ones rejected. When the plants have done growing the foliage will drop off, and they should then be sparingly watered, and be kept pretty dry all the winter, and out of reach of harm from frost. The following season, as soon as they begin to show signs of activity, they should be freely watered, but not shifted, be placed where they can have plenty of air and light, and shifted only when they begin to flower. It is a good plan to plant the seedlings out in a bed in the garden when all danger from frost has passed; the colours come brighter and more distinct, and the raiser is better able to form an estimate of their value. It is well to have this bed placed in a situation where it can be shaded from the sun, and then a good opportunity will be afforded for the raiser to thoroughly test and make a suitable selection from his seedlings. We have already touched on the great interest attaching to the raising and blooming of seedling plants. It is an occupation of an exceedingly pleasing character.

The illustrations will show, to some extent, the quite different types of flower in cultivation, though

neither is a very modern variety. There are a section of long-tubed varieties, represented by *F. Venusta* (the Beautiful Fuchsia). This is one of the oldest varieties in cultivation, having been introduced from Mexico half a century ago; but is now very scarce, though of late it has again been sought after in several quarters. The colours are crimson-purple. Other handsome long-tubed sorts are *Dominiana*, *Corymbiflora*, *Fulgens*, and *Serratifolia*, all of which are very distinct in character. The other variety illustrated, *F. splendens*, was introduced from Mexico about the year 1841, and it still remains a favourite. It will be seen that the flowers are quite different from the others and much shorter; they have a scarlet tube and green sepals.

LIST OF VARIETIES.

Single Varieties with Red Tubes and Sepals, and Dark Corollas.

Alfonso. Charming. Duke of Albany. Enoch Arden. Gazelle. General Garfield. General Roberts. Henry Brooks. Improvement.	James Huntley. James Lye. James Welch. Mr. J. Huntley. Mr. King. President. Sir Bartle Frere. Spittre. Wave of Life.
--	--

Single Varieties with White Tubes and Sepals, and Pink, Rose, Carmine, and Scarlet Corollas.

Beauty of Clyffe Hall. Beauty of Trowbridge. Blushing Bride. Harriet Lye. Lady Heytesbury. Lye's Favourite.	Lye's Perfection. Marginata. Mrs. Bright. Mrs. Marshall. Prince Alfred. Princess Beatrice.
--	---

Single Varieties with Red Tubes and Sepals, and White Corollas.

Cannell's Gem. Delight. Flocon de Neige.	Mrs. E. Bennett. Mrs. Mein. Tournefort.
--	---

Double Varieties with Red Tubes and Sepals, and Violet, Blue, and Purple Corollas.

Alfred Dumesnil. Avalanche. Champion of the World. Gem of Ipswich.	La France. Marvellous. Monument. Sir Garnet Wolseley.
---	--

Double Varieties with Red Tubes and Sepals, and White Corollas.

Frau Emma Topfer. Gustave Doré. Madame Jules Chrétien.	Minstrel. Mrs. H. Cannell. Nellie Morton.
--	---

Various Species and Varieties of Fuchsias for Conservatory Decoration.

Albo coccinea. Corymbiflora. Dominianum.	Fulgens. Serratifolia. Splendens.
--	---

Fuchsias with Golden and Variegated Foliage.

Aucubifolia. Cloth of Gold. Meteor.	Pillar of Gold. Regalia. Sun-ray.
---	---

ROCK, ALPINE, FERN, AND WILD GARDENING.

ALPINE PLANTS.

BY EDWARD W. BADGER, F.R.H.S.

ALPINE PLANTS may be described popularly as the plants of lowly growth which naturally occupy the mountainous regions in most parts of the earth. In their native homes they are usually during a part, often a large part, of every year, protected by a thick covering of snow from the effects of the inclement weather which almost invariably prevails for many months at a time at high altitudes. The plants of these regions, which are so prized and admired for their gem-like qualities, are, for the most part, only a few inches high, and yet their roots usually penetrate to a great depth, whereby they are able to withstand the burning sun of the short, but trying, summers which prevail in most Alpine regions. Ignorance or forgetfulness of these circumstances is probably a chief cause of frequent failures to grow these lovely, diversified, and interesting plants in many English gardens, where they are often placed on ill-made rockeries, in which neither sufficient root-room is provided, nor suitable protection afforded to compensate for the absence of the conditions which prevail in their natural habitats.

The plentifulness of these plants in their native homes is a striking illustration of the Darwinian generalisation of the "survival of the fittest"; their lowly stature and their compact growth, which keeps them close to the surface of the soil or rocks, are, doubtless, conditions secured for them by the sifting processes of nature, which during long ages have eliminated from the Alpine flora all the plants incapable of existence under conditions which, however congenial to the plants which are found to thrive at high altitudes, are destructive of others of larger size. The struggle for existence which goes on everywhere limits the vegetation of elevated regions for the most part to such plants as those now under consideration, and yet there is scarcely one of them which may not be grown in most English gardens if suitable conditions are provided for them. It is our purpose to set these forth briefly and plainly, and to mention some of the plants which are best adapted to adorn the gardens in which they are grown, and to yield much pleasure to the intelligent cultivator.

Alpines grow naturally on the surface and among the crevices of mountain-sides, where a great depth of soil affords ample space for the roots to ramify as far as necessary to obtain a sufficient supply of suitable food. The natural position of these plants is usually such, that an annual top-dressing of soil is brought to them by rain or melted snow. The suc-

cessful amateur bears these facts in mind when he undertakes to grow Alpines in his garden. He so makes his rockery as to provide abundance of soil of the right kind, that the plants may not lack food; he makes it deep enough to cradle the roots to travel away from the surface, so that spells of dry weather may not hurt the plants; where necessary, he gives an annual top-dressing of suitable soil; and he so arranges stones—limestone, or sandstone, or whatever kind is obtainable and fit for the purpose—that the conditions most favourable for the plants may be secured. In forming a rockery, he does not build up a miniature mimic mountain range, but rather as fair an imitation of such a piece of Cumberland fell-side or of some mountain slope in Wales, Scotland, or Switzerland with which he is familiar as suits the place he has to fill, and the special circumstances of his surroundings. He always keeps the type characteristics of his pattern-piece of natural hill-side well in mind, and adapts them as best he can to his own requirements, which will, of course, vary more or less in every case.

Soil.—The first requisite for success is good soil, in sufficient abundance, and of such kinds as the varied requirements of the plants he wishes to grow may necessitate. One of our best authorities says that a depth of "three feet is not too much for most species, and it is in nearly all cases a good plan to have plenty of broken sandstone or grit mixed with the soil. Any good free loam, with plenty of sand, broken grit, &c., will be found to suit the great majority of Alpine and dwarf herbaceous plants, from Pinks to Gromwells or Gentians; but peat is required by some, as, for example, various small and brilliant rock-plants like the *Menziesias*, *Trillium*, *Cypripedium*, *Spigelia marilandica*, and a number of other mountain and bog plants. Hence, though the general mass may be of the soil above described, it will be desirable to have a few masses of peat here and there

. . . . The soil of one or more portions might also be chalky or calcareous, for the sake of plants that are known to thrive best on such formations, as the pretty *Polygala calcarea*, the Bee Orchis, *Rhododendron Chamæcistus*, &c.³³ This is admirable advice, and may be safely followed. Our own practice has been just that described above, and we have grown Alpines of almost all kinds with nearly unvarying success. The plan of growing Alpines in "pockets," which will be described further on, enables the special requirements of any given plant to be provided for at the smallest possible cost in money and trouble, and in a very simple manner.

Situation.—The best position for the larger number of these plants is one fully exposed to the sun. There are some which delight in partial shade,

but these are exceptions to the general rule. The shade of trees or walls is to be particularly avoided; and while many of the plants are extremely accommodating, and may be grown almost anywhere, there are others so exacting in their requirements that they will not brook the presence of any rival in their own domain, and will fail to thrive if they have not a full share of sunlight. The plants which are so exacting are also usually those whose intrinsic beauty is such as will repay the fullest attention to their wants. The situation should be somewhat elevated above the ordinary ground-level; it should not have a uniform height of surface, or it will be monotonous in appearance, but should rise and fall in gentle undulations, as is generally the case in a natural Alpiny. One of the reasons for the situation being somewhat elevated is that good drainage is so secured, which is an essential condition of success with a large number of these plants, especially during our damp winter months, when the presence of stagnant moisture would be certain to insure their speedy death. On the other hand, a condition of comparative dryness at this season of the year is distinctly beneficial. A somewhat elevated position brings the plants during the blooming period closer to the observer's eye, which, as they are small, and generally very beautiful, is a manifest advantage. But do not let it be supposed that we for a moment recommend anything like a pinnacled formation for the rockery: that under all circumstances is to be most carefully avoided.

Watering.—As the rockery is to be above the ground-level, and fully exposed, the soil during dry weather will rapidly lose its moisture. It is, at the same time, absolutely necessary, in order to keep the plants in health, that they should never suffer from drought. In their native homes, the hot sun, while it dries the soil about the plants, melts the snow at higher altitudes, and so yields the roots a supply of life-sustaining moisture at the time when it is most required. In our gardens, or in many of them, this supply of moisture must be provided artificially. Where possible, a hose laid on to a water service will be found the most efficient means of watering; but where this is not attainable, the water-barrow and watering-can, or some other contrivance, must be used instead. In some way water must be applied freely during the growing period; not in small dribbles, just moistening the surface, but plentifully, so as to sink down some distance into the soil, and reach the roots (however deep they may run), which must never during the summer be allowed to suffer from dryness. Such a watering as we have described will need repeating at intervals, shorter or longer according to the season; but one such watering will be far more beneficial than a number of surface sprinklings,

such as many amateurs usually, but erroneously, think sufficient.

The Rockery.—In common-place rockeries, stone of some kind, or whatever is used as a substitute for stone, constitutes the most prominent feature; whereas it should be an almost invisible adjunct, though a most necessary and useful one, just as our bones are to our bodies. Our own rockery, on which we grow a great variety of Alpines, occupies three sides of a small lawn, and faces respectively the south, west, and east. It is protected from the north by a fence, which on the south side is planted with a variety of climbing plants, many of them evergreen, so that at all seasons it forms a pleasant background. The longest side of the rockery is in front of this fence, and consists of a border of varying width, from seven or eight feet to three feet. At irregular intervals, at the broadest points, *Retinosporas*, *Skimmias*, *Pernettyas*, &c., are planted in the background, while hardy heaths occupy more forward positions. In front of these plants is the rockery proper. It varies in surface-level, but changes from one height to another gently, never abruptly. In forming it, the first step was to place endwise thin slabs of red sandstone (which is plentiful in our neighbourhood) at the front of the border, and close up to the grass. These slabs constitute what may be called a permanent dwarf boundary-wall between the grass and the border, varying from six inches to a foot or so in height. It is so constructed as to seem a natural outcrop from the grass. It permits of the grass being mown close up to it, and the proximity of the lawn enhances the beauty of the plants grown in the border, while with a moderate amount of attention the dwarf wall is a most useful ally in preventing the encroachment of the Alpine plants on to the grass. Except when first forming the rockery, the stone constituting the front boundary-line was not intended to be seen, and rarely has been. Overhanging plants, such as *Saxifrages*, *Sedums*, &c., were planted close at the back of it, and now hang downwards to the grass. These are from time to time, as necessary, kept within bounds, and supply a varied and beautiful covering for the stone, green and pleasant to the eye even in the depth of winter, and masses of flowers during the spring and early summer months.

The next step was to fill the border with suitable soil, and so to form the foundation of the rockery. The soil was placed so as to afford the surface outline, or contour, which we considered most suitable to the position. Nowhere does its height exceed twenty-four inches above the general level of the border; but in no part is there a less depth of good soil than two feet six inches; in the

higher parts it is from twelve to eighteen inches deeper. The next step was to introduce the stone so as to provide the skeleton of the rockery. Some of these stones were arranged so as to form fissures, which are necessary for many plants. Others were so placed as to appear to grow naturally out of the surface, and provide many nestling-nooks for those plants which need such protection. Every stone was fixed in such a manner that it would conduct all moisture falling upon it which it did not absorb to plants growing at its base. Consequently no stones were allowed to overhang the surface of stone or soil lying at a lower level—a common error, which has led to the destruction of many a valuable gem. Wherever possible, the stones were placed so as to form pockets, edged on all sides with stone, which we have found very conducive to the health of most plants, inasmuch as the roots have been kept cool by the moisture held by the stones. Moreover, whenever a plant has grown too big for its pocket, we have found it easy to lift it bodily from the pocket, divide it, and re-plant so much of it in its former home as we found suitable. These pockets have another advantage: when a special compost is needed for a plant, we simply remove the ordinary soil from a pocket, fill it with the required compost, and the plant is thus supplied to its liking at the least possible cost.

This rockery, Alpine border, or, as old Maund, in his "Botanic Garden," suggests it should be called, "Lapideum," has now for years past been a source of great interest and pleasure to ourselves and many friends, not a few of whom have been led to imitate it in their own gardens. From January to December it always affords some objects of interest to tempt one into the garden, and there cannot be a doubt as to the ever-fresh pleasure it yields in those portions of the year when flowers in the ordinary borders are scarcely to be seen. Bulbs in great variety have been freely planted among the other plants, and for such are scarce, the plan adopted of setting apart pockets for them has been found to answer admirably. They are secured from the spade of the gardener, and come up year after year with fresh and often increased vigour. From March to July this rock border is at its best; the plants in bloom are innumerable, and their charms are most diversified in character; a single genus even, such as the Saxifrages, for instance, yields foliage and flowers greatly differing from each other in appearance, but all alike in being beautiful.

Large Rockeries.—Where sufficient space is available for, and it is desired to form, rockeries on a larger scale than would be admissible in ordinary-sized gardens, for which the plan just described is chiefly intended, much bolder effects can be obtained,

and more ambitious imitations of rock scenery may be prudently and successfully attempted. One of the most perfect and instructive rockeries of this class is at York, and constitutes an object of ever-increasing attraction to visitors to that city. The origin of this rockery seems to have been due to what may be called an accidental circumstance, as may be gathered from the following description:—"About thirty years since, there resided in the county of York a young man of delicate health, but with an extremely active and observant mind. It was about the year 1851 that he, in company with some relatives, visited Norway, with the hope that the wild scenery and the Norwegian mountain air would be the means of restoring his health. It was while on this visit, I believe, and also in rambling over our Cumberland and Welsh mountains, that he acquired a real and lasting love for Alpine flowers. On his return home the thought occurred to him, 'Why cannot we, by constructing rock-work, bring as it were the mountains (in miniature) into our gardens? We should then, I feel persuaded, be able to cultivate these beautiful Alpine flowers, by being able to place them in similar positions to those in which they are found in their native homes.' This idea he carried out with great artistic, but, at the same time, a pleasing natural taste. The rock-work completed, importations of plants were then made from various parts of Europe, which were planted and watched with loving interest and care."

Another rockery on a grand scale is at Darley Dale, in Derbyshire, where Sir Joseph Whitworth has utilised some stone-quarries near to his mansion so artistically as now to present the appearance of natural picturesque rockeries of great extent, where bewildering numbers of plants have been so suitably disposed as to give the visitor the impression that he is gazing on a piece of Nature's daintiest handiwork. There are, it is needless to say, numberless other instances of fine rockeries in many public gardens, and in the private grounds of the nobility and gentry in all parts of the kingdom. The rockery at Kew is an instance of a most successful kind, accessible to every one, which may be studied with advantage by all; so, too, is the small but well-furnished rockery near the large viney in the gardens of the Royal Horticultural Society at Chiswick, on which Mr. Barron skilfully grows an immense variety of most interesting Alpines, and of which a portion is shown in the coloured plate.

In districts where natural rocks, by a judicious removal of the surface soil, can be made use of in forming rockeries, some very fine effects may often be obtained at a trifling outlay, where a man of correct taste has the superintendence of

the work: this, indeed, is a very necessary condition of success; and, fortunately, it is not now so difficult as it was a few years ago to obtain efficient services in designing and forming rockeries which shall be successful from all points of view. The leading idea which should prevail everywhere is naturalness allied with suitability, avoiding all extravagances, but boldly using every local advantage to the utmost extent. Where water is at command, it will always be found a valuable ally. A trickling rill along a rocky bed will admit of the growth of plants which otherwise must be excluded: such, for instance, as aquatic and such bog-loving plants as depend for their existence on an ever-present supply of moisture. Stepping-stones, fringed and bossed with suitable plants, and picturesque bridges may oftentimes be advantageously introduced; here and there, too, a place may be found for a tiny pool, the bed and margins of which will provide a congenial home for many interesting plants, adding variety in form of foliage and flowers, and so increasing the pleasures of the garden, while the pool itself will act as a foil to the quick-flowing rill, and introduce the elements of peacefulness and contemplativeness amid scenes of hurry and precipitancy. Such contrasts are almost always pleasing, provided they are introduced judiciously.

The construction of such large rockeries as we are now referring to will rarely or never be attempted by the amateur without the aid of a skilled professional gardener; and there is consequently no necessity on this occasion to give detailed instructions for their formation. But any amateur who desires to make a successful attempt at constructing a rockery of any pretensions without professional aid, will find time and money well spent if first of all he visits and patiently studies some of the well-made artificial rockeries within his reach, and then devotes his summer holiday to wandering among our native hills and mountains, or, still better, among those of Switzerland, ascertaining how Nature grows Alpine plants, and familiarising himself with the principal characteristics of a natural rockery. During such a ramble as we are recommending the observant eye will learn many lessons which will prove invaluable, and are scarcely to be acquired in any other way.

THE VINE AND ITS FRUIT.

BY WILLIAM COLEMAN.

DISEASES TO WHICH THE VINE IS SUBJECT.

OF all the exotic fruits under hot-house culture, the vine is subject to far more diseases than any other. First and foremost stands the disease known

to gardeners as "shanking;" then there are mildew, rust, scalding, bleeding, fungus on the roots, warts on the leaves, and aerial roots; but as these are less difficult to deal with, and may be averted by good detailed management, the first and most prevalent affection claims our earliest attention.

Shanking.—This perplexing enemy to grape-growers puts in an appearance just when the berries begin to change colour, and it continues more or less active until the crop is ripe. On its first appearance a slender black thread is detected round the stalks of the berries, further growth is arrested, the stalks lose their vitality, and the berries become intensely sour, and shrivel into what are not inaptly termed vinegar berries. Sometimes a few berries in every bunch shank; at other times a whole bunch goes, and in very bad cases the crop is completely ruined. It is generally admitted that shanking is more prevalent in late houses than in early ones, where a large portion of the roots are inside, and having the benefit of a genial bottom heat, get thoroughly ripe, firm, and woody before the vines go to rest in the autumn.

That shanking may be caused by some sudden shock or derangement of the system there is little doubt. It may be that the foliage has been prematurely destroyed by red spider; the vines may have been overstrained in preceding years; checks and chills may have been produced by bad ventilation; or it may be that the borders have been kept too dry. One or all of these ills combined might produce severe shanking, and it is by no means improbable that some of them exist at times in every vineyard, and contribute their share to the failure of the crop; but they are not the primary cause of shanking.

If twenty borders which produce shanked grapes were examined, it would be found that the majority, if not all of them, were composed of too rich materials containing an excess of organic matter, in which the vines grow with great luxuriance, but fail to ripen their wood. The roots, although plentiful, would not be firm, hard, and fibry, but soft and fleshy, like those of Asparagus, and being unripe, would perish right back to the main roots in the winter. The next season a new supply of young roots or feeders would have to be made; but the borders being cold, rich, deep, and wet, they would be late in forming and quite incapable of maintaining the early growth produced and supported by the stored-up sap of the previous year. This, the first check, would take place about the time the grapes are stoning or approaching that stage. The crop, lightened by wholesale shanking, would throw the vines into a long-jointed vigorous growth; the roots

would again persist in growing late in the autumn, and so this unsatisfactory state would go on from year to year, each year getting worse, as the roots would be penetrating deeper into the subsoil. When this perplexing and disappointing collapse sets in, many years' experience justifies the assertion that there is but one never-failing remedy, and that is to raise the roots and re-lay them in new compost. If carefully performed, and over-cropping is avoided, a change will take place as if by magic: but once let the roots descend into the subsoil, and shanking will again put in an appearance.

In low, cold situations, where the borders are deep and tenacious, the drainage may require turning over, raising and ventilating, and the compost may be made more porous and less rich by the addition of an extra quantity of old lime rubble, burnt earth, or road-scrappings. In such a border the growth may not be so strong or pithy, but it will be hard, firm, and short-jointed, and the roots will be well ripened, and capable of performing their proper functions when the stoning process again comes round. What is wanted is a warm, well-drained border, full of hard fibry roots that will ripen with the foliage, rest with the vines—if vines ever do rest—and produce thousands of hungry mouths ready to devour plenty of stimulating food when the vines are carrying a crop of fruit.

Mildew (*Oidium Tuckeri*).—This fungoid growth is comparatively new to grape-growers in this country. It attacks the young leaves and fruit both in vineries and in the open air, and if not speedily arrested very soon destroys the crop. In cold, unfavourable seasons the entire crop in wine-growing countries is frequently ruined by it. When mildew first appears the young leaves look as though dusted over with fine white powder. From the leaves it extends to the fruit, and so rapid is the progress that a few days will suffice for its spread over every vine in a large house. Like all other fungoid growths, although the spores may be present, it cannot make any progress unless the conditions favourable to its development are produced. Dryness at the roots, a low, cold, damp atmosphere in badly-ventilated houses—one or both combined are most likely to bring them into activity, when, if once allowed to get thoroughly established, the extirpation is attended with great difficulty. When mildew attacks vines under glass the borders should be examined, and if at all dry, thoroughly supplied with water; then the only effectual agent—flowers of sulphur—should be applied, either as a wash to the hot-water pipes, or in a dry state with a dredge or sulphurator. The niggardly system of keeping the house close and damp to save fuel must give way to liberal firing

and judicious ventilation; and last, but not least, the most generous treatment must be given to the vines. By the liberal use of water to the roots and sulphur in the atmosphere, the mildew itself may be arrested, but its effects remain, as the cuticle is completely destroyed, turns black (Fig. 30), and the berries soon crack and perish. In gardens subject to this *Oidium*, prevention being better than cure, Gishurst compound or soft-soap and sulphur should always be used for washing the vines before forcing is commenced, and sulphur should be used with quicklime for washing the walls. It may also be advantageously applied in the form of vapour in the following manner:—On a fine evening, heat the pipes until they are uncomfortably warm to the hand, then paint them over with a mixture of sulphur and skim milk, to which a little soft-soap may be added. Air the house early the following morning, and repeat the process the next evening if necessary. The modern method of applying the fumes of sulphur consists in sprinkling flowers of sulphur over lumps of fresh-slaked lime laid on the floor; but it is dangerous, and should never be heated above 150° or 160°, as anything above those figures might prove too strong for the tender foliage. On no account should sulphur be sprinkled on heated irons or shovels, otherwise sulphuric acid, which is produced at a temperature of 232°, will quickly put an end to all life, animal and vegetable. Neither should sulphur be used on the hot pipes before the grapes are thinned, as the tender cuticle of the berries is often injured by the fumes.

Rust.—This can scarcely be termed a disease, as healthy vines, under good management, are never affected by it. There are several causes assigned for its appearance; first and foremost being the application of sulphur to the hot pipes for the destruction of spider or mildew. The sudden admission of cold draughts of air when the house is very hot, and the tender young berries are moist, and most sensitive to rapid depressions of temperature, will also bring about this affection; while touching the berries with perspiring hands during the process of thinning, or rubbing them with the hair when working amongst them, anything in fact of a greasy nature, which injures the tender cuticle, results in rust. The berries do not, however, cease to swell, but they never lay on bloom, and look very unsightly and unwholesome as they grow older, and the roughness of the skin becomes fully developed. To avoid the pernicious influence of antidotes for other diseases, sulphur should not be applied to the pipes, if it can be avoided, until after the grapes are stoned, and then it should be applied when the berries are thoroughly

dry. Muscats and those tender delicious kinds, White Frontignan, and Duchess of Buccleuch, are often badly rusted by sulphur, if applied when they are ripe or approaching that stage.

Scalding (Fig. 31).—This is a disease which affects certain kinds of grapes, always at one particular stage of their growth. Lady Downes and Muscats are most subject to it, and it always attacks them during the time they are finishing stoning. In fine, steady weather, the disease is very slight; but during hot oppressive days, notably when the atmosphere is charged with electricity, the bunches

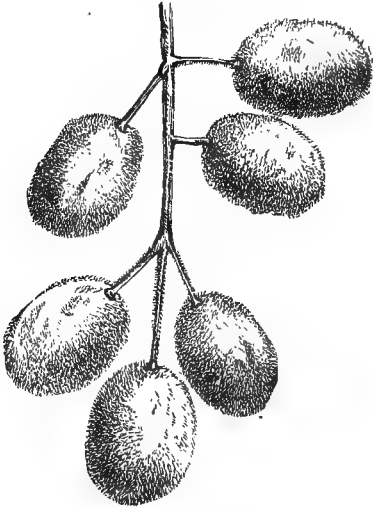


Fig. 30.—Mildew.

suffer severely. The berries suddenly become depressed and puckered on one side; the kernels seem to ferment, and in a few hours they look as if they had been syringed or touched with boiling water. What is most remarkable, scalding is not confined to bunches that are exposed to the sun, as many of them are placed where the sun cannot touch them. During the stoning process, great attention should be given to ventilation throughout the day, and the moment a scalded berry is detected, the house should be as freely ventilated as a warm conservatory. A low temperature must not, however, be caused by allowing the fires to go out, as the link which completes the twenty-four hours, consists of keeping the pipes and the house warm through the night to prevent the berries from getting cold before morning, otherwise they will condense moisture, as they will not warm so quickly as the air of the house when the sun again falls upon the roof. If root-action

is satisfactory, the critical period will not exceed three weeks.

Bleeding.—When bleeding sets in, it is almost impossible to stop it until the vines get into leaf, when Nature lends her healing art; but by that time vigorous vines are very often seriously enervated. Searing with hot irons, sealing-wax, painter's knotting, and other styptics have been recommended; but so powerful is the force of the sap, that every application is diluted and rendered useless until it finds an outlet in the leaves. Fortunately a preventive remedy which is extremely simple can

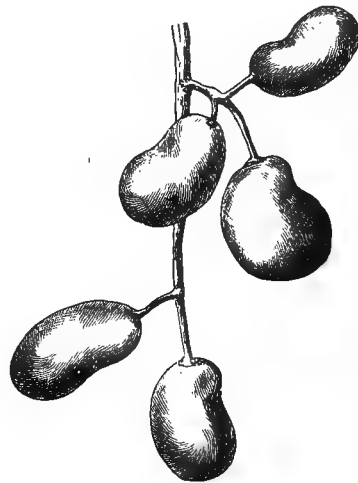


Fig. 31.—Scalding.

always be found in early pruning, as has been suggested in a previous article. Thomson's styptic should always be applied to every cut the moment the vines are pruned.

Warts on the Back of the Leaf.—If this is not a disease, it is a very unsightly gathering of vegetable matter in the wrong place, and a sure indication that the management of the house is far from satisfactory. Many think it does no harm, but when warts become very bad, the foliage cups, turns pale yellow, and eventually dies. Moreover the first application of sulphur to the pipes turns every wart black, a sure proof that the organised matter is in a very sensitive, if not a congestive state. Warts are most prevalent in small, close, early-forced pits and houses, which are imperfectly ventilated, and saturated with stagnant atmosphere. Large houses that are freely ventilated

rarely suffer, a fair proof that more fresh air and less atmospheric moisture will prevent this evil.

Air Roots on the Stems.—Many people take little heed of these, but allow them to grow on and die off with the foliage. If the shoots are placed over pots of soil or moss, they soon take hold and form established vines. The late Mr. Fleming used to moss the stems, and feed by syringing with liquid; but they are unsightly, and, like warts on the leaves, they incontestably prove that something is wrong. Aerial roots proceed from two causes, either the borders are cold, wet, and unfavourable to the growth of the natural roots at the time when a large expanse of foliage and fruit is making a heavy demand upon them, or the vinery is kept too close and warm. The remedy for the first evil will be found in lifting and re-laying the roots in new compost, for the second in a more perfect system of ventilation.

Fungus on the Roots.—Although this underground and consequently out-of-sight worker does

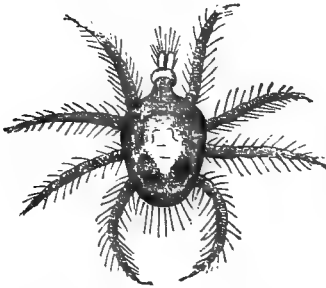


Fig. 32.—Red Spider (magnified).

not often attack vines, when it does it generally works serious mischief before its presence is detected. It sometimes happens that vines, and not unfrequently conifers, apparently in the rudest health, suddenly collapse and die; when, on the removal of the soil, the roots are found completely covered with the mycelium or spawn of some fungus, which has been produced by decaying woody matter in the border. The most common cause of the presence of this fungus is the introduction of leaf-mould containing bits of sticks in the formation of the border. Or it may be that the decaying stem of an old vine has been left in the border. When this rapidly-spreading fungus is found, there is only one remedy—the entire removal of every particle of soil containing the white thread-like mycelium, otherwise it will soon overrun the borders, and destroy every root. When all the affected soil has been

removed, the roots should be well washed with warm water and sprinkled with quicklime. This will speedily destroy all the spawn with which it is brought into contact, when the borders may be made up with new compost.

Insects which Prey upon the Vine.—As many insects by their persistent attacks on the leaves, shoots, and roots of vines speedily weaken or destroy their vitality, every grape-grower should be able to detect them at sight. To enable him to do this, the accompanying illustrations, which are highly magnified, with instructions for destroying the insects, will be found useful.

Red Spider—*Tetranychus telarius* (Fig. 32).—With the exception of the Phylloxera, this is the most general, as it is the most troublesome insect with which the grape-grower has to contend. It breeds and feeds on the lower sides of the leaves, where it spins its web, and increases with alarming rapidity, especially if the house is kept hot, dry, and badly ventilated. In colour it is of a lightish brown, but so small that it cannot readily be seen without the aid of a magnifying-glass; but not so its work, as the first intimation which the experienced cultivator receives is generally conveyed by the brownish appearance of the leaves, often in a dry corner or near the hot-water pipes. In such places these minute insects breed by the thousand, and feed upon the juices of the leaves, which they very soon destroy. From the leaves, if unchecked, they soon find their way to the bunches, which it is hardly necessary to say never colour or attain their proper flavour.

With the above remarks for his guidance, the amateur should ever be on the alert for the enemy, and the appearance of the first brownish-looking leaf should be the signal for unrelenting warfare. In the first instance, sponging the lower sides of the leaves with warm soapy water may be resorted to, and although it is a slow process, it is a certain cure, and an active person will go over many leaves in a few hours. Supplementary to sponging,

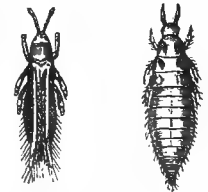


Fig. 33.—Thrips minutis.
sinn.

water the roots freely, and keep the atmosphere of the house as moist as may be consistent with the health of the growing vines. If incessant syringing could be practised, and every leaf could be thoroughly washed, the webs would be broken, and spider would soon disappear; but as ordinary water would damage the fruit, the syringe can only be used when it is

pure and free from calcareous sediment, or there is no fear of the spray reaching the berries. The last resort is sulphur mixed with milk, and applied to the pipes when they are hot, in exactly the same way as recommended for destroying mildew. But, where it can be applied, pure water is the best agent, as it refreshes and strengthens the vines, while it weakens the spider and eventually clears the house.

Thrips (*Thrips minutissima*) (Fig. 33).—The accompanying greatly-magnified figure represents this voracious little enemy. It is a long slender insect, dark brown, sometimes almost black. It feeds upon the leaves of the vines, which it soon renders useless for elaborating the sap, and being a dirty insect it soon spoils the fruit. Like the red spider, it rejoices in a high dry temperature, and strongly

remedy for summer use is methylated spirits applied with a camel-hair brush, as the warmth draws them out of their snug winter quarters under the bark. Fir-tree oil and paraffin in a diluted form also produce instant death, but without unceasing attention these remedies only scotch the enemy. As a winter dressing gas-tar is now generally used in the following way:—Having rubbed off all the loose bark, well scrubbed the rods with strong soap-water, and stopped the holes in old spurs with Gishurst compound, paint every bit of the wood, young and old, with the tar mixture, when the vines are thoroughly at rest. As tar is very powerful and difficult to mix, it should be carefully prepared as follows:—To one peck of dry, sifted loam placed over the fire in an iron pot, add half a pint of tar; thoroughly mix the two together, and add as much boiling water as

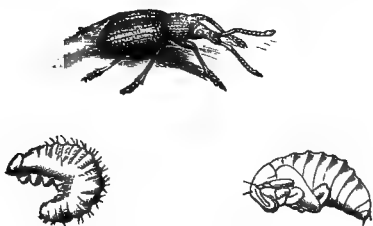


Fig. 35.—Vine Beetle (*Otiorynchus picipes*).

objects to water, but water alone will not eradicate it. Fortunately, it is not so generally met with as the spider; indeed, it is rarely met with in vineries from which plants, especially Azaleas, are strictly excluded. If taken in time, sponging with soap and tobacco-water will check its ravages and destroy it; but the most effectual remedy is fumigating with tobacco-paper. This should be repeated two or three times at intervals of ten days, in order to catch the larvæ as they merge into life.

Mealy Bug (*Dactylopius adonidum*) (Fig. 34).—This disgusting insect, like the thrips, is not so frequently met with on the vine as the spider; but, unfortunately, it is becoming very prevalent where plants are grown in the house. The white mealy fluff, from which it takes its name, is an excretion almost impervious to water, but it instantly melts away under oils or spirits. This pest is one of the most troublesome met with in vine-culture, and hence the importance of excluding all suspicious plants from the vineries. When once introduced it spreads from the branches, where it finds a secure hiding-place, to the shoots, and thence to the bunches, which it renders unfit for use. The best

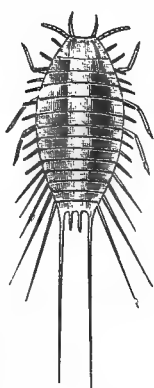


Fig. 34.—Mealy Bug.

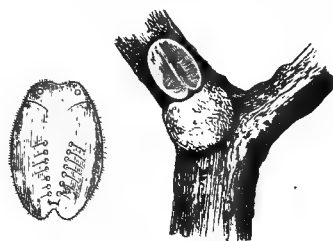


Fig. 36.—Scale (*Coccus vitis*).

will reduce the mass to the consistency of cream. Apply when cold enough with an old paint-brush.

The Vine Beetle (*Otiorynchus picipes*) (Fig. 35).—This nocturnal worker, although not very common in our vineries, sometimes does serious mischief before its presence is detected. It comes out at night, when all is quiet, and eats or partly eats through the tender young leaders of the vines. Sometimes they are only just touched or blackened, but they never do any more good, and have to be cut back to a sound bud below the injury. Unlike some of our voracious enemies, this beetle is epicurean in its tastes, always giving preference to certain varieties of vines, if it can get them. The best way to destroy it is to go quietly at night, spread a sheet under the vines, and give the rods a sharp shake with the hand, when they will fall upon the sheet and be readily seen.

Scale (*Coccus vitis*) (Fig. 36).—This insect is, fortunately, not often met with in England, for it is a most disagreeable scourge and very difficult to extirpate. If not taken in time it extends from the wood to the leaves, and thence to the fruit. As the

females cover their eggs with their inanimate shells through the winter, the vines should be thoroughly cleansed when they are pruned, and should be looked over every week for any of the young that may have escaped to form new colonies.

The Vine Louse (*Phylloxera vastatrix*) (Figs. 37—39).—Of all the insects with which the grape-grower has to contend this appears to be the most terrible. Within the last few years it has found its way from the Continent, where it devastates whole vineyards, into our own vineries, in which already it has wrought wholesale destruction; and there can be but little doubt that it is now insidiously and silently working in many unsuspected places, where it will remain until favourable conditions and circumstances admit of its withering development. While the French Government are offering rewards of tens of thousands of pounds for remedies that will destroy the *Phylloxera* without injuring the vines, and other Governments, in the plenitude of their wisdom, are making perplexing laws, which are as useless as they are oppressive, for preventing its introduction into their own countries, the silent death-dealing pest is rapidly spreading over every wine-growing district in Europe. We learn from those who have had the misfortune to grapple with this insect in British hot-houses, that it is capable of destroying a healthy vine within a month; and no certain remedy for its destruction, save that of stamping out, has as yet been discovered: that is, by taking out all the vines and burning them, together with the soil in which they grew, thoroughly cleansing, painting and lime-washing the houses, salting or scalding the site of the borders, and re-planting with fresh vines.

The mature insect is described as being of a yellowish-brown colour, and so transparent that the eggs, which are also transparent, can be seen in its inside. Its various forms are shown in the illustrations, highly magnified, which appear on the next page. The insect first attacks the points of the roots, and works along to the base of the stem (Fig. 37, *b*, *c*, *d*), stripping off the bark as it proceeds on its way, and moving in such numbers that, when examined under a microscope, the insects present the appearance of miniature swarms of bees, literally rolling over each other. Underground they breed in myriads, preferring the dry warm inside borders, where they are most numerous, while in cold wet borders they are less plentiful, if not entirely absent, a proof that water and cold are antagonistic to them. They do not remain on the roots after they have devoured the bark, neither are they often seen about the house, except in the galls, as shown on the leaf (Fig. 39), which they enter

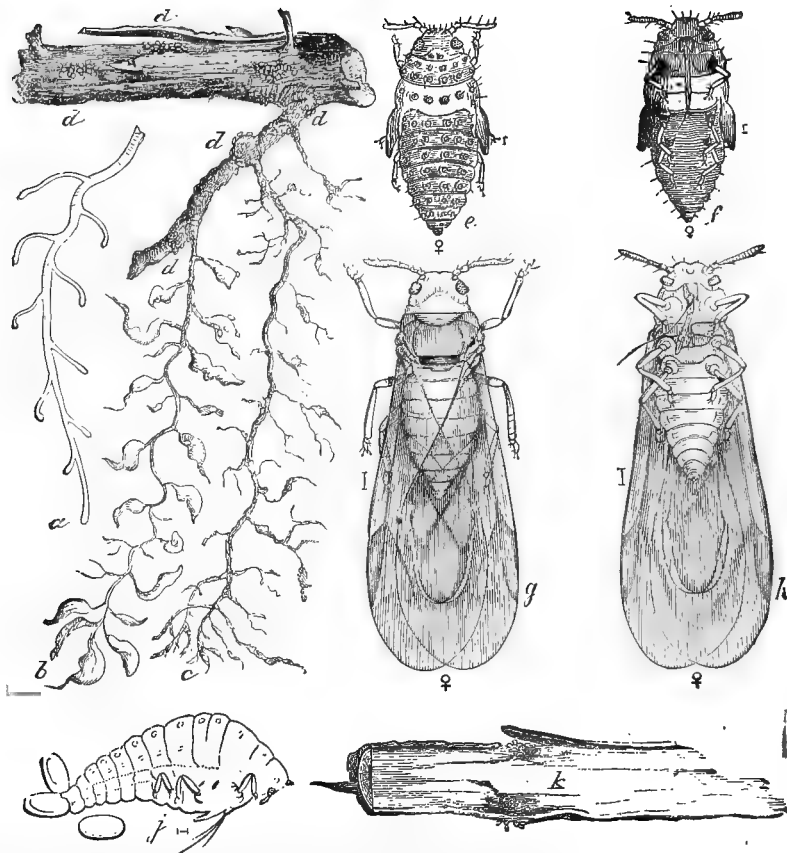
from the top side. From experiments that have been made it appears that submersion in water for forty-eight hours kills them, or a weak solution of carbolic acid causes instant death; indeed, it seems probable that these soft viscid creatures are easily deprived of life when they are brought to light; but the great difficulty lies in getting at them, as chemicals can only be conveyed through the agency of water, and then arises the question, will one application destroy the larvae as well as the living insects? Our knowledge of other insects justifies us in thinking the attempt would end in failure. The only consoling part of this sad story is the well-proved fact that the *Phylloxera* will not live or breed on the roots of any plant save the vine; and as vines in English hot-houses are confined to a very small area as compared with Continental vineyards, it is the duty of every grape-grower to dig up, burn, and destroy every particle of wood, root, and soil, as soon as the presence of this terrible scourge becomes known to him.

REMARKABLE VINES.

As a conclusion to these articles, lovers of grape-lore may be interested in a brief account of some of the most remarkable vines which are now in existence in this country, and producing tons of grapes of the finest quality annually.

Amongst these, varieties of the Black Hamburgh, which may be considered as the national grape and the gardener's friend, are the most numerous. The vine at Hampton Court, although not the oldest, is perhaps the best known to the general public, and on that account is worthy of the first place in this record. It was planted in 1769, and was raised from a cutting taken from a large vine at Valentine House, Essex. Its girth is now 42 inches, and it fills a house 66 feet long and 30 feet wide. For the past hundred years it has been an object of great interest to grape-growers and the public, who marvel at this fine specimen of extension training. It is still in excellent health, and produces from 1,200 to 1,800 small bunches annually. In 1822 the girth of the stem was 13 inches, and the produce in one year amounted to 2,200 bunches of 1 lb. each. William Cobbett, in his description of it fifty years ago, says: "There is a vine in the king's garden which has for half a century produced annually nearly a ton of grapes." George III. must have been a good judge of their quality, as he enjoyed the fruit for fifty years.

The vine at Cumberland Lodge, which is now about seventy-five years old, is much larger than the Hamburgh at Hampton Court. It was originally planted in a small pit, which it soon filled; then a house was erected over it, and enlarged from time



Cornell University Libraries

Fig. 37.—PHYLLOXERA. *a*, healthy root; *b*, infested root, showing knots and swellings caused by the lice; *c*, a root deserted, and rootlets decaying; *d*, insects on larger roots; *e*, *f*, upper and under surface of female pupa; *g*, *h*, upper and under surface of winged female; *i*, wingless female laying eggs; *k*, large root rotting through punctures of the lice.

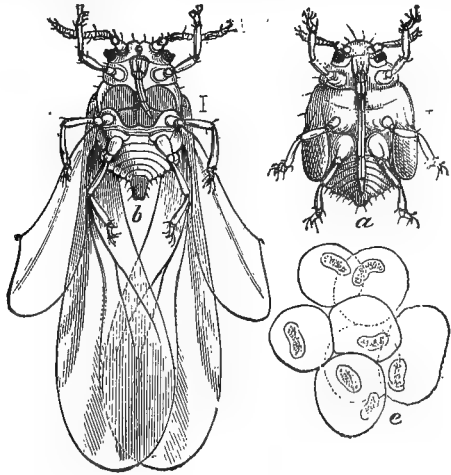


Fig. 38.—Pupa and imago of short-bodied form of Phylloxera. *a*, imperfect eggs formed in the abdomen.

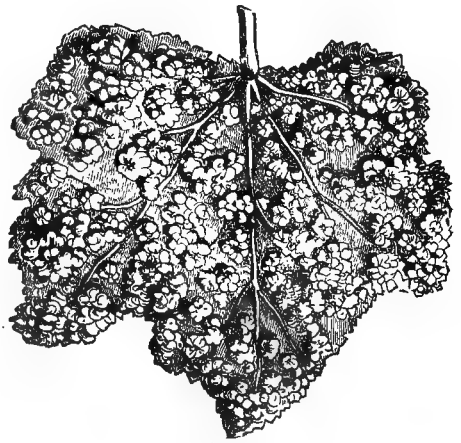


Fig. 39.—Vine-leaf infested with Phylloxera, forming small galls on leaf.

to time, until its present dimensions are 138 feet in length and 20 feet in width. The circumference of the stem is 3 feet 6 inches where it branches into two rods. Each of these again break into two stems, which extend the whole length of the house, and cover every part of the trellis with branches. These branches are pruned on the close-spur system, the space, 2,500 feet, of trellis for extension having long since been filled. Some seven years ago it was my privilege to be present when the first box of grapes of the season was cut, to be forwarded to the Queen, then in Scotland. Many of the bunches, as well as the berries, were remarkably fine, and appeared to be the counterpart of the produce of the vine at Eastnor; but they were slightly deficient in colour. I have since learned that this produce exceeded 1,200 lbs. The houses in which these two veterans are grown are heated by flues, but the vines are allowed to come on with the increasing warmth of the season, consequently little fire-heat is used.

A worthy descendant of the Hamburg at Cumberland Lodge may be seen at Sillwood Park, near Ascot. It is upwards of fifty years old, and fills a house 120 feet in length, with a rafter of 12 feet. The vine, planted in the centre, is about three feet in circumference, and throws out eight lateral branches, which are trained horizontally the whole length of the house. These rods furnish the bearing wood, which covers 1,500 feet of trellis, and produces about 1,800 bunches of grapes annually.

The celebrated Hamburg vine at the late Mr. Kay's nursery, Finchley, now more than a quarter of a century old, filled a house 90 feet in length and 18 feet in width by the time it was seven years old. Being much younger than the preceding vines, and its branches having been so rapidly extended, while its roots are in a good grape soil, the produce, as may be supposed, is superior to that obtained from the older vines. It must not, however, be inferred that great age prevents vines from producing first-class grapes, as the horticultural journals record yearly proofs to the contrary. So long as fresh food can be given to the roots, and the branches can extend, old vines will produce magnificent bunches and berries by the hundredweight from generation to generation.

In addition to the preceding, there is a vine at Shardloes, Bucks, nearly one hundred years old, filling a house 80 feet in length; and the vine at Eastnor, seventy-five years old, and filling a house 72 feet in length. This vine, like the Muscat at Harewood, was supplied with fresh soil and drainage twenty years ago. A new house was built over it, 30 feet longer and 3 feet wider than the old one; extension was at once indulged in, and the effect

produced by the combination of new compost, better drainage, and a larger house was marvellous.

The Muscat at Harewood just referred to is undoubtedly the finest of its kind in Britain. It is now over one hundred years old, having been planted in 1783. It is pruned on the long-spur system, and the produce a few years ago averaged 400 bunches of 1 lb. each.

Mr. Thomson, in his excellent book on the vine, speaks of vines over one hundred years old at Moredun, Edinburgh. They are planted in outside borders, and the roots have travelled under the foundations of brick walls in search of suitable food.

He also describes a Hamburg growing at Kennell House, Breadalbane. This, like the Finchley vine, is comparatively young, having been planted in 1832. The produce, some 600 bunches annually, is said to be very fine, and quite free from shanked berries. It now fills a house 172 feet long and 2½ feet wide. Combined with extension training, the keystone of success, it appears, exists in the form of an old Asparagus-bed, into which the roots have found their way. So long as the juvenile of fifty odd summers exists, we may safely predict that the Asparagus-bed will be safe from molestation.

The sister island does not seem to be noted for old vines, but there are a few. When at the viceregal lodge thirty years ago, Mr. Smith was training a very promising young extension Hamburg, which went on well for some years, but has since died.

At Castletown, the seat of the late T. Conolly, Esq., near Celbridge, an old vine filled a house which, to the best of my recollection, must have been nearly 80 feet in length. It bore immense crops of black grapes, but being an inferior variety, a Hamburg had been planted at the opposite end to take its place, and, judging from the way in which it was then progressing, there can be but little doubt that the veteran has long since been removed.

THE FLOWER GARDEN.

By WILLIAM WILDSMITH.

WINTER BEDDING.

THIS phase of flower gardening is not nearly so largely practised as it ought to be, though why such should be the case it is difficult to surmise, unless it be on the ground of the expense of material and labour. This, after all, is not nearly so formidable as at first sight appears, particularly now that there are so many species of plants which are equally well suited for summer as winter, so that one planting of such kinds of plants suffices for the two seasons. We shall hope to show that there is really but very

little more labour attendant on the adoption of the two-seasons plan of bedding—summer and winter—than if one branch only were done, whilst the satisfaction and pleasure attendant upon furnished flower-beds in winter would warrant a far larger additional expenditure of both money and labour.

To the success of the system, the first requisite is a close study of what hardy plants are suited for association with the summer bedders, without imparting undue sombreness to the general effect. Quiet beauty rather than gaiety is at all times desirable; but the other extreme of dullness in the summer season must be guarded against; and fortunately the wealth of suitable plants is so great that, to all ordinary observers, there is little danger of this even when the garden has to be arranged after this two-seasons plan. In some cases this is not required, the summer bedding being all cleared away first, and the winter arrangements being purely such. Under these conditions greater gaiety is better assured during the summer; and as shrubs would then be the principal winter occupants of the beds, they present a more filled-out effect, but not so refined as when dwarf carpeting plants are used. Therefore it is best to be content with a reasonable amount of summer gaiety, and have the greater refinement and greater variety in winter; and not only this, but less labour of plant-

ing in autumn when the summer garden is over. This latter is the plan we have followed for years, and it will perhaps be made more plain by the accompanying illustrative example.

Design, Fig. 8, gives the summer and winter arrangement of the same bed. It will be noted that

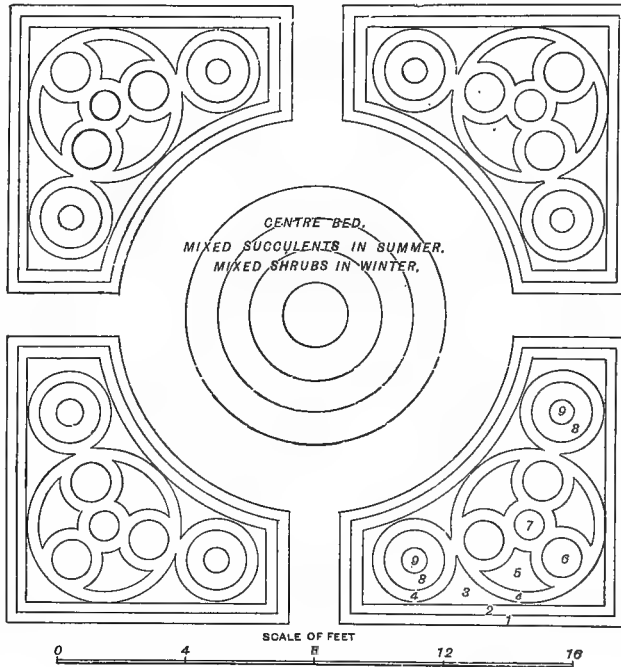


Fig. 8.—DESIGN FOR WINTER BEDDING.

Summer Planting.

1. Raised edging and line of *Herniaria glabra* (green).
2. *Pyrethrum*, Golden Feather.
3. *Echeveria secunda glauca*, slightly raised and the interspaces filled in with *Sedum glaucum*.
4. Groundwork of *Sedum acre elegans variegatum*.
5. *Alternanthera magnifica*, with central dot-plant of *Grevillea robusta*.
6. *Kleinia repens*, with central dot-plant of *Sempervivum arboreum variegatum*.
7. *Echeveria glauca metallica* and centre plant of *Agave americanum variegata*.
8. *Alternanthera amabilis*.
9. *Kleinia repens* and central plant of *Agave americana variegata*.

Winter Planting.

1. Same as summer.
2. Same as summer.
3. Same as summer.
4. Same as summer.
5. *Erica carnea*, and small Golden Holly as a centre.
6. *Sedum Lydium* (green), and centre plant of *Retinospora pisifera aurea*.
7. Central plant of *Cupressus erecta viridis*, surrounded with the green *Euonymus*.
8. *Sedum corsicum* (grey).
9. Golden variegated *Euonymus*.

The central bed, which in summer is marked to be planted with Tree Succulents, such as *Sempervivum arboreum*, *Sempervivum Hendersonii*, and others of similar habit, is one of the most novel and telling features of the arrangement. The carpeting or undergrowth to the tall succulents may be either tuft-growing Sedums, or the flowering *Mesembryanthemum conspicuum*. Having tried both plants, we certainly give preference to the former, flowers

summer planting is entirely a foliage arrangement, but it does not follow from this that the same principle is not applicable to flowering plants; it is equally so, but this arrangement is given (both summer and winter) as one we have recently put in practice, and which proved at both seasons as effective as the most exacting taste could desire. The *Echeveria* in No. 3 is the only doubtful plant as to withstanding the winter; and in nine seasons out of ten it would stand if planted a little sloping, or on edge, to throw off rain, which, lodging on the crowns of the plants, proves far more destructive to the plants than does frost.

seeming quite out of character with succulents, even though the flowering plant itself belongs to that order. The most suitable kinds of shrubs for the winter planting of this central bed are upright growers; not clipped to make them unnaturally formal, but such as *Thuja aurea*, *Cupressus Lawsonii erecta*, and golden *Retinosporas*; and the carpeting may either be that of the summer or variegated Ivy, *Euonymus*, *Stachys lanata*, or variegated Thyme. Taking this arrangement as a whole, and taking into account the gloom of winter, it is proportionately as bright as that of the summer; add to this the fact of how little labour and how comparatively few plants are needed to so transform the bed, and the merits of winter bedding become conspicuously apparent.

The same principle of arrangement is applicable to the simplest or the most varied of gardens, and what is another advantage, it can be done wholly or in part, according to the material at command. Even half the beds filled in winter would certainly look better than all being empty; for so accustomed are we to see bare beds at that season, that the half which must remain empty, if necessary, owing to lack of plants, would not appear particularly objectionable. But we must again repeat that there is such an abundance of material to be had at a very cheap rate as will, when coupled with the desire to carry out winter bedding on the lines here indicated, render it a very easy matter indeed to fully furnish the whole of the beds.

List of Plants.—Keeping in view the first essential condition to the successful practice of this duplex method of planting, viz., that of using in the summer arrangement as many hardy plants as possible suitable for association with the various descriptions of summer bedding plants, the list of these is placed first.

Evergreen shrubs, in small plants for middles and angles of beds, to relieve objectionable flat surfaces and dense masses of colour:—

Cupressus Lawsonii aurea.
C. Lawsonii argentea.
C. Lawsonii erecta viridis.
Euonymus macrophyllus variegatus.
E. japonicus albo-variegatus.
Juniperus hibernica.
J. japonica alba variegata.
Osmanthus ilicifolius variegatus.

Retinospora obtusa densa.
R. filifera.
R. pisifera.
R. pisifera argentea.
R. plumosa aurea.
R. squarrosa.
Thuja aurea.
Thujopsis borealis.

And all other small Conifers that bear transplantation well. The following are also suitable:—

Aralia Sieboldii.
Bambusa Metake.
B. Fortunei.
Phormium tenax.

P. tenax variegata.
Yucca gloriosa.
Y. filamentosa.
Y. recurva.

Of suitable small-growing hardy plants that harmonise well with summer bedders for use as ground-works and divisional lines, the name is legion. Amongst the best are many kinds of Saxifragas, Sedums, Sempervivums, and others of like growth and habit, that are too well known to be particularised here. In addition to the shrubs, &c., here named as suitable for use in summer—and, as a matter of course, throughout the winter—the following may be added as effective winter kinds:—Green and variegated Aucubas for massing; variegated Hollies, as standards amongst masses of *Berberis Aquifolium*, *B. japonica*, or other greenery; *Cotoneaster microphylla*, a plant most suitable for large vases, as a companion plant for the green and variegated Ivies, and Periwinkles (*Vincas*) for drooping over the edges, and it also makes a good dot-plant, on a ground-work of the broad-leaved *Vinca elegantissima variegata*. The golden variegated Yew is another good plant for either grouping or as single plants; and no shrub bears the frequent transplantation that winter bedding entails as do this and the common Yew, unless perhaps it be Box, both green and variegated, which are also invaluable for winter decoration. The Japanese Honeysuckle, Portugal Laurels, *Skimmia japonica*, and *Kalmias* complete the list of shrubs; but there are numerous other plants that, if common, are in their way just as valuable. Amongst them are *Ajuga reptans purpurea*, *Stachys lanata*, common and variegated Thymes, Heaths, *Veronica incana*, and *Veronica rupestris*. Here, then, is an ample array of material with which, combined with the will, labour, and ground, our gardens can be made as attractive in winter as in summer.

To get up a stock of plants of course takes time, but when once had they are comparatively a permanency, which is more than can be said about summer bedders; whilst, as compared with these, they do not involve a tithe of their cost, if houses, fires, labour, and short duration be placed in the balance, with the piece of ground that is required as a reserve garden for the transfer and increase of shrubs, &c., during the spring and summer.

To be effective at once, Sedums and other dwarf ground-work plants should, at the winter season, be lifted in turf fashion, and be pressed down in their allotted positions. To this end it is necessary to divide them in spring time, and plant out in beds of convenient width for paring off without treading on the plots. In districts where Heather is plentiful, that which has been nibbled close by rabbits makes the most perfect setting, or ground-work, for all descriptions of shrubs; and if this cannot be had, or any of the other ground-work plants mentioned, a surfacing of cocoa-fibre refuse will prove of immense service by imparting a finished and neat appearance.

ORCHIDS.

BY WILLIAM HUGH GOWER.

Anætochilus.—A small genus of terrestrial Orchids, which, in the island of Ceylon, is called by the Cingalese the King of the Woods; they have slender-jointed rhizomes, and grow but a few inches high. They are natives of the continent of India as well as the Indian Islands, and there is little doubt that many very fine forms remain undiscovered up to the present time. *Anætochilus* are remarkable for the extreme beauty of their leaves, but their flowers, though curious, are small and inconspicuous. These plants have up to the present time sorely troubled their admirers, inasmuch as they have hitherto proved very precarious and uncertain in their nature, and extremely difficult to keep alive for any length of time. Several reasons may be given to account for this: and, first, we think they have always been kept in much too high a temperature; secondly, we are of opinion that they have been treated to the influence of light too freely; thirdly, we believe that naturally they are not long-lived, but are produced freely from seed. To support our views respecting these plants, let us take into consideration where they grow. A friend of ours who has collected these plants in their wild homes says, "*Anætochilus* are found at an elevation of from 3,000 to 4,000 feet, and most frequently in ravines near mountain streams. Though the temperature must fall much below freezing in winter, the plants are never exposed to the direct influence of frost, being sheltered by trees. The maximum temperature probably never exceeds 70°, and this can only be for an hour or so in the day. They grow freely in a temperature of 65°, and rot off very quickly if any decayed vegetable matter or mildew is allowed to accumulate about the stem. They should never be allowed to dry up, though free drainage is undoubtedly essential. The soil in which they are found growing is a combination of peat and vegetable mould."

To imitate the seclusion these plants grow in naturally, they should be placed under bell-glasses or in a small hand-frame. The pots used for them should be small and thoroughly drained, the soil to consist of one part fibrous peat, one part living sphagnum moss, a small portion of sharp sand, and a little finely-broken charcoal; this must not be pressed down very firmly, and the whole should be surfaced with some live moss chopped small. This is important, as the *Anætochilus* grow so much freer when the roots are surrounded with vegetation. During the summer season they enjoy an abundant supply of water, but avoid watering much over the leaves. They require but little rest, and certainly no drying off, but during the months of November,

December, and January the supply of water must be greatly reduced. In the month of February re-pot, as it is best to give them fresh soil at least once a year. Place them in a shady secluded corner in the Brazilian House.

A. Bullenii.—Leaves ovate-lanceolate, two to three inches long, dark bronzy-green, with three bold stripes of coppery-red traversing them. Borneo.

A. Dominii.—Leaves somewhat ovate, the centre tawny-yellow, margined with dark olive-green, the principal veins being whitish. A garden hybrid, obtained between *A. xanthophyllum* and *Goodyera discolor*.

A. intermedium.—Leaves ovate, or cordate when the plant is vigorous, some two and a half inches long, ground-colour intensely dark and velvety, main ribs bright sparkling gold colour, netted between with fine lines of the same brilliant hue. Java.

A. Lowii (correct name *Dossinia marmorata*).—Leaves broadly ovate-lanceolate, three to five inches long and two to three broad; ground-colour, deep reddish olive-green, traversed by golden veins, which fade to some extent as the leaves get old. There is another form of this species with the ground-colour of the leaves a bright green, which is sometimes named *A. Lowii virescens*. Borneo.

A. Lobtii.—Leaves ovate, the ground-colour deep olive-green, midrib silvery white, with finer transverse reticulations. Java.

A. Nevillianum.—Leaves ovate-lanceolate, deep rich velvety-green, marbled with orange. Borneo.

A. Petola.—The correct name of this beautiful plant is *Macodes Petola*, but it so much resembles *Anætochilus*, and is so often called by that name, that we retain it in the list for convenience. Leaves oval, bright velvety-green, clouded with a slightly deeper hue, and beautifully netted over the entire surface with sparkling golden lines. Java.

A. Ruckerii.—This, together with *Bullenii* and *Nevillianus*, has only been brought to this country upon one occasion, and at the present time they are very rare in cultivation; their extreme beauty, however, should induce lovers of this family to obtain them again. The leaves are broadly ovate, ground-colour bronzy-green, beautifully spotted or marbled over the whole surface. Borneo.

A. setaceum.—This is the "Wana Rajah," or King of the Woods, of the Cingalese. Leaves roundish ovate, upwards of two inches long, and about an inch and a half broad; ground-colour of a rich deep coppery hue and velvety, main ribs broadly striped with bright gold, the intermediate spaces beautifully netted with the same. Ceylon and several of the East Indian Islands.

A. setaceum, var. *cordatum*.—As its name implies, the leaves of this variety are distinctly heart-shaped; the ground-colour is slightly greener, and

deep green, with a broad central band of white tinged with gold. Java.

A. xanthophyllum.—This beautiful species has



ANGRÆCUM EBURNEUM VIRENS.

the golden reticulations are broader. It is extremely beautiful and rare. Ceylon, &c.

A. striatum—sometimes and more correctly named *Monochilus regium*—a somewhat taller plant than the majority of the *Anæctochilus*. Leaves narrow-lanceolate, some three inches long; margins

broadly-ovate leaves, some two and a half inches long, and nearly two inches in breadth, with a broad central band of orange, clouded with green, densely netted with brilliant gold; the margins are dark olive-green, also covered with a network of gold. Ceylon.

Angræcum.—This is a large family of epiphytes, but many of the species produce such small flowers that, judging them from a decorative point of view, they are not worth the trouble and expense entailed in their cultivation, whilst others produce larger flowers than any family in the order.

Angræcums have their leaves arranged in a two-ranked (distichous) manner, and are quite destitute of pseudo-bulbs to support them, so that it is necessary to exercise care in carrying them through the resting season; for if not subjected to a period of rest, very few flowers will be produced, whilst if it is carried to excess the leaves will shrivel and fall off, thus rendering the plants naked and unsightly.

These plants are all natives of various parts of Africa or the African Islands, and are all found in the hottest latitudes, saving one or two exceptions, such as *A. falcatum*, from China and Japan, and *A. funale*, from the West Indies.

The latter is a very curious and interesting plant, being both stem-

less and leafless, the entire organism consisting of a mass of cord-like roots, from the centre of which it produces flowers. They all enjoy sun, air, and light to the fullest extent. The larger kinds succeed best under pot culture; the smaller ones thrive better in hanging baskets or on blocks of wood; indeed, the requirements of Angræcums are about the same as already laid down for the culture of *Erides*. East Indian House for all the species except *A. falcatum*, and this thrives best in the Peruvian House.

A. Chailleanum.—This handsome and distinct species is named in honour of M. du Chaillu, who found it when on one of his celebrated gorilla expe-

ditions. The leaves are distichous, leathery in texture, six to eight inches long, and upwards of an inch broad; unequally two-lobed at the apex, and deep green; racemes axillary, about the same length as the leaves; flowers white, and bearing a very long yellowish-green spur. May and June. Gaboon and Nun rivers, Western Africa.

A. citratum.—An elegant small-growing plant. The leaves are from three to six inches long, oblong lanceolate, with an acute point and contracted base, bright shining green on the upper side, paler beneath; raceme from six to twelve inches long, many-flowered; flowers closely set, nearly an inch across, white, suffused with pale citron-colour; spur short, pale yellow. Spring months. Madagascar.

A. eburneum.—A large bold-growing species, which, under the name of *A. superbum*, the late Mr. Ellis describes as so abundant on the outskirts of the forests on his journey from Tamatave to Antananarivo, the capital of Madagascar; plant erect; leaves

distichous, from one to two feet in length, sometimes more; bright light green in colour; spike erect, as long or longer than the leaves; flowers about two inches in diameter; sepals and petals light green; lip large, ivory-white, tinged with green at the base. January to March. Madagascar.

A. eburneum, var. *virens*.—A plant similar in habit, but somewhat less robust than the species, from which it is easily distinguished by its intense deep green leaves; sepals and petals green, as also is the spur; lip white, tinged with green. January to March. Madagascar.

A. Ellisii.—This species was introduced by the late Rev. W. Ellis, to whom we are indebted for so



FLOWER OF *A. VIRENS* (natural size).

many beautiful plants from that wonderful island he loved so well. The leaves are distichous, about a foot long, upwards of two inches wide, lobed at the apex, dark green above, paler beneath; spikes eighteen to twenty-four inches long, arcuate, many-flowered, pure white, very sweet-scented; spur straight, slender, some six inches or more long, buff-coloured; the petals are much reflexed, and the side view of the flower presents a very striking likeness to a cockatoo with its crest up. Spring months. Madagascar.

A. Kotschyi.—A plant similar in habit to the preceding; the leaves, however, are broader, and not lobed at the apex; racemes long and pendulous, many-flowered; flowers ivory-white; spur very long, much twisted, and reddish-brown in colour. October and November. Eastern Africa.

A. sesquipedale, an erect-growing, handsome species, producing enormous flowers. Mr. Ellis, who first introduced it in a living state, says respecting it:—“*Angræcum sesquipedale* does not grow in the moist and thickly-wooded parts of the lower districts of the island, but generally on the straggling trees along the edges of the forests.” “It seemed to grow most freely where there was plenty of light and air.” “In its native state, the plant most frequently presented a starved appearance and straggling habit. In this state the flowers were abundant, and deeper in creamy colour than when growing in the shade.” Again he says:—“The largest plants were found about twelve or twenty feet from the ground, and smaller ones often higher up; but I once found the trunk of a tree lying quite rotten on the ground, and *Angræcum sesquipedale* growing at intervals along its entire length. The roots, which had penetrated the decayed vegetable fibre of the tree, were comparatively white, short, and fleshy; the leaves larger, of a darker green, and more succulent; but there were no flowers.” This latter remark proves the necessity of a short season of rest to produce flowers. Under cultivation, this grand species has produced flowers as large, or even exceeding the dimensions which its name records. Leaves two-ranked, closely imbricating at the base, broadly oblong, about a foot long, bluntly lobed at the apex, intense deep green in colour; peduncles axillary; two to five-flowered; flowers pure ivory-white, in some varieties becoming creamy, measuring six to seven inches across, and its long greenish spur upwards of a foot in length; sepals and petals nearly equal in size, broad at the base, and tapering upwards to a point; the lip is ovate, and also pointed, slightly serrate on the edges. Madagascar.

Other species of *Angræcum*, most of them of recent introduction, and all bearing white flowers, are *A. cryptodon*, *descendens*, *fastuosum*, *fuscatum*, and *modestum*, all from Madagascar; *A. caudatum*,

crenatum, and *Eichlerianum*, from Western Africa; and *A. Scottianum* and *A. Leonis*, from the Comoro Islands.

Anguloa.—A genus of terrestrial plants, containing but a few species, all of which are, however, well deserving the attention of lovers of orchids. They are named in honour of Angulo, a famous Spanish naturalist, and produce large, stout, erect pseudo-bulbs, which attain a height of six to nine inches; leaves usually in pairs, some twelve to eighteen inches long, broad and plaited; scape produced from the base of the pseudo-bulb, about one foot long, erect, leafy, bearing on the summit a single large and fleshy flower.

Anguloas like deep shade, and should be potted in rough peat and sphagnum moss. When growing they enjoy an abundant supply of water to the roots, and the atmosphere should also be well charged with moisture; but it is during this stage only that such a moist regimen holds good. After the pseudo-bulbs are finished, avoiding any sudden changes, the supply must be gradually withheld if the plants are to thrive. Peruvian House.

A. Clowesii.—This is the most robust of the known species. The flowers come up with the young shoots, and expand when the growth is about half completed. The scapes bear one large and Tulip-like flower, which is rich yellow in colour, with the perfume of a medicine-chest. On account of the great substance of the sepals and petals, the flowers last a long time in perfection. June and July. Columbia.

A. eburnea.—Less robust in growth than the preceding, but similar in appearance; pseudo-bulbs deep green; flowers large, pure white, in some varieties slightly dotted with pink on the labellum. June and July. New Grenada.

A. Ruckervii.—The pseudo-bulbs of this grand species are some three or four inches high, oblong-ovate, deep green. The broad flag-shaped leaves are light green; flowers large; sepals and petals rich brownish-orange, plain outside, but the inner surface profusely spotted with crimson; lip greenish-yellow. June and July. Columbia.

A. Ruckervii, var. *sanguinea*.—Rather less robust in habit than the typical plant, but producing flowers equally as large. These are tawny-yellow or greenish on the outside, but inside the sepals and petals are of a uniform deep blood-colour. June and July. Columbia.

A. uniflora.—This is the smallest species of the genus yet introduced. The flowers are very beautiful, being pure white or creamy white, spotted with pink. In some varieties the spotting is very profuse. June and July. Columbia.

THE LIFE-HISTORY OF PLANTS.

By DR. MAXWELL T. MASTERS, F.R.S.

NUTRITION.—ROOTS AND ROOT-STOCKS.

FROM what has been said in previous chapters, it will be evident that the popular conception of a root is widely different from that entertained by the botanist. To the ordinary observer any portion of the plant that is beneath the soil is a root. But, quite irrespectively of the accident of position, the botanist recognises the root as a distinct organ by its external conformation and internal structure, by its mode of growth, and more especially by the work that it has to do. There are, however, certain organs more or less intermediate between roots and stems, and to some extent having the properties of both, to which a few words may with advantage be at this point devoted.

Root-stocks.—Closely allied, indeed, both in structure and in function to the bulbs, tubers, and other underground developments of which mention has already been made, are the "rhizomes" or "root-stocks," or, as they are sometimes called, the "stocks." It is impossible to draw any sharply-defined line of definition between these and the pre-

ceding organs on the one hand, and roots taken in a general sense on the other, nor in this place is it at all necessary to attempt to do so. They vary in form in different plants, and serve as means to discriminate between different species, on which account alone they should be carefully noted by the student, while as furnishing indications for appropriate

modes of cultivation they are of the highest importance. Generally, they are underground stems or branches, more or less elongated vertically or horizontally, or developments of the caulicle (see Vol. I., p. 87); usually rather thick, sometimes slender; branched, or rarely unbranched; having no true leaves underground but merely little membranous scales, which represent leaves in an undeveloped and functionless condition. They

give off true root-fibres, and therefore are often confounded with roots; but, apart from other distinctions of minute structure and mode of growth, it may be pointed out that, as a rule, no true root produces leaves or even leaf-scales. The root-stocks frequently produce a tuft of leaves at the upper end or "crown," as may be seen in a Strawberry plant, in the Carrot, or in the common Plantain (*Plantago*). The gardener's term "parting the root" applies to the subdivision of the crown of the rhizome. By



Fig. 36.—Subterranean Stem of *Carex*, with shoots produced in succession during four years, and giving off roots from the under surface.

this mode of propagation one or more buds are separated from the parent stock and form new plants. "Parting the root," then, is only another way of taking cuttings.

Another form of root-stock is exemplified by what gardeners call "creeping roots," as in the common Bindweed (*Convolvulus*) or the Couch-grass (*Triticum repens*). Why these are not strictly roots will be understood from what has already been said. Such forms of rhizome are an unmitigated nuisance to the gardener and farmer. There are, however, instances where this mode

of growth is very advantageous, as on sandy seashores or dunes, where these so-called creeping roots render inestimable service in partially fixing the sand and preventing its dispersal over the neighbouring country. By their means, planting with Broom, Furze, and other plants, to act as nurses for valuable Pines, becomes possible, and thus what were once barren wastes may be converted into most profitable land. This affords an excellent

illustration of the value that accrues from the study of the mode of growth of the commonest weeds. We are all to apt to despise these weeds rather than to utilise them and turn them to advantage, as we might readily do.

Root-stocks, like bulbs, afford characteristic examples of the "indefinite" and "definite" modes of growth (see Vol. I., page 298). In the common Solomon's Seal (*Polygonatum multiflorum*) we have a long, thick, horizontal root-stock, terminated by a stalk, which ascends to bear leaves and flowers, and which is the real termination of the stem. The horizontal growth is carried on by a bud formed at the side near the tip of the root-stock, and which bud itself ends in an inflorescence the following season. In other cases the growth is "indefinite" because the root-stock ends in a leaf-bud,

which continues the horizontal growth below ground, the leaves and flowers being borne on axillary buds produced from the side of the root-stock, and thrust up into the light and air—e.g., Primrose, Couch-grass. It must be remembered that the terms definite and indefinite in these cases refer to the order and direction of growth, and not to time, and this is the more important to be borne in mind in that most of these plants with root-stocks are what are called "herbaceous perennials." Their growth in a particular direction may be checked, or

it may not be, but in either case the duration is limited. The young shoots die down in winter, not, however, before provision has been made for the future by the development of new buds from the flanks or end of the stock, which new buds will remain

dormant through the winter, to start into renewed growth the following season, as we have seen to be the case with bulbs. While growth is thus provided for at or near one end of the stock, it

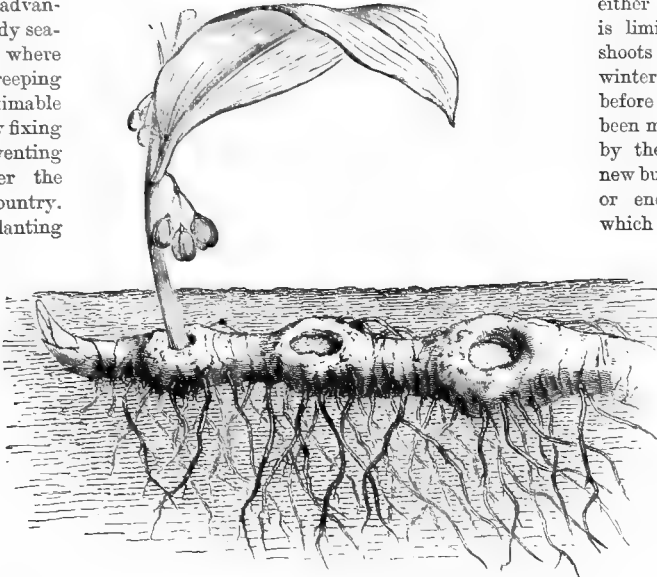


Fig. 37.—Root-stock of Solomon's Seal (*Polygonatum multiflorum*), giving off roots from the under surface and shoots from the upper side.

generally happens that decay and death of the older portions at the opposite end occur, and thus it happens that by the onward march of the new and the decay of the old parts, the plant actually changes its position in course of time.

The conditions of growth above alluded to furnish the explanation of the directions so generally given to "part or divide the roots," or to transplant every two or three years certain kinds of herbaceous perennials.

The Root.—Coming now to the consideration of the root proper as an organ of absorption—"feeding-roots" as the gardener appropriately terms them—we may pass over as unimportant in the present connection all the varied forms of roots described in books. We may ignore in practice the distinction

drawn by botanists between "true roots," or such as are the direct prolongations or branches of the radicle of the seedling, and "adventitious roots," or those which are developed only indirectly from the seedling plant, and are produced from the stem, in some cases from the leaves or other parts of the plant. The distinction between "tap-roots," as of a radish (Fig. 38), in which the body of the root or of the root-stock is relatively large, being developed



Fig. 38.—Tap-root of Radish.

duced hairs of extreme tenuity, consisting only of a single cell, each one of which exercises the function of absorption, and is in this sense a perfect root. We must distinguish then between "root-hairs" and "root-fibrils." Root-hairs, though very general, are not of universal occurrence; root-fibrils are always present, and though sometimes destitute of hairs, generally give origin to them. The root-fibril, or ultimate subdivision of the root, may be looked on in all cases as a mere thread of cellular tissue, growing in length by rapid subdivision of the constituent cells, not exactly at the tip, but just above it. Here it is a mere aggregation of minute,

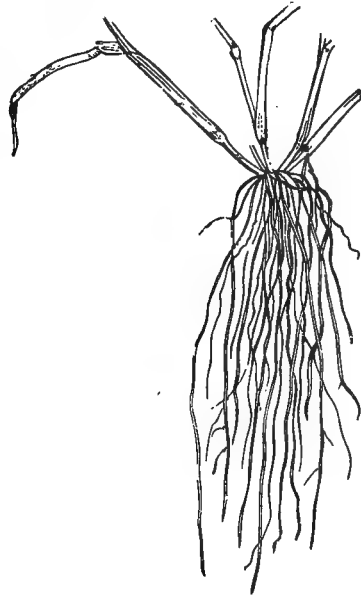


Fig. 39.—Fibrous Roots of Grass.

as a holdfast, or as a store-place for nutritious matters, and the fibres are comparatively few, and "fibrous roots," as those of a grass (Fig. 39), though important from the point of view of form and classification, is less so from that of physiology, because in both cases the essential portions, so far as regards work, are the root-fibres or feeding-roots, and of these the ultimate subdivisions only. The feeding-root, apart from all less important and variable characteristics, may be looked on physiologically as a mere thread of cellular tissue. In a simple form we meet with such a root in the common Duckweed of our ponds, *Lemna* (Fig. 40), but even this is not the least complex form in which the root exists, for from the surface of many roots just above their tips are pro-

closely-packed, globular cells, rich in protoplasm, and therefore highly endowed with vital activity. Above, some of the globular cells show a tendency to lengthen and to become progressively modified into wood-cells and vessels. The extreme tip is very generally guarded by a little cap, which may be seen by the naked eye in the Duckweed, but usually requires the use of a powerful magnifying-glass to detect it. This cap fits on to the tip of the slender root-fibre like a thimble on the point of a finger. This illustration, however, would be very misleading without further explanation. The thimble is put on the finger, but has no connection with it; the root-cap is the direct production of the tip of the root itself, some of the cells of which are told off

to form this protective shield. The active growing point, then, is just within or above this shield, protected by which the roots extend, while as growth goes on, numerous root-hairs, as before explained, issue from the sides of the roots and constitute the most important agents of absorption.

The essential office of a root is to take up from the soil, or air, or water in which it is growing sufficient liquid to supply the requirements of the plant, to effect the necessary solution of inert or insoluble

all this marvellous activity and sensibility to impressions is manifested by the protoplasm of the cells, to which reference was made in the last section.

The explanation of the necessity for careful ground operations, such as trenching, digging, hoeing, stirring, for appropriate potting-soils, and the like, is surely afforded by the wonderful life-history of the root-fibrils.

Root-action.—Supposing all the conditions favourable—the soil neither unduly loose nor unduly compact, its temperature neither too high nor too low, its texture permeated with air, moist but not sodden—root-action at once begins. The general conditions, in a word, are much the same as those

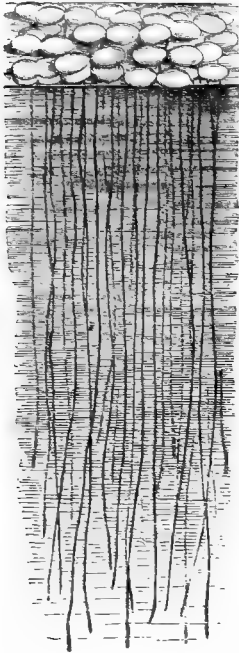


Fig. 40.—Simple Fibrous Roots: Duckweed.

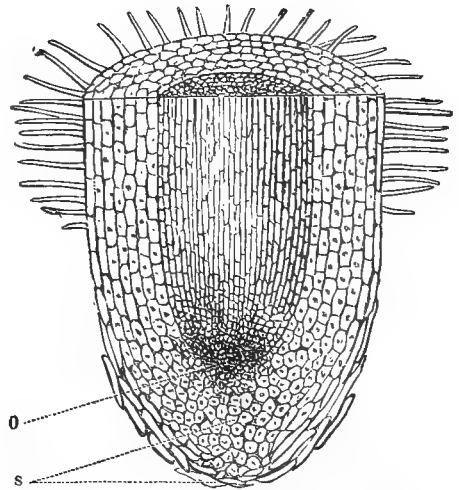


Fig. 41.—Section through a Root, showing the tip, o, covered by the root-cap, s; above are seen, on either side, the root-hairs.

matter, and provide for the loss occasioned by evaporation. How it does all this we shall shortly consider. It is only necessary to recall the fact that, though this is the essential work of the root, other duties are performed by it, such as the storage of food before referred to, and the fixation of the plant in the soil. How the tiny root-fibres penetrate the ground, wriggle their way among and between the particles of soil, round some obstacles and over others, has been alluded to under the head of Germination (Vol. I., p. 86), where also the marvellous sensitiveness of the tip of the root to various impressions has been mentioned. Perhaps there is nothing more wonderful in the whole of vegetable physiology than these evidences of life, verging even upon intelligence, in the fine thread-like tips of the roots. And

which are necessary in the case of the germination of the seedling plant. (See Vol. I., pp. 23, 24.)

By growth near the tip beneath the sheltering root-cap, the root-fibres are thrust in between the particles of soil, as it were, in search of moisture, and having found it, the root-hairs are produced in abundance to make the most of it. Gardeners well know and appreciate the dense cobwebby masses which are produced on vine-roots in a properly-made border, and which may, indeed, be seen in most cases where the roots are in a moist food-supplying medium, though there are some plants in which these hairs are never produced.

How the Roots Feed.—All being ready, the action commences. And now what happens? Our

forefathers thought that roots had mouths, that they opened them when there was a prospect of a meal, and closed them when the supplies were not forthcoming. Later on the supposed open mouths gave place to equally supposititious sponges at the tips of the roots, and even now gardeners talk freely about "spongioles," as if it were quite certain that such organs existed and that they sucked up the moisture from the soil just as a sponge does. Even as an illustrative metaphor this is utterly incorrect, for, unfortunately for this theory, it is now definitely ascertained that there are no such organs, and that moisture is not absorbed into the plant in the same way as water into a sponge. We know now that the tip of the root is covered by an impenetrable root-cap of dead tissue, that there are no openings whatever at or near the tip of the root, at least none that are visible; that therefore solid matters, however fine, cannot be absorbed by the root. What then is absorbed? The answer to this question is—Water.

What the Roots Feed on.—*Water.*—It is a prevalent error to suppose that the soil always contains plant-food ready for immediate use. It may do so sometimes and in small proportions, but the general state of things is just the reverse. People have come to look on the soil as a great soup-kettle, in which masses of solid matter are plunged in nutritive juices, like pieces of meat or vegetable in a basin of broth, and they imagine that all the roots have to do is just to suck up the good things thus provided for them. The soil does indeed contain earthy and saline ingredients, as well as carbonaceous and other matters suitable for plant-nutrition, but for the most part in an insoluble or inert condition, so that they require special modification before they can be turned to account.

Water, however, exists in all soils in more or less abundance. It is more or less impregnated with air, and contains a minute proportion of saline matter in solution. As it is the primary requisite of the plant, so it is absorbed with proportionate avidity. But if there are no open mouths, no pores, no spongioles, if the roots and root-hairs present to the water an unbroken surface, it may be asked how the water becomes transferred from the soil into the root. That it does so is beyond question; it is apparent to every one, and every one acts on the belief. Common experience places the matter beyond dispute, and the demonstrations of the chemist, however neatly and cleverly they may be devised, are in so far superfluous. When it comes to the question how the transfer is effected, then common observation fails to supply an answer, and we must avail ourselves of the

aid of the scientist. From him we learn by what simple, yet none the less wondrous, means the matter is accomplished. The water having an affinity, as chemists say, for the cell-membrane, wets it, soaks its constituent particles, elbows them out of the way, if the metaphor may be allowed, and so makes its way through and between them till it gains the interior of the cell, and there diffuses itself amid the denser particles of the fluids within. In other words, the water passes from without to within the cell by the operation of the process of "osmosis" previously referred to. The circumstances that regulate osmosis have been carefully studied by physicists and chemists, but it is unnecessary to refer to them here further than to say that the process essentially depends on the varying physical nature of the two fluids, on the nature and condition of the intervening membrane, the temperature, and atmospheric pressure.

By far the largest part of all plants consists of water. Juicy plants, like Lettuce, may contain as much as 90 per cent., the hardest wood when felled not less than 40 per cent. (*Warrington.*) Without water the protoplasm could not fulfil its office, without it the plant would be reduced to an inert mass, with no more life in it than in the drawers and bottles in a druggist's shop with their varied contents. The machinery would be there, the fuel would be there, the raw material would be there, but for want of the water the machinery would be at rest, the fuel would be useless, the raw material would remain raw. Water, then, is essential to plants; to secure an adequate supply of it is the main office of the root, and it effects this by the process of osmosis. The actual quantity of water taken up is not necessarily an index of the amount required, for plants may take up more than they actually require, having the means, as we shall hereafter see, of disposing of the surplus. Still, it is evident that the elimination of this surplus is so much labour wasted.

Watering.—There is probably no one operation of practical gardening that demands more discretion in its performance, and gets less, than this matter of watering. Plants vary extremely in the extent of their requirements, according to their structure and hereditary qualities. One wants a great deal, another does with a scanty pittance. The same plant at one season requires a thorough soaking, at another period it is best kept without any. If the temperature be high and the light intense, much may be required; if the opposite conditions prevail, the supply of water must be curtailed in proportion. The tendency of inexperienced gardeners and amateurs is to water all plants in all seasons and

under all conditions in equal amount. A jobbing gardener will soak a Primrose, whose sere and yellow leaves and "knotting" bud ought to show him that nothing is required but to let the plant alone for a season; he will pass over with a scanty modicum a plant whose rapidly-growing shoots and expanding foliage should be enough to proclaim the necessity for abundant supplies.

To water plants properly, demands not only observation but intelligent judgment. The circumstances to be taken into account are, among others, the condition of the atmosphere as to heat and light, the nature of the soil as to drainage and moisture, the texture of the plant, the thickness or tenuity of its leaves, the nature of its covering, thin and exposed, leathery, or coated with hairs or waxy exudation; the condition of the roots, whether they are near the surface, or at a considerable depth below it, whether there is an abundance of fine fibrous feeding-roots or whether there are comparatively few, whether the root or other part of the plant has or has not a store of liquid to draw upon in case of need, and so forth.

Again, plants in rapid growth necessarily make greater demands on their food-supplies than they do when at rest; hence, while it may be good practice to give plenty of water during the growing period, it is almost always advisable to lessen the amount during the flowering season; and although more water may again be required when the fruit is ripening, little or none is requisite for the proper maturation of the seed. Newly transplanted trees or shrubs require very cautious watering according to circumstances. On the one hand, they must never be allowed to become dry; but on the other hand, they may suffer from supplies in excess of what, in their relatively enfeebled condition, they can properly digest or rid themselves of. The general conditions of temperature and light with reference to the amount and frequency of watering need only to be mentioned, for the importance of a due consideration of these factors must be obvious to every one. One pitfall, however, may be pointed out with a view of preventing the inexperienced cultivator from being misled by climatic or geographical facts. A plant, let us say a native of the Khasya hills, grows in a country where from 500 to 600 inches of rain fall annually, and as one inch of rain means rather more than one hundred tons of water per acre, it is quite clear that it would be impracticable to give it anything like that amount in cultivation here. What we wish to show is, that it would not only not be necessary for us, even if it were practicable, to give such enormous supplies of water, but that it would certainly be injurious to do so, because we could not maintain the concomitant

temperature and other atmospheric conditions. On the other hand, although our own climate, especially that of our glass-houses, is vastly more moisture-laden than that of the so-called rainless districts of Arabia, Scinde, or Peru, yet that circumstance need not deter the intelligent gardener from undertaking the cultivation of what plants may reach him from those localities.

While, therefore, geographical and especially climatic indications are very valuable to the gardener, they are of less importance for him than the indications furnished by the construction and appearance of the plant itself. Up to this time the indications of the microscope have not been much employed in the service of the gardener, nevertheless it is certain that they would in many cases afford essential aid to the cultivator, by revealing the natural requirements of the plant as manifested by its internal structure, a point that we shall have to consider later on when discussing leaf-action. Suffice it here to allude to the more obvious external characteristics. The smaller and finer the root-fibres, the thinner the texture of the leaves and their covering, the smaller the size and proportion of the reserve organs, the more water is likely to be required. On the contrary, where the reserve organs are largely developed, as in a Cactus-stem, a bulb, or the pseudobulb of an Orchid, where the leaves are thick and juicy, or covered with a leathery rind, or one covered with wax, or a thick felting of hair, there the amount of water required will be relatively less, except it may be for a short period when growth is going on actively. It will be seen that it is not only the quantity of water to be given which demands attention, but the frequency of the dose and the time when it should be administered. The structural hints above given bring this out very clearly, and show why it is that some plants will flag directly if their supplies be cut off, while others as clearly show that they need water only at relatively long intervals, the supplies stored up in their tissues being sufficient for the support of life till some extra demand arises which must be met by supplies from without.

The Solid Constituents of Plants.—Water, however, is not the only substance which plants derive from the soil. Although it may be true that eight or nine-tenths of a plant consist of water, yet the remaining one or two-tenths of solid matter have to be accounted for. They enter the plant through the roots and through the leaves, from the soil and from the air, not indeed as solids, but either as liquids or as gases. One of the main duties of the plant, then, is the conversion of liquid and gaseous matter to solid substances. Of the solid substances

in the plant by far the larger proportion consists of carbon, and this is obtained from the atmosphere through the agency of the leaves, and, may consequently be passed over till the subject of leaf-action is dealt with. The other solid matters of which a plant consists are derived from the soil by the agency of the roots. These are earthy or mineral substances, destitute of nitrogen, or in other cases containing that important element of plant constitution. By chemical analysis it has been found that a large number of mineral or nitrogenous substances exist in plants. Analysis also has shown that some of these ingredients exist in much larger quantities than others in the same plant, and that the quantity of any particular ingredient in the plant varies with the age and state of growth. Some parts of the same plant may contain much, others none at all. Again, while one plant may contain much of one substance, another may have little or none, and this even although the plants may be growing side by side under the same conditions, and even although they may be very nearly allied plants. Two grasses for instance, species of *Poa*, growing together, and so much alike that only the practised eye can discriminate them, have yet a very different chemical constitution so far as these mineral substances are concerned. Chemical analysis therefore reveals the existence of numerous mineral ingredients in the plant, and in varying proportions: a similar analysis of the soil shows the source whence they are derived. Analysis, however, does not tell us of what use these matters are in the plant, nor what precise proportion of them is requisite.

Essentials of Plant Dietary.—It is a common thing to include all the substances found in plants by analysis as plant-foods, and in textbooks an imposing array of chemical substances is duly catalogued under the heading “food of plants.” The heading is misleading in several ways: it leads the reader to form an exaggerated idea of their value, and practically to undervalue, if not to ignore, such infinitely more important matters as water and carbonic acid gas. It induces him to consider them, as enumerated, as so many articles of food; the truth being that as such they are none of them foods; and, moreover, that only some of them really enter into the composition of plant-food, and those in small and variable proportions. These errors arising from the unchecked use of chemical analysis may be eliminated by the study of the practical results of experiment on the growth of plants, not by asking the chemist to tell us what remains in his vessels after their contents have been subjected to fire or to destructive analysis,

but by actually interrogating the plant itself as it is growing, and by making it tell us what it is doing at a particular time, and what substances are requisite to enable it to do so.

This is effected experimentally by growing the same plant under various conditions, with a large or with a small proportion of one particular substance, alone or in combination, or in other cases with none at all. These procedures are constructive, rather than destructive like chemical analysis, and they illustrate the desirability in all cases of establishing trial-grounds, or of setting aside part of the garden or even a few flower-pots for experimental purposes. By such means it has become possible to eliminate from the large quantities of various substances found in plants, those that are essential and those that are non-essential, and to ascertain what proportions of each particular ingredient are most favourable at various stages of growth and development.

The essential mineral ingredients found in the ash of plants, after burning away the more perishable matters, are potassium, the basis of potash; magnesium, the basis of magnesia; calcium, which stands in like relation to the salts of lime; iron; phosphorus; and a little sulphur. These, with water, nitrogen, or ammonia, and carbonic acid, consisting of oxygen and carbon, constitute the food of plants, or rather the raw materials out of which the food is made.

Adverting to the mineral matters which remain in the ash of plants after burning, we have now to inquire in what form and in what manner they gain entrance into the plant. It is certain they do not enter it as potassium, magnesium, or iron, as the case may be. Again, it is certain that they do not and cannot enter the plant in a solid state, and are not found in the living plant except in combination with other substances. Thus the potassium occurs in combination with oxygen, and with certain acids formed in and by the plant itself, such as oxalic, malic, citric acids, &c. In like manner the iron exists in the form of salts; the phosphorus is united with oxygen, forming phosphoric acid, and this again is united with various bases to form salts. The full history of all these matters belongs to chemistry rather than to physiology, so that we can only offer here a few considerations as to the manner in which these salts gain access to the plant. In the first place, it is necessary to point out that, as a rule, subject to a few exceptions which we need not stop to consider, these salts do not exist as such in the soil.

Soils.—It is found by careful experiment, as well as by the coarser operations of tillage and drainage, that the mechanical nature of the soil, and its power

of absorbing and retaining water, are in most cases of much greater importance than its chemical composition; and hence, while the latter point is not to be overlooked, nor the agency of manures regarded as by any means unimportant, yet these are in most cases secondary to the physical condition of the soil. The delicate nature of the root-fibrils, their marvellous powers of sensation and movement, also illustrate this, and show the necessity for a proper relation between the nature of the root and the porosity of the soil, its temperature, and power of absorbing water and various gases, such as ammonia. The care exercised by the gardener in the construction of well-drained porous vine-borders, and in the selection of appropriate potting-soil according to the nature of the plant and the character of its roots, is thus abundantly justified.

So, too, the character of root-growth and the amount of root-activity largely depend on the temperature and moisture of the soil. A hot, relatively dry soil tends to promote succulent growth; the plant under such circumstances is under the necessity of storing water: and those that by peculiarities of structure resulting from hereditary endowment can do this will be placed at an advantage. A porous, moist, warm soil is the most favourable for the development of fibrous roots and root-hairs, the actual amount of heat, of course, varying according to different plants. A hot or water-logged soil would cause the root-fibres to rot and decay. A cold one would either not allow of their formation, or, if formed, it would offer such obstacles to their penetration that they would be of little value, and gradually dwindle. The power, however, that roots have, under such circumstances, of extending themselves for long distances in search of a more propitious state of things, is one of their most noteworthy properties.

Soils consist either wholly or in various degrees of admixture of one or other of the following ingredients:—clay, sand, lime, or decayed vegetable matter (humus). The clay consists of aluminium in combination with silicic acid, the sand consists of insoluble silica, the lime exists in the form of carbonate or phosphate of calcium. But these substances are rarely pure and unmixed; the clays usually contain much potash, the sand also may contain potash, or salts of lime, or iron, according to its origin; the lime is usually mixed with clay or sand, or both. Of the humus, consisting of decayed vegetable material, we shall have to make special mention further on. Many of the substances named as existing in the soil are, under ordinary circumstances, insoluble, and hence they are useless in that form to the plant, while those that are soluble are apt to be washed out by heavy rains, and to find their way into the water-courses by natural or artificial

drainage. If the feeding-roots of plants are at hand, and in an active condition, they may absorb some of these soluble matters forthwith by the process of osmosis, as previously explained, and in this way the nitrates more particularly are taken up.

Solution of Inert Materials.—There still remain the insoluble matters in the soil, matters so little, if at all, soluble in water, that the roots would be unable to absorb them were there not some means of rendering them soluble. So far as is known at present, there are two principal methods of converting the insoluble and inert into the soluble and useful, one external to the plant itself, by the agency of bacterial "microbes," the other dependent upon the acid secretions of the plant itself. A few words of explanation may be given in illustration of both these phenomena.

Bacteria.—Under the general name of "bacteria," or the still more comprehensive name of "microbes," are included a number of different forms, supposed to be plants in the simplest stage of development, of extreme minuteness, extreme simplicity of organisation, but with a prodigious power of multiplication under propitious circumstances. They not only vary in size and form, as above stated, but especially in their life-conditions, the circumstances propitious to some being indifferent, or even fatal, to others. It is by the agency of germs of this nature, that various kinds of fermentation are induced; such as the alcoholic, in which, after starch has been converted into sugar, a further change takes place into alcohol and vinegar; the lactic, the butyric, &c. So certain diseases, fevers of various kinds, hydrophobia, diphtheria, cholera, &c., have been proved to be connected with, and in many instances to be absolutely dependent on, these minute organisms. The proof is obtained by experiment, as by isolating and cultivating the germs, and thus their mode of growth and the changes they bring about in animal or vegetable fluids may be ascertained. On the contrary, by rigorously preventing their access, or by destroying them, the changes in question do not take place, and cannot be made to do so till the microbes are again allowed access. In all probability we are but on the threshold of these inquiries, and future investigations will reveal that many of the phenomena which go on in the living plant are essentially connected with these agents. Already it has been shown (and this is our reason for alluding to them) that certain of these microbes effect the conversion of insoluble and inert nitrites in the soil into soluble and active nitrates. To explain how they do this would necessitate a knowledge of chemical details which is not requisite for our present purpose, which is simply to point out one way in which inert matters in the

soil may be altered in character, taken up and utilised by the plant. The phenomena also show very remarkably the interdependence of living organisms of various natures one upon another, and upon mineral matters, and they give some hint of the changes and activity going on in that soil which the generality of people still look on more especially, but very erroneously, as an illustration of fixity and repose.

Solvent Action of the Roots.—Another means by which insoluble matters in the soil become taken up by the plant is explained by the solvent action exercised by the roots themselves. The tips of the roots above the root-cap, or the extreme ends of the root-hairs, come into close contact with the particles of soil, and then an acid exudation from the cell takes place, which immediately attacks the particles of soil, and aided by the water around it, effects the solution of the mineral matter which it contains. The solution is absorbed as fast as it is produced, and so none is perceptible in the soil itself. It is, however, to be noticed that this acid exudation from the cell-wall is produced as a consequence of direct contact with suitable matter, but not otherwise, just as the gastric juice in the stomach of an animal is only produced when the glands which secrete it are directly stimulated by the presence of food.

Summary.—So far then as we know at present, liquid food, or rather liquid materials capable of being converted into food, are introduced into the roots of plants in one or other of three ways—by direct osmotic absorption or diffusion, as in the case of water and substances dissolved in it; by the agency of "microbes," which turn the insoluble into the soluble; and by the agency of the roots themselves in furnishing at the right moment, and in the right quantity, a proper solvent.

The substances introduced into the plant by the roots are, first and foremost, water; then mineral matters, of which potash and phosphates are among the most important, and nitrates, which supply the nitrogen that is a constant component element of protoplasm, and hence illustrates the reason why nitrogenous manures, such as guano, nitrate of soda, or ammonia-salts, are so valuable in promoting vegetation.

COMMON GARDEN FLOWERS.

The Common Rock Rose.—This well-known British and European plant is *Helianthemum vulgare*, the name being derived from the Greek *helios*, the sun; and *antheon*, a flower. *Vulgare* means common, and refers to the prevalence of the plant. It is also known as the Sun Rose, the Little Sunflower, and the Dwarf Cistus. Linnæus named it *Cistus helianthemum*. It is to be found in plenty in dry and hilly pastures, or in chalky or gravelly soil. There are several species which were introduced from different parts of Europe, and one, at least, from North America; but the fine varieties which are now found in cultivation are really very handsome and showy plants, which are probably seedlings from *H. vulgare*,



ROCK ROSE.

though some are imagined to be distinct species. They are well termed a beautiful class of perennials, and they are excellent for rough rock-work, where they can take root between the stones; also for banks, edgings, &c., in hot and exposed situations; they appear to thrive on any soil, but show to the greatest advantage on a chalky one; the flowers are rather transient, but produced in such quantities and so continuously, that tufts are covered

with blossom for a considerable period of the year. The close, compact, trailing growth particularly fits them for planting near ledges, where they can hang down over the front, as in the case of rock-work. Certain varieties can be increased in the readiest manner by dividing the roots in the autumn and spring, or by saving seed and sowing it in the open ground.

There are a few double varieties that produce large full flowers of a very showy character, viz., the rosy-buff, chocolate, sulphur, and yellow. Of single varieties, the following are well deserving attention:—

Cecilia, straw and yellow.	} Oculata. Sudbury Gem, rich rose. Tigrinum florepleno. Yellow Beauty.
Garibaldi.	
Lady Elizabeth.	
Magnificent, primrose and orange.	

Lychnis.—This genus comprehends a rather numerous group of hardy herbaceous perennials, a few of which are very handsome border plants. The name *Lychnis*—from *lychnos*, a lamp—refers to the brilliancy of the flowers. One of the best known is *Lychnis chalcidonica*; this is a well-known old border plant, growing two feet or so in height, and bearing



LYCHNIS CHALCEDONICA.

flower-stems surmounted with a corymb of bright scarlet flowers that are very showy. One of the common names of this plant is the Cross of Jerusalem, from the resemblance of its scarlet petals, both in shape and colour, to the arms of a Maltese or Jerusa-

lem cross. It is also known as the Flower of Bristol, or in all probability, more properly Flower of Bristow, and also Flower of Constantinople—the latter name from its growing wild near the Turkish capital, the former from its colour being "Bristol red," as in

Skelton's poem upon Eleanor Rummig, "Her kirtle Bristow red." This plant does well in a rich light loam, and it can be propagated by means of seed, also by division of the roots. In addition to the red, there is a white variety, known as *L. chalcidonica alba*; and besides these there is the double scarlet, which is a very fine border flower; and the double white also. The two last are best increased by division of the roots. *Lychnis dioica flore pleno* is a very handsome and neat border plant, commencing to bloom in April, and continuing at intervals the whole of the summer, especially if the flowering shoots are picked off as soon as they have done blooming; it produces myriads of large double crimson flowers; it is exceedingly fine for cutting, and most useful for massing, and can be highly recommended as a free-growing hardy border plant. *Lychnis Haageana* is, as its name implies, a German hybrid; a very showy perennial, about one foot in height, remarkable for its striking flowers nearly two inches across, of every shade of colour, from brilliant scarlet to pure white; hardy, and very easily grown, doing well in any ordinary garden soil. We are unable to give particulars as to its parental origin, but it was raised by Mr. Haage, of Erfurt, Germany. It seeds very freely, and seed is found to produce many fine varieties. The seed can be sown in the open ground. This is known by the name of the Shaggy Lychnis, because the flowers are somewhat divided. *L. Lagascea* is the Rock Lychnis, and is a native of the sub-alpine region of the Western Pyrenees. It is a pretty plant, forming compact tufts from two to three inches in height, producing slender stems bearing deep rose-coloured flowers; it makes a very useful and beautiful rock plant, because so free of growth, from its producing such an abundance of flowers, and its adaptability for planting on the sunny slopes of the rock-work. It does well in the open border in a good loam, and makes a pretty pot-plant. *L. Viscaria* is known as the Red German Catchfly, and it is found in Wales and near Edinburgh; it is also freely distributed over Europe and Asia. There is a white variety also, both bearing single flowers. This has also been produced in double forms, all of which are fine border flowers; one of the finest of these is *L. Viscaria splendens plena*—one that is totally distinct in colour and time of flowering. The flowers are very large and double, of a bright fiery-rose, and arranged very closely together on erect slender stems. It is perfectly hardy, very free-flowering, and one of the best and most useful of perennials, doing well in garden soil. The old Rose Campion of our gardens is *L. coronaria*. There are the white, flesh-coloured, and deep red varieties, but the latter is mostly grown, its large ruby-coloured flowers being very handsome. There are the double red and double white varieties,

but the latter are scarcer, because, unlike the former, or single types, they cannot be raised from seeds. Some years ago, a beautiful *Lychnis*, named *Senno*, was introduced from Japan by Messrs. Veitch and Sons, but it did not succeed in this country, and we fear it has become almost lost to cultivation.

Trollius, Troll Flower, or Globe Flower.

—The generic name, *Trollius*, is said to have come from the Swedish *troll*, or Danish *trolde*, and indicates a malignant supernatural being, a name corresponding to the Scotch *Witches' Gowan*, and given to this plant on account of its acrid poisonous qualities. It is called the Globe Flower from its form; the flowers are composed of about fifteen concave petals, which converge into the form of a globe. The common form, *T. europæus*, is a large, handsome plant, common in gardens, and growing wild in the mountainous parts of Scotland, Wales, and the North of England. Some very fine and richly-coloured varieties have been found growing wild by English botanists. There are a few introduced species, such as *T. asiaticus*, the Asiatic Globe Flower, an introduction from Siberia; the leaves larger than those of *T. europæus*, and of a paler green, the flowers deep golden-yellow. *T. napellifolius* has been introduced from various parts of Europe. It is considered by some to be merely a variety of *T. europæus*, from which it appears to differ in its colour, in not being quite so tall, and in having a greater number of lobes in its leaves. There are *T. japonicus*, with double flowers, *T. americanus*, and others; and in addition not a few good scaling varieties have also been raised. But it is *T. asiaticus* and *T. europæus* that are best known in our gardens.

They are all spring-flowering, and are extremely showy. They should be planted out in a good, deep, yellow loam, where they can root freely and deeply; at the same time they will do in almost any soil and situation. But to have large specimens luxuriant in growth a moist shady spot is the best; and in such a place they are objects of great beauty; and any one variety can be increased by division of the roots, carefully dividing the plants in the autumn, and placing the divided pieces round the sides of pots until they have drawn root sufficiently to be planted out permanently in the open ground. All the species and varieties are true herbaceous plants, losing their foliage in the autumn, and breaking up into fresh growth in spring.

The Poppy (*Papaver*).—Everybody, we may reasonably suppose, knows the Common Red Poppy of our fields, for during summer its rich scarlet flowers can be seen among the corn; short-lived

though they are, yet they are extremely gay while the blossoms endure. This is *Papaver Rhæas*, the Field Poppy, and its English names are the Common Red Poppy, Corn Rose, and Cup Rose. It is a common British plant, is of annual duration, and blooms abundantly in June and July. Then there is the Garden, or Opium, or White Poppy, *P. somniferum*, and this is not only regarded as the type, but the most important plant of the family. It is found in a wild state throughout the whole of Europe, in Egypt, and in Asia; and, though frequently met with apparently wild in Britain, it is generally believed to have been introduced at some early period, probably from some part of Asia. It is a plant of great value in medicine: Poppy-heads are the dried seed-vessels or capsules of this plant. It is in the capsules that the juice most abounds, and this juice, which exudes after incision, becomes dry and hard, and is then known by the name of Opium. The Poppy is extensively cultivated in the Asiatic provinces of Turkey, Egypt, Persia, and India. "The plants during their growth are carefully watered and manured, the watering being more liberal as the period of flowering approaches, and until the capsules are half-grown, when it is discontinued, and the gathering of the opium commences. The manner in which opium is obtained is still the same as that practised in the East centuries before the time of our Saviour. A

few days after the fall of the flower, men and women proceed to the fields at sunset, and make horizontal incisions in the Poppy-heads or capsules, taking care not to cut so deep as to penetrate their cavity.

A white juice exudes, and appears in the form of tears on the edges of the incisions, and the night dews favour the exudation of the juice. The field is left in this state for twenty-four hours, after which the juice is scraped off with a small iron scoop or blunt knives. A portion of the skin of the capsule is also removed, and constitutes about one-twelfth of the whole product. This operation is never performed more than once on each head. After it is gathered the opium is put into small earthen vessels, and moistened with saliva, then worked with a wooden spatule, in the sun, till it attains a proper consistency. It is then formed into cakes, and wrapped in leaves of Tobacco or Poppy, and sent into the market." (Hogg's *Vegetable Kingdom*.) The culture of this medicinal Poppy is carried on to some extent in this country. The fine double Poppies seen in gardens are selected varieties of



PAPAVER ORIENTALE.

P. somniferum. The Carnation and Peony-flowered Poppies are forms of these. What is found in some seed lists as *Papaver Danebrog* is a small variety of *P. somniferum*, bearing scarlet flowers having a white spot on each petal. The Ranunculus or Marseilles Poppies are known as French varieties, and have been bred up, in all probability,

from *P. Rhœas*. Some of the double varieties are very fine indeed. *P. umbrosum* is a beautiful introduction of medium growth, and flowering very freely. It has rich vermilion flowers, each petal having a large black blotch.

There are some beautiful perennial Poppies, quite hardy, and well deserving a place in the garden. *P. bracteatum* has large crimson salver-shaped flowers, six to eight inches in width, and it is very showy indeed. *P. orientale* resembles it, but the flowers are scarlet rather than crimson. *P. nudicaule* is a much smaller-flowering species, forming tufts of bright yellow flowers on slender stalks about one foot in height. There is a white-flowered variety of this, and a deep orange form also. These should be planted out in well-manured ground, and suffered to become established, and then they flower very finely indeed.

The generic name *Papaver* is said to be derived from *papa*, infant's food, because the juice of the plant was mixed with that to prevent a child being wakeful. If so, we may conclude that the Anglo-Saxon name for the plant, *Papig*, and our English "Poppy" had a similar origin. Theocritus tells us that the Greeks had the custom of taking a petal of the Corn Poppy, and laying it on the thumb and forefinger of one hand and slapping it with the other. If it gave a crack, it was a sign their lovers loved them; but if it failed, they lamented their disappointment. The Drapery Bee (*Apis papaveris*) forms the linings of its cells from the petals of the Poppy, cutting and adapting them to her purpose most dexterously. The Poppy is one of the plants the seeds of which, if buried deeply in the soil, will retain their power of vegetating many years. Tull relates an instance of their doing so after being buried twenty-four years. This explains why no

lengthened fallowing gets rid of this gay weed, and that scarcely a ripening harvest-field is found in which we do not see "merry Poppies, all amid the waving corn."

The Potentilla.—The common name of the Potentilla is *Cinquefoil*, so named both according to the French *cinq* and *feuilles*, and Latin *cinque foliola*,

so called from its five leaflets. The generic name *Potentilla* is from *potens*, powerful, from its supposed medicinal quality; but with the exception of *Potentilla reptans*, or Creeping Cinquefoil, a very common British plant, none of the species are remarkable for their products or properties. The root of this plant has a bitterish, styptic, slightly sweetish taste, and was formerly used in diarrhoea, and other complaints for which astringents are usually prescribed.

There are a large number of introduced species of Potentillas, but the many fine hybrids now found in our gardens have, no doubt, been derived from the Bloody Cinquefoil, *P. atrosanguinea*, introduced from Nepal in 1822. There is a British species

named *P. Fragariastrum*, the strawberry-leaved Cinquefoil; the leaves greatly resemble those of this fruit, and it is sometimes termed the Barren Strawberry. But this has only three leaflets instead of five, and it is considered as the connecting link between the two genera, *Fragaria* (Strawberry) and *Potentilla*.

Nearly all the fine varieties of the present day have Strawberry-like foliage, and the flowers are of many rich shades of colour, excepting blue and purple. Some fine introduced species besides *P. atrosanguinea* have no doubt proved useful as parents, but excepting in old botanical gardens such species are now seldom to be met with. For a long time



PAPAVER NUDICAULE.



the flowers were single, now there are many double-flowered forms, with large Rose-like blossoms, and very showy in appearance.

The *Potentilla* will thrive in almost any soil, but a good stiff, rather sandy, and well-manured one suits it exactly. In this the plants will grow to great size and strength. The *Potentilla* is easily cultivated if it only has a suitable soil, and it is well in the autumn to place some dung about the plants, which may be lightly forked into the surface in early spring, taking care not to injure the roots. It will flourish in light land if the plants be mulched and watered during the summer.

And the *Potentilla* can be propagated by division of the roots in autumn or spring, or by taking off any side growths with roots attached to them when they present themselves to view. It is the best plan to do this in the spring of the year, when the plants are becoming active, and if the offsets can be put into pots they will root all the more readily. As the *Potentilla* seeds freely, it can also be increased by sowing seeds, and in this way new and improved varieties are obtained. The seed germinates best when sown in shallow boxes or seed-pans soon after being gathered at the end of the summer, and these placed in a cold frame for the winter. Not that the seeds vegetate much in the autumn, but they germinate in early spring, and fine plants can thus be obtained by the end of the summer for flowering the following year. From this stage the plants rapidly increase in size, and form rich masses in beds or borders.

SELECTION OF SINGLE-FLOWERED POTENTILLAS.

Atrosanguinea.
Golden Cup.
Goldfinch.
Harlequin.
Magnet.

Sanguinea aurea.
Smontii.
Splendens.
Striata multiflora.

DOUBLE-FLOWERED POTENTILLAS.

Alfred Salter.
California.
Chameleon.
Dr. André.
Eldorado.
Hamlet.
Jane Salter.
Louis van Houtte.
Madame Rouillard.

Mons. Dondin.
Perfecta plena.
Phebus.
Purpurea.
Toussaint L'Ouverture.
Vase d'Or.
Versicolor.
Victor Lemoine.
William Rollisson.

THE KITCHEN GARDEN.

BY WILLIAM EARLEY.

Spinach, New Zealand (*Tetragonia expansa*).

—This is a half-hardy annual, received from the country whence it derives its name. It is of very robust growth, of recumbent habit, and possessing a capacity to withstand dry weather. This characteristic affirms its great usefulness at such seasons, as the commoner kind is least valuable, owing to its habit of running so quickly to seed. New Zealand Spinach, being a half-hardy annual, succeeds best

when sown singly in small pots, and raised in a frame or glass structure. Choose sixty-sized pots, and sow three or four seeds in each, to insure that, at least, one will germinate; should more than two plants form, remove the others. Ten plants will be sufficient, treated as advised, to give pickings two or three times a week during the season. Double this number should insure a good supply. When the young plants are affirmed in growth, harden them off gradually about May 1st and onward, by placing them in a cold



TOMATOES.

giving air freely daily and on warm nights. But shut the lights down in cold weather. Prepare a space for them, consisting of a warm sunny site and light sandy nature, if possible; work the soil up deeply, mixing therewith a very liberal quantity of manure; such a quantity, in fact, as will raise the soil up somewhat into ridge-shape. The plants so treated ordinarily grow to an extent of about two feet apart, hence abundant room must be given them so to do. About May 22nd carefully place each plant therein. Turn each out of the pot, pressing the roots down firmly into the soil, and water them well in. During the months of June and July, when they grow rapidly, an occasional copious manual watering will greatly aid the crop. For use gather the largest leaves as they form, taking care not to injure the points of the growing shoots; as such shoots turn upwards from the otherwise prostrate plants, they are readily observed, and injury to them is easily avoided.

Tomato (*Lycopersicum esculentum*; syn. *Solanum Lycopersicum*). French, *Tomate*; German, *Liebesapfel*;

Spanish, *Tomate*; Italian, *Pomo d'Oro*.—The Tomato, or "Love-apple," a singularly beautiful, bright red and orange fruit-bearing plant, a half-hardy annual, and a native of South America, first introduced into this country in the year 1596, has, like the Jerusalem Artichoke, made, until recent years, slow progress in public estimation. At the present time, however, it is gaining in favour, and is become a standing and popular addition to our culinary comestibles. Its use is very various. Connoisseurs partake of the ripe fruits in the uncooked state, whilst the *chef de cuisine* turns them to account in a great variety of ways. Italian warehousemen, besides, are intimate with Tomato ketchup, to say nothing of its use as a preserve and pickle.

Unquestionably the taste or liking for it is an acquired one, on which basis it is likely ultimately to become the most popular of any garden product grown for similar purposes. The plant is a very robust, enduring one, though its growth as concerns leaf and branch formation can be advanced to any degree without the needful result of producing good supplies of large and fine fruits. Its being of free and easy growth as a plant will tend to increase its culture in the future, especially when culturists can be made to understand the very simple rules, which it is necessary to follow in view of insuring abundant fruitfulness, to which reference will be especially made.

For the summer crop, sow seeds early in the month of March. These may be sown in pots, boxes, or frames, as may be most convenient, as they germinate and grow very easily. When the young plants possess two or three rough leaves, pot them off, putting each into a small-sized single pot, or three plants in each large sixty-sized pot, at equal distances apart round its sides. When these have perfected a moderate first growth, carefully remove them from these pots, separate the roots, and pot each by itself singly into similar-sized pots. Keep the young plants at all stages of growth where plenty of fresh air can reach them, and well supplied with water. Between April 25th and May 2nd arrange to place the plants in a cool frame, facing full sunshine, giving air freely except in cold weather, especially during frosty nights. About May 22nd turn each plant out of its pot, and plant at the foot of a south-aspect wall, after having first prepared the ground for them. They should be planted at distances of ten or twelve inches apart, on any site where head-room sufficient exists for them to grow, and be trained in position for fruiting. The custom is to take advantage of any vacant space existing between wall fruit-trees grown upon such an aspect. Where this is not obtainable an east-aspect wall or fence should be chosen.

The soil which the Tomato succeeds best in, and

the only soil, in fact, suited to it, is a light loam of a sandy nature. A little decayed manure should be forked into it, and slight mounds should be made above this wherein to place the roots. So soon as planted nail each plant to the wall, make the soil firm around its base, and give a good watering to settle the soil firmly around the roots. During the next two months following encourage growth by every possible means, nailing as many of the shoots as form to the wall without unduly crowding any. When the wall is thus filled with the main shoots in such manner that room for more does not exist, then, and only then, cut away all minor ones, or such as push up below and unduly crowd any more robust and needful.

Do not, as is so common a practice in this country, resort to pinching off the points frequently during the whole period of growth. Such a practice, the origin of which it is most difficult to determine, is, to say the least, reprehensible. It checks growth, often causing such flowers as form to turn "blind" in the efforts made by a plant of most robust constitution at a renewal of the very growth it is deprived of. By permitting the plants to grow naturally until such time as a goodly head has been formed, and upon that head a plentiful supply of flowers, which will "set" and form fruit, much more heavy and abundant crops can be secured than by any such restrictive system as above. Even in the gardens of the Royal Horticultural Society, plants of this kind have been seen treated probably more harshly than anywhere, being towards autumn simply stems, two or three feet in height, with meagre crops. On the other hand, the writer of these remarks has grown upon two plants in one nine-inch pot forty-two pounds weight of fruit, which was verified by witnesses, who saw a dozen of such pots similarly laden with fruits; no stopping having been done to these plants until the month of August.

In America, where this plant is highly valued, and where its crops are considered already "the most important of all garden products," such liberal treatment is more generally practised. Their climate is better suited to it, certainly, but no effort has yet been made to follow out their simple process of culture. They raise plants upon moderate hot-beds, transplant them on the same, and finally transplant the young seedlings on to mounds of sandy soil, having a "spit" of good manure placed under each. The distance between these hills is from three to five feet. The object here is to expose the base of the haulm of the plant to the utmost heat of the sun constantly, and to keep it somewhat dry.

Yet another important fact in connection with this plant has been entirely overlooked in practice. It is, that naturally it is of recumbent habit of growth;

and where it is practicable, I strongly advise that the young haulms as they grow when planted at the base of warm walls be trained, by the usual process of nailing, horizontal, or as nearly horizontal as possible. Where convenient walls or fences do not exist against which to train them, they may be planted as near to such an aspect as possible, and be permitted to grow over slates or trellis-work. A mulching of straw placed around them would be beneficial, as it would neutralise the ground-damp and coldness, whilst not depriving the plants of any direct solar heat. Where the recumbent form cannot be practised, they may be grown in a row as near to a warm sunny aspect as possible, tied and trained to stakes.

Another very excellent and practical way is to grow the plants on in pots until of goodly size, then give a shift into large pots, placing the pots on any elevation, such as the bottom of a vine border, having a falling bank-front, in such manner that the plants can grow down upon its sides. The pots, in this instance, should not be crocked, however, and the bottom of each should be placed upon rich soil, in such manner that the lowermost roots can penetrate into the rich soil below, which they will do with remarkable results as regards cropping. Often very valuable sites of this kind exist in gardens in connection with soil and manure heaps, which could be turned to good account in the production of Tomatoes, but which thus far have been utilised for Vegetable Marrows, or nothing at all.

House-grown or "forced" Tomatoes are become a general mid-winter and early spring luxury, the production of which has been thus far a profitable industry when undertaken for marketing purposes. Low span-roofed houses, and all similar ones adapted for Cucumber-growing, are excellent for this purpose, permitting of the plants being grown somewhat after their natural habit. Planted with young plants during the midsummer season, when the Cucumber crop is past, or Cucumbers are at a discount, they are pushed on to produce very early crops of fruit before the houses are again wanted for Cucumbers, and are sold at a high price per pound.

Cultivated varieties of the red-fruited kind have been very greatly improved of late years, culminating in such highly meritorious varieties as Excelsior, Paragon, Trophy, Stamfordianum, &c., to which further advances are yearly being added. That named Greengage, and indeed Golden Trophy, are great advances on the old "Large Yellow" in its peculiar colour, &c. The Red Cherry and Red Currant varieties are very ornamental, besides being useful, though, as regards the latter, in far less degree than the whole of those which precede them above.

Suitable varieties for general culture are :—

Acme, Hathaway's, Sutton's Perfection, President Cleveland, Prelude, Horsford's Chiswicke Red, Mayflower, Paragon, Eclipse, and Golden Queen.

Turnip (*Brassica Rapa*). French, *Navet*; German, *Speise-Rüben*; Spanish, *Nobo comun*; Italian, *Navone*.—The Turnip is a British plant, growing wild in its normal form in many districts, possessing little or no resemblance to the cultivated varieties better known, probably, to many. The French Turnip or Navet is not, when observed also in its really normal form, identical with this British species, *Brassica Rapa*, but is really a distinct species, named *Brassica Napus*, or, in other words, *esculentum*, an edible variety of the well-known Rape. Sufficient for this purpose is it, however, that we deal with the Turnip as generally known and understood, both British and French. It succeeds best in free strong soil or sandy loam which has been exposed to winter frosts, &c., and but moderately enriched. Larger roots may be produced upon stiff, more highly enriched land, but these are wanting in that peculiar solidity which is a sure attendant of free flesh and excellence of flavour. Those who would succeed in the latter particulars, therefore, must choose such soils as are suggested, and always upon most fully-exposed sites. To attempt to grow this and all similar surface-bulbing vegetables in shaded situations, or in too immediate contact with crops of taller stature, confined spaces, &c., is to insure unsatisfactory results.

In gardens and for household uses periodical sowings are needful, by which means a succession of tender produce can alone be insured, though for the main winter supply a much larger breadth should be sown and grown than for any other.

With soil aerated by winter exposure, and slightly manured at any time previously, preparations for the first sowing within any given year must be undertaken during the third or fourth week in the month of March. Slightly fork over the surface of the soil which has lain in fallow, roughly breaking down all lumps, &c. Rake the surface over well, to level it and to remove all large stones, &c., and sow the seeds broadcast. Thick sowing, or rather thick growing, is always to be avoided. Owing, however, to the predilection birds have for the seeds, the former is a necessity. Choose at all times a dry day for the operation, when the surface soil is also moderately dry. After the seeds are sown, push a rake to and fro over the ground, to duly cover the seeds with soil, making every effort possible to keep off small birds until germination has been effected. Make yet other small sowings about the middle of April and during the third week in May. These spring sowings severally only produce moderate-sized bulbs, as the plant

is exceptionally impatient of heat and drought; it rapidly runs off to seed, a fact which, once perpetrated, entirely destroys the crop and its usefulness. For the main crop a large bed should be sown about July 12th, and where Turnips are required constantly, as young and as fresh as possible, make another moderate sowing about August 11th. I have given in general terms the kind of soil most suitable. Where some slight variations are admissible, or forced on the cultivator, it will be preferable to give the richest and best soil to the July sowing, the warmest site to the March sowing, and the stoniest and lightest to the August sowing. So soon as the young crop has four or five young leaves, forming or formed, be quick to hoe freely amongst them, and in process of hoeing to chop them out, which is another mode of expressing the peculiar practice of thinning they are subject to. This must be done very decisively, as loss, rather than gain, accrues to any attempt at having a large crop, so far as number is concerned. Any that are left too thickly growing together will form but a small and indifferent bulb, whereas plentiful thinning out will insure a quicker and an immensely better produce. In view of this it is immaterial whether the seeds be sown in rows or broadcast, the latter being preferable, both in the matter of quick sowing, and simplicity as regards thinning the young plants out. When drill-row sowing is practised the drills should be eight inches apart, and the young plants thinned out to the same distances apart in the rows. Limited distances apart all ways will also suffice for broadcast sowings.

The very troublesome insect known as the Turnip-fly, or black flea (*Haltica nemorum*), and club-root being natural enemies of the plant, certain precautions are sometimes to be recommended in regard to them. The former is subject to no particular season or place, though during rainy seasons the young plants are enabled to advance so rapidly as to grow up beyond their power of vital injury. During dry hot seasons, on the contrary, it is often very difficult to secure a crop owing to their ravages upon the minute seedling plants at the moment when they come through the ground and subsequently. Club-root, on the other hand, is more partial to some soils and situations than others; so much so that where it exists habitually its attacks are anticipated.

To neutralise the injurious results arising from both these enemies drill-row sowings are to be preferred. When the drills are drawn a probable antidote for the fly consists in steeping the seeds in sulphur-water, so managed as to insure some of the sulphur adhering to the seeds when subsequently taken out and sown. Another aid is to sow equal parts of soot and lime over the seeds when sown in the drills before covering them in. For club-root, lime and

wood-ashes sown along the drill-rows before the seeds are sown have beneficial results. Thin sowings of soot or lime broadcast over the bed when the plants are coming up, is also known to do good. Plants are more liable to clubbing when seeds are sown upon newly-manured ground than upon such as has lain a month or two in fallow, and is therefore better aerated, and hence "sweeter."

The Turnip produces a dual crop. The young growing shoots, when they push up in seed-stalk form in the early spring, prove a very tender green vegetable, which is greatly valued by many. As, however, the main winter crop is generally used before the season for spring growth takes place, and it is not desirable to use valuable bulbs for this purpose, dependence is placed upon the August sowing, or the remnant of plants not used therefrom, to supply such "Turnip-greens" in the early spring. Any sized plant which has passed through the winter uninjured, whether it has a base or Turnip proper at its root or not, will furnish a crop of tops, and may be relied on to furnish a supply. The moment any portion of any crop shows symptoms of going to seed it becomes useless for culinary purposes; hence, save when "greens" are required, or real seeds are to be grown and perfected, it will be necessary to immediately pull the crop up, else will the ground be robbed of its richness to a very considerable extent.

For the winter supply, the July-sown, matured crop is best taken up and stored away beyond the reach of frost. The best way to do this is to draw each bulb, cut off the leaves and their foot-stalks, but do not injure the root-base, then clamp them in the open ground precisely as Potatoes are clamped; they keep longer fresh and tender thus treated than in any other way. Many varieties are offered in seed form. Early Stone is excellent for the first spring sowing. For general garden crops the American, or "Strap-leaved," is not excelled. For deep soil the Long White or Cow-horn variety is well adapted.

Excellent varieties for general culture are:—Early Red American (Strap-leaf), Milan Strap-leaf, Black Stone, White Globe, Green Top Stone, Early Snowball, and Early Paris Market (oblong).

Vegetable Marrow (*Cucurbita Pepo ovifera*). French, *Courge à manger*; German, *Kürbiss*; Spanish, *Calabasa Pontanera*.—The peculiar fruiting plant, which has gained so much popularity in this country, especially in towns, known commonly as Vegetable Marrow, is properly a Gourd, owing its English name to some fancied or real merit the fruits possess when cooked. In America they are known by the name of Squash; the ripened fruits often receive also the name of Pumpkin, and are utilised by the lower classes as pie-fruit, &c.

THE ROSE AND ITS CULTURE.

By D. T. FISH.

TRAINING.

Probably antecedent and erroneous practice, as regards the culture of any imported plant, has never obtained so firm a footing as in regard to this one. Within the area of gardens, it was, when first introduced, treated as a tender or semi-tropical plant, and received cultural aid and consideration in all ways similar to the Cucumber. This practice still finds hosts of followers; mounds of manure and fermenting materials being far too generally employed in connection with its culture. That this is an erroneous practice we need not go farther than the open fields to affirm, where the immense quantities sent into the metropolis and all large towns are freely produced by ordinary field culture *pur et simple*, good dressings of manure being, as a matter of course, applied. The custom in connection with field culture is, besides, to sow the seeds in the open ground in the exact positions where they are intended to grow and produce the crop. This system—namely, avoiding excessively rich beds, and sowing the seeds and growing the plants under full exposure—gives far heavier results than such a “coddling” system as gains precedence within garden walls.

An open and exposed site within the garden should be chosen for them, and where they can be grown as a single row with extending vines. The soil must be deeply dug and manured, and an additional layer may certainly, with advantage, be placed centrally, and covered with soil. Along the ridge thus formed the seeds may be sown in part, a portion being sown in a pot a week or two previously to insure a batch of somewhat forwarder plants, which, when potted off and hardened, may also be planted on the same ridge. These seeds may be sown, the latter in a pot under shelter about April 15th, and those in the ridge about May 12th. When the young plants begin to grow freely, induce the shoots to grow right and left from the centre of the ridge; and should a dry period ensue about the end of the month of June, give a copious root-watering. By these simple means good and constant supplies will be assured. The fruit are never better for culinary purposes than when cooked whole; for which purpose they should be taken from the plants when three or four inches long only. The needful hoeings and weedings need not be more than referred to. As regards the sorts, Long-ribbed, Vegetable Cream, the Custard, and the Bush varieties are desirable. The latter produce fruit freely, and have not the same habit as all others of rambling over the surface of the ground, which is an advantage, especially in small gardens of limited extent.

The Potato is reserved for separate treatment; and some notes on simultaneous cropping, and a popular calendar of operations for the kitchen garden, will therefore sufficiently complete and conclude this series of articles.

ROSES naturally assume many forms; their differences of stature and of character have already been briefly adverted to. As to varieties in form, what could be greater than the small-leaved, compact-growing Scotch Roses, bristling with short, sharp prickles, and not exceeding an average of two feet in height, and another Scotch variety of the *arvensis* species of Rose, the Ayrshire, rambling and scrambling to a height or length of twenty or more feet? In the cultivation of a family varying so widely, it is only natural that the normal diversities should be preserved, and at times intensified and exaggerated. For Roses not only differ widely in a state of nature, but are among the most plastic material in the hands of art. And thus it has come to pass that we have all sizes and all forms of Roses, much to the bewilderment of amateurs, and greatly to the enrichment of our gardens. The almost infinite varieties of form and stature of the plants, the wonderful diversity of colour, scent, shape, and size of the blooms, have ever been among the most interesting and greatest attractions of our Roses.

It must be confessed that of late years there have been vigorous and sustained efforts made to level up all Roses to one uniform standard, that of the best show-blooms. In pursuit of this not a few Roses of special interest have disappeared from many gardens. At the present moment the Rose-fever runs high in the direction of Hybrid Perpetuals, Teas, and a few favourite Noisettes, and it is impossible to over-praise or grow too many of such magnificent Roses. Still, a place might be found for other strains, species, and varieties, which will be named and described in subsequent chapters. And even the popular sorts may be moulded by pruning and training into other forms than those of the common standard or squat dwarf bush. To show how to educe variety of form out of these and other Roses is the purport of this chapter. And as pruning may in some important senses be said to be the basis of training, it will be logical as well as sensible to begin our section on the training of Roses with a continuation of pruning as a means of moulding Roses into form. The highest examples of Rose-training contain those two apparently opposite qualities, symmetry and diversity. Each Rose may be a symmetrical type of a particular-formed Rose, and yet the mere juxtaposition of two forms will yield a richer variety than if neither had been more or less perfect of its kind. For example, a perfect dwarf and a perfect standard afford more contrast or diversity than if the dwarf were climbing up into standard stature,

or the latter were worked so low as to look like a dwarf. Similar contrasts may be drawn between pillar and weeping Roses. The more perfect each after its kind, the more charming the symmetry of each, and the stronger and more satisfactory the contrast between them.

These principles must be clearly borne in mind, and persistently applied in practice, in pruning Roses into form. All modes of pruning already described, with many modifications of each, will be needed to succeed perfectly in this, as it were, building up Roses into shape with the knife. The phrase reads like a bull, but it is full of meaning and of truth. A branch, or series of branches, is needed somewhere. A cut may have to be made some distance from the base or blank space before it can be produced, and much calculation and contrivance must always be exercised if the form desired is to be crowned with perfection.

A superfluity of material is almost more difficult to deal with than a scarcity. By looking well ahead this may generally be prevented by disbudding, a species of prevention that saves a great deal of cutting and carving afterwards.

Early Pruning Essential.—If a stitch in time saves nine, a cut in time may save ninety and nine, and is in fact the only way of moulding Roses and other plants into good forms. Other mistakes, cultural or otherwise, may be pruned off, or grown out of, but structural ones mostly endure for a lifetime. To rectify these later on is to destroy the bush or tree. Hence the importance of a clear perception of form from the first, and persistent efforts to keep it constantly in view afterwards. As the twig is bent, the tree is inclined. Yes, and it is even more true that as the Rose is pruned, so it may be made to assume almost any shape or form desired. As has been already shown, there are great natural diversities. But most of these can be greatly intensified, and others equally or more strikingly induced, by artificial treatment. Hardly any family of plants is so pliable in the hands of the trainer as the Rose. Under his guidance the one shoot becomes three, or any desired number of shoots, and on these any sized or shaped Roses may be built up. And this question of the number of shoots to start with is one of the very first that have to be decided by the trainer. It is by no means so easy as it seems. Returning to the bud, for instance, some prefer one only on a briar, others two, many three. Practically a good many briars determine the results for themselves, by only producing one or more shoots fit for budding on. But either way, by stopping or pruning, the rosarian may soon have as many Rose-shoots for the base of his future plant as he may choose to use.

Number of Shoots.—Perhaps on the whole three shoots as nearly alike in strength, and at about equal distances apart, form the best base to start with, as there is mostly more beauty, if not a better chance of fortune or success, in odd than even numbers. But Nature protests against hard and fast lines in the exact number of her Rose-shoots as elsewhere. When we cut for three we may get but two, and sometimes only one, or we may lose one or more by accident, as if to prevent the trainer from adhering too slavishly to general rules as to making base-shoots.

The question of character and form of Rose, species or varieties, also comes in to confuse, and it may be confound our numbers; pillar, pyramid, and climbing Roses requiring different numbers from standards and dwarfs.

For pyramidal Roses, for example, four shoots are not only better than three, but almost necessary to success—that is, one central shoot with three posted at as nearly as may be equal distances, so as to form a triangle round its base. These may either be forced out at the base of the shoot itself, or may be independent branches proceeding from the root-stock. The latter may help to widen the base of the pyramid, and to give it bulk and massive beauty in less time than if it were all produced from the central stem.

Then, again, where such qualities are not only not required, but would be a positive drawback, as in the case of pillar, climbing, or scrambling Roses, such are mostly built up on one stem only, or multiples of one, for succession, as the first one warrants. One of the chief charms of such Roses is their slenderness in contrast with their height; and though tastes differ and practice varies in regard to this vital matter also, it is certain that a pillar Rose with a large base becomes a pyramidal one spoiled, and few objects are less satisfactory than a climbing Rose with a large proportion of its material huddled together at its base, instead of climbing high and running far from such coigns of vantage as the tall stake, tree, chimney, or arch affords it, showering down its beauty and fragrance with wanton prodigality.

Of course there are in most gardens places for climbing and all other Roses, in which the highest art and best taste are exhibited by simply planting them, and leaving them alone to ramble or scramble at their own sweet will, in their own wild and free natural ways, over stones, roots, tree-stumps, banks of uneven soil, rocks, gravel or chalk-pits, old quarries, or any unsightly, out-of-the-way place that needs clothing or furnishing. In such positions, and for such purposes, the less the pruner or the trainer interferes, the more perfect and satisfactory the

result. However, even among these children of nature, the pruner may occasionally cut the strong to make room for the weak, and give a lead here and a tie yonder, a help to one struggling shoot and a hindrance to that strong, encroaching, overshadowing one, that will add greatly to the beauty and richness of the bank or maze of Roses; but he must leave no visible trace of his presence behind, or half the charm vanishes.

And this principle of concealing the processes, and presenting, as far as may be, only the finished results of them, should run through and dominate all our prunings and trainings of Roses. Cuts, ties,

the pruning or thinning needful to perfect their blossoming will also contribute to moulding and keeping them in the most enjoyable and useful forms.

Standard Rose with Single Bud.—As such are within reach of all, it may be well to take this, first of all, as an illustration of how Roses can be pruned into any desired form. There are two ways of proceeding in the matter: one of stopping the growth of the current year, so as to force them into forming two, three, or more distinct shoots the first season, and that of allowing the first shoot to grow



Fig. 35.



Fig. 36.

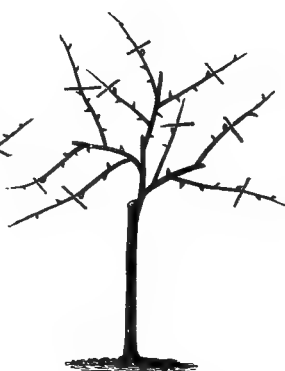


Fig. 37.

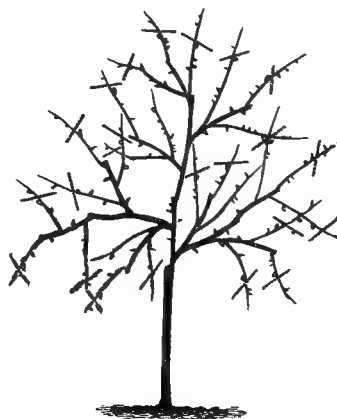


Fig. 38.

STANDARD ROSE, SHOWING ITS FORMATION BY PRUNING.

shreds, nails, stakes, should all be as little seen as possible; and the Roses, even during the process of moulding into shape, and especially when finished, should appear just as if they had grown so. Nature in the stocks, or tied to a whipping-post, would be the most apt and true description of not a few Roses one sees under the process of injudicious or over-training. In many cases, too, the training is never finished; the Roses are always going to be, never *are*, things of beauty: the ground is too poor, the stakes, poles, or arches too high, the plants too strong, or the supports too weak; and hence the Roses are never finished nor perfect.

No doubt, where many Roses are grown, it is almost impossible to have them all perfect, prune and train as we may; but it is far better to curtail their numbers than spread mediocrity and advertise failure over a wider area. Many Roses, too, may be grown without much training. The natural tendency of many species and varieties—for example, most of the **Teas**—is to form nice bushes of different heights;

to its full height and ripen before pruning. The last will be chosen for purposes of illustration, so as to make all more plain and easily understood. Fig. 35 shows the shoot as it appears in the autumn. The whole of the strength of the root being concentrated into this one shoot, it has grown very vigorously, as may be seen. In the winter, or spring of the next year, the single shoot is cut back to within three buds of its base. This severe cutting back is needful to insure that the basis of the future head shall be well and truly laid as close to the main stem as possible. Few things mar the beauty of the Rose-tree more, or destroy its true character sooner, than allowing its first main branches to start at some considerable distance from its root-stock or the crown of the briar. By cutting the first shoot or shoots “home,” as it is technically called, at first, such evils or unsightlinesses are prevented.

Pruning the Second Year.—By cutting the three branches back within three buds of their base

(Fig. 36), the Rose-tree will be furnished with nine branches the following year. These will form strong, well-ripened shoots before the end of the growing season. Any lateral or small shoots should be removed during the summer and autumn, and the shoots disbudded back to within six inches or a foot of their base. This tends to a fuller development and a more thorough ripening of the buds, on which the future life and form of the tree depend.

Pruning the Third Year.—This differs little from the second, excepting in the greater number of shoots to cut back. Occasionally, too, some of the shoots from intercrossing, or taking a wrong course, may be cut out bodily, or removed during the summer to give more light and air, or to develop or make room for better-placed shoots. To make this matter more simple, however, the entire number of shoots are shown in Fig. 37.

Growth and Pruning the Fourth Year.—Fig. 38 shows the Rose-tree as it would look before pruning in the fourth year from the start. It will now have over twenty shoots, sufficient to form a good standard Rose, and base enough to form one of the very largest that need or can be grown.

The cross-lines show the same tree cut back in the autumn or spring. There is no need to pursue the process further. At the same rate of increase, the same tree during its next season's growth would have the required number of shoots, and, in fact, have grown into such a finished standard Rose-tree (Fig. 39) as will fitly close these descriptions and illustrations.

The Pyramidal Rose on a Single Stem.

—On the whole, the same method is the best for forming pyramidal Roses. True, they may be formed by four, seven, nine, or any number of stems; but in such cases they are hardly likely to be so stable or symmetrical as on the one-stem principle. In forming pyramids thus, they also may become almost self-supporting as they get old, the main or leading stems growing into something like the thickness and stability of a tree. Pyramids thus formed also bloom more freely, and if they are

worked plants the evils and inconveniences of suckers are almost immediately detected and removed; whereas in many-stemmed worked pyramidal Roses, the stock not seldom gets so much mixed up with the Rose on its top, that in the gardens of amateurs it sometimes first suppresses and then succeeds it. A curious case of the marvellous deterioration of a Charles Lefebvre Rose, was speedily explained by the fact that the De la Grifferaie stock had completely overgrown and smothered it. Of course this could not have happened to a skilled rosarian; but it is not for such, but those that know little about Roses, that such cases are cited as warnings. So considerable,

however, is the risk of this unobserved development of stock in pyramidal Roses, that own-root plants are to be preferred for this form. And failing these, the confining of the Roses to one stem, and starting the base a foot, eighteen inches, or even two feet from the ground, renders the intrusion of shoots from the stocks impossible, and also adds to the beauty, and more fully displays the true character, of pyramidal Roses (Fig. 44).



Fig. 39.—Standard Rose, completed.

First Pruning of Pyramidal Roses.—In the formation of these, the leading shoot should always have the pre-eminence from the first (Fig. 40). That

shoot, though beheaded every year, should be cut back to the best and most prominent bud. In order to insure the presence of a fine bud at this point, it is good practice to disbud the upper end of the shoot as already described, or even to shorten the leader considerably, about the middle of September. This throws the strength of the plant into the buds left, and insures that the upper ones especially, that is those nearest to the beheading-line, shall break vigorously next year. But apart from that, the natural tendency of the sap to flow with most vigour in a vertical course, insures that the top bud on the leading shoot shall not only break with the greatest vigour, but maintain its supremacy for strength throughout the summer. In the practice of moulding Roses into good pyramids, the difficulty seldom or never is about the strength of the leader, but the maintenance of an equality of strength among the semi-horizontal branches. Where this is the case, these side-branches may often be strengthened

by the suppression of the leader by prompt stopping several times during the growing season. It should seldom or never, however, be headed down closer than within a foot or so of its base. But in practice this suppression for the mere moulding of pyramidal Roses into shape is seldom necessary, though it is often practised to gain most of the solid advantages of two full growths and crops of forming branches within the year.

Second Pruning of Pyramidal Roses.—The second pruning consists in the shortening back of the leader, and the three or more branches under

and as a fair sample of what a pyramidal Rose should grow into (Fig. 44).

Further Treatment.—This consists in the close pruning of such Roses every winter and spring. The hardier and later had better be pruned in November, as such Roses cannot afford to lose the vital and growing force of breaking their buds before pruning, which smaller standards or dwarfs may bear with more or less impunity. Pyramidal Roses, chiefly from their size and the number of Roses they produce, seldom yield blooms of the highest excellency; but they make up in numbers



Fig. 40.



Fig. 41.



Fig. 42.

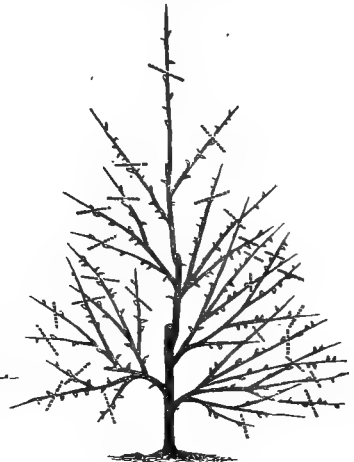


Fig. 43.

PYRAMIDAL ROSE-PRUNING.

it (Fig. 41). During the next summer the Rose will have advanced another and a long step towards its final and complete form. The three rudimentary branches of the first year will have multiplied into the compound or more complex branches shown at the base of the embryo pyramid (Fig. 42). On the top of these, climbing above, and still rather closely hugging them, three or more other side-shoots will be found, while the leader itself has advanced at least a foot or more, as may be desired.

Further Development.—Figs. 42 and 43 illustrate and explain these points, and the repetition of these processes year after year results in the formation of pyramidal Roses of any size desired. It is not necessary to follow the pruning as a means of forming them further; but, as in the case of standard Roses, it may be satisfactory to present a fair sample of a pyramid—alike as an inspiring and teaching model to be kept in view by every reader,

what they lack in perfection or size of individual blossoms, while no object within the whole range of nature or the rich domain of art could prove more attractive than a single plant, several, a group, a line, or avenue by the sides of a main walk or road, of pyramidal Roses of perfect form, and smothered with bloom from base to summit.

Weeping Roses.—These do not differ greatly in principle from those already explained and illustrated. The great thing in the formation of weeping Roses is to start with a stem sufficiently tall to make them effective. From seven to fifteen feet high will make good weeping Roses. The name explains the form. Having started at a sufficient elevation, one, two, or three hoops of different sizes are useful, and indeed almost indispensable, as a framework on which to fix and arrange the shoots of the Roses. Sometimes half-spherical or umbrella trellises (Fig. 45) are fixed to the top of a very stout central

stake of iron, which thus serves the combined purpose of keeping roots and stem immovable, and giving stability to the training-frame upon the top. At others, from three to five or more strong stakes round the side support hoop or hoops or frames. In any case great strength is needed, as the purchase of the wind on a weeping Rose, and its tendency to whip all the branches into fragments or confused bundles of bruised foliage and flower, without form or comeliness, must be seen or felt to be properly estimated and provided against. Where iron or wire hoops are used, the rings should be perforated at

tions for particular purposes), providing rich soil for their roots, and judicious long pruning—carried to such excess as not to prune at all in many cases—weeping Roses will soon reach down to the ground, and prove as grateful in affording useful shade as they are in enriching the landscape with unique subjects of interest and beauty.

How to Prune and Train Pillar and other Roses.—In pillar and climbing Roses several shoots may be used instead of one, and the practice may be far less formal and generally more



Fig. 44.—Pyramidal Pruning, finished.



Fig. 45.—Umbrella Trainer for Weeping Roses.

distances of a foot or so, and iron pegs projecting two inches or so on either side driven home, so as to become immovable. This prevents the wind from sweeping the branches round the hoop into confusion or sheer destruction. When wooden hoops are used the natural snags should be kept on to serve the same purpose, that of fixing the branches securely where placed, and making them independent of wind and weather. Fig. 45 shows a section of a weeping Rose fixed in position.

It will also be seen that the very longest of all modes of long pruning is adopted. It would, indeed, be a waste of time, as well as a trial of patience, to mount Roses on the highest available stocks, and then prune back their drooping shoots so often and so severely as to hinder their becoming effectual. By the choice of rapid-growing Roses (see our selec-

rapid. Pyramids are also formed at times of Ayrshire, Noisette, and Evergreen Roses, and in such cases the procedure may be different. The above instructions are given for the formation of standards and pyramidal Roses out of Hybrid Perpetuals. Roses that run twenty feet a year claim, and should have, greater liberty of growth and freedom of training. They, in a word, should have less pruning and more room. Two or more shoots run from the ground up a pole or tree, with the snags left on to support the Roses, may be left almost full length, and may form a magnificent pillar or climbing Rose the next year. The secret of perpetuating their beauty lies in, if possible, cutting out a main shoot back to the root annually, or so often as opportunity presents itself. From the base of this, other long rambling shoots will spring forth, probably more vigorous

than those removed. By exercising sense and judgment in the removal, as far as may be, of the oldest branches and shoots, the Roses may thus be pruned into a renewal of their youth annually, and by the aid of such root-dressings as will be described in our articles on Culture, will continue to bud and blossom as only such Roses can for so many years, that they may be safely reckoned among the permanent objects of beauty and interest in the garden.

The Firm Fixing of Trained Roses.—Without fixity of tenure and security against disturbance, the best-trained Roses soon become wretched and pitiable examples of love's painstaking and skilful labour lost. Even common standard Roses are so often blown out of the perpendicular by rough winds as to completely mar their form, and excite our commiseration rather than admiration. Stakes of wood soon rot, and besides have seldom sufficient foothold to remain for any length of time firmly fixed in the ground. The zigzag action of the wind, greatly aided by the leverage of the Rose-top, first loosens the stakes and then throws them over. Iron stakes, with variously-formed bases, have been substituted for wood with good effect. (See article on PLANTING.) Objection has been justly taken to heavy iron bottoms for stakes, as they speedily corrode in the ground; and although it is said that soils with a fair percentage of iron are the most favourable for the development of high colour in Roses, it is certain that the roots of Roses metaphorically turn up their noses at the large doses of iron rust generated by iron stakes. The best cure for this is to dip the base of the stake into hot pitch, and allow this to become thoroughly hard and dry before putting it in the ground. A similar coating, or one of tar varnish, is the best dressing for the upper portion of the stakes, and will last for years. Figures of several iron Rose-stakes have already been given, and they may be had of any length.

GREEN-HOUSE PLANTS.

By WILLIAM HUGH GOWER.

Epacris.—Handsome free-flowering plants, admirably adapted for bouquet-making, as well as the general decoration of green-house or conservatory. These plants bear the knife well, and consequently recommend themselves to ladies who cut their own flowers and like long stems with them.

Epacris are peculiar to Australia and New Zea-

land. The species from the latter country are not showy. They are generally found in elevated positions, a knowledge of which should assist the cultivator.

The genus has always been popular with lovers of plants, and therefore the hybridiser has paid considerable attention to them, the result being the production of numerous extremely beautiful varieties.

The flowers of Epacris are tubular, waxy, more or less drooping, and spring from the bases of the closely-set leaves, in such numbers as to form dense racemes of bloom. There are two distinct sections of Epacris, one being erect and bushy, the other having a somewhat lax or trailing habit of growth. The latter produce longer flowers, and usually bloom later in the season, and display their beauties to the greatest advantage when trained upon a wire trellis.

The bushy kinds should be cut back hard after blooming. The lax growers must only have an inch or two of their shoots trimmed off.

When Epacris are young, they should be potted in good rough peat, with a liberal quantity of sharp sand added; but after they have attained size and strength, the addition of a small quantity of light loam will be found advantageous. The erect-growing kinds mostly bloom in winter and early spring. Soon after the blooming season is past, cut the shoots down to an inch or two of the previous year's wood. They should then be placed in a frame or some position which will give them a closer atmosphere than usual, giving them an occasional sprinkling with the syringe or rose watering-can, which will materially assist in the production of young shoots. When the new growths are about an inch long, re-pot the plants; and as soon as root-action begins, give them more air. When the young shoots have made some four or five inches of growth, pinch out the points, and they will again form lateral shoots, and thus produce more dense and compact bushes. If the plants are to flower the following winter, do not stop the shoots a second time (unless the plants are very thin), as with one stopping they will make long stout shoots, which will be clothed with flowers the greater part of their length, and be more effective than a greater quantity of smaller ones.

The plants having become well established in their pots, remove them to the open air, standing them upon a bed of ashes to keep worms from entering the pots. Here they may remain until autumn, when it will be necessary to return them to their winter quarters, which should be a cool and airy position.

The lax growers being, as before remarked, later bloomers than the shrubby kinds, must not be

pruned at the same time, but immediately the flowers are past should be taken in hand, so that no time be lost in getting the next season's flowering-wood started.

Epacris require an abundant supply of water, but they cannot endure it to stagnate about their roots. Therefore, drain the pots well, and never allow the plants to suffer for want of water.

The following enumeration of species and of varieties will afford the means for a good selection for all decorative purposes.

SECTION I.—ERECT GROWERS.

Alba odoratissima, white, sweet-scented.
Butterfly, white and rose.
Campanulata, deep blush.
Campanulata alba, pure white.
Carminata, bright red.
Densiflora, blush.
Elegans, pale rose.
Exquisita, bright pink, large.
Fireball, bright scarlet, tipped with rose.
Hyacinthiflora, soft pink, dense spikes.
Hyacinthiflora candidissima, pure white, large, very dense spikes.
Hyacinthiflora carminata, bright pink.
Impressa coccinea, rich crimson.
Ingramii, bright red, tipped with pink.
Lady Alice Peel, salmon.
Lady Panmure, white and rose.
Mont Blanc, pure white, tubes stained with lemon inside.
Nivalis compacta, snow-white.
Picturata, deep pink.
Pulchella major, pure white, sweet-scented.
Sunset, brilliant red and pink.
The Bride, pure white.
Tricolor, bright red, pink, and rose.
Vesuvius, brilliant crimson.
Vicountess Hill, scarlet.



EPACRIS NIVALIS.

SECTION II.—LAX GROWERS.

<p><i>Devoniana</i>, rich bright scarlet. <i>Eclipse</i>, brilliant crimson, tipped with white, large. <i>Grandiflora rubra</i>, bright red and white.</p>	<p><i>Minata</i>, deep scarlet and white. <i>M. splendens</i>, fiery-red and white, very large. <i>Onosmeflora</i>, white. <i>O. plena</i>, white, double.</p>
--	---

Epigynium.—A small genus of Indian *Vaccinie*. For treatment, see *Ceratostema*. They are mostly epiphytal in their native habitats.

E. acuminatum, an elegant compact shrub, with alternate lanceolate leaves, tapering to a sharp point and toothed at the edges; deep green above, paler below and tinged with a shade of dull purple; flowers in dense drooping corymbs from the branches,

forming long racemes of deep red flowers, which are very effective. Summer months. Northern India; 3,000 to 4,000 feet elevation.

E. leucobotrys. This beautiful plant in a state of nature is frequently found epiphytal upon the branches of the large forest trees. It is a much-branched evergreen shrub, the leaves being clustered on the points of all the shoots. The leaves are oblong, bluntly toothed, and bright green; racemes long and drooping, bearing a quantity of tubular greenish-white flowers. These are succeeded by pure waxy-white berries, which render it very ornamental. Summer months: Northern India.

Erica.—This beautiful family of plants, familiar to every lover of flowers by the name of Heaths, is exclusively confined to the Old World; some few are natives of Europe, but the head-quarters of the genus is on the mountains of South Africa about the Cape of Good Hope.

Although the genus is a large one, none of its members have any economic properties; cattle do not care for them as fodder, although cows sometimes will browse on the young shoots, but this, it is said, causes the milk to assume a reddish colour as if stained with blood; with grouse, however, the buds

and young shoots of our native species are great favourites; hares and rabbits also browse on them, and the bee-keeper fully understands that the flowers yield an abundance of honey.

The majority of known species were introduced to this country in the reign of George III., and to Mr. Francis Masson, a celebrated botanical collector, we are indebted for not only so many Cape Heaths, but a vast quantity of other plants from that region.

The striking beauty of the waxy tubular flowers of *Ericas* soon installed them first favourites in the horticultural world, and an immense number of new varieties have been obtained in English gardens, the majority of which far surpass the Cape species in beauty.

The cultivation of *Ericas* is generally looked upon as being a matter of extreme difficulty, but the grand specimens which are to be found in the gardens of Great Britain and Ireland, are at least a proof that it is an art the British gardeners have fully mastered, and in which they stand pre-eminent; for no other Europeans can rival, far less surpass them in the culture of these plants. Climate, no doubt, has much to do with this, for in the North of Europe the changes in the temperature are too extreme, and in the South the atmosphere is too hot and arid to suit the constitutions of Cape Heaths, so that no matter how careful or painstaking a Continental gardener may be, he cannot thoroughly overcome the difficulties of climate.

These plants will grow only in peat, earth, and sharp sand; this, however, must not be hard and harsh, nor boggy, or spongy, but good, fibrous, gritty peat, and it is best not sifted, but the fibre should be chopped up with the soil; the coarseness must, of course, be regulated by the size of the pots into which the plants are shifted. The pots must be carefully drained; that is to say, the drainage material should be so placed as to allow the water to rapidly pass away; this can be effected with a few properly-adjusted pieces of broken pots in a far better manner than is oftentimes done with a large quantity, when the operation is performed in a thoughtless and careless manner.

Heaths, when they have attained considerable size, may be kept in the same pot for several years, if the mould is not sour, and the drainage remains in working order; but when these plants are re-potted it should be done before they get thoroughly pot-bound, but always let the old pots be well filled with roots before putting into larger ones. When the plant is taken out of the old pot the shoulder of the ball should be carefully rubbed down and the drainage material removed with as little injury to the roots as possible; place sufficient mould over the drainage in the new pot to allow the plant to stand at its proper level, which should be about two inches below the rim, fill round the sides with the new mould, and press it down very firmly as the process goes on, for the roots of *Ericas* are very fine, and they root more freely and thrive best when potted hard.

Heaths, like all other plants, require a certain amount of pruning, but with these plants the operation requires considerable care and forethought. In the case of the soft-wooded free-growing kinds, we advise the knife to be used pretty freely; immediately after flowering cut the shoots back below the points which have bloomed, and any shoots or laterals which have not flowered may also be stopped at the same time; after the shoots have started let them grow

freely until they are about six inches long, when the points should be pinched out; after this, if the plant is tolerably bushy, do not stop again, and the result will be fine long spikes of bloom. With the hard-wooded kinds, however, the case is very different, a knife should never be applied to them; these will only require just the points pinched out at any time, and this may be done from time to time according to the style in which the cultivator wishes to build up the specimen. In performing this operation a thought must be given as to the time of flowering, for if it is done too late in the season, it prevents the wood attaining maturity, and the result is that the plant is bare of flowers.

The judicious application of water is one of the great secrets in Heath-culture; many inexperienced in this matter say they should not have much water; our experience, however, goes to prove that *Ericas* like an abundant supply of water when growing, but it must be carried off quickly. It is difficult to moisten a ball of peat through with a small quantity of water, and the roots of these plants should never be allowed to suffer drought, or in all probability death will rapidly ensue; and the same end will speedily be arrived at if the roots become soddened with water; therefore, in watering, give sufficient water to thoroughly penetrate the whole mass of soil, look over the plants frequently in order to anticipate their wants, be sure the drainage is free and open, and all will be well. In winter less water as a matter of course will be necessary, but winter or summer, whenever it is given, do it thoroughly.

Ericas may be stood in the open air during the summer months, the full exposure to the sun being very beneficial in ripening the growth, and the plants have the advantage of standing on a cooler bottom than when on a stage in the house.

These plants require thorough ventilation, therefore the lights must be always kept open in genial weather to allow of a free circulation of air. Fire-heat is one of their greatest enemies, and, unless during frosty weather, it should never be applied. An exception to this rule, however, may be made during a period of dull wet weather when the atmosphere becomes heavy and damp; then a little heat may be applied with advantage, but the ventilators must be all opened at the time, and the house allowed to get cool again before night. Mildew is a pest which must be kept from these plants, or the leaves will become rusty, and the bare stems left after the leaves fall greatly disfigure their appearance. Whenever this is discovered, immediately dust the affected part with sulphur; the plants should be laid on their sides during the operation in order to prevent its falling on the soil, as it is very injurious to the roots.

E. æmula.—A dwarf variety; foliage very dense and hoary; flowers large, many in a whorl, deep green and red. May to August.

E. affinis.—A free-growing kind, with rich deep green leaves; flowers pale yellow, contracted at the mouth. April to May.

E. Aitoniana.—A Cape species, named in honour of "Aiton," author of "Hortus Kewensis." A slender, somewhat lax grower, with short bright green leaves; flowers long, arranged in terminal whorls, pure white; very sticky. July to September.

E. Aitoniana turgida.—Habit similar to the preceding, but a little stronger; flowers long and much inflated at the base, white, tinged with pink. July to August.

E. Aitoniana rosea.—Similar to the last-named in habit; flowers large, in terminal whorls, rosy-pink. June to August.

E. alopecuroides.—A free grower with small downy leaves; flowers ovate, numerous, reddish-purple. September to October.

E. ampullacea.—A compact-growing species with bright green leaves, slightly hairy at the edges; flowers in large umbels, tubes much swollen at the base, reddish-pink; limb white. July to August.

E. ampullacea obbata.—A very fine variety; flowers large, flask-shaped, inflated at base, and contracted at the neck; waxy-white. July to September.

E. ampullacea rubra.—Similar to the species, but with larger flowers, which are bright red. May to June.

E. andromedæflora.—A somewhat tall-growing species; leaves deep green; flowers globular; calyx large and soft pink, whilst the corolla is reddish-pink. Propagated from seed. April to June.

E. aristata.—A dense grower, with leaves closely set; flowers large, many in a whorl, tubular, but with swollen base, deep red; limb white. May to July.

E. aristata Barnesii.—A superb form, having rich dark foliage; flowers bright red, with broad pure white limb. May to July.

E. aristata virens.—Leaves deep green; flowers similar to preceding, but heavy red in the tube; limb pinkish-white. May to July.

E. Archeriana.—A free-growing species; flowers long, tubular, deep scarlet. August to September.

E. Beaumontia.—Sometimes found in collections under the name of *rubrocella*. The flowers are campanulate, pendulous, purple, purplish-white. April to July.

E. Bergiana.—This is a free-flowering and very pretty species. The leaves are downy; flowers terminal, drooping, campanulate in shape, purple. It is also known by the various names of *E. lacunæflora*, *E. quadriflora*, and *E. nitens*. May to July.

E. brunsades.—This plant is so densely clothed with woolly hairs that it has been called *E. villosa*. It is a rather slender grower, but withal so singular and beautiful that a place should be found for it in every collection. Flowers pink, the stamens black; exserted, produced in terminal whorls. May to July.

E. caffra nana.—A small-flowered variety,

but valuable on account of the season at which it blooms. A slender-growing plant, producing abundance of small white campanulate flowers. Known also by the names of *E. strignosa* and *E. prolifera*.

E. campanulata.—Flowers campanulate, drooping, bright yellow; an abundant bloomer, and most desirable on account of its colour. May to July.

E. Candolleana.—A free but compact grower; flowers large, tubular, produced in umbels; white suffused with rosy-pink. June to August.

E. Cavendishiana.—A bold strong grower, very vigorous; foliage bright rich green; flowers tubular, about an inch long, bright yellow. May to July.

E. cerinthoides coronata.—A somewhat lax-growing



ERICA AITONIANA TURGIDA.

plant; leaves short, deep green; flowers tubular, in terminal umbels, very numerous, deep scarlet, clothed with short hair. August to September.

E. colorans verna.—A soft-wooded erect-growing kind; flowers white, suffused with reddish-pink. March to May.

E. depressa.—A hard-wooded slow-growing species; sometimes known as *E. humilis*. Growth drooping; leaves intense deep green; flowers tubular, pale yellow; very handsome. May to July.

E. depressa multiflora.—This resembles the preceding in its intense deep green leaves and yellow flowers, but the growths do not droop as in the species; it is also generally a little later in flowering. June to August.

E. Devoniana.—A handsome variety, with somewhat broad leaves for a Heath; flowers tubular, in umbels, swollen at the base, reddish-purple. May to June.

E. Douglassii.—Growths lax; flowers tubular, tender, in terminal umbels, tubes deep flesh-colour; limbs large, spreading, white. June to July.

E. effusa.—A superb variety, of robust constitution. Leaves tomentose; flowers in terminal whorls of from ten to twelve, tubes inflated at base, crimson-scarlet; limb reflexed, soft primrose-yellow. June to August.

E. elegans.—Habit of growth somewhat depressed, very shrubby; leaves long and fleshy, glaucous; calyx large, bright rosy-red; corolla contracted, nearly same colour as calyx, tipped with green; very handsome. May to July.

E. elegans glauca.—Similar to the preceding, but larger in all its parts, more erect in habit, and freer in growth; very glaucous. May to July.

E. eximia superba.—A close compact-habited kind, and a free bloomer; flowers in whorls, tubular, about an inch long, bright red, tipped with olive-green. June to July.

E. exurgens.—A strong erect-growing species, with tubular flowers upwards of an inch long, slender at the base, swelling upwards, dark orange; stamens exerted. Winter months.

E. Fairriana.—Leaves furnished with long hairs at the edges. A profuse bloomer; flowers large, in terminal umbels, tubular, much inflated at base, contracted at the mouth, rich deep rose, purple band at neck; limb white. A superb variety. June to August.

E. ferruginea superba.—A free bloomer and of good constitution. Leaves thickly clothed with rusty-brown hairs; flowers tubular, bright rosy-red. July to August.

E. florida.—An erect free-growing plant. Leaves clothed with a grey tomentum; flowers small but very numerous, campanulate, creamy-white. May to July.

E. gemmifera.—A very handsome species, frequently to be found in gardens under the name of *E. Massonii minor*. Leaves furnished with long hairs at the margins; flowers disposed in whorls of eight or more, tubular, deep red, paler towards the neck; segments tipped with green. July to August.

E. gracilis.—A soft-wooded free-growing species, with smooth, bright green leaves; flowers globose, small but produced in the greatest abundance, reddish-purple. There are two varieties, an autumnal bloomer and a spring bloomer. Saving in the time of flowering there is no distinction.

E. grandinosa.—A free-growing kind, with bright green leaves; flowers globose, smooth, and pure white; popularly known as the Hailstone Heath. May to July.

E. Hartnelliana.—A handsome variety, free in growth and an abundant bloomer; flowers disposed in large whorls, tubular, red at base, banded with green at the neck; limb white. May and June.

E. hybrida.—Sometimes found under the name of *E. cylindrica*. It is an erect, free-growing, soft-wooded kind, with smooth, bright green leaves, and long tubular flowers of a brilliant red. May and June.

E. hyemalis.—This is perhaps the best-known Heath in cultivation. It is very largely grown for decorative purposes. It is a free-growing erect plant, with pale green leaves, and an abundant bloomer; flowers bell-shaped, drooping, reddish-pink at the base, white towards the mouth. There is also a pure white variety. December to March.

E. infundibuliformis.—A handsome free-flowering species; flowers tubular, slender, tubes red; limb spreading, pure white. June to August.

E. intermedia.—A strong and rapid-growing plant, producing its large whorls of drooping pure white flowers in abundance. April to July.

E. Irbyana.—Flowers large, disposed in whorls, flask-shaped, sharply contracted at top, rosy-pink, neck banded with greenish-black; a very fine plant. July to August.

E. Jacksoniana.—A very beautiful variety; flowers in whorls, tubular, deep red; a dark band round the neck; limb white. July to September.

E. jasmiflora alba.—A most desirable, strong-growing, hard-wooded plant, producing very large and long flask-shaped flowers, which are pure white. June to August.

E. McNabiana.—This fine Heath was named in honour of Mr. McNab, curator of the Botanic Gardens, Edinburgh, who gathered together a very fine collection of these plants, and whose skill in their cultivation has become historical. Leaves thick, slightly recurved and deep green; flowers

large, tubular, upwards of an inch long; tubes reddish-pink, with a very dark band round the neck; limb spreading, white. May to July.

E. McNabiana rosea.—In growth this very desirable variety differs from the preceding in the more recurved leaves; the flowers also are much longer and larger; tubes rich dark rose, with a band of deep blackish-purple round the neck; limb spreading, white. Its normal flowering season is May to July; it occasionally, however, blooms again in the autumn.

E. mammosa major.—A strong erect-growing plant, producing large whorls of long, drooping, tubular flowers, which are deep reddish-purple in colour; a very showy and useful variety. July to November.

E. Massonii major.—Named in honour of the introducer of so many Cape Heaths. It is, perhaps, the grandest and most stately of the whole genus, and, at the same time, the most difficult to keep in good condition. It is a slow-growing plant, but very free-branching. The leaves are closely set, and densely clothed with woolly hairs; these absorb the moisture if it should get wet, and this leads to mildew, and turns them a reddish-brown, causing the plant to present a very patchy and unsightly appearance. When carefully attended to, however, the plant is very handsome either in or out of flower. The flowers are tubular, upwards of an inch long, disposed in large terminal whorls, deep fiery-red; limb olive-green and yellow. June to August.

E. Marnockiana.—The flowers of this very handsome variety are entirely destitute of the viscid gum with which nearly all the blooms of the hard-wooded Heaths are coated, so that neither dust nor insects can find a lodgment upon them, which is a great advantage. Flowers large, tubular, inflated at the base; tubes rich purplish-crimson, with a darker band round the neck; limb white. July to September.

E. mutabilis.—A slender-growing plant, which may with propriety be called a perpetual bloomer;

but it requires considerable attention to keep it in health during the winter. Mildew is its great enemy. The flowers are disposed in whorls, tubes long and slender, and of a uniform bright red throughout.

E. obbata.—A grand variety. The flowers are much inflated, produced in large whorls, and are pure white. June to August.

E. odora rosea.—Known also in gardens by the name of *E. odorata*. It is delicately fragrant, well deserving a place in every collection of plants. The leaves are rather small and sparse, dark green; flowers campanulate, pendulous, and pure white. May to July.

E. opulenta.—A compact yet free-growing plant; the leaves closely set, small, and slightly hairy. The long tubular flowers are produced in large whorls, tubes much inflated at base, bright crimson-lake; neck banded with reddish-brown; limb pink. June to August.

E. ornata.—The habit of this delicately-beautiful variety is robust and free; flowers large, tubes much inflated; soft white, shaded with carmine at the base, neck banded with green; limb white. July and August.

E. ovata.—This fine plant has several synonyms, being found in some gardens under the names of *E. mitraformis* and *E. hirtiflora*; leaves somewhat spreading, hairy at

the edges, and dark green; flowers in terminal whorls, tubes much inflated at base, reddish-purple; limb white. June and July.

E. Parmentieriana rosea.—An elegant and most useful plant; compact in growth and a profuse bloomer; leaves dense, bright green; flowers tubular, inflated at the base, and rosy-purple in colour. July and August.

E. Paxtoniana.—Habit robust and good; leaves hairy and recurved; flowers in terminal whorls, tubes upwards of an inch long, reddish-salmon, neck banded with greenish-brown. June to August.

E. persoluta.—A free slender-growing species, very useful for cutting. The flowers are small, globose, reddish-pink in colour, and produced in great abun-



ERICA HYEMALIS.

dance from all the points of the shoots. There is a white-flowering form called *alba*, and another, *rubra*, with deep red flowers, but in habit and appearance they are identical. April and May.

E. perspicua nana.—A dwarf close-growing plant and a free bloomer; leaves somewhat hairy, deep green; flowers disposed in terminal clusters, tubes slender, delicate flesh-colour; limb white. May and June.

E. perspicua rosea.—In habit and general appearance this variety resembles the preceding. The flowers, however, are rich deep rose. It is a very desirable plant. May and June.

E. primuloides.—A small-growing species of great beauty; leaves dense and deep green; flowers slender, tubes red; limb large and spreading, rosy-purple. May and June.

E. princeps coccinea.—A beautiful but rather straggling grower. The leaves are thick, hairy, and dark green; flowers stout, tubes bright scarlet. The original *E. princeps* is a far less showy plant than this variety. There is also a form, with pinkish flesh-coloured flowers, called *carnea*. All are extremely handsome. May and June.

E. propendens.—In habit of growth this resembles somewhat *E. hyemalis*, and, like it also, this is a very free bloomer; flowers campanulate, drooping, and soft purplish-lilac in colour. May to July.

E. pyramidalis.—A soft-wooded free-growing species, erect in growth, with narrow slightly woolly leaves; flowers tubular, produced from the points of all the shoots in abundance, rosy-pink throughout. February to May.

E. retorta.—An elegant hard-wooded kind; leaves recurved, dark green; flowers in terminal whorls, tubes reddish-pink. June to August.

E. retorta major.—More robust than the species, and the flowers are larger; tubes red, with a darker band round the neck; limb spreading, white. July to October.

E. rubens.—A small, compact, free-growing kind; leaves dense, bright green; flowers bell-shaped, dark red. July to August.

E. rubro-calyx, sometimes called *ruber-calyx*, and also *rubido*. It takes its name from the fact of the calyx being coloured as well as the corolla. It is an erect soft-wooded kind, and a free bloomer; tubes pure white; calyx reddish-purple. May to July.

E. Savilleiana.—A dense-growing species with dark green leaves, and small bell-shaped flowers of a reddish-pink hue. June to August.

E. Shannoniiana.—A grand variety of robust habit; leaves spreading, dark green; flowers large, tubular, much inflated at the base, white, shaded with reddish-purple. June to August.

E. Shannoniiana glabra.—A most desirable plant. It is a strong grower; the whorls are many-flowered; the tubes are much swollen at the base, ivory-white, and quite free from the viscid gum so common to these plants. July and August.

E. Sindryana, sometimes called *E. zingerella*. It is a handsome soft-wooded plant of the *hyemalis* section, which it much resembles both in growth and bloom. It flowers, however, in March and April.

E. Spenceiiana.—This very distinct and useful variety is a soft-wooded plant of free growth, with dense, dark green leaves; flowers tubular, long, and slender; tubes smallest at base; purplish-lilac. May to July.

E. Thunbergii.—A very curious and ornamental species; leaves glaucous; flowers highly coloured, being yellow, green, white, and scarlet. May to July.

E. tricolor coronata.—In all the varieties of *E. tricolor* the leaves are very closely set and more or less clothed with ferruginous hairs, which renders them liable to attacks of mildew if the foliage is allowed to get wet. The form now under consideration produces many-flowered whorls of large tubular blooms, which are pinkish flesh-colour, neck banded with green; limb white. July and August.

E. tricolor flammea.—Flowers large, much inflated, fiery-red at base, passing to white towards the upper part, neck green. June and July.

E. tricolor Holdfordiana.—Flowers very large, base of tube pale flesh, passing into reddish-pink, neck green. June and July.

E. tricolor profusa.—Tubes much swollen at base, where they are bright crimson, shading to rosy-carmine and white, neck yellowish-green. July and August.

E. tricolor Wilsoniana.—Flowers large and much inflated, sharply contracted at the throat, rosy-pink at the base, passing to white, neck banded green. June to August.

E. triumphans.—This species belongs to the arborescent section, that includes *elegans*, *andromediflora*, *Thunbergii*, *tacifolia*, &c., in which the calyx is usually highly coloured as well as the corolla. They are also extremely difficult to increase from cuttings, but are raised from seed. The present plant is a bold and somewhat coarse-growing kind; leaves large, smooth, and dark green; flowers globose, drooping, and pure white, with an enlarged calyx. May and June.

E. tubiformis.—A very showy kind; flowers long; the tubes rich red, mouth rosy-pink; limb spreading, white. April to July.

E. venosa.—Leaves dark green, nearly smooth; whorls of flowers large; tubes rich bright crimson; limb white. July and August.

E. ventricosa breviflora.—The *ventricosas* are a very beautiful section. They are mostly dwarf and compact in habit, with dense foliage, flowers long, tubular, and disposed in terminal umbels on all the branches. The flowers are all smooth and destitute of gum; this variety is a rather stronger grower than the majority. Flowers almost globose, of a uniform deep rose. May and June.

E. ventricosa carnea.—Leaves small; flowers long, inflated at base, soft flesh-colour. May to July.

E. ventricosa coccinea minor.—A very dwarf, dense-growing variety, with dark green leaves, and a most profuse bloomer; flowers long, slender, tubes china-white; limb spreading, bright red. May and June.

E. ventricosa grandiflora.—Flowers very large and wholly deep purplish-crimson; a superb form. June and July.

E. ventricosa magnifica.—A somewhat stiff, erect-growing kind; an abundant bloomer; flowers rosy-red. June and July.

E. ventricosa splendens.—This form is more hirsute than any of the others; flowers large, the tubes swollen in the middle, porcelain-white; limb rosy-purple tipped with white. June and July.

E. ventricosa tricolor.—Flowers long, tubes creamy-white, flesh-colour at neck; limb white. A very handsome variety. July to August.

E. Vernoniana.—A grand variety, with flowers in very large terminal whorls, tubes much swollen at base, sharply contracted at the throat, pure waxy-white, neck banded green; limb broad and spreading. June to August.

E. vestita alba.—The varieties of this section are not very numerous, but they are very distinct from all other Heaths. They are rather apt to lose their leaves, and do not conform to any style of training. They are characterised by their stout erect growths, and dense, long, dark green, linear leaves, which are soft and silky. The flowers are tubular, semi-erect, slightly curved, smallest at the base, and are disposed in whorls an inch or two below the points of the shoot. In *vestita alba* the flowers are rather short, pure white. May to July.

E. vestita carnea.—Flowers numerous, soft pink or flesh-colour. June and July.

E. vestita coccinea.—Similar to the preceding; colour bright reddish-scarlet. July and August.

E. vestita rosea.—Flowers about the size of *alba*, in large whorls, deep, rich rose; very handsome. August and September.

E. Victoria.—A hard-wooded kind of great beauty, robust in habit, and an abundant bloomer; flowers large, tubular, inflated at base, tubes purplish-crimson, neck banded with black; limb white. April and May.

E. Westphalingia.—This is also called *E. undulata*. An erect, quick-growing kind; flowers tubular, of a uniform soft red. May to July.

E. Wilmoreana.—A soft-wooded kind, with grey-green leaves; flowers bell-shaped, pendulous, purple at base, tipped with white; an abundant bloomer; one of the most popular and generally grown of all early Heaths. February to April.

THE HARDY FRUIT GARDEN.

By D. T. FISH, ASSISTED BY WILLIAM CARMICHAEL.

ARRANGEMENT.

Place.—As to the place, near to or within sight of the dwelling-house, whether that be a mansion, a villa, or a cottage, is undoubtedly the best place. It was a vulgar error that demanded the separation of pleasure from profit in the ornamentation of the dwelling-house; and even the highest and most severely æsthetic taste of the present day is prepared to admit fruit-trees into the home landscape or garden. Perhaps the most suitable and convenient place for the fruit garden is the intermediate area between the flower and the vegetable or kitchen garden. It is only fitting that plants grown mainly or wholly for their beauty should embellish and enwreath the base and the immediate foreground of the dwelling-house, and our fruit trees might make good their claim to this first circle of absolute beauty. For what flower or flowering shrub can match or excel the snowy whiteness of Cherries, Plums and Pears, or the delicate and deep pink of Apple and Peach-blossom? Still, on the whole, our gradation has taste, propriety, and convenience to recommend it. Flowers, chaste and bright, on green turf and bright gravel, to form a soft rich base of beauty round the dwelling-house. Beyond this the fruit garden, leading pleasantly on or into the kitchen garden proper and culinary department.

Of course, each may be kept purely for its own specific purpose, or the three may be more or less mixed. But, as a rule, the fruit garden will prove most satisfactory, alike on principles of taste and grounds of utility, when occupying a mid position—a sort of half-way house between the purely ornamental and strictly utilitarian portions of the garden. These terms, however, must be understood in a limited and comparative sense. For it will be one of our main objects to make the fruit garden highly beautiful as well as profitable; and even a kitchen garden, skilfully cropped and carefully kept, if not exactly a thing of beauty or joy for ever, may yet yield a rich harvest of satisfaction through its order, cleanliness, and plenty.

Size.—This may vary from a rod to an acre or several acres. But apart from the orchard, which is not included in our idea of a fruit garden, it seldom may exceed a quarter or half an acre. Of course, much depends on the size and habits of the family, and whether all the fruit is to be consumed at home or part of it disposed of to others.

Neither need fruit gardens be nearly so large as formerly. For the last twenty years the chief improvements in fruit-culture have run in two directions—the forcing of the trees into earlier fruitfulness, and the gathering of more fruit from less space. The huge trees of the olden times have been cut down into pillars, pyramids, bushes, cordons; and these small trees have been forced into an amount of fertility within a limit of time that would have read like a fairy tale to the older cultivators. Such wholesale reduction in the size of trees, and in the intervening period between their starting and maturity, have enabled the size of fruit gardens to be cut down to the smallest limits, until it is hardly an exaggeration to assert that every yard of earth may grow a fruit-tree to perfection. When the general public becomes thoroughly alive to the revolution that has been effected in fruit-culture, through the employment of dwarfing and fructifying stocks, the practice of root-pruning, and the introduction of repressive systems of treatment and training, fruit-trees will find their way into every garden, and fruit gardens become as plentiful and common as the never-failing flower-bed and borders of dwarf trees or shrubs. As already stated, the fruit garden might readily be made as beautiful as either, while far more profitable. The smaller it is, the more productive as a rule, and thus more interesting, neither cultural skill nor taste being necessarily associated with size.

Plan.—The character of the fruit garden may be infinitely varied. For example, it may be a square, a parallelogram, an oval, or a circle, enclosed with walls or hedges, or not enclosed at all. The different fruits may be massed in blocks, or marshalled in lines, each sort of fruit grown together, or different sorts mixed, trees massed in one place, bush fruit in another, or the two interlined. Again, the surface may be on a dead level, even fall, or be chosen or made as irregular as possible. For example, one of the most successful fruit gardens ever seen by the writer was thrown into a series of ridges and furrows, the warmest sides of the ridges being nine feet, and the cooler sides six. The character, number, width, and direction of the walks introduce an endless source of variety; while not a few fruit gardens are almost made or marred on the question of walks or no walks. The walks may also be raised above, sunk below, or made even with the surface.

It may also be remarked in passing that there seems no particular reason why walks should be almost invariably straight in fruit gardens. Where they are so, a good plan to furnish shade, and add to the beauty, plenty, and enjoyment of the garden, is to throw light wire or iron arches over the main paths, and use them as trainers for Apple, Pear, Cherry, or other fruit-trees. A marvellous amount of variety may be thrown into fruit gardens by furnishing them with trees of different character. For example, the old-fashioned semi-forest-like fruit-trees of the olden times, with which the more primitive fruit gardens were chiefly furnished, have almost disappeared before the trim pillars and pyramids, squat bushes, vases, and cordons, the natural products of dwarfing stocks and new methods of root-pruning.

Returning to our starting-point, few things give greater variety to the fruit garden than the vital difference involved between the two extremes of walls and no walls. Again, walls of differing heights greatly alter the character of gardens. In regard to this, it may be said that the age of high walls from fourteen to sixteen feet has passed away. When well furnished, these were simply magnificent; but, with all the help given by rich borders, they took years to furnish, and they cast a baleful shade behind, thus giving a dark and sombre look and feeling to many a fruit garden of the old school.

But the use of walls not only imparts shelter and conserves heat, but greatly widens and extends the area of cultivation by rendering the successful culture of such luscious fruits as Peaches, Nectarines, Apricots, Plums, and the finer Pears in the open air possible in our climate. By cutting down their height to an average of ten or twelve feet, their efficiency is increased, their thickness and consequent cost greatly diminished. By adopting curvilinear, panelled, and pillared walls, a maximum amount of stability and protection may be obtained at a minimum cost. These forms also introduce more beauty into fruit gardens than the more common straight walls.

For mere purposes of shelter, living hedges of Beech, Yew, Privet, Arborvitæ, Box, Holly, or other plants are quite as efficient as walls. Even dead screens may be utilised for purposes of protection to fruit-trees; and some of the finest fruit-trees ever seen by the writer were ripened on a fence formed of furze, firmly fixed in position with a rough line of strong stakes.

In not a few situations fruit gardens are as well or better without screens or shelter of any sort, and excess of shelter is always injurious. It often attenuates and weakens fruit-trees so much, that they suffer more from the indirect effects of the shelter

than benefit from its direct power of protection. Very high walls are apt to add to the destructive power of spring frosts by the additional stillness they give to the enclosed area of air, this stillness increasing the energy of radiation.

Hence, too, the vital importance of choosing rolling or uneven ground for the fruit garden, where that is practicable. The air is less stagnant on such surfaces, and hence rolling ground not merely imparts variety but brings safety to the fruit garden. Hence much of the labour and ex-

to obtain the full force of the sun on the south wall either before or after noon, as desired—is the most convenient for working and the most economical for enclosing with walls. The nearer the fruit garden approaches to a square, the shorter the wall needed to enclose any given area. With a view also of securing the largest possible amount of the most genial wall-space, the length of the garden from east to west should be as much again, or as five to three, of its width from north to south. This will furnish a maximum extent of south wall, which

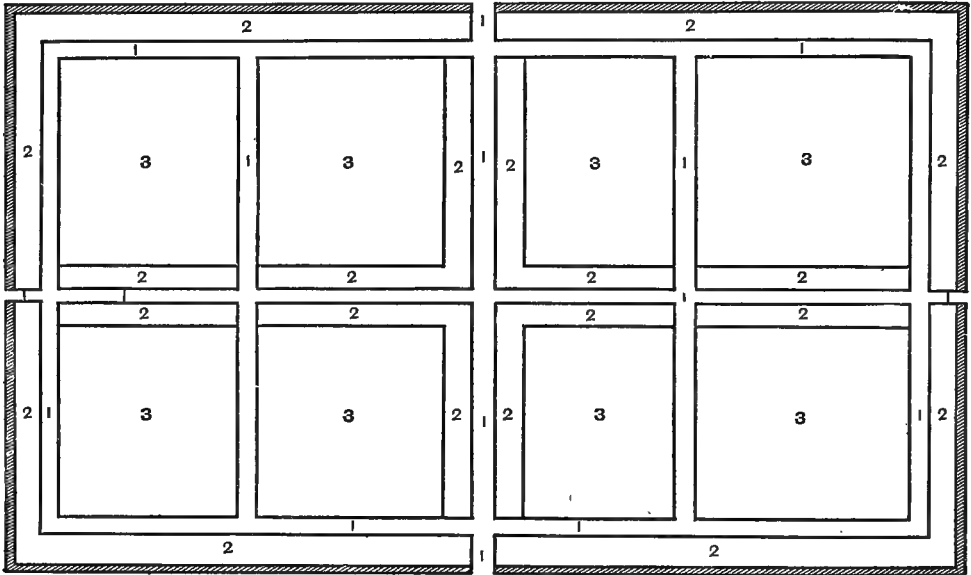


Fig. 1.—PLAN FOR A FRUIT GARDEN.

1, Walks ; 2, Fruit-tree Borders ; 3, Beds for Fruit-trees.

pense incurred in making fruit gardens level is not seldom worse than wasted. Gardens on the flat or a regular hanging slope may be more easily cultivated, but they are seldom so fruitful as those on the side of a rolling hill, with a gentle inclination to the sunny south or genial west.

The accompanying ground-plan of a fruit garden is one of many plans that may be adopted. It is not desirable to slavishly adhere to any particular arrangement, though the pleasures and profits of most fruit gardens are in direct ratio to the foresight and skill brought to bear on their planning and culture.

In most cases some form of square—parallelogram, rhombus, or rhomboid, the two latter long squares, set out of square, or rather out of the meridian, so as

is the most valuable for the culture of Peaches, Nectarines, Grape-vines, and Figs. According to locality, these walls may be direct south at noon, or at 11 a.m., or 1 p.m. These apparently slight changes tend to moderate or regulate the heat on the southern walls, and to make both the east and west walls more generally useful for the culture of the better sorts of fruit, such as Peaches, Plums, Pears, Apricots, Cherries, &c.

The question of the proper aspect of the fruit garden is almost as important, where the fruit garden is not enclosed with walls ; as climate is very largely determined by aspect, and differences in temperature varying from 5° to 10° may often be found within a few yards. Such differences may arise from shelter or the lack of it, the inclination, drainage, character,

and texture of the soil, and other causes. As a rule the most genial, that is the warmest, aspects should be chosen, though there are exceptions to this, as in the case of bush-fruits, such as Gooseberries and Currants, these being mostly finest and, more singular still, sweetest on the coldest sites.

Of course, thorough drainage, so as to prevent the possibility of the accumulation, rather than insure the removal, of stagnant water, is indispensable. A depth of two or more feet of good soil should also be provided, and where it is impracticable to obtain such a depth all over the surface, the system of mound or ridge and furrow planting may be resorted to. It has almost passed into an axiom among cultivators that a load, that is a cubic yard, of earth will suffice to grow and preserve in health and fertility a fruit-tree for a good many years.

On wet soils and subsoils considerable success has been attained by forming the soil into a mound above the line of the general surface.

Forming Barriers against the Roots Penetrating too Deeply into Barren Soils or Injurious Subsoils.—It used to be thought that a barrier of barrenness would suffice to arrest the boring properties or downward tendencies of the roots. Hence layers of stones, brick refuse, chalk, and even puddled clay and sea or other sand were placed under the roots of trees to keep them near to the surface.

Such expedients only hastened the downward course of the roots. Hence the origin of concrete, stone, slate, or asphalted bases for fruit-tree beds and borders. These proved successful in preventing the roots going further down; but as they were generally covered with a layer of drainage, the latter seemed to draw the roots down to the concrete or barrier, where they were not seldom found spreading out into a perfect network of fibres just where there was least for them to feed on.

Hence, though the practice of rendering the base of fruit-tree borders impervious to the roots is still adopted in many cases, the modern fruit-grower entices the roots up by liberal culture and food on the surface, rather than arrests their downward course by physical obstacles to their further progress.

Among these improved methods of root-culture are : a firmer surface, freedom from digging, and surface feeding in the form of mulching with maiden soils or nourishing manure.

Most of the dwarfing stocks employed are also distinguished by freer rooting, and this tendency is intensified by the modern practice of root-pruning. But as most of these practices may be again alluded to in describing the special culture of particular

fruits, it will not be needful further to advert to them in these general remarks on the fruit garden.

Fruit gardens on grass are mostly called orchards, the trees in them necessarily having rather tall stems and being placed at considerable distances apart, in order to keep the grass green underneath ; but not a few orchards are sub-cropped with fruit-bushes and Raspberries, and such are again inter-cropped with vegetables. But, generally, modern fruit gardens are planted with dwarf or pyramidal trees, at distances of from four feet to six, or, at the most, eight feet asunder, only leaving sufficient space to afford free access for cultural purposes and for gathering the crops of fruit. The entire area is, in fact, covered with the trees, and the surface of the soil kept free of weeds or duly mulched over to conserve the moisture or feed the roots. By keeping each species and variety of fruit as nearly as may be to itself, each may the more readily have the special culture that it needs, without injury, or interference with others.

DECORATIVE USE OF FLOWERS.

BY JAMES HUDSON.

INTRODUCTION.

AMONG the various uses to which cut flowers and plants are applied, perhaps there is no one which has received such impetus of late years as decoration of a festive character. Flowers are now in far greater request for the embellishment of the dinner-table, as well as in many other ways, than was the case even a few years ago. This has been undoubtedly the means of fostering a greater demand for those plants and flowers that are the best adapted for such requirements, causing many suitable subjects to be cultivated in numbers, whereas formerly only solitary examples were to be found in many establishments. It has likewise been productive of good in bringing many flowers into more prominent notice. Flowers that would escape the notice of many a casual observer in the open air, when surrounded by more gaily-attired examples, will oftentimes meet with much favour when artistically arranged in suitable vases, and brought under close observation, so that their particular beauties are the more readily discernible.

Even with a limited space at command, there are numbers of suitable subjects that can be advantageously cultivated for the purposes now being dwelt upon. The immense numbers of herbaceous plants, of many genera and species, will yield a good supply the greater part of the year, and the intervening periods can easily be bridged over by those who have a green-house at their command.

More fortunate still for those lovers of floral decorations who can draw upon the resources of our stoves and hot-houses, wherewith to beautify and render *recherché* their various arrangements, when for a while the wintry blasts lay prostrate the beauties of our hardier flowers, with but few exceptions. Happily, however, those harbingers of spring-time, the Snowdrop and the Crocus, quickly unfold their blossoms, ere the frosts and snows have left us even, for the return of more congenial weather. These are soon followed by the Primrose in various shades of colour, the Oxlip, the Cowslip, and the Polyanthus, all of which can be turned to good account in a rustic manner for many decorations. As these, in their turn, fade and wither away before the bright rays of the coming summer, we have a wealth of beautiful flowers that vie with each other in brilliancy of colour or in beauty of form and outline. So on throughout the sunshine of the summer months, the flower garden yields an immense variety of choice subjects for decorations.

As the summer wanes away and signs of coming autumn are apparent in the beautiful tints of the foliage of our trees and deciduous shrubs, there again is another wide field of selection should flowers be somewhat scarce. The beautiful hues of colour that many leaves assume during this period of the year are the admiration of all lovers of nature. The artist gathers therefrom many suggestions for his pencil and brush. The lover of floral arrangements is also an artist, using the natural beauties wherewith the all-beneficent Creator has endowed this earth of ours, and displaying them for the better admiration and entertainment of others, as occasion may occur, each in their own sphere of life.

It is wonderful how some enthusiastic admirers of flowers will contrive, either by the aid of flowers or foliage individually, or both combined, to make most effective arrangements with but little material from which to choose. The wild flowers of our fields and hedgerows will, when tastefully arranged in as natural a manner as possible, most favourably compare with the choicest inmates of our hot-houses, if these latter have not had the same artistic taste displayed in their grouping together. Instances in proof of this may be frequently seen at the horticultural exhibitions held throughout the length and breadth of the country during the summer months. Disappointments have thereby been occasioned to those exhibitors who have relied on the quality of their flowers to gain the coveted awards, when to their dismay they have seen other competitors placed before them with tastefully arranged vases composed of selections from commoner and less pretentious subjects. I would strongly urge those who desire to excel in dinner-table and

other decorations also, to pay close attention to the variety and different tastes in arrangement that are brought together on these occasions. Notes should be made of such methods and selections of flowers as appear the most effective, and the first opportunity should be taken to improve upon the hints thus gained for decorations in the home circle. By this means a more ready knowledge of the best applicable uses of various flowers will soon be gained.

In the arrangement of cut flowers and foliage for all decorations, there are many subsidiary points to be considered.

MATERIALS.

In order to attain the desired end of securing an artistic arrangement, it is necessary to have a knowledge of what flowers are best adapted for the vases or epergnes that are intended to be used, so that they can be displayed to the best advantage in the same. By this means any waste in material can be obviated, or reduced to the lowest possible limit. For instance, in some cases flowers with short available foot-stalks could be arranged with good effect, whilst in other instances those with long stems would be of far greater service. Lengthening the stems in an artificial manner with wire can, of course, be performed, but it ought to be avoided in all practicable cases for the better preservation of the flowers.

Ground-work of the Design.—Many persons make it a practice to arrange vases of cut flowers without having previously inserted some fern or foliage as ground-work. This is, we think, a mistake, and especially in the case of large-sized arrangements, which necessitate the use of a goodly quantity of material in the form of flowers. In all table decorations, other than small specimen glasses, we find the work is far more easily performed by making good use of fern-fronds at the commencement. The Maidenhair fern is always a favourite with floral decorators; but many use it as a finish to their work, whereas we think, and have found from practice, that it is best used before any flowers are inserted at all. Over a ground-work of moss the fronds of this and other ferns with miscellaneous foliage can be so arranged as if still on the plant, in a natural-growing position. After the insertion of the requisite foliage, the flowers can be arranged to give tone and harmony to the whole. Thus we should be toning *up* to the required standard in colour effect; not, as many would have it done, by first placing the flowers (in a far too methodical manner oftentimes) over the entire surface, then toning *down* by the addition of fern-fronds, &c. Comparison between the two methods

will make this plain at once to any one acquainted with the work; in the former manner just sufficient flowers are used to give the requisite effect, in the latter method the fern-fronds are used to hide some of the flowers that ought not to have had a place at all. Here is a waste of material decidedly, which ought at all times to be avoided; and a sacrifice, too, is made of the elegant and graceful appearance that ought to be produced, in favour of a display that imparts density and heaviness. It is always easy to add one or two fern-fronds at the finish, should it be necessary; but we find with practice that about the right quantity can be arranged beforehand.

Foliage.—The foliage of many kinds of flowering plants and bulbs can be used most advantageously in conjunction with the flower of each given genus. This is an important point frequently overlooked by floral decorators, who, perhaps from force of habit more than any other assignable cause, prefer to rely far too much on the supply derived from ferns—the Maidenhair fern in particular. We would not for one moment disparage this valuable fern for decorative purposes, but when a preponderance of it is allowed in a collective group of decorations it will produce a sameness and repetition that, with a little forethought, might easily have been avoided. We should not then hear the complaint so often made, that the Maidenhair ferns had been robbed so much for cut purposes; and Fig. 1 will show how possible it is to produce a fine effect without ferns of any kind. It will be found that the foliage of many bulbous plants is the best adjunct to the flowers of the same which can possibly be used in floral arrangements. Take, for instance, a few spikes of *Gladiolus* in two or three distinct colours, and arrange them in a suitable vase; nothing will associate so well with these as their own foliage. The Calla Lily (*Richardia ethiopica*) may be cited as another instance in the same direction; the White Water-lily (*Nymphaea alba*) likewise is displayed to the best advantage when resting on its own beautiful leaves. These latter are somewhat fugacious, and require repeated renewal: this is the great drawback to their more frequent use. The Cape Lily (*Schizostylis coccinea*) and other Liliaceous plants from the South of Africa—such as *Tritonia aurea*, the Sparaxis, the Ixia, and the Babiana—should all be used in unison with their own foliage. The Daffodils (*Narcissus*), now so popular with floral admirers, may be taken as another example; we often use leaf-growths of these pretty bulbs cut from close to the ground when requiring to arrange any of their flowers. The handsome blossoms of the Tulips also never look better than when arranged

with their own beautiful leaves, provided the latter are well developed.

Of our more choice exotics among bulbous plants, the Lily of the Amazon (*Eucharis amazonica*) is still another instance. When the last two or three flowers only are left on any spikes of this plant, we like then to take off the whole of them at once, with a good length of the flower-stem attached. Two or three such spikes, with some of the smallest foliage of the same plant, will make a handsome decoration by themselves. The lovely trusses of *Pancratium fragrans* will associate well with the foliage of *Aspidistra lurida*, its own leaves being somewhat too rigid and not often so conveniently spared as the substitute we have named. *Tallota purpurea* will go well with the leaves of the *Aspidistra* also. These are sufficient instances among bulbous plants to illustrate our meaning, which may easily be adopted as readily as in the case of the Lily of the Valley, with which hardly any one would think of using other than its own foliage.

Of other plants and shrubs many notable cases might be cited, with the flowers of which their own foliage is the best accompaniment. The Rose, among many others, affords an admirable illustration of this method. Suppose we take some few flowers of the tea-scented kinds for a decoration, no foliage will be more appropriate wherewith to arrange them than their own beautiful leaves, especially such as, in their younger stages of growth, partake of a bronzy or coppery hue. The shoots also from some of the climbing Roses, as the Banksian and the Ayrshire, are most useful in larger arrangements.

The Chrysanthemum (double kinds) furnishes us with an instance in which a hardy and common shrub, viz., *Berberis (Mahonia) Aquifolium*, can be made of the greatest service as a groundwork for this popular autumn flower. The Winter Jasmine (*Jasminum nudiflorum*) is another case in which the *Berberis* foliage is a valuable aid. The single Dahlias, now so universally cultivated, afford still another illustration of the value of this same shrub to accompany their flowers. We do, in fact, put nearly as much value on the *Berberis Aquifolium* as on some of the most popular ferns for decorative use in floral grouping. The Copper Beech (*Fagus sylvatica purpurea*) supplies us with another useful help in decorations, consisting chiefly of white or yellow flowers, whilst the Variegated Maple (*Acer Negundo albo-variegatum*) forms a good contrast to various shades of blue or scarlet. Another climbing evergreen—which is not so frequently seen as it should be, and still less used in a cut state—is *Garrya elliptica*, the long and pendulous catkins of which, during the months of January and February, cause it to be much admired when arranged as a fringing

to a trumpet vase of medium height. Only recently we used them in this way for a dinner-table decoration, some of the catkins measuring fully ten inches in length.

Of the inmates of our conservatories, green-houses, and stoves, there are a great many plants of shrubby growth whose flowers are never seen to better advantage than when in company with their own foliage. The Cape Jasmines (*Gardenias*) may be quoted as a notable case; the bright glossy green of their leaves will make the best background possible, and if a few small shoots can be spared, so much the

With the *Epacris*, the addition of a few sprays of *Ericas* that nearest resemble the common Heather will be all that is required, such for instance as *E. caffra*, *E. gracilis*, and *E. melanthera*.

Besides the few cases of exterior aid from other than the foliage of each given genus of flowering subjects that we have quoted as samples, there are numerous most useful helps to be found both among our hardy plants and tender exotics also. Of the former, the species of Sedge Grass (*Carex*) are at all times of service in arrangements of any Liliaceous plants; another near ally is to be found in the



Fig. 1.—AN ARRANGEMENT WITHOUT MAIDENHAIR OR ANY OTHER FERN.

better. It will at times entail a sacrifice of one or more partially-developed flowers if much growth is taken off with the fully-expanded bloom, but smaller pieces of undergrowth can be got to go with the blossoms in such cases. The large and various family of Begonias afford us a class of plants that can be made to do good service in decorations without the aid of other foliage. The handsome leaves of some of the varieties, as *B. metallica*, *B. incarnata purpurescens*, and other types, chiefly such as come under the classification of "Ornamental Foliage varieties," are all most valuable when appropriately used. The beautiful shades of colour to be found in the Camellia need no other foliage than their own deep green leaves to set them off to advantage. The graceful foliage of many species of the numerous family of Acacias forms an ample accompaniment for their pretty spikes of bloom.

Cyperus alternifolius of our stoves, which is deserving of more extended use than it often meets with. Another handy grass is the Variegated Arundo or Ribbon Grass of our gardens; somewhat resembling this, but more graceful in habit, is the variegated *Eulalia japonica* of our green-houses. The *Equisetums* or Horse-tails are in character when used with Water-lilies and other water or bog plants. Some people use the leaves of the Pampas Grass, after having split the same with a common pin into narrow strips; we do not, however, approve of such methods being resorted to. The Meadow Rue (*Thalictrum adiantifolium*), also called the Maidenhair *Thalictrum*, is a very useful substitute for fern when the latter is scarce. The smaller-leaved forms of Ivies make most beautiful backgrounds, and in rustic arrangements can be freely interspersed with the flowers. Of the Ivies

we prefer those which assume a bronzy hue during the autumn and winter months, also the kinds with finely-cut or laciniated foliage. A few of the

Veitchii) is at all times of service when it can be obtained in good condition, and this is almost invariably the case. The several varieties of grape-



Fig. 2.—A FREE ARRANGEMENT OF FLOWERS, FERNS, AND FOLIAGE.

variegated forms are also very pretty, especially one or two kinds with a tinge of pale pink around the edges of the leaves. During the autumn months, also, the Virginian Creeper furnishes a useful addition, the points of the shoots in particular. The small-leaved species of the same genus (*Ampelopsis*

Vitis heterophylla) that are grown as climbers for the beauty of their foliage, are all very pretty in larger forms of decorations. The foliage too is valuable in garnishing the dessert, thereby saving the otherwise almost constant demands upon those kinds on which we rely for our grapes (*Vitis*

vinifera). Of the Honeysuckles, two or three kinds are very pretty when used in fairly long sprays: the variegated form (*Lonicera aureo-reticulata*), and the free-flowering white variety (*L. brachypoda*), are two of the best.

Among green-house plants and climbers, we have several valuable helps; one of the best is *Ficus repens* and its smaller form, *F. repens minima*. These can be grown on any damp, green wall, that would otherwise be an eyesore. The variegated variety of *Solanum jasminoides* is a pretty thing in its way when used in fairly long pieces. From the stove-house we obtain a wealth of richly-coloured and diversified foliage that is a most material aid in all choice decorations; supplies of which may often be taken in lieu of using so many flowers, giving, by so doing, a greater variety in the arrangements, as well as being a considerable saving in flowers also. Small leaves of the Alocasias, such as *A. metallica*, *A. macrorhiza variegata*, and *A. Jenningsi*, can be effectively arranged with bold flowers. Their near allies, the Caladiums, are another type of useful ornamental-leaved plants to cut from; *C. argyrites* (the Silver-leaf Caladium) being the very best of the whole genus, yielding an immense number of its small leaves during a lengthy season. Like the Alocasias, the small leaves of all the other sorts of Caladiums will be found the most available.

The South African Asparagus (*A. plumosus nanus*) is one of the most valuable additions that have been added to our collections of late years. To the floral decorator it is an inestimable aid in almost any kind of arrangement. Its beautiful branches, which are finer than the fronds of the most delicate fern, are of a bright cheerful green. Sprays of this Asparagus have the valuable property of retaining their freshness in water for two or three weeks; I have kept it in good condition myself in rooms where a quantity of gas is daily consumed, for the lesser time named. The same spray can be used for nights in succession, without the aid of water to keep it fresh, provided it be placed in water during the day-time. This property of great persistency will cause it to be much sought after when it becomes better known. The great drawback to its more extended cultivation at present is the difficulty that is experienced, by expert propagators even, in increasing the stock. *Asparagus tenuissimus* is another beautiful species, also from South Africa; it is quite distinct from *A. plumosus nanus*, and better adapted perhaps for entwining around the slender stems of many glass vases than that species. These kinds of Asparagus will in time be formidable rivals to our more favourite ferns, on which so many now rely for cut purposes. *Cissus discolor* is an old favourite, without a rival in its way; nothing sur-

passes the richness of the markings of its beautiful leaves before they arrive at maturity. Long shoots of this *Cissus*, when grown in a fair amount of sunshine, are beautiful objects if stretched out on a white table-cloth, or for circling among the branches of silver épergnes.

The large family of Crotons, to which so many choice additions have been made of late years, gives us an immense variety of richly-coloured foliage. The individual leaves of the broader forms and many of the long pendulous types can frequently be turned to good account for dinner-table decorations, showing to advantage when under artificial light. The narrower-leaved varieties can be used in the form of single shoots also; any beautifully-coloured shoot even, of either form, might be cut from the plant and used for one night, and in the morning be returned to the garden for propagation without any fear of injury. The Fittonias give us some beautiful objects for dwarf arrangements and as a carpeting to table plants. *F. argyroneura* is the best adapted for cutting from, looking very pretty when dotted over a fresh tuft of *Selaginella denticulata*. The Marantas furnish us with a distinct type of foliage, that associates well with white and light-coloured flowers. The leaves, however, have a propensity of curling up and becoming unsightly in a few hours. The beautiful spathes of *Maranta Warsceviczii* are most welcome when in flower, the ivory-white contrasting so well with the dark velvety foliage. Amongst the Screw Pines we make good use of one variety in a cut state—viz., *Pandanus graminifolius*. Its grass-like foliage is very light and elegant. The Stove Grass (*Panicum variegatum*) is so well known, it scarcely requires any recommendation. Small shoots can be worked in around the bases of such flower-vases as are dressed out so as to rest on the table-cloth. *Paullinia thalictrifolia* will be found most serviceable, being both elegant and distinct in its growth, which is semi-scandent. Shoots of moderate length will produce a beautiful effect as a margin to any vase of a foot or more in height, allowing the points to almost touch the cloth. The handsome shell-like leaves of the Peperomias are very appropriate additions to many arrangements; they last well too in a cut state, and supply us with a substitute for *Caladium argyrites* during the winter months. Being freely produced, one can well afford to cut them liberally. The Tradescantias, again, give us another variety of foliage to which we can turn pretty frequently without fear of injury.

Another beautiful climbing plant is *Myrsiphyllum asparagoides*, from the Cape of Good Hope; if this be grown in a temperate house, with the convenience of an open border, so that its roots can ramble at their own will, an abundance of material for entwining

around the stems of glass vases and épergnes will be available. It is a plant much sought after for this purpose by the floral decorators of New York and other trans-Atlantic cities. Being of a distinct character, light and elegant in growth, and of a pleasing shade of green, it is one of the best plants for the purposes just enumerated that can well be grown. The several examples of foliage adjuncts that we have quoted will be of great service in decorations, choosing each kind with discrimination, and having regard to the flowers that are to be the predominating feature in each given case. The use of such will greatly relieve the severe strain that is at times put upon the ferns for cut supply.

Ferns and Mosses.—Of these valuable associates with flowers, there are a goodly number which are not so much cultivated as they deserve to be. One of the very best is *Gleichenia (Mertensia) abelata*, from New Holland; this is easily grown in a warm green-house. When a plant has attained goodly dimensions, the last developed whorl or growth makes an excellent base on which to arrange a vase of trumpet shape with flowers. It is a fern of the greatest durability when cut, keeping in good condition quite a fortnight. Certainly it is, in a measure, a scarce plant at the present time; but were it more sought after, a necessary supply would soon be propagated to meet the demand. Of the larger-growing forms of *Adiantum*, one of the best is *A. Cardiochlena*, from Caraccas. The fronds of this fern are of great persistency, and being of much beauty, are of great service in all arrangements that have the base resting on the table. *A. Sanctæ-Catharinæ* is another useful kind for the same purpose. Two other choice sorts are *A. Feei* and *A. Williamsii*, both of medium growth. Of the smaller types of *Adiantum*, that are quite distinct from the common kind of Maiden-hair, *A. amabile* is very pretty; its long pendent fronds look at their best when fringing a tall trumpet vase. *A. concinnum*, with its long arching fronds of a roseate hue in the young state, are beautiful when in association with the foregoing species, or even by themselves. The lovely fronds of *A. Farleyense*, which are best used when in a well-hardened state, should not be placed too thickly together, or their individual beauty will not so readily be seen. It is not one of the best to keep in a cut state, therefore defer using it until immediately required for display. Several of the *Davallias* are amongst the most durable of all ferns when cut, not given to curl up or wither if exposed to cold currents of air. To the decorator one or more of the best-adapted kinds are simply invaluable. *D. bullata* (the Squirrel's Foot) is one of the prettiest. This species produces its fronds very freely; these

can be used when in a young state and of a pale green colour without disappointment. As age approaches they assume a darker hue, but none the less useful. *D. Tyermanni*, with fronds of a glaucous green, is another good species; so are *D. dissecta*, *D. decora*, *D. elegans*, and *D. tenuifolia stricta*. Each and all are good, and the comparative ease with which they can be cultivated should cause them to be used extensively. The recently introduced species, *D. fijiensis major*, should also be a valuable kind, being very distinct. A few fronds of the golden and silver species of *Gymnogramma* are pleasingly effective when intermixed with other foliage, endeavouring as much as possible to show the inverse surface of each frond. *Onychium japonicum* is a very pretty and extremely light fern for intermixing with flowers. Of the *Pteris*, the well-known Ribbon Fern in its choicer crested forms (*P. serrulata*, var. *cristata*) *P. cretica*, and *P. umbrosa*, will all be found of useful service.

Among the climbing or scandent ferns there are two, at the least, which are extremely useful for circling around the branches of épergnes and the stems of glass vases. These are *Lygodium scandens* and *L. palmatum*, to be found in some catalogues under the generic synonym of *Stenochlaena*. *L. scandens* is one of the prettiest ferns grown for decoration in many ways; each individual frond should be trained up a string by itself, and when required to be cut, it can be detached at the requisite length with ease. Another class of ferns, not often seen used in a cut state, are the *Goniophlebiums* and *Nephrolepis*. Of the former genus, *G. subauriculatum* is one of the most graceful objects imaginable, when taken for an exterior fringing to a tall vase in such a manner as to allow the points of the fronds to hang down nearly to the base. The *Nephrolepis* can be used in the same way, but are not quite so light and elegant as the *Goniophlebium* just named. *N. davalloides*, when it assumes its true character, is one of the best; *N. tuberosa* and *N. exaltata* are also two serviceable kinds, both of good lasting properties. Of the hardy exotic and British ferns there are numerous species that supply us with useful fronds, chiefly for extra-sized arrangements. Of the former, *A. pedatum* would be one of the best were it more cultivated. *Cyrtomium falcatum*, with its distinct fronds, is another; whilst of the several forms of *Lastreas*, *L. Sieboldii* is one of the prettiest. The British species of this last genus, with the *Polypodiums*, the *Polystichums*, and the large family of *Athyriums*, or Lady Ferns, give a wide field of choice, while the *Scolopendriums*, or Hart's Tongue Ferns, are valuable in large decorations.

From the *Selaginellas*, or Club Mosses, we receive considerable help. One kind of these has been pre-

viously mentioned (*S. denticulata*). There are others, however, that are well worthy of a place in almost all kinds of arrangements. The Blue Selaginella (*S. caesia*) is of much value; its extended form of growth causes it to be often sought after by decorators as a pendant around small glass vases. *S. umbrosa*, *S. canescens*, *S. inaequalifolia*, *S. Martensii*, and its variegated form, *S. stolonifera* and *S. Wildenovii*, are all choice additions to almost any decorations, possessing novelty and distinct foliage. These latter kinds are not so frequently made use of as they might be, although they thrive under ordinary stove treatment, and could be had without much trouble in most cases.

Wild Plants and Grasses.—Amongst British wild plants there are several genera that yield us an infinite source of pleasure in a decorative sense, either from their flowers or their fruits; and lovers of the flora of our own country should obtain such kinds as come under their notice. For use during the winter months the Gladwyn (*Iris fetidissima*) is most distinct and effective, with its spikes bearing their seed-pods, which, as they unfold when fully matured, exhibit their brilliantly-coloured berries to perfection. It grows freely in the southern counties, in moist situations, such as hedgerows and ditches. An excellent associate with the Gladwyn is the Cotton Grass, with its feathery plumes of soft down that are nearly white in colour; its botanical name is *Eriophorum angustifolium*. The Cats' Tails (*Typha*) should be obtained for tall vases; or they can be used with the foregoing aquatics. The red berries of the Gladwyn, the white plumes of the grass, and the brown tail-like spikes of the *Typha* would harmonise well together. To these also the Aquatic Grass, *Glyceria aquatica*, would be an appropriate addition. Many more of the hardy British grasses are of the greatest use in floral decorations; these should be collected when in their best condition, and laid by for future requirements.

Those ornamental flowering grasses of our gardens, now much more sought after than formerly, are of most essential and valuable service to the decorator. The following are among the best, and ought to find a place in gardens of very limited extent—viz., *Agrostis nebulosa*, and *A. pulchella*; *Briza gracilis*, and *B. maxima*, the Quaking Grasses; *Lagurus ovatus*, the Hare's Tail Grass, very distinct; *Hordeum jubatum*, the Barley Grass; *Eragrostis elegans*, the Love Grass, one of the lightest and best for autumn use; *Bromus patulus nanus*, of recent introduction, and distinct in habit. The foregoing kinds are all annuals, and are readily raised from seed every spring. Besides these there are *Stipa pinnata*, the well-known

Feather Grass; this is easily increased by division, or can be also raised from seed, but being a perennial would not produce its flowering plumes the same season as sown. *Gymnethrix latifolia* is likewise useful, its graceful foliage constituting its chief value. *Erianthus Ravenæ* (Man's Beard), and *Arundo conspiciua* (the Silvery Arundo), are both of importance in larger-sized arrangements; each of them somewhat resembles the Pampas Grass (*Gynurium argenteum*). This latter well-known plant of our gardens yields spikes rather too large for mixed arrangements, unless of extra dimensions, but for tall vases is always effective. The two foregoing kinds should, therefore, be used in preference when required to associate with Liliaceous plants and flowers. In order to economise these flowering grasses for future uses during the late autumn and winter months, each kind in sufficient quantity should be picked when in good condition; not left till they begin to fade. After this has been done, each sort should be placed in a glass jar or other receptacle suitable for the purpose, but without water. They are better not tied in bunches, merely placed therein in a loose manner; this is preferable also to the custom sometimes followed of suspending them by their stems. In this latter manner the natural style and elegance of growth is oftentimes lost as the grasses become dried. An airy room is the best place to keep them in, being careful to avoid any accumulation of dust as much as possible.

Hardy Flowers and Plants.—In unison with these grasses there are several flowers, which, from their long durability and property of retaining their colours fairly well, are known by the term of Everlasting Flowers. These are of the utmost service and value to all whose gardens do not furnish them with sufficient natural flowers throughout the entire year. A reserve of some of the best of them may advantageously be kept by those even who do, as a rule, rely on fresh flowers at all seasons. In cases of emergency, either through misadventure or from extra demand, they will be found quite capable of filling the place of fresh productions. From the hardy herbaceous plants we can select several examples, which, if not so showy as some, are yet attractive by their light appearance, intermixing amongst larger flowers with good effect. The Staticee, or Sea Lavenders, are of this class, and will be found very useful. *Gypsophila paniculata* is also most light and elegant. The Great Thrift, or *Armeria cephalotes*, with attention in drying, can be turned to good account. *Gnaphalium margaritaceum* and *G. arenarium*, the former having white and the latter yellow flowers, are each of service. These are much sought after for "immor-

telles," and usually imported from the Continent. Of annuals easily raised from seed, we have an excellent choice. The best are *Acroclinium roseum* and its double form, also the white variety *A. album*. These have slender stems, and easily arrange with the grasses afore-named. The purple and white forms of *Xeranthemum annuum*, both single and double varieties, can be used in a similar way. So also can the light and pretty *Rhodanthes*, both pink and white varieties. The two forms of *R. maculata* are probably of strongest constitution. Their flowers should be taken for keeping purposes just as the major part of the blossoms are about to expand. The well-known *Helichrysums* are valuable at all times whilst their flowers can be had, and being of easy culture, come within the reach of the many. For drying to use later on, the half-developed buds, and those too which are about to expand, will be found the best. These had better be suspended in small bunches, or tied in rows on strings to dry; another good plan is to thrust the flower-stalks through the meshes of a piece of fish-netting, with the flowers upwards and exposed to the sun. These are among the best of the tender annuals, requiring slight protection if sown early. The Green-house Annual, *Gomphrena*, or Globe Amaranth, in two or three different colours, is another very pretty addition to the list, very distinct from any of the foregoing.

From green-house plants, we have the *Aphelaxis* in various shades of purple and pink, and the *Phenacoma prolifera*, very similar in form, but quite distinct in colour, being of a crimson shade. These are both choice additions to any collection of everlasting; but, like many others, must not be left on the plants till they are faded. Those that are required for drying purposes should be taken off as soon as the centre of each flower begins to darken in colour, looking somewhat like mildew. From the green-house also there are the pretty forms of *Statice*; the bright blue sheath-like envelopments of the small white flowers retain their colour for many months, without any trouble. *Statice imbricata* is one of the best for these requirements, always perfecting an abundance of its large spikes. *S. profusa*, a smaller-growing form, is likewise most floriferous, and of a paler shade of blue. Both species are well worthy of cultivation for cut purposes alone.

From our hardy shrubs we can secure some assistance, also as a reserve when fresh flowers are not so numerous. One species of *Sumach* (*Rhus Cotinus*) furnishes us with quantities of feathery spikes that can be turned to a good account in cases of emergency. The long shoots of the common Barberry (*Berberis vulgaris*), when loaded with their pretty

racemes of brilliant-coloured fruit, are a great aid. Branches of the Strawberry Tree (*Arbutus Uredo*), when well cropped with their gaily-coloured bunches of berries, make an effective arrangement by reducing their surrounding foliage in a liberal manner. The cut-leaved Brambles are another instance in which both the foliage and fruit can be effectively displayed. The handsome bunches of the latter, when fully ripe, are no mean decoration with their own foliage and some few other gaily-coloured, autumn-tinted leaves as a contrast thereto. Among hardy annuals there are some good ones that one scarcely ever sees made use of to any extent. *Gypsophila elegans*, and its rose-coloured form, are two of the lightest-looking flowers imaginable; insignificant, some may say, who know not their value as a finish to floral decorations. Let such, however, try the use of them a few times, after which we think they will be more favourably impressed with their utility. *Cacalia coccinea* (the Tassel Flower) is very striking, and at the same time of much use. *Campanula Lorei*, and its white variety, are two annuals readily raised from seed, and very pretty for intermixing with larger flowers.

From the numerous classes of biennials, perennials, and herbaceous plants, there are many kinds that should be more grown than is often the case, to supply the decorator with a greater variety. It may be well to enumerate a few that may advantageously be added to any collection which does not already include them. The newer kinds of Columbine are an instance, of which *Aquilegia californica hybrida*, *A. cœrulea hybrida*, and *A. chrysantha* are three of the best. *Chelone barbata coccinea*, a near ally of the showy *Penstemon*, is excellent for the cornucopias of glass stands or épergnes, and with it may be used *Gaura Lindheimeri*, whose spikes, with its pink and white flowers, are always pleasing. *Humea elegans* furnishes us with another light and graceful subject for using in a similar way. *Salvia patens*, with its rich blue blossoms, can always find admirers; and *Spirœa Aruncus* (Goat's Beard), if only moderately used (one spike alone being enough), is always telling. During the autumn months the Starworts in great variety will afford a quantity of material for cut supplies. *Aster Amellus* is one of the best of these pretty Daisy-like flowers. The Japan Wind-flower (*Anemone japonica*), and its white variety, are both simply invaluable during the same season of the year. The latter kind is one of the prettiest white flowers we have. *Bocconia cordata*, with its immense panicles of flowers, if not strikingly effective, yet supplies a good amount of material for large stands and vases. The spikes of the *Ophiopogons* (Snakes' Beards) are very pretty when interspersed among flowers with shorter stems. The dwarf varieties of *Veronicas*

(Speedwells) of the herbaceous section are also of good effect when used in the same way.

Numerous other examples might be given of flowers that are of most essential service in floral arrangements, but any close observer will readily discern any novelty which presents itself to his notice, and place the same under requisition to supply a change from the ordinary routine of decorations. Experiments should be made both in the material employed and at the same time in the methods of arrangement. Frequent repetition of the same design, with more or less the same kinds of flowers, should be studiously avoided; otherwise the best of flowers, with tasteful grouping even, will grow wearisome to the eye, and thereby their beauties will be passed over unnoticed.

MANAGEMENT AND PRESERVATION OF MATERIAL.

The Foundation.—Water may fairly be considered as the best of all aids that can be brought into requisition for the sustenance of cut flowers, and, where any choice of the same can be exercised, we would at all times prefer rain-water in preference to that which has been drawn, either through great lengths of pipes or from deep wells. For some kinds of arrangements sand of fine quality will be found of great service; when this is used a layer of green moss is an essential help in hiding the sand from view. Failing the moss, a beautiful carpeting can be had by using some tufts of *Selaginella denticulata*, though this method would by some be considered extravagant. Little sprigs of Box-leaved Myrtle (*Myrtus buxifolia*) would be an excellent substitute, for those who can succeed in cultivating it in the open air of the more southern counties of England. The common Box of gardens (*Buxus*) is perhaps the most readily obtained when moss cannot be had; small shoots of this shrub would last out several arrangements. Use moss, however, when it can be had, as it is of valuable service in conserving moisture for the better keeping of the flowers. The great advantage in using sand and moss in combination, is in the assistance thereby gained in retaining the flowers in their desired position when using shallow vases or glass dishes. Sufficient water should be added thereto in order to saturate the sand, without destroying its consistency in the retention of the flowers in the position in which they have been placed.

Stems.—It is a great assistance to those who arrange decorations to have all the flowers cut with as much available length of foot-stalks and stems as possible. The flowers can then be used and displayed with far greater ease than is the case when very short stems have to be dealt with; the character

and habit of growth will likewise aid in the general effect. It is a mistake very frequently made—sometimes, no doubt, for fear of injuring the plant or shrub, as the case may be, but more often, we think, through thoughtlessness—that the flowers are cut with needlessly short stems. All who cut their own flowers will easily be able to secure their desired ends in this respect. In the case of some pot-plants of slow growth, due caution must necessarily be exercised. Small bushes, for instance, of Camellias must be leniently dealt with; but from large plants of the same genus that are in robust health a fair amount of stem may be secured, with even advantage in the case of prominent shoots, inducing back breaks to be made from buds that would in some instances have remained dormant. The slow-growing *Ericas* from the Cape of Good Hope, and some few genera of New Holland plants, will need to be carefully treated. The greater portion of the *Epacris* from the latter country furnish us, on the other hand, with a most abundant supply of flower-spikes of excellent length; these we have found to be of most valuable service from October to March. The flowers of *Cyclamen persicum* should never be cut, but be separated from the corm by a gentle twist with the thumb and finger, giving also a slight gain in the length of the foot-stalk. *Lachenalia tricolor* and the other species should be operated on in the same manner as the *Cyclamens*.

All flowers, too, should be chosen for such designs as will best display them to advantage. The error is oftentimes made of using flowers in an unnatural manner: in the case of the *Fuchsia*, for instance, I have seen it worked into an arrangement in which its pendent flowers were made to look upwards, and time had been wasted in either wiring the blossoms or using other means to this end. The red and white forms of *Lapageria* are another example, which by careful wiring I saw made to stand erect, instead of being used in a natural way, as they ought to be. All such errors should be avoided.

Use of Gum.—Some kinds of flowers, from their liability to soon dropping, either from off their foot-stalk, as in the case of the single Chinese *Primroses* (*Primula sinensis*), or from shedding their petals, as in the case of the *Pelargoniums* of the single types, have ceased to be used by some through this failing. This drawback to the use of these and similar subjects can easily be overcome by the application of a little liquid gum. This, if done with care, will fix the flowers and petals for a more lengthened period. We make it a constant practice to gum our *Camellias* before using them in specimen glasses. In doing this we choose a small camel's-hair brush, and with it apply a fair amount of the

liquid around the base of the blossom where it is united to the stem, and also thrust a little between the back petals where it will not be visible. This will be the means of holding the flowers together much longer, and is by far a better method than wiring the blooms in order to attain the desired end when they are intended for glass vases. For bouquets and other similar purposes the wiring process is much the best. The kind of gum known as "Florists' Gum" is better than a solution of pure gum-arabic, by reason of its drying the more readily after application. When flowers that have been wired are placed in glass vases with water, a deposit of rust will soon be observed around the sides. This, and any other deposit that adheres to the vases and thereby detracts from their transparency, can be easily removed with a weak solution of hydrochloric acid. This preparation, however, being a corrosive poison, requires great care in application, and caution should be exercised accordingly. It is much to be preferred to the use of any material that would scratch and disfigure the glass.

Preservation.— Many flowers can be preserved for several days if a cool and damp cellar or other similar place is at command, where they can be kept nearly or quite in the dark. The Passion Flowers, for instance, that we very rarely see open for more than one day—in fact, this is about the limit of their existence—may be preserved in good condition for three or four, and even five days, if cut early in the morning, after fully expanding, and then placed in the dark till required. Some of the Passifloras flower, as it were, by fits and starts, and perhaps just when a few flowers are wanted, they are a few days past. By adopting the means just detailed, an extension can be made, very possibly, to meet the requirements. Blossoms of the Passifloras will also remain open during the evening if cut early in the day, whereas on the plant the majority will close in the afternoon. Other "flowers of a day" can be kept in a similar manner, such as the Ipomœas, for example. Water Lilies, when required in a cut state, can be made to remain open all night with ease by passing the thumb and finger up each petal and reflexing it. It is disappointing, when using these and kindred flowers, to have them close just when they are most needed to display their beauties; any means, therefore, that can be adopted to secure the desired end may fairly be practised, as long as the natural beauty of the flower is not destroyed.

During the summer months all flowers will be found to keep the better if cut early in the day or late in the evening, when their vitality is not being weakened by rapid evaporation. In warm weather

we prefer to complete all arrangements early in the morning, and place them away (if not immediately required) in a cool and shaded place that is free from draught. The retention of the dew on the flowers will have a beautiful effect in the evening; this cannot, however, be managed unless a cold, moist cellar is available till the needed time for bringing them forth.

GLASS STRUCTURES AND APPLIANCES.

GARDEN FRAMES.

THE one-light frame (Fig. 11) marks a new departure in horticulture. In this simple and useful contrivance glass appliances may be said to end and glass houses to begin. The frame is a half-way house, as it were, between the two. Frames are as elastic as portable. They may be had to cover a yard, or overspread an acre, at will. While mostly placed on the level ground, they may also be raised up to do excellent fostering and conservative service against walls, and are ever at hand, or ought to be, to meet the wants or wishes of the cultivator. For convenience frames are concentrated into one place technically known as the frame-ground or Melon-ground (from the old but still good practice of growing Melons in frames). Still, the fact of being so portable, and, on the whole, so slightly, as to be placed over seeds or plants anywhere, is one of their greatest merits, and causes them to be used to great convenience and advantage in the most out-of-the-way places. Every garden should have one or many garden frames. They may be made of any size, so long as they are neither too large nor too heavy to be easily portable. They are mostly made of one and a quarter, one and a half, or two-inch deal, dovetailed or morticed together at the corners. This, however, adds greatly to the cost of making, and is now often superseded with strong ties at each corner, by which the sides and ends are firmly nailed together. Frames thus made are equally strong and durable as those morticed in the usual way. Bolts or clasps are also used for this purpose, for the same reason.

The best deal is generally chosen for frames, for the less sap-wood in them the longer they will last. Some have tried hard wood, such as oak or ash, but it is too heavy and not so durable as deal. Poplar is sufficiently light; and that or sycamore and lime last fairly well if kept wet, as is mostly the case with what are called dung-frames, that is, those warmed or protected with manure either under or around them, or both. Garden frames are generally painted or smeared over with tar or some of the

many preparations of coal-tar varnish. This adds greatly to their durability if the frames are what are called cool or cold ones. But in cases where hot dung is used under or around the frames, it matters little whether they are painted or not, as the gases in the manure speedily remove the paint or destroy its powers of protection. If good well-seasoned deal is used, it is astonishing how long garden frames will last.

The length of garden frames is generally measured by the number of lights. Hence we have the phrase, one, two, three, and four-light frames. They are seldom made longer than four lights, and three are the most popular for cultural purposes, one or two-light frames being more generally used for the raising of seeds and fostering of cuttings or of seedling plants.

The depth and

lights, twelve feet long and six feet wide, and so of others.

But, of course, these sizes may be changed. Perhaps the most common one-light frames are four feet wide and three long. A handy size for two-lights is seven or eight feet long and six or seven wide. Lights are, however, occasionally made larger—four and a half or five feet wide and six, seven, or even eight feet long. But in practice it is found that these are too heavy for prompt and convenient use. The ponderous weight gives rise to serious

breakages, and there is no advantage, but the reverse, in having portable lights too heavy. Hence the popularity of six by four feet portable frame sashes. Three-light frames are also generally preferred to four, five, or six-light, for similar reasons. Neither is there any benefit in having

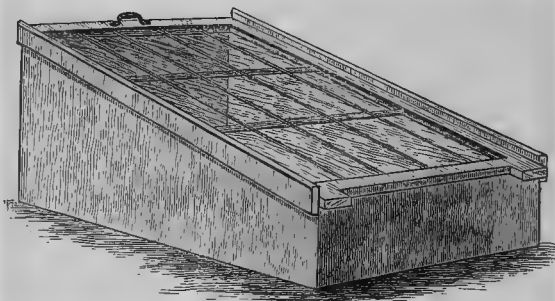


Fig. 11.—One-light Frame.



Fig. 12.—Span-roofed Frame.

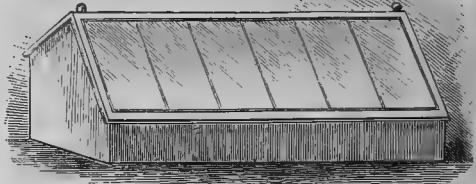


Fig. 13.—Hip-roofed Frame.

the width of frames are, to some extent, partially influenced by their length; but this is not necessarily the case, and occasionally—especially in the gardens of amateurs—one-light frames may be met with of the most enormous and unwieldy dimensions.

The width of frames means the length of sash, which is mostly from one to two or even three feet more than its width. The average width of sashes ranges from three feet to four feet, three and a half feet being a common width, and the length of the frame is the breadth of one or more sashes. Thus, the length of a one light-frame will be mostly three feet, three and a half, or four feet, and the width four, four and a half, five, or six feet. Two-light frames will thus be seven or eight feet long and six or seven feet wide, and so on; three-

larger frames, for assuming that frames and lights are made of uniform sizes, which they should be, nothing can well be easier than to extend the frames to any desired extent by simply placing several side by side. Or, if that is thought better, the sides may be taken out where they meet in those cases where these are bolted together, and thus two or more frames be converted into one. Not a few cultural advantages may, however, be derived from using frames with a limited number of lights. It gives the culturist more direct and special control over each crop, enabling him to foster one and retard another at will, while the limited space occupied by the two ends, under four inches at the most, is so small as to be immaterial.

Garden frames having more than one light are strengthened with rafters running from back to

front, the upper surface being let firmly into the frame, level with its upper surface, while an inch or so of the central portion stands up as high as the lights, to keep them in position when sliding up or down. In a two-light frame one rafter suffices, a three-light needs two, and so on, an additional rafter being needed for every added light. These rafters are generally made of from two to four-inch stuff, according to the width of the frame.

The lights, whether one or many, are made of two-inch stuff, the styles varying in width from two inches to four, and the rails or ends from three

stances, and hence the reason of using small squares and a considerable number of sash-bars, which not only add to the strength of the frames, but greatly protect the glass against breakages. Notwithstanding all the improvements in glazing, and the rapid development of dry glazing, the old system of bedding in putty—and filling each side of the rebated rafter with the same so as to form an angle—is that most generally used for garden frames. The glass most commonly employed is about sixteen ounces to the foot. Twenty-one ounce is sometimes used, but on the whole the sixteen-ounce is better, being so

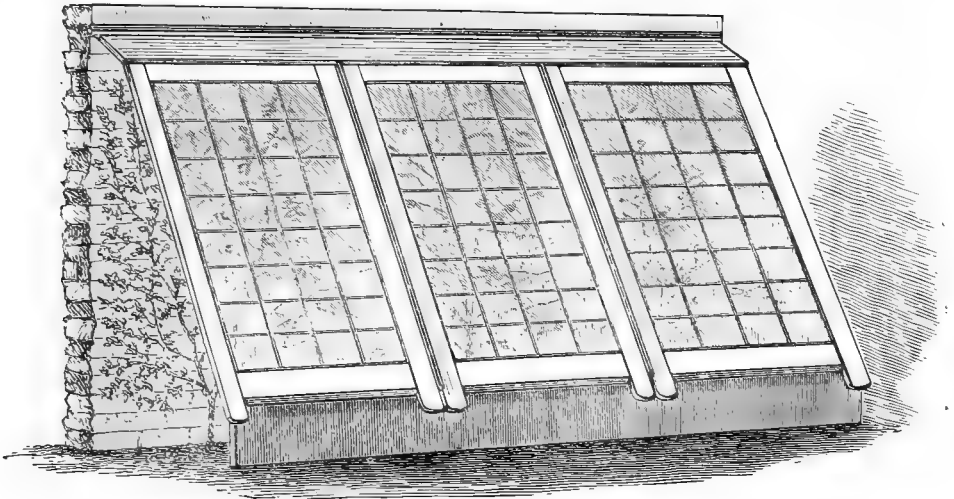


Fig. 14.—Loose Frames used to Protect Trees.

to six inches. The sash-bars are formed of inch, inch-and-quarter, inch-and-half, or two-inch deal, and are rebated to receive the glass. These used to be morticed in at each end, but now mere rebated splices of wood are frequently nailed on to the rails at each end, and these serve most of the purposes of the former mode of fitting sash-bars. The number of sash-bars in frame-lights is now much less than formerly, for broader as well as longer squares are used. Eight rows of squares, five inches by eight, used to be the orthodox number in three-foot lights. Now half that number of squares, ten inches by sixteen or eighteen inches, are generally used. For common garden frames it is hardly advisable to enlarge the squares beyond these sizes. The excessive portability—I had almost written mobility—of the lights slipping up or down, maybe off and on, several times a day, subjects the glass to excessive risks of breakage. These risks are increased by covering with mats and more dangerous sub-

much lighter, and with careful glazing and handling afterwards it is not much more liable to breakage.

The risk of breakage is greatly reduced since the number of laps has been lessened and their sizes narrowed to an eighth of an inch or so. The wide laps were not only the cause of the semi-obscurity of the old frame-lights, but a fruitful source of the breakage of the glass.

The pitch or angle of garden frames is generally secured by forming the back from a foot to eighteen inches deeper than the front. Hence depths at back of from eighteen inches to two feet, and in front of from nine to fifteen inches. Much shallower frames are also used for many purposes, such as the wintering of Cauliflowers, Lettuces, Endive, &c. These are frequently not more than from a foot to fifteen inches at back, and from six to nine inches in front. Such disparities of depth suffice to carry off the water freely and to protect the frames against drip. Serious inconveniences, however, very often arise in

practice from the disparity of depth in garden frames. The plants in front have barely time to start till they crush their heads against the glass, while those at the back not seldom become drawn because of their distance from the same. To remedy such evils and provide a uniform height over the entire area of the frames, the latter may be made of the same height at front and back, and the slope or pitch secured by placing on a bed or base with the desired fall.

Each sash is furnished with a strong iron handle, firmly bolted or secured on to the centre of the top rail, as in Fig. 11. This is a most important adjunct to a garden sash-frame, which is almost in perpetual motion in most gardens throughout the growing season.

Other forms of garden frames, such as hip and span-roofed ones (Figs. 12 and 13), have recently been introduced and strongly recommended at different times, and many years ago a dome-shaped garden frame was invented and used in France; but none of these have proved formidable rivals to the old-fashioned lean-to-roofed garden frame, which still holds its ground as the most efficient portable glass contrivance for the protection and cultivation of many garden plants. Not a few, however, of the modern hip and span-roofed frames are most convenient and useful. The lights are hung on a central rod passed through the apex, or on hooks fastened there, and the front lights can thus be thrown readily over on to the back ones in the case of span-roofed frames; or the back ones raised for ventilation in the case of those of hip-span form (Fig. 13). Garden frames of those forms also afford more room for the storage of taller plants than those of the ordinary form; but such advantages hardly compensate for the additional cost of production and the greater difficulties of working and covering the frames in cold weather.

Different Sorts of Garden Frames.—These have generally been divided into three classes—those of cold, temperate, and hot-bed or tropical frames; but the distinctions are neither of structure nor of size, but simply of temperature and uses. Cold frames are those from which the frost is only excluded. They are largely occupied with such florists' flowers as *Picotées*, *Auriculas*, &c. Temperate frames are largely furnished with bedding and the hardier green-house plants, and should be provided with a temperature of from 40° to 45° in all weathers. Tropical or hot-bed frames command a tropical temperature, and are largely used for the culture of Cucumbers and Melons, and the growth of stove and other tender plants in a young state.

The Frame or Melon Ground.—As this is daily losing much of its old significance, a few sentences may prove useful to describe its character and usefulness. This was mostly a warm sheltered spot, surrounded by high walls or hedges, with a warm outlook to the south, south-east, south-west, or west; and a good cart-road for ready access and egress of manures and soils. With a plentiful supply of these, and frames or pits in serried ranks or regular rows, the Melon-ground became and continued a veritable hot-bed of rapid production. It was at once the most interesting, profitable, and productive spot in the whole garden. Sheltered from all the coldest and most generally prevailing winds, its normal temperature was mostly from 5° to 10° above the average, while the heat, husbanded by glass and augmented at will by layers of manure, leaves, and other fermenting materials, furnished fostering and stimulating forces of the highest value, and sufficiently potent to meet the wants of cultivators.

Though modern improvements in the construction and warming of glass structures have relegated the Melon and frame ground to a place of secondary importance, yet no garden, large or small, is fully furnished with the most useful horticultural appliances that has not a frame-ground. By placing frames tolerably close together, space, as well as warmth, is husbanded and economised, though no two frames must be placed so closely as for the one in front to overshadow the one behind. To prevent this a distance of the width of the frame, with a few feet to spare, will usually suffice. For example, between frames six feet wide, spaces from six to ten feet should intervene.

Other Uses for Garden Frames.—Among these the protection of fruit-trees or tender shrubs on walls, Tea Roses, or other flowers or plants in the open, are the most obvious and useful. Our first experience of the extreme usefulness of the accidental application of portable lights was in this wise:—A narrow lean-to Peach-house was formed of old frame-lights. These were so nicely fitted together against a wall and narrow trellis, and the enclosed area so well heated, that the Peaches were ripened and all gathered early in June. The lights were immediately removed and fitted up in a rough way against Peach-trees in the open. These were ripened in splendid condition in a cold summer and district at the latter end of September and early in October.

Since then every possible spare frame or other lights have been utilised in the spring and in autumn. They are just as useful at the latter season as at the former, in imparting the highest flavour to stone-fruits and choice Pears in the open

air, and also in imparting that nut-brown maturity to the wood, the best possible preparation to meet the colds of winter and spring, and the surest promise of a fine crop of fruit the succeeding season.

Fig. 14 gives a fair illustration of how spare lights can be placed against Peach or other walls, and from these simple beginnings have sprung forth all the full crop of glass copings and screens for walls, or coverings for fruit-trees and Roses, and the angular or semi-round glass protectors for placing over cordons in the open. An enlargement of the original and ancient triangular Pea-guard has proved one of the best protectors for ground cordons, whilst for those on walls nothing has proved more useful than a few frame-lights posted up against them. For the protection of groups or masses of choice semi-hardy Alpine and other plants there is nothing to excel small frames, with glass lights, or the other glass contrivances described in these pages.

Other Frames besides those of Glass.—

For the purposes of mere protection, and the blanching of such products as Sea-kale and Endive, and the forcing of Asparagus, frames covered with thin wood, felt, paper (common brown and Willesden), canvas, calico, zinc, and other substances, have been used. The bases of such frames are mostly far rougher and simpler than those made for glass. Two styles or rails merely nailed together, with a centre style to keep the material from bulging in the middle, is generally sufficient. On such frames the material used must be tightly stretched and nailed. If this is done in a dry state the frames become, and long continue, tight as drums in actual use. This extreme tension renders most of the textile or other materials used almost water-tight, while if stout canvas or calico is dressed with linseed oil and beeswax it becomes virtually impervious, and sufficiently transparent to preserve many plants throughout the winter. Turf frames thatched with reed and straw are also exceeding useful in severe weather; these are more useful for mere protection than actual cultivation, and are better adapted for rendering glass frames frost-proof than as substitutes for them. Even Russian mats nailed on to wooden frames become far more useful than applied in the usual way, and will carry many semi-tender plants through the winter that would utterly perish without them. When and where opaque frames are used, every opportunity of genial weather must be seized to expose the plants freely to the light. Thus fortified at intervals, and kept as cool and dormant as possible during severe weather—conditions almost insured through the opacity of the covering—the plants suffer little from spells of darkness of a week's duration. But such structures

are at best but the makeshifts of frame-culture, and it only reaches perfection under glass lights, and wooden sides and tops and bottoms.

COMMON GARDEN FLOWERS.

Barrenwort (*Epimedium*).—One of the best-known representatives of this is *E. alpinum*, the Alpine Barrenwort, a beautiful, hardy plant, a native of South and Eastern Europe, but naturalised in woods and coppices in the North of England, &c. The term Barrenwort is employed, according to Gerard, "because it is an enemy to conception, and not because it is described by Dioscorides as being barren both of flowers and leaves." Nevertheless, this belief in its sterilising powers may be due to the remark of Dioscorides, who must have meant some other plant, for this seeds very freely in Styria and other parts of Austria. *A. alpinum* is a dwarf evergreen herb, with handsome foliage, and slender, creeping root-stock which scarcely penetrates the ground; the flowers are produced in spring, colour purplish, yellow on the inside. *E. pinnatum* is the large yellow Barrenwort, probably the handsomest species and strongest-grown of the genus. It flowers late in spring, or early in summer, the blossoms large, and of a bright golden-yellow colour. *E. purpureum* is so named on account of its flowers, which are purplish on the outside, brownish-yellow within, and twice as large as those of *E. alpinum*. This is a Japanese species. *E. violaceum* is also from Japan; the flowers large, numerous, and of a violet colour. There are a few other species, but we have named those that are most distinct. They form a lovely genus of dwarf-growing plants, taking the form of neat clumps, about one foot in height, of long-stalked, leathery leaves, and graceful panicles of lovely flowers. But if any one would succeed with them, they must have special treatment. They grow best in light, peaty soil, in a partially-shaded situation, and they are also well adapted for pot-culture. On the shady parts of rock-work they will grow and flower freely, provided they be planted in proper soil. On the shady, warm slopes of the unrivalled spring garden at Belvoir Castle, Grantham, these *Epimediums* are used with great effect, and in the months of April and May they are objects of rare beauty.

Gentian (*Gentiana* or *Gentianella*).—The name of *Gentiana*, and its English form *Gentian*, was bestowed by Dioscorides on some species of medicinal plants, the virtues of which were believed to have been discovered by Gentius, King of Illyria. Linnæus adopted it as a generic name, but it is doubtful if

his genus includes the *Gentiana* of Dioscorides and Pliny. Two of the species appear to be natives of the British Isles, viz., *G. Pneumonanthe* and *G. verna*. The former is known as the Heath Gentian, and Marsh Gentian, and it has local names, such as the Autumn Bellflower, and Harvest Bells, alluding to its time of blooming, and the form of the corolla; Marsh Gentian, from its growing in boggy places. It is a British perennial, scarcely less beautiful than any Alpine Gentian, and bears beautiful blue tubular flowers an inch and a half long. *G. verna* is the Vernal Gentian; it grows in Teesdale, and in a few places on the western shores of Ireland. The blue of this

flower is of the most vivid and brilliant description; it is, in fact, the bluest of the blue—one of the most charming of all Alpine plants, and should be in every garden of hardy flowers. It may be grown well in sandy loam mixed with broken limestone or gravel, and,

indeed, it is not very particular as to soil, provided that it be mixed with sharp sand and grit, kept moist, and well drained. A very important point in the culture of this plant is to leave it for several years undisturbed. *G. acutilis* is best known as the Gentianella; it is a well-known old inhabitant of our gardens, growing close to the ground, putting forth dense leathery leaves, and bearing on stems, two inches in length, large solitary flowers, of the deepest and most lustrous blue. In some places, such as the moist parts of Yorkshire and Lancashire, where the plant does well, edgings are made of it, and when dense in foliage and flowers they are of the most exquisite beauty. It does well in a moist, deep loam; it is easily grown, and it should not be frequently disturbed. *G. Andreuxi* (Andrews' or the Closed Gentian) grows about two feet in height, and produces numerous terminal flowers in axillary clusters. The flowers never expand, remaining as it were in

the bud, and are about one and a half inches in length, of a rich purplish-blue, striped inside with white. *G. asclepiadea* is a showy border plant, having erect, slender stems, two feet in height, producing an abundance of purplish-blue flowers in long terminal clusters. This is a true herbaceous plant, dying down every year, and thus keeping perfectly safe during the winter. Lastly we name *G. septemfida*; the Crested Gentian, a lovely plant, bearing, on stems six to twelve inches high, flowers in clusters, cylindrical, widening towards the mouth, of a beautiful blue and white inside, greenish-brown outside, having between each of the larger segments of the

flowers one smaller and finely cut. This is a native of the Caucasus, and one of the most desirable species for cultivation on the rockwork, thriving best in moist sandy peat, and increased by division.

We may say of all the Gentians that they do best in a moist sandy

loam or peat; that they suffer from drought, and should have some amount of shade; and they are all the more deserving of culture because they supply such rich hues of blue, purple, and violet.



GENTIANA VERNA.



Geranium or Cranesbill.—Under this head we do not intend to treat of the Pelargoniums; for though the Pelargonium was at one time included in the genus, which accounts for the existence of the common name Geranium as applied to them, it is no longer so included, though the Pelargoniums will be certainly known as Geraniums for many years to come. According to one authority, Geranium is derived from *Geramos*, the Greek for a crane, the seed-capsules being beaked so as to resemble the head and beak of that bird. We have British and imported species. Some of the latter are very handsome, forming dense, leafy, compact bushes of foliage during summer, and flowering freely and continuously. *G. pratense*, the Meadow Geranium, is



GEUM COCCINEUM.

a rather common native plant, but it has two double varieties, the blue and the white, and both are very handsome, and well deserving a place in the garden. They do well in good garden soil, and can be increased by division of the roots. Then there is

G. sanguineum, the Bloody Cranesbill, the name referring to the blood-coloured or crimson flowers, and it would be appropriate also to the purplish-red colour which the whole plant often assumes after flowering. This is a native species, forming very neat and

somewhat spreading close tufts, from one to two feet high. The flowers are very showy, and it well deserves a place in the garden. It grows on any soil, and is readily propagated by division or seeds. *G. argenteum* is the Silvery Cranesbill, a lovely Alpine form, with leaves of a silvery-white, and large pale rose-coloured flowers. It comes from the Alps, or Dauphny, and the Pyrenees, is perfectly hardy, flowers in early summer, and is a gem for association with the choicest plants on rockwork. It should have a firm, sandy, well-drained soil. It is freely increased by seeds. *G. armenium* is a neat symmetrical plant, growing about two feet in height, bearing large, deep purplish-crimson flowers, and does well in the open border. *G. cinereum* is the Grey Cranesbill, a beautiful dwarf plant, forming tufts of silvery foliage six inches in height, adorned with numerous white flowers veined with purple. It is a plant that is particularly at home on rockworks, and it seeds abundantly, and can be easily raised in this way. *G. Endressi* is one of the brightest and most effective of the family. The flowers are exceedingly numerous, and of a bright rose-colour. This is one of the best of hardy perennials, and it grows and flowers freely in any good ordinary border soil. *G. ibericum* is, perhaps, the best of the strong-growing varieties, forming handsome symmetrical bushes two feet in height, the flowers as large as a florin, and of a rich purplish-blue; this is extra fine. One of the best-known is *G. Robertianum*, the Herb Robert. We are informed that *Robertianum* refers to St. Robert, a Benedictine monk, Abbot of Molesme, who died A.D. 1110. His anniversary is on the 29th of April, and, as this plant is then beginning to flower, our Roman Catholic forefathers dedicated it to him. This similarly accounts for its common name, Herb Robert. It is also called by some the Stinking Cranesbill, on account of its strong disagreeable smell, which is said to be offensive to bed-bugs. This is so common, being abundant on waste ground, on banks, walls, and under hedges, and in woods in all parts of the country, that it is not much grown in gardens. Some fine varieties have been raised from it. They are annuals, and increased by seeds.

Geum.—The origin of this word is *geyo*, “to stimulate”; the roots of some of them and of allied species have the same properties as Peruvian Bark. Geum is also known as Avens; but the true form of Avens is said to be *G. urbanum*, a wild plant, which grows abundantly in woods and hedges in Britain. It is also known as the Herb Bennet. Avens is a word of obscure origin, quite unintelligible, and spelt in several different ways. As this plant was supposed to ward off the devil and evil spirits, venomous

serpents and wild beasts, it is possible that the Greek rendering in the sense of “antidote” may be the original and proper form of the word: Herb Bennet (*Herba benedicta*, “blessed herb”), the Avens, so called, Platearius tells us, because “when the root is in the house the devil can do nothing, and flies from it; wherefore it is blessed above all other herbs.” He adds that, if a man carries the root about him, no venomous beast can harm him; further, that when it is growing in a garden no venomous beast will approach within scent of it. The Scarlet Geum of our gardens is *G. chilense*, the Chili Avens, introduced about 1826, a well-known and showy hardy herbaceous perennial, growing freely, and flowering profusely in any good garden soil. A variety named *coccineum* is from seed, and of a rich blood-colour; this is also known as *G. atrosanguineum*, the dark blood-coloured Avens. The double form of this, *G. coccineum plenum*, is a grand variety of the old-fashioned Scarlet Geum, having larger heads, and more numerous flowers of a bright, dazzling scarlet; the flowers are double, lasting a considerable time, and are invaluable for cutting. It can be highly recommended as a first-class perennial, and no choice collection is complete without it. *G. montanum* is the Mountain Aven, from the Alps and Pyrenees. It is a charming rock or border plant, forming large, compact tufts of foliage and producing an abundance of showy golden-yellow flowers, on stems nine to twelve inches high, and so makes a very valuable perennial. Stony ground and banks suit it best. *G. coccineum* and its double variety can both be raised from seeds, which should be sown in May to flower the following summer.

Gypsophila.—This represents a genus of plants, containing both annual and perennial species, for which we have no common name. The name is derived from *gyposos*, “chalk;” and *phileo*, “to love,” in reference to the soil most suitable to them. There are many hardy perennial species, but few of which are grown. *G. Struthium*, a Spanish species, is said to possess certain saponaceous properties, and is used by the Spaniards for scouring instead of soap.

The Gypsophilas most deserving of cultivation among the hardy perennials are: *G. repens*, or *prostrata*, a valuable though not a brilliant plant, remarkable for its dwarf spreading habit, its multitude of pink or white flowers, veined with rose, on thread-like stems, and its adaptability for rockwork or stony ground. It is a native of the Pyrenees and Alps, growing six or eight inches high, and flowering in summer. *G. cerastioides* is a new species, growing about six inches in height, producing innumerable pure white flowers, much larger than any other of this genus; it is a first-class border and rock plant. But the best-known and the most valuable is *G. pani-*

cutata, a slender-growing plant. From a thick root-stock, it sends up each year a set of shoots, with smooth, narrow leaves, to a height of two feet; from there a perfect cloud of small flowers, supported on the slenderest of foot-stalks, forms a conical mass of elegance, its beauty continuing through August and September. It is very useful for mixing with cut flowers; and if the flowers are dried they come in very useful for winter decoration. *G. Stevensi* somewhat resembles *G. paniculata*, but is of much smaller dimensions; flowers white, somewhat larger than those of *G. paniculata*, but not so numerous. The latter comes from Siberia and Sicily, and does well in any light, sandy soil. *G. Stevensi* comes from Germany, and will flourish in any ordinary garden soil.

Of the annual kinds, *G. muralis*, from France, and *G. elegans*, from the Caucasus, are even more beautiful and profuse of bloom, and will merit being naturalised on old ruins and bare rocky places; particularly the former, which has rose-coloured flowers, and grows about nine inches in height. *G. elegans* is taller, reaching a height of eighteen inches, and, like the preceding, bears rose-coloured flowers. Both make charming rock plants.

Achillea (*Milfoil*).—The common Yarrow of our fields must be known to many. This is *Achillea Millefolium*; the generic name is derived from *Achilles*, a pupil of Chiron, who first used it in medicine as a healer of wounds. *Millefolium* means "thousand-leaved," and alludes to the numerous segments of the leaves. Its popular names, Milfoil and Thousand-leaved Grass, refer to the same; its more homely name, Yarrow, is said to be a corruption of the Anglo-Saxon name of the plant, *Gearewe*, and is derived probably from *gearo*, "active," on account of the plant's speedy influence when used as a medicine. One of the common names of the Yarrow is Nosebleed, from its having been put into the nose, as we learn from Gerard, to cause bleeding and to cure the meagrim, and also from its being used as a means of testing a lover's fidelity. Forby, in his "East Anglia" (p. 424), tells us that in that part of England a girl will tickle the inside of the nostril with a leaf of this plant, saying—

"Yarroway, Yarroway, bear a white blow;
If my love love me, my nose will bleed now."

Parkinson says that "it is called of some Nose-bleede, from making the nose bleede if it be put into it, but assuredly it will stay the bleeding of it." It is held, however, that this application of the Yarrow, and all the superstitions connected with it, have arisen, as in so many other instances, from the mediæval herbalists having been misled by a name, and taken one plant for another. Yarrow was long considered as a noxious

weed, but is now reckoned as a grateful food for sheep when mixed with the common pasture grasses, and is therefore generally sown along with such other seeds as are reckoned best adapted for permanent sheep pasture, on such soils as it is found naturally to thrive in; the quantity of seed should never exceed 1½ lbs. to 2 lbs. per acre. It is stated that the Scotch Highlanders make an ointment of the Yarrow, which dries and heals wounds.

There are a great many species and varieties of *Achillea*, nearly if not quite all of which are hardy herbaceous plants, thriving in good garden soil, and propagated by root-divisions, by cuttings, and by sowing their seeds. A few are very useful plants in the hardy border, growing among Phloxes, Pentstemons, Evergreen Candytufts, &c.; such as *Achillea Clavenna*, from the Alps of Switzerland, the Silvery Yarrow, which produces compact tufts of hoary foliage and numerous heads of white flowers; it is very useful for edging purposes, and makes a conspicuous rock or border plant. *A. Parmica florepleno*, a double-flowered form of the Sneezewort, so called from the powder made of it causing to sneeze, is one of the most useful of border perennials, producing numerous erect stems two and a half feet high, terminating with abundant pure white flowers, exceedingly double; for cutting purposes in the summer it is invaluable, and as a decorative garden plant can be highly recommended.

A. serrata is the Serrate-leaved *Achillea*, from the European Alps; and of this there is a double form, similar in appearance to the foregoing, but the flowers are not so double but purer in colour; the leaves are also very deeply cut, and it blooms later than the preceding. *A. tomentosa*, the Woolly Yarrow, is a European species, a neat creeping evergreen, with numerous large heads of bright yellow flowers on stems six inches long; it flowers early in spring, and is very useful for cutting from. *A. umbellata* is the Dwarf Silvery Yarrow, from the mountains of Greece, a very neat and distinct white-foliaged edging or rock plant; the flowers white, produced in close compact heads. The last two can be used for bedding purposes.

The Hare-bell (*Campanula*).—*Campanula* means a small bell, and alludes to the form of the flowers. The common Hare-bell of our fields is *C. rotundifolia*, which can be found in most northern regions; its name *rotundifolia*, "round-leaved," refers to the shape of the leaves, which approach to circular, but the notch at their base renders them what botanists term kidney or heart-shaped. Of its popular names Hare-bell is perhaps derived from the Saxon words *har* and *belle*, literally "a grey bell;" but whether this be so or not, or whether it is a corruption of *hair*,

alluding to the delicacy and hair-like character of the stalk on which it is so lightly pendulous, we will

There are a large number of Campanulas, and they are divided into three sections—annuals, bien-



CAMPANULA PERSICIFOLIA FLOREPLENO.

not attempt to decide. The common Blue-bell, or Wild Hyacinth (*Scilla nutans*), is regarded by some as the Hare-bell. Some writers hold that *Campanula rotundifolia* is the Blue-bell of Scotland, on whose high lands and heaths it is a common ornament.

nials, and perennials; while there are a few greenhouse varieties. It is only necessary to devote a few lines to the annual forms; the best are *C. attica*, *C. Loreyi*, and *C. pentagonia*; these are all dwarf-growing varieties, and seed can be sown in the open

ground in early spring. Venus' Looking-glass, or Ladies' Looking-glass (*Specularia speculum*), formerly called *C. speculum*, is so named from the resemblance of its flowers, set upon their cylindrical ovary, to an ancient mirror at the end of a handle. The name is given by Spenser in his "Faerie Queene" to a magic mirror, in which a lady might see her destined husband.

Among the biennial varieties a foremost place must be given to *Campanula Medium*, the Canterbury Bell, so named by Gerard from growing very plentifully in the low woods about Canterbury—in allusion, probably, to the bells so-called that were used by pilgrims on their road to and from the shrine of St. Thomas. It would appear that this came originally from Germany or Italy. Of Canterbury Bells there is now a large group of very fine varieties, double and single, varied in colour and singularly handsome. There is a variety called *calycanthema*, so named because the calyx has broadened out and become a broad saucer-shaped secondary flower. There are the blue and white varieties of this, and they deserve a place in every garden. Canterbury Bells are increased by means of seeds; these should be sown in boxes or in the open border in May, and planted out in the autumn to flower the following summer. Seeds should be sown every year, and the plants require to be planted in good garden soil so as to secure good heads of bloom.

Of hardy perennial species and varieties, there is a very numerous group. We will content ourselves with indicating the most valuable of them. *C. carpatica*, the Carpathian Hare-bell, forms neat, compact tufts, about a foot in height, covered with large, erect, blue flowers; useful as an edging, bedding, or border plant. *Carpatica alba* is a pure white variety, similar in all other respects. They do well in any good garden soil. *C. garganica*, the Gargano Hare-bell, from Italy, is an excellent dwarf species, bearing bluish-purple flowers, with white centres. It is well adapted for rock-work, and for borders of light gritty soil. *C. glomerata dahurica* is a very fine variety of the Clustered Harebell, a very desirable and handsome plant, invaluable for cutting, or for the decoration of the flower border. It grows about eighteen inches in height, forming a number of stems producing clusters of flowers in the axils of the leaves, and terminating with large heads of rich deep purple blossoms; one of the finest hardy plants in cultivation. This does well in any good soil; so does *C. grandis*, the Great Bell-flower, a fine old-fashioned perennial, forming a bush three feet in height, composed of spikes thickly set with large blue salver-shaped flowers; there is a fine white variety of this also. *C. grandiflora* (more correctly *Platycodon grandiflorum*) is the Noble Hare-bell, a

very effective hardy border perennial, producing, late in autumn, erect spikes of large salver-shaped blue flowers; this also has a white variety, and they are both distinct in habit and bloom from all other Campanulas. *C. Hendersonii* is a hybrid Bell-flower of great merit, possessing the characteristic of flowering throughout the summer. The flowers are large and very numerous, of a pretty mauve colour, growing to about twelve inches in height, forming a pyramidal outline. It is very vigorous in growth, perfectly hardy, and very distinct, doing well in a good loam. *C. persicifolia* is the Peach-leaved Campanula, growing two and a half to three feet in height, and bearing large, broadly bell-shaped, blue flowers; there is a white variety also. The double white-flowered form of this (*C. persicifolia alba florepleno*) is one of the very best of the genus; the flowers pure white, in long close spikes; very double, and exceedingly free-growing; really a grand perennial. *C. pulla*, the Dark-coloured Hare-bell, is one of the best of the dwarf species, forming in cool shady situations carpets of the loveliest verdure, and numerous stems two inches in height, terminating with drooping deep purple flowers; very charming when seen in a mass. *C. turbinata*, the Vase Hare-bell, is a sturdy little kind, four inches or so in height, and bearing, for the size of the plant, huge, very handsome, deep purple, cup-shaped flowers. It is of the character of *C. carpatica*, but dwarfer, and with larger flowers. There are several fine varieties of this, and all do well on warm sandy slopes or borders. *C. Van Houttei* is a very fine hybrid Bell-flower, one of the finest and showiest of this extensive genus, producing erect stems two feet in height, bearing immense dark blue flowers, fully two inches in length. A variety named *pallida* is a counterpart of the preceding, but with pale lavender-coloured flowers.

Of the green-house section we may mention two species only—one, *C. Barrelieri* (Barrelier's Campanula), a dwarf, trailing species, very suitable for pots and baskets, bearing profusely large, pale, greyish-blue, saucer-shaped flowers; a plant that can often be met with in excellent form in cottage windows; and the great Chimney Campanula, *C. pyramidalis*, a noble plant for pot-culture, or the back of the herbaceous border, forming a pyramid, composed of numerous stems, four to five feet in height, each stem being crowded with large, blue, salver-shaped flowers. *C. pyramidalis alba* is similar to the above in every respect, but bears white flowers. These two do well in good soil, which should be well manured in order to insure fine flowers; both can be raised from seeds. *C. Barrelieri* does best in a gritty soil, and a plant of it will last many years.

THE PINE-APPLE.

BY WILLIAM COLEMAN.

PROPAGATION OF THE PINE.

THE propagation of the Pine is easily effected by means of suckers, crowns, gills, seeds, and dormant buds.

Suckers.—With the exception of very shy kinds, which do not produce suckers freely, there is no difficulty in keeping up a good stock by leaving one or two promising suckers near the base of each plant at the time it throws up its fruit. It is not necessary to take off the suckers before the old stool is removed from the fruiting-pit, as they make very rapid growth during the time they are feeding on the parent plants; neither is it advisable to detach or pot them during the winter months. Modern Pine-growers, who produce such astonishing results in the course of a few months, generally leave the suckers on the stools, which are shaken out, and re-potted in small pots, till they become very large and ripe at the base, with an abundance of embryo roots, ready to take to the soil as soon as they are potted into eight-inch pots. Their age dates from the time they are potted. Those from winter fruiterers should be potted in March, or any time during the summer, and those from summer fruiterers not later than September: after this month, detachment should be deferred until spring. If well managed in a bottom heat of 90°, they are fit for the first and last shift into the fruiting-pots in February. They are again grown on rapidly, until the pots are full of roots, when they are slightly checked, but not starved, and they are ready for starting by the time they are eighteen months old. In the preparation of the suckers, all that is necessary is to remove a few of the small leaves from the base and to cut the end smooth with a sharp knife; they are then ready for potting. The pots should be clean, well crocked and dry, and from five to eight inches in diameter. The soil should be rich, firm, fibrous, and free from animal manure, as it will form the nucleus of the future ball of the plant, and on this account nothing likely to become pasty should be used.

Crowns.—Young plants of very scarce or shy kinds, such as the smooth-leaved Cayenne, which never throws up many suckers, are frequently propagated from crowns; but Pine-growers do not generally care for them, as it takes a much longer time to grow them into fruiting plants, and the prevailing impression is that they do not start so freely or produce such heavy Pines as sucker plants. Formerly it was the custom to strip off a few of the lower leaves, pare the fleshy part off the base, and

lay them aside to dry before they were potted; but it is better to pot them at once, in very small pots filled with dry fibrous soil, and plunge them in a strong heat, where the moisture from the fermenting bed will keep them fresh until the roots are formed, when they may be sparingly watered.

Gills.—These are off-sets resembling miniature suckers, produced at the base of the fruit; but being very small, it requires a great deal of time to grow them up to the size of ordinary suckers. They are therefore seldom if ever used when good suckers can be obtained. The best mode of propagation is the insertion of a number of them round the inside of the rim of a six-inch pot, and to pot them singly when they are well rooted.

Seeds.—Those who are interested in the raising of new varieties, and have the command of a good stock of patience, can indulge in the interesting art of cross-fertilisation by impregnating the flowers of one kind with pollen obtained from another. The pollen can be conveyed with a camel's-hair pencil when the atmosphere of the house is dry, and the two plants selected are equally advanced. When ripe, the seeds should be taken out of the pips, and sown at once in light sandy soil placed in shallow pans and previously warmed by being plunged in the bed over a temperature of 90° to 100°. If covered to the depth of a quarter of an inch with soil, and a bell-glass is placed over the pans, frequent watering may be dispensed with, and the seeds will germinate with more certainty than when these precautions are neglected. When fit for handling, the young plants must be potted off in light peaty soil, and replaced in the closest part of the propagating pit, where they can have a good bottom heat and be kept close to the glass. As growth proceeds, they will require constant shifts into larger pots, until they have attained sufficient size to be placed under the ordinary treatment which will be recommended in the chapter on Cultivation. As all hybridists are anxious to ascertain with as little delay as possible the result of their labour, it is a good plan to devote a small pit to the special culture of seedlings, and to keep them constantly growing until they arrive at the fruiting state, which will not be less than three years.

Dormant Eyes.—Choice kinds which yield few suckers can be increased in the following way:—When the old stools have produced the suckers which started with or before the fruit, strip off all the old leaves and lay them side by side, in shallow boxes some six inches in depth, to admit of two inches of drainage and four inches of soil. Fill in and cover

THE DARK-EYED FRINGED DENDROBE (DENDROBIUM FIMBRIATUM ; VAR. OCULATUM).

A stove Epiphyte of great beauty from the East Indies, belonging to Orchids. Of this most beautiful plant our gardens contain two distinct varieties : one with whole-coloured flowers, the other with a deep rich pitch-brown spot in the middle of the lip. In both the colour is otherwise of a rich apricot-yellow, rendered the more brilliant in consequence of the surface and edge of the lip being cut up into glittering points innumerable.

with light compost, plunge the boxes in a tan or leaf bed where the heat beneath them ranges from 90° to 100°. Cover the tops of the boxes with large squares of glass to prevent the soil from becoming too wet, or too dry, as frequent watering is objectionable. After a time some of the dormant buds formed at the base of every leaf will begin to swell and eventually burst into growth; but as all of them will not start together, the most forward should be taken off with as little disturbance as possible as soon as they have formed roots, when they can be potted singly, and treated as seedlings. Other buds, which might otherwise remain dormant, will then go on starting into growth, until the old stools are exhausted. It is the practice with some to split up the stems, and cut them into squares some two inches in length, for propagation after the manner of striking Vine-eyes, in small pots plunged in a strong bottom heat. But a little reflection will convince the reader that reducing the already enfeebled stems into so many small pieces must cause a great loss of sap, which is not the case when the stems are buried whole. It is the excitement of the sap which causes the latent eyes to start, and it will therefore at once become evident that the use of the knife is objectionable. In our own cultivation of the Pine-apple, both systems have frequently been tried, and the first has always resulted in the production of the greatest percentage of young plants. In order to make these remarks on propagation as intelligible and practical as possible, it may be well to close them by saying that a small, close, efficiently heated pit in which plenty of moisture can be constantly maintained, will form the best structure for raising young plants in. If bottom heat from pipes can be properly secured, cocoa-nut fibre may be used as a plunging medium, but when good Oak-leaves can be obtained there is nothing to surpass them for Pines in every stage of their growth, from the seed or the sucker to the ripe fruit.

CULTIVATION.

Cultivation of Suckers.—The cultivation of the Pine-apple may be commenced at any season of the year, the best being undoubtedly the latter end of the summer, as the plants which have produced summer fruit are the most likely to be well furnished with stout ripe suckers, fit for detaching by the end of August, or early in September. Assuming then that the pit (Fig. 4, p. 33) has been made up with fermenting material, consisting of Oak-leaves or tan, and that the heat has declined to a little below 90°, proceed to take off the suckers, by twisting them backwards and forwards until they part from the stem; strip off the short scaly leaves, under which a number

of brown roots will be found ready for immediate action; cut the lower ends smooth with the knife, and lay them aside in two sizes, ready for potting. As cleanliness is an important item in successful culture, provide a sufficient number of six and eight-inch pots; if new, let them be soaked in water; if old, thoroughly wash inside and out, and place them in the sun to dry. Meantime, provide a supply of clean crocks, oyster-shells, or charcoal, for drainage; break them rather small, and sift out the dust. Place about two inches in each pot, the coarsest in the bottom, and the finest on the surface; cover with a little cocoa-nut fibre, and a few bits of rough turf; then sprinkle with a pinch of dry soot, and place them on the bench in the two sizes ready for use.

Potting.—If the compost is cold and damp, spread it thinly in the sun or a warm house until it is fit for use, then commence with the largest suckers, and, as a matter of course, the largest pots; place one in the centre of each pot, ram firmly with a potting stick to keep them steady, leaving nearly an inch of space on the surface when finished, for the reception of water when roots are formed. Convey the first batch to the plunging-pit, and proceed in a like manner with the second size. When all the suckers are potted, calculate the distance which the space at command will allow to intervene between the pots, and plunge to the rims, always bearing in mind that the largest plants must occupy the back, and the smallest the front of the pit. It sometimes happens that the disturbance of the plunging material raises the temperature of the bed to a degree which may be considered too high for the well-being of the young roots. Anything, however, which does not exceed 95° below the bottoms of the pots will do no harm, as roots under such conditions are rapidly formed, and soon find their way to the sides of the pots. During the first fortnight it will be necessary to shade from bright sunshine through the hottest part of the day, and to dew the plants very lightly with a syringe after the canvas is removed on fine afternoons. The sides of the pit and the surface of the bed may also be damped, but no water must be given to the plants until the roots touch the sides of the pots, when water at a temperature of 80° may be given in sufficient quantity to moisten every part of the ball. After the plants have been watered they will soon begin to grow freely, when the shading and damping may be reduced, but not entirely discontinued, on very bright days. Air may now be given pretty freely early on fine mornings, and gradually increased as the plants become strong, and capable of bearing full exposure to light. Shading must be entirely dispensed with, and the syringe very sparingly used, at least overhead, otherwise a weakly

growth will be encouraged on the commencement of winter, a condition from which, as is well known to practical Pine-growers, no after-treatment can entirely restore them.

As future success depends upon keeping the plants vigorous, compact, and sturdy through the winter months, care must be taken that they do not sink too far away from the glass, which must be kept scrupulously clean; that they do not become crowded to the slightest extent; and air must be given, as may be most convenient, either at the back or front, so as to avoid creating a draught.

Assuming that the plants occupy a light pit and the points of the leaves nearly touch the glass, the temperature throughout September should range from 65° at night to 75° by day, with air, and 10° to 15° more for a short time after being shut up on fine afternoons, with solar heat. As days decrease in length, and sun-heat becomes feeble, a gradual fall in the top and bottom heat should take place through October to the extent of, say, 5°, more or less, according to the state of the weather, so that by the beginning of November the bottom heat will range from 76° to 80°, and the top heat from 58° at night to 65° by day. As there is no standing still in nature, the object through the winter months should be the maintenance of steady heat, which will keep the plants slightly progressing. This is the safest and only means by which the roots can be kept in a fresh, healthy condition; and as the minimum heats contained in the preceding paragraph will be found ample, they must not be exceeded when it is mild, while in the event of unusually dark, heavy, or severe weather setting in, it will be found the most prudent course to descend a little from these figures, in preference to following the old and now exploded plan of exciting the plants when they should be resting.

Water.—If any of the plants are plunged within the influence of the hot-water pipes, it will be necessary to examine them occasionally, and in the event of the tan having become dry, a little water must be given, not only to the plants so situated, but to the tan as well. It is not, however, often necessary to apply water in winter, as the plunging material is, as a rule, sufficiently moist to keep the soil and roots in a sound and healthy condition. Still, with hot-water pipes around and below the small pots, there is always a possibility of some being affected by the dry heat, and it is by paying timely attention to minor details like these that some succeed where others fail.

In a preceding chapter attention was drawn to the importance of making provision, be it never so limited, for getting into the smallest pits in winter,

as well as for covering the glass in severe weather during the hours of darkness. Under the old system of management the first arrangement was not considered necessary; consequently it often happened that for days and weeks together the lights could not be opened to admit of the daily details receiving timely attention. To compensate for this drawback, and to insure what were considered snug and comfortable quarters for the almost hermetically encased plants, a general turn-over took place as soon as the newly-fallen Oak-leaves could be secured; a violent bottom heat followed, and the roots of every plant perished, owing to their subjection to a temperature considerably too high for Pines at any season of the year. Some twenty-five years ago it was my misfortune to take to a stock of Pines in May, which had been so treated. Every plant was roofless, and, down to the smallest succession, started into fruit. Had the plants been allowed to remain in the old plunging material until February, there can be no doubt that the white, healthy roots, which every good Pine-grower now expects to find about that time, would have been present, and the loss of a number of good plants would have been avoided.

Ventilation.—In mild winters we experience many fine days, when a little air for an hour or two can be admitted, without having recourse to extra firing. Whenever this is the case, a very small opening at the apex will change and sweeten the atmosphere; great care must, however, be observed, as the smallest chink will soon tell upon the temperature, and sudden depressions are at all times injurious. But as a constant supply of fresh air is important, and we no longer have the old six-inch squares of glass with open laps, forming a most perfect system of ventilation, or filtration of the air, the best arrangement under the modern system of glazing will be found in the introduction of sliding brick ventilators under every light, a little above the ground-line, and opposite the hot-water pipes, both in the front and back walls. As these can be opened or closed from the exterior in all weathers, and the air so introduced becomes warm before it reaches the foliage, plants can be kept in the best possible condition when the elements are adverse to top ventilation.

Winter Growth.—In Pine-growing establishments, where a good stock of plants in every stage of growth exists, the treatment here recommended for the management of autumn suckers will result in the production of a set of robust healthy succession plants, fit for shifting in February, and growing steadily on into fruiting stock by the following autumn. But, assuming that a general stock does not exist, and fruiting plants are wanted with all speed, then a

slight departure from the lines laid down is open to the cultivator, provided he has the command of a light span-roofed pit like the engraving (Fig. 5), in which the plants can be kept steadily growing under the influence of a day and night temperature slightly in excess of that recommended for the ordinary stock of suckers. In a pit of this kind the plants will have the benefit of every ray of light and sunshine throughout the winter months, moisture can be given in moderation, and the increase in the day and night temperature, instead of being bound by any hard and fast line through all weathers, will naturally take place when the sky is bright, and the external atmosphere is mild. In the selection of suckers for this purpose, the strongest of the Queens are to be preferred, as they grow freely and quickly into a fruiting condition. But unless the suitable convenience is at command, not only for growing the plants through the winter, but also for resting them in May, this attempt to steal a march will be best left alone, as there is great danger of getting the plants drawn into a soft weakly growth, a condition which will most certainly defeat the object held in view, namely, the production of ripe fruit in little over twelve months after the rootless suckers have been potted.

Succession Plants.—If all has gone on well, the plants which little more than five months ago were rootless suckers, will now be considered Succession Plants, a term by which they are usually distinguished from fruiters, and it is of these that we are now about to treat.

About the end of January, or early in February, the September-potted suckers will have filled their pots with roots; but, owing to the unusual size of the pots which were used, and the possibility of a protracted period of rough weather, there will yet remain some two or three weeks, which will be quite as well devoted to the gentle excitement of the roots, and the necessary preparations for potting. The experienced Pine-grower can tell at a glance when the plants are ready for the final shift into fruiting-pots, but the uninitiated will do well to make a careful examination of a few of the most promising, and if the roots are not sufficiently numerous to keep the ball well together, the operation of shifting should be deferred until they are in a satisfactory condition. In order to accelerate this process, an

early start being important, the top and bottom heats may be gradually raised about 5° higher than was recommended for the preceding three months; atmospheric moisture may also be slightly increased, and, if needful, a little warm water at a temperature of 80° may be applied to the roots. Under this treatment, with the temperature ranging from 60° at night to 70° by day, the white, healthy roots will soon begin to push, and the best possible condition for potting will have been secured. If, on the other hand, any of the plants have become pot-bound, the balls should be gently pressed with the hands until the roots can be disentangled, as matted balls are apt to become dry, and the roots, having pursued a spiral direction, do not take so freely to the new compost. Moreover, the watering of newly-potted plants in February

being undesirable, neglect of this simple preliminary operation may result in some of the strongest and best plants starting prematurely into fruit. With these hints for his guidance the intelligent amateur will ever be on the watch, not only for the suitable condition of his plants, but also for a mild, favourable period for the performance of the work.

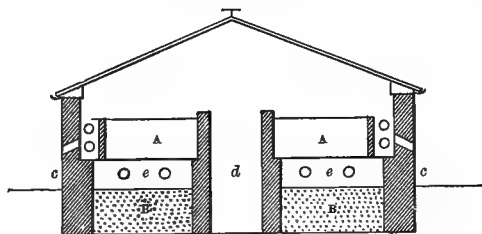


Fig. 5.—SPAN-ROOFED PIT.

AA, Plunging-bed; BB, drainage; cc, ventilators; d, passage; ee, hot-air chambers; oo, pipes.

Preparations for Potting.—When it is borne in mind that the plants now under treatment will occupy the pots to which they are about to be transferred until they have ripened off their fruit, and matured one or two suckers, it will be obvious that this is one of the most important operations, and, as such, should receive the greatest attention in all its details. Some ten days before the time for shifting arrives every plant should be examined, and watered sufficiently to bring every particle of the soil into a healthy growing state, and a little more air should be given to prevent the excitement applied to the roots from affecting the leaves prior to the removal to the potting-bench. During the few days which will intervene the necessary preliminaries in the potting-shed must be proceeded with, so that everything may be ready at hand when a suitable day for potting arrives. Having thoroughly cleansed the pots inside and out, let them be crocked with the same materials and care as was recommended for suckers, using the lower stratum of crocks, also well washed, a little coarser, and finishing off with finer particles quite free from dust.

Size of Pots.—The size of the pots may vary

from ten inches in diameter for the second size, to eleven or twelve inches for the strongest and best plants. Pots above this size will be superfluous, and the plants in the hands of the amateur will be more liable to get out of order; indeed, very fine Pines can be grown in much smaller pots than the sizes here recommended, as success depends more upon feeding at the proper time, and daily attention to minor details, than it does upon a large mass of soil. Having already discussed the soil, its preparation, and the necessary corrective ingredients, it is only requisite to say that it must be dry; but as this is a vague term, it may be explained as meaning a compost sufficiently free from moisture to admit of any amount of ramming or pressing without becoming adhesive, or losing its elasticity. In many instances early spring plants have been potted-in soil which has been much too wet, and the unsatisfactory progress which they have made has been attributed to every cause but the right one. If, then, the compost is not thoroughly satisfactory, it is better to defer potting until it is made so by the addition of rough, dry charcoal, or burnt earth, and exposure to the atmosphere of a house, where it can become thoroughly warm before it is used.

Preparation of the House.—If the house or pit intended for the reception of the plants has been previously used, it should be thoroughly cleansed, the glass and woodwork well washed—the latter painted, if necessary—and the walls whitewashed with quicklime and sulphur, for the twofold purpose of destroying all insect life, and aiding in the diffusion of light and heat, two important points in the management of plants at this early season. The preparation of the plunging material will next require consideration. If new tan or leaves have to be used for giving bottom heat, they should be collected, and well worked out of doors, where they can be protected from wet, to get rid of the violent heat before they are placed in the pit, otherwise they will give much trouble in the future by becoming too hot for the well-being of the roots. It is quite true that they will not be placed in immediate contact with the plunging material, consequently a strong bottom heat will not injure them so much directly as by forcing a weak, elongated growth at a time when it is all-important that the plants should be kept dwarf and sturdy. To avoid this dilemma it is the safest plan to sift all the old tan, at least once a year, and add a moderate quantity of new, either to the surface or, in larger quantities, near the back and front walls of the pit, to be properly mixed with the old when the bed again requires renovating. When the old tan occupies the centre of the bed, and the outside rows are plunged in the new, they are in

the most convenient position for rocking or lifting should this undesirable operation be found necessary. Good, sound Oak-leaves, if obtainable in proper condition in November, though certainly a little more troublesome than tan, are considered, by many the best for plunging purposes, as the gases, together with the moisture, which they are constantly giving off, contain all the elements conducive to the vigour and health of the plants. Therefore, when and where these are constantly used, their preparation should be commenced as soon as they are harvested; then, as has been advised in the management of tan, their introduction should be piecemeal, by placing a small quantity of the new on the surface of the bed, and leaving the lower stratum undisturbed. The greatest drawback where leaves are used, and the old leaf-mould is not removed annually, is the rapidity with which worms increase, and, as a matter of course, find their way into the pots. Now, notwithstanding the fact that modern theorists have elevated these subterraneous workers by proving that they fertilise and improve our pastures by raising tons of soil to the surface, plant-growers in general, and Pine-growers in particular, dread their presence in their plunging-beds, and very naturally use their best endeavours to destroy them. The most effectual way is to remove all the infected matter, and, after well dressing the sides and bottom of the pit with quicklime, replace with new. If this is impracticable, then the whole of the bed should be turned over, dressed with lime as the work proceeds, and made firm and level, ready for the reception of the new leaves.

Where hot-water pipes are used for giving bottom heat, as is shown in the sections, all these difficulties are reduced or done away with, as the valves can be opened or shut at pleasure, and the heat regulated to a degree. The plunging material, under this the best of all arrangements, being just deep enough to receive the pots, may consist of tan, cocoa-nut fibre, or leaves, all good Pine-growers much preferring the latter after they have once tried them.

Potting.—With pots, compost, and plunging-bed in satisfactory order, select a number of the best plants from the pit; but before turning them out of the pots, strip off a few of the lower short leaves to allow of their being placed a little deeper in the pots they are about to occupy, as well as to encourage the formation of more surface roots from the hard, brown part of the stem. When turned out remove all the old crocks, and every particle of loose, inert soil. Carefully preserve the roots from injury, and proceed to fill the new pot with the roughest part of the compost, which must be moderately well rammed until its level will admit of the top of the ball being

placed two inches below the level of the rim. If in thoroughly good condition and abundantly supplied with roots, a twelve-inch shift may be given; if only indifferently rooted, use a smaller size, as it is of no use sending the carriage in advance of the steed. Fill in with rough compost: ram firmly with a potting-stick as the work proceeds, and finish off with a little fine soil, raising it slightly round the collar of the plant. If the staple of the compost is heavier than that recommended at page 34, then the ramming, so essential in the use of light sandy loams, need not be so closely followed up; but all soils in which the Pine-apple will thrive should be made so firm as to prevent the possibility of much moisture being held in suspension, while it is sufficiently sound and free to admit of the free passage of water after it has been applied to the surface.

Having selected all the best plants, which may be presumed to occupy the eight-inch pots, and placed them in the larger size for fruiterers, proceed with the second class and treat them in a similar way, only using the ten and eleven-inch pots. It invariably happens that some of the plants are found badly rooted—it may be through being too wet, from drip, or from being too cold; be this as it may, plants in such a condition should not be shifted into larger pots until the sucker-pots are properly filled with roots. Therefore the proper course will be a careful examination of the crocks and soil, when, these being satisfactory, return the plant to the original pot to be replaced in the sucker-pit. If the examination is unsatisfactory, shake away all the soil, trim off all decayed parts, and re-pot in new compost.

When all the plants are potted, proceed with their arrangement in the succession house in the following manner:—Select as many of the tallest plants, irrespective of the size of the pots, as will form the back row, allowing a clear space of two feet from stem to stem for Queens, and a little more for Cayennes and Rothschilds. Then proceed with the second row, and finish off with the most stocky plants at the front. The distance here recommended may appear rather extravagant, but not if it is borne in mind that, with the whole of the growing season before us, and the great importance which attaches to full exposure to light, anything short of this space will soon interfere with its proper diffusion at a time when the production of broad, stout, inflexible foliage must be the predominating aim of the cultivator. The depth to which the pots may be plunged must be regulated by the state of the bed. If the bottom heat ranges from 85° to 90°, they may be plunged two-thirds of their depth in the tan or leaves; if it exceeds 90°, then shallower, by placing them in a basin, which can be

filled up when the heat declines to 85°. As the abuse rather than the use of bottom heat at this early season has to be guarded against, a bottom heat thermometer placed in the bed will soon indicate any sudden rise, which so often takes place immediately after the tan has been disturbed. A few degrees for a short time will not make much difference; but if it continues, rocking must be resorted to, not so much for the protection of the roots, which have not yet reached the sides, as to prevent a too rapid growth so early in the season. For a few days after potting the plants must be kept rather close, with plenty of atmospheric moisture, produced by damping the walls and floors two or three times a day, and by keeping the evaporating pans full of pure water; but overhead syringing must not be indulged in. The temperature during this period and through the month of March may range from 60° to 65° at night, and 70° to 75° by day, when the weather is favourable; but as few Pine-growers now believe in fixed temperatures, these figures must be taken as the mean to which the heats above or below must approximate, and be governed by external conditions.

When the roots have commenced making their way through the new compost, which can be observed by the sharp, turgid texture of the foliage, a little air must be given every day when the temperature touches 70° with the prospect of its rising to 75°. About 1 p.m. on bright days reducing may be commenced, to be followed by complete closing in time for sun-heat to raise the house to 80°. As there is no rule without an exception, so there is no fixed rule by which cultivators are governed; these figures are only approximate; but if judiciously adhered to, the young beginner will find that by the middle of April he has overcome the risk which attends the one-shift system, by getting the roots well in advance of the foliage, and in the best possible condition for receiving their first supply of water.

Watering.—From the end of February to the middle of April may seem a long time to keep the plants without water; but it is not too long, for plants plunged in a moist fermenting medium are constantly receiving moisture from it, as well as from the atmosphere, and this at a season when the perspiratory organs of a plant like the Pine-apple in a glass structure are not very active. Indeed, more mischief is done in Pine-stoves by the too liberal application of water to the roots in early spring than many people imagine. Mere dribbles, on the other hand, are equally pernicious, as the surface roots only are reached by the water, and the inexperienced are misled by the moistened appearance of the soil, when the active roots which have struck

down to the drainage really require a good supply of this important element. Practised growers can tell by the appearance of the plants when water is needed, and the unskilled can easily ascertain for themselves by an examination of the soil, and the ring of the pots—if dull and heavy, they may be considered wet enough; if sharp and hollow, water will do no harm, although they may not be suffering. If provision has been made for storing soft water, this will be found the best for watering and syringing with. The temperature should not be below 80° when it is applied, and the quantity, it is hardly necessary to repeat, should be sufficient to permeate every part of the balls of the plants to which it is given.

Summer Treatment.—By the end of April the steadily-maintained bottom heat of 85°, combined with the stimulus produced by the supply of tepid water in the early part of the month, will have started the plants into good growth. The stems will now begin to swell out, and the dark green leaves, by taking their natural mode of growth, and spreading themselves out in every direction, so as to secure the greatest amount of light, will soon show that the space of two feet allotted to each plant, while giving them plenty of room, is by no means extravagant. If the weather is fine and mild the temperature may be gradually raised to 70° as the mean for the night, or, properly speaking, the morning, as after bright, sunny afternoons, when a goodly amount of sun-heat can be shut in, the house may stand about 75° at banking-time, and gradually fall to 70° at daylight. A little night air, admitted through the front sliding ventilators placed opposite the hot-water pipes, will do good service in keeping the foliage stout and healthy until the days increase in length and brightness, when this danger, as the necessity for sharp firing decreases, will be reduced to a minimum.

As sun-heat and daylight increase, so must the amount of atmospheric moisture, by keeping the evaporating-pans full of water, and damping the walls, paths, and surface of the bed at intervals during the day. Overhead syringing at this early season need not be frequent, otherwise the water which finds its way into the axils of the leaves will descend to the surface roots, and more than counteract the good it is expected to produce. An occasional dewing over, however, with a very fine syringe, which will deposit the water in the form of spray, after the house is closed with strong heat, will be beneficial; for, while cleansing the foliage, it will soon be absorbed by the atmosphere, and so produce conditions in which the Pine makes the most satisfactory progress.

Strong fire-heat, at all times objectionable, must be reduced as much as possible by every means within the cultivator's reach consistent with the maintenance of the proper day and night temperature. The former can be considerably increased by giving a chink of air at the apex as soon as the sun begins to play upon the glass, by gradually increasing it until the highest point, 85°, is reached, and by shutting up very early in the afternoon, with the prospect of the confined solar heat raising it to 90°, or a few degrees more. As a matter of course, the house will be immediately syringed to counteract the drawing influence which would otherwise be produced. To husband the heat so enclosed, the blinds should be let down when night air is given, and drawn up again when it is shut off in the morning. With many Pine-growers who have an abundance of hot-water power at their command, this important matter does not receive the attention it deserves; indeed, some disregard night-shading altogether; but let them try the experiment with two houses in every respect alike as to heating and aspect, and they will soon find that the consumption of fuel is considerably reduced, while the warmth and steady humidity of the interior are preserved beyond their expectations. All admit that growing Pines must have a plentiful supply of moisture; that this, as well as heat, escapes more rapidly on bright moonlight nights than when the sky is overcast and cloudy; and, further, that the cold glass is a rapid condenser; therefore, if the glass could be kept as warm as the interior of the house, no heat would escape; but as this cannot be more than partially attained, good non-conducting shading through the night will be found an invaluable boon to the Pine-grower.

By the middle of May the roots will have found their way to the crocks and sides of the pots, and under the influence of the great amount of sun-heat which can now be shut in, growth will be very marked and rapid. This will, of course, necessitate more frequent attention to syringing and watering, or rather to the production of more atmospheric moisture by damping the walls and paths, and dewing the plants overhead occasionally, to keep the foliage clean and fresh. Every plant should be examined once a week, and if the soil appears dry some two or three inches from the surface, water, tinged with guano, may be given in quantity sufficient to reach the drainage; but the requirements of individual plants being doubtful, they may be allowed to stand over until the following week, as the moisture given to counteract sharp fire-heat through the night, and the long period through which they are kept in a humid, feeding atmosphere after closing for the day, prevent the waste one might imagine: hence the importance of keeping the roots well in hand, and,

while avoiding a check from dryness, carefully guarding against getting them into a wet state.

Some three months having elapsed since the plunging-bed was made up, it will now be necessary to ascertain if anything is needed to keep it in proper condition. There are two evils to which Pine-beds are liable, and neglect of either of them, now the roots are working round the pots, may prove very serious. If composed of fermenting material alone, whether leaves or tan, the effect produced by more frequent watering, and the increasing power of the sun, is sometimes so marked as to raise the temperature of the bed several degrees in the space of a few hours. To counteract this the plunging thermometer should be carefully watched, and when the heat exceeds 90° the pots should be rocked until they stand loosely in the tan; when the heat, often transient, has subsided, the plunging material may be pressed back to their sides again. Although the roots are extremely tender, and easily injured by strong heat, disturbance is not advisable if it can be avoided; but when deeply-plunged pots are kept in very strong heat for any length of time the roots suffer, like the foliage, by being drawn too fast, if they do not get killed. The other evil to which attention must be paid is what is termed "heating dry," no uncommon occurrence when hot water is the moving power, and tan or leaves the plunging medium. It sometimes happens that deep, old tan beds get dry, but in either case the remedy is the same—the application of water in such a way that it will pass through the tan without touching the roots. If the plants have got too low, or too thick, an event of this kind offers a good opportunity for lifting, and re-arranging them in the old tan after it has been corrected; but with the roots in a highly sensitive state all Pine-growers should dread any interference which will cause violent fermentation. Ventilation throughout the month, and, in fact, throughout the summer, must be conducted on the same principle, that is, the admission of a little air at the apex as soon as the sun begins to tell on the glass, and a gradual increase with a rising thermometer until the maximum of 85° is reached. Although fire-heat is still a necessity, yet by storing up sunshine all the afternoon the starting of fires may often be delayed, but care must be taken that the houses do not fall below 70° at night—a temperature which will admit of shutting it off early on fine mornings, when night air is also taken away, for early syringing.

Shading.—As the days approach their greatest length, and the sun its highest altitude, a little light shading may be necessary for a short time through the hottest part of the day; but unless the houses are very light, and closely glazed, and the tips of the

leaves, now close to the glass, show a tendency to become brown, the plants will make a more satisfactory growth under full exposure. One of the very worst practices, which cannot be too strongly condemned, is systematic shading, as it softens and weakens the whole system of the plants, and very often thwarts the cultivator in his otherwise well-directed efforts to get them into suitable condition for going into partial rest in October. In modern Pineries some shade is undoubtedly necessary when bright sun breaks upon them before the pipes have cooled down after sharp firing; but when they have become cold, if all is going on well at the root, steady atmospheric moisture will be found quite sufficient to prevent the foliage from becoming brown and wiry, a condition in which they cannot perspire freely. Any one having grown Pines, Queens in particular, in the old-fashioned, small-squared, open-lapped houses, knows how compact, fresh, and green the foliage can be kept through the hottest summers without a thread of shading; a fair proof that, of two evils, a little tinge of brown is of less consequence than a soft watery growth.

Through the months of June and July the plants must have what may be termed liberal treatment, both as regards air and water, and the more frequent application of moisture from the syringe. The day and night temperature during this period will not require any alteration, as ordinary summer weather will admit of a minimum of 70° being maintained with a chink of air, almost without having to start the fires; but where bottom heat is obtained from hot-water pipes, gentle fires are always found necessary to keep up the proper degree of heat, which should be kept steadily at 85°. The maximum of 85°, with a rise of 5° after closing, will be secured by the early opening and closing of the ventilators, and by opening the top-heat valves on dull mornings in such exceptional seasons as have been experienced during the past seven years. The pots being now full of roots, water at the temperature of the bed, with a little guano or good clarified liquid manure added, must be given in larger quantities as often as may be found needful to keep the soil in what is known as a good growing condition, but not so wet as Pines intended for late spring starting will bear. When overhead syringing is thought necessary, the water should be soft, and as warm as the atmosphere of the house at the time it is shut up. If the surface of the bed, as well as the walls and floors, are nicely moistened twice a day, the overhead syringing, even in the hottest weather, must be light, otherwise the most forward plants, particularly the Queens, will show a tendency to throw out suckers; and as these will rob the plants, they must be twisted out with a pair of pincers as soon as they are formed.

ROCK, ALPINE, FERN, AND WILD GARDENING.

ALPINE PLANTS.

BY EDWARD W. BADGER, F.R.H.S.

Rock Mounds and Beds.—There are many small gardens where the rock borders, and the still more extensive rockeries contemplated in the foregoing remarks, would be out of place, or for which sufficient room could not be found. In such gardens only a small space can be set apart for an Alpinery, and this must usually take the form of a single bed or mound, or perhaps two at most. In these cases, the choicest Alpine gems should have the preference, and no trouble be stinted to insure their successful cultivation. It is fortunate that some of the loveliest of these plants may be grown in perfection under such a variety of circumstances, that the humblest amateur may undertake the cultivation of a select collection of them, with the fullest assurance that they will thrive in his garden as well as in the extensive grounds of the neighbouring peer, provided he will be at a little trouble. The remarks on the preparation of rock borders and the formation of pockets (see page 77) contain all the information which any intelligent person would require in order to make the best kind of bed or mound for growing Alpines. A sufficient depth of soil to afford ample room for deeply penetrating roots to wander at will; soil of the proper kind to yield a supply of the necessary food and to retain moisture in sufficient degree; isolation of one plant from another by the stones used to form the pockets; the prevention of overcrowding or the preponderance of strong-growing plants over weaker-growing ones; never allowing the plants to get dry at the roots during the growing months, and preventing the stagnation of water about the roots when the plants are at rest: these are the conditions of success for the grower of a small number of plants, as well as for one who has room for a full collection; and the results, other things being equal, will be as satisfactory in the one case as the other.

The rock mound or bed should be in a fully exposed position, away from the shade of trees and walls, open to every ray of sunshine and all the rain that falls. Its shape is of no moment so long as it harmonises with its surroundings; and the more it can be made to assume the appearance of a natural outgrowth of the position occupied, the greater will be the charm of it. The smaller it is, the more the need to keep it moderate in height; for though it is an advantage for it to be above the general level of the surrounding garden, it would be a great disadvantage to make it so high

in proportion to its size as to unduly expose too large a surface to the drying effects of a parching-east wind or broiling sunshine. This is a point to be insisted on, because the bulk of small rockeries are invariably made higher than is proper. It is possible to make a very attractive rock mound on a small scale. This is to be done by raising the surface a foot or eighteen inches above the level of the surrounding surface, margining the outline with stones so as to define the bed and provide places for plants which thrive better in a dependent position, and then making the remainder of the surface into as many pockets as there is room for, according to the size and rate of growth of the plants which it is intended to use.

A very charming bed might be made if no other genus than *Saxifraga* were used to plant it. Using the various forms of the generic type of *Saxifrage*, of which London Pride is the best-known representative, for the margins, and for the next tier some of the closer-growing moss-like species such as *S. atropurpurea*, *Wallacei*, &c., and then in the higher parts planting some of the encrusted forms from the larger *S. longifolia* and *pyramidalis* down to the tiny *cæsia*, with an intermingling of plants of the *oppositifolia* section, where they could rest on a ledge of stone and hang down in front of it, a collection of lovely plants, whether in or out of flower, would be brought together and, as it were, focussed for observation, which could not fail to please at all seasons of the year. But where more variety is desired, as it will be in most places, the *Saxifrages* may be intermingled with *Sempervivums*, the smaller *Campanulas*, such as *S. pulla*, *pumila* (white and blue), *carpatica*, *muralis*, and *turbinata*, a few of the dwarf bulbous plants (Snowdrops, Crocuses, *Scillas*, *Chionodoxa Luciliae*), some of the smaller *Dianthus*es, *Gentians*, and *Hepaticas*, or any of the many dwarf and compact-growing plants which will be named later on in our selection of Alpine plants for general use. We should advise young beginners to content themselves at first with some of the plants most easily grown, and which will be marked with an asterisk (*) in our selected list. When they have grown these successfully and gained experience, they will be able to adventure with more confidence on the cultivation of more difficult plants.

Natural Rockeries.—There are many gardens in this country, situated on hillsides and elsewhere, in which there exist possibilities needing only to be used to be converted into natural rockeries which would far surpass any artificial ones capable of construction at ten times the expense these would cost. Wherever the underlying rock, whether sandstone,

limestone, chalk, or granite, is so near the surface as to be easily laid bare, and the surface is irregular in outline, here a natural rockery may be almost always made at trifling cost. If the conditions occur in a cottage garden, however small, they may be utilised, and even in the largest domain the conditions may not be more capable of effective use, though on a larger scale. Where disused stone-quarries occur in grounds, they often offer opportunities of the greatest value which, used judiciously, will afford charming rockeries; and disused gravel and marl pits may often be converted into strikingly beautiful homes for many lovely plants under the directing hand of a skilled operator. In all spots where the natural rock crops out at the surface, or is so near it as to be easily made the surface, the most satisfactory results are easy of attainment, and should be utilised.

Materials for the Rockery.—Natural stone should be preferred when it can be obtained. Some kinds are better than others, but the kind common to the district will generally be most used. Even though it should be less effective than some other kind which can be got only at great trouble and expense, the trivial disadvantage may be compensated for in a large degree by using it judiciously as an adjunct rather than as a prominent feature, and by the proper planting of such subjects as will speedily cover the greater part of it. Red Sandstone, Old or New, is perhaps the most universally useful kind for most purposes. The grits and conglomerates are nearly all as good. The limestones, again, are capable of most artistic use, and are sure to be preferred if most easily obtainable. Schists and shales may often be employed with effect. Where natural rock is unobtainable, or very costly, artificial blocks made of brick rubble and concrete, if skilfully constructed, are by no means to be despised, though to produce anything really good with this material artistic skill is a most necessary condition; and the amateur is therefore advised, if he has to depend on himself alone, to avoid artificial rock-work, and use natural rock.

One kind of rock only should be used in a garden; for nothing is more ridiculous than for the rockery to present an appearance in any way suggestive of a collection of mineralogical specimens. Much less rock is really needed for the formation of a first-class rockery than is usually employed. Its chief uses are to form the ribs of the construction, whatever its size; to assist in retaining moisture in contact with the roots; to prevent unduly quick evaporation at the surface, and to aid in the healthy development of roots, which it undoubtedly does, as any one may readily ascertain by examining the buried stones in an established rockery.

But under this heading it will be as well to say a word about materials which should be avoided, and this is the more necessary because they are constantly used, and are often found hurtful or ridiculous. On no account employ the roots of trees for Alpines. However picturesque these may look for a time, sooner or later they will decay, and give rise to a frequent cause of death to plants large and small, namely, the mycelium of various kinds of fungi, which, ramifying about the roots of living plants, will very rapidly lead to their destruction, after first debilitating them. Decaying roots of trees are also favourite haunts of slugs, and many insects hurtful to vegetation. They are, therefore, on both accounts to be carefully avoided. And as the kind of rockery we wish to become common in our gardens is to be as far as possible an imitation of a *natural* rockery, all adventitious and extravagant materials should be kept away; such, for instance, as pieces of statues, portions of old buildings, or anything else that bears vestiges of man's handiwork upon it. Study nature as to the materials to be found in her prettiest bits of rock garden, and follow her teaching implicitly, and there will be no fear of a repetition of the hideous jumbles which hitherto have been far too common in our gardens.

Bog-plants.—The Alpine flora includes many lovely plants which thrive only in bogs or boggy places. No traveller with any interest in gardening, who sees these plants in a state of nature, but will desire to transfer some of them to his own garden. If he is to do so successfully, it will be necessary for him to provide for them as many of the conditions under which they were found thriving in their Alpine solitude as possible. Of these, the most important are a constant supply of moisture, and soil of a more or less peaty nature. In our own country the alteration of natural conditions by draining and other operations has rendered many of our bogs and marshes incapable of growing several native plants which previously grew profusely. This suggests the lesson we wish to impart, namely, that where it is desired to grow bog-loving plants in an English garden, *an artificial bog must be provided for them.* And this may be done in many gardens without an extraordinary expenditure of money or labour. Wherever there is a little rill of water or a pool, however small, the formation of a bog will be easy of accomplishment. When neither is at hand, a pipe laid on from a water-service, or from some vessel at a higher level kept filled from time to time—which need not involve much labour for the supply of a sufficiency of water even during the hottest and driest months—will be found a very efficient plan for keeping a miniature bog sufficiently moist to admit of many plants being grown.

in perfection. In some way, then, a continuous supply of moisture at the roots is a necessary condition for the successful cultivation of bog-plants: it is not a large quantity that is required, so long as it is never absent; it is therefore desirable, in order to economise the supply of water to the utmost, that arrangements should be made to insure it trickling from the source of supply as gently as possible, and in such a manner as to insure its regular diffusion over the entire area devoted to bog-plants.

One way of securing this result is to arrange a little rocky basin at the highest available level, into which the water should be first discharged, and from which, being margined by gently-sloping stones, the water will pass by gravitation to the lower level on which the bog is situated. The bog-bed may be made of any size, according to requirements and space available—a few square feet or yards, or on any larger scale desired. As a rule, small bogs only will be made where the water has to be supplied with some difficulty, but the principle of construction will be much the same whatever the size.

The first thing to do after having fixed on the site, will be to remove the ordinary garden soil to a depth of from twenty to thirty inches at least, over the entire area of the bed. This space must then be filled with peat, peaty soil, or such substitutes in the way of vegetable mould, decayed leaves, and some peat, as the ease or difficulty of obtaining these ingredients may render most convenient. As it is impossible to provide by general directions for all possible combinations of circumstances, we shall content ourselves with a statement of such first principles as are applicable to all cases, and which only need applying with intelligence to lead to success. When peat or peaty soil is easily procurable, it is always to be preferred. Where it can be obtained only at considerable cost, as in districts where it is scarce, a fairly good substitute will be found in sound turfy loam and leaf-mould, in about equal proportions, for the lower part of the bed, the pure peat being reserved for the uppermost six or eight inches. In fact, the uppermost layer may consist of one-half peat, and sharp sand and leaf-mould in equal quantities, well mixed together, and many plants will thrive in it. For other plants for which peat is indispensable it must be provided if they are to be grown; and the system of pockets already described will enable the cultivator to isolate such peat-loving plants, and secure the proper soil for them at the smallest possible cost, by limiting its use to those pockets where these plants are to be grown.

As already indicated, it will be invariably advantageous to place the bog-bed on a lower level than the surrounding surface, so as to utilise to the utmost all moisture derived from natural

or artificial sources. The employment of rock for making pockets and ledges, and to isolate the plants from one another, is strongly to be recommended, and the rock may be so introduced as to aid in producing artistic effects, as well as providing secure foothold when weeding or planting has to be done. Some of the Gentians will thrive in such a bed, so as to repay all the trouble and expense incurred; indeed, *Gentiana bavarica* and our lovely British *G. Pneumonanthe* (the Marsh Gentian) will thrive only in such positions. *G. acaulis* (Gentianella) planted at the edge of the bog-bed will thrive much better than on the ordinary rockery. Our common Buckbean (*Menyanthes trifoliata*), the Butterworts (*Pinguicula*), the Grass of Parnassus (*Parnassia palustris*), the Sundews (*Drosera*), many Orchises, *Cypripediums*, &c., are mentioned here, to indicate the class of lovely plants for which bog-beds must be provided if it is desired to grow them in our gardens in the highest perfection. Along with these plants may be most appropriately intermingled Irises, Narcissi, and many other interesting bulbous plants, which thrive in a moist peaty bottom. In the immediate neighbourhood of the bog many plants will thrive better than elsewhere, for though not needing as much moisture as the natural occupants of bogs, they seem to benefit by the constant presence of moisture in the air. In the list which will follow, these will be indicated by some such phrase as "Plant near bog-bed."

Alpines in Ordinary Borders.—There are many positions in gardens other than on rockeries where some Alpine plants, and among them not a few of great beauty, may be properly planted, and where they will keep in health, and thrive. These positions will be in the very front line of the mixed border, in full exposure, away from the larger and coarser plants, and where they will not be liable to be overgrown. All the hardier kinds, which grow freely, are suitable for such positions, and will certainly adorn them. The dwarf hardy Heaths, many of the Saxifrages, Sedums, and Sempervivums, the Forget-me-nots, Saponarias, Hepaticas, Silenes, the dwarf Campanulas, and many others, may be used to form the most charming of front rows in the choicest and most select mixed borders. The larger and more vigorous kinds such as the Sun-roses (*Helianthemums*) will find congenial positions on raised sunny banks, fringing drives, and on the margins of shrubbery borders, where they are not overshadowed by trees and shrubs.

Alpines on Window-sills.—Where a broad window-sill—especially a stone one—exists, there, particularly if fully exposed to the south, any of the

succulent plants which are found growing naturally in dry rocky spots might be planted with every anticipation of success. A dainty use of bits of rock, peat, and loam, sufficient to afford a foot-hold, and a charming outside window garden might be secured with little or no trouble.

Reserve Plants.—It will be advisable to grow at least one or two plants of each of the rarer kinds in pots, so that protection may be given to them in severe winters, and a species which may be killed on the rockery may be kept alive in the reserve garden, to supply its place on the return of spring. It is also a source of great pleasure when a friend sees some plant on the rockery which he much admires, to be able, on his departure, to surprise him with a duplicate plant in a pot, which he may carry home with him. In this way we have set many friends growing choice Alpines who previously had never done so. It is also advisable to grow any new plant, coming to hand in a small or delicate state, for a time in a pot, until it is thoroughly established, before placing it permanently in the rockery. The reserve garden of Alpines should consist for the most part of these plants in pots, duplicates of established plants, and plants on trial, or in a state of preparation for planting out.

If possible, two shallow frames should be set apart for the reserve Alpine garden, one of them fully exposed, the other facing north. The bed of the frame should be covered with four to six inches of finely-sifted coal-ashes, and on this a layer of sand or cocoa-nut fibre should be placed. The pots containing the Alpines should be plunged in the porous material up to the rim, so as to minimise evaporation, and maintain a uniform temperature about the roots. Small pots should be used for economy of space, and to prevent over-potting. The frame placed in the north aspect will be found most serviceable for the protection of plants during the winter, when the lights should be kept on only during severe weather, at which times the further protection of a mat or litter should be provided, and kept on until a thaw has set in thoroughly. Whenever the weather is mild, plenty of fresh air should be admitted, and all decaying leaves carefully removed. The use of a few fragments of stone on the surface of the pots, on which the plants may repose, will in many instances be found conducive to their well-being, and often prevent their damping off. The soil to be used in potting should be such as is usually employed for small pot plants, consisting of good turfy soil, sweet and well-decomposed leaf-mould, and sand in equal quantities, well mixed together. A few fragments of porous stone may be judiciously inserted in each pot. The young plant should then be firmly fixed in

the centre, carefully avoiding the least injury to the delicate roots. The same plan will serve for newly-rooted cuttings, offsets, seedlings, and divisions of full-sized roots. The propagation of the choice Alpines in these several ways will be found a very interesting occupation, and the stock of tiny treasures will soon increase, so as to provide for the wants of the cultivator to fill blanks and extensions of the rockery, and permit of presents to friends.

How to Form a Collection of Alpines.—The quickest way is to buy such plants as are wanted from one of the many firms who now offer these plants for sale in pots. Several houses, who may be relied on to supply good plants, true to name, advertise collections of one hundred varieties at prices varying from 25s. to 60s., according to the plants selected, and smaller collections at slightly higher prices; another plan is to obtain from one's friends surplus plants; or, thirdly, to combine the two methods. Raising from seed those kinds of which seeds are obtainable will take time, but when successful will be found a very pleasurable pursuit. It will be unnecessary to dwell on the way to do this, as full instructions are given in other pages about seed-sowing and after-treatment of seedlings, to which we refer our readers.

How to Plant Alpines.—Being generally furnished with plenty of roots, the operation of planting Alpines is not by any means difficult, especially when the plants have simply to be transferred from pots to the rockery. The chief point is to plant firmly, but in doing so to avoid pressing roughly about the collar of the plant, or the roots will wholly or in part be broken off or bruised, especially in the case of the more delicate subjects. After the plant is firmly fixed in its new home, and cannot be moved without considerable effort, fill the surface up to the collar of the plant with nice potting material, in which there is plenty of leaf-mould and sand, and if the weather is dry, give a good watering from a fine-rosed watering-can. A day or two afterwards loosen the surface soil with a small hand-fork, and ascertain that the plant is firmly fixed, or if it is not, make it so. *Never plant Alpines when the ground is saturated with moisture or works heavily.*

The After-treatment of Alpines.—When a rockery has been planted a few months it will be advisable to examine every part of it, and, where necessary, to give a slight surface dressing of such potting material as is mentioned in the preceding paragraph. In the case of plants which raise their collars every season, this top-dressing is an absolute necessity, unless the plant be taken up bodily and re-planted. Many

of the *Primulas* and some of the *Campanulas* require to be re-planted annually, or they will become leggy. Remove all past flowering stems promptly, unless it is desired to save seed. Take care that the stronger-growing plants do not encroach upon the weaker growers. We once lost the loveliest clump of *Gentiana verna* we ever saw in a garden, by the rapid growth of a mossy *Saxifrage* during a few weeks' absence from home. It is simply astonishing how soon the work of extermination is done. Of course the best plan is to carefully avoid placing rapid growers in the neighbourhood of any of the less robust plants. During the spring and summer months pay great attention to watering, so as to insure that no plant suffers from drought. If a spell of hot, dry weather sets in, it will be a wise precaution to give a surfacing of cocoa-nut fibre after watering. This will preserve the efficacy of the watering for a considerable time. Keep a sharp look-out after slugs and predaceous insects. When a plant has overgrown its position, reduce its proportions with promptitude, or it will hurt its neighbours. Never allow weeds any quarter. If these directions are intelligently followed, it will be found that a large proportion of the Alpine plants of temperate climes may be successfully grown in most English gardens.

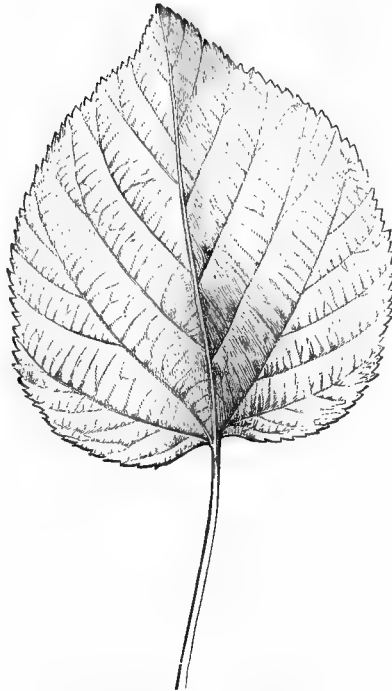


Fig. 42.—Simple Toothed Leaf of the Lime-tree, showing the stalk and the blade.

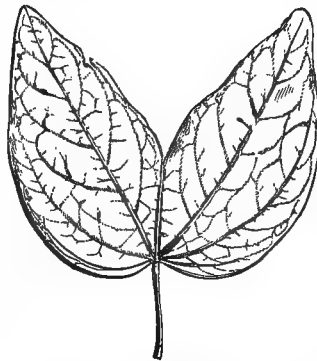


Fig. 43.—Divided or Lobed Leaf of *Bauhinia*.

soil the greater part of the water required by the plant, they absorb the mineral and earthy matters, especially the nitrates. Their chief, and sometimes only, field of operation is the soil. All this has been told in preceding chapters. The leaves take from the air the greater part of the gases required to feed and build up the plant, and possibly some of the water. In addition to this, the leaf is the great laboratory, or factory, in which the substances taken in by the root, as well as by its own exertions, are blended and modified so as ultimately to serve as food for the plant, to build up its substance, fabricate its cell-walls and its protoplasm, form and store away the starch and other ingredients which render the organs of reserve so important to the plant. In doing all this it absorbs some gases and gives off others; it throws off

superfluous water and, under certain conditions, absorbs it. Much of its work can only be accomplished under the influence of solar light. The work that it does in common with the root and other organs of the plant it can do irrespective of light, provided heat, moisture, and other conditions be suitable; but the special work of the leaf, which we shall have to consider in this section, can only be done when the leaf is exposed to light, and what is true of the leaf is true of all parts of plants that are green in colour, such as the young shoots or the unripe fruit.

THE LIFE-HISTORY OF PLANTS.

By DR. MAXWELL T. MASTERS, F.R.S.

NUTRITION: THE LEAVES AND WHAT THEY DO.

THE most important organs of the plant, so far as its nutrition is concerned, are the roots and the leaves. The roots, as we have seen, take from the

The Nature of Leaves.—In botanical language, everything that bears a leaf is a stem or a branch of a stem. The root is not a stem, because it bears no leaves; the tuber of a Potato or of a Jerusalem Artichoke is a stem, because it does bear leaves—not necessarily fully-developed leaves, for they may be mere unformed scale-leaves. The

leaves, whether perfectly developed or mere scales, occur at regular definite intervals called "nodes." The nodes, therefore, are the places where the leaves spring from the stem, and anything that comes from those nodes (not being a stem or a branch) is a leaf.

Speaking generally, and disregarding exceptions, a leaf is a flat plate continuous with the bark of the shoot, and having an upper surface looking to the heavens, a lower surface, usually duller in colour, turned in the opposite direction. It may be "sessile," when it springs from the stem without any intervening stalk; or it is provided with a "petiole" or leaf-stalk, which separates the blade or flat part of the leaf from the stem — the leaf-stalk being intermediate, not only in position but also in structure and function, between stem and leaf. In form, size, and appearance leaves vary almost beyond description. These variations are of two kinds: those which

are, as it were, mere stages or phases of growth, and as such may occur in all plants, and those which are peculiar to certain plants and serve as distinguishing characteristics—such as the cylindrical hollow leaves of an Onion, or the pinnate foliage of a Rose. For an account of the principal forms of leaves reference must be made to botanical text-books.

Forms of Leaves.—The functions of a fully-developed leaf are essentially the same whatever its form, and therefore in this place it is not necessary to enter into much detail concerning the myriad shapes they assume. For our purpose it is enough to know

that some leaves, such as scale-leaves, are imperfectly developed or degenerate organs, of great interest morphologically and historically, but of no special use to the plant; while other leaves, despite their variations in different cases, nevertheless fulfil the same duties. So far as form goes, it is enough for us here to recognise the three main groups of leaves: (1) simple leaves, when they are in one piece, which may be quite "entire," or in which the margin may be variously indented, but always to a very slight extent, so that the substance is still undivided (Fig. 42); (2) divided leaves, where the blade of the leaf is branched or lobed in various ways and to a



Fig. 44.—Partite Leaf of Hemp.

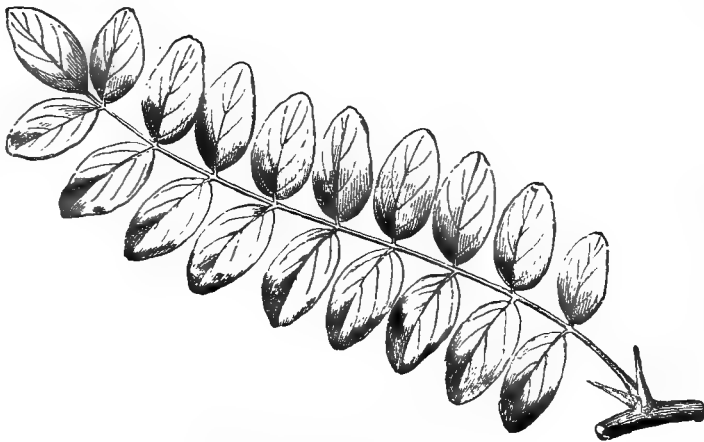


Fig. 45.—Compound (Pinnate) Leaf of Robinia.

various extent (Figs. 43, 44); and (3) compound leaves, where the branching of the blade of the leaf goes to such an extent that each subdivision is completely distinct from its neighbour, and generally "articulated," that is, separated from the common stalk by a distinct constriction or joint (Fig. 45). Of these three types the modifications are infinite.

The "Insertion" of Leaves.—The mode in which leaves spring from the stem is also a matter of primary importance to the botanist, and it has also a distinct physiological significance. Leaves are said to be "opposite" when they spring from opposite sides of the stem at the same level; "verticillate," or "whorled," when a ring of leaves start from one point, so as to form a "whorl" (Fig. 46); and "alternate" when they spring from different sides of the stem, one above another at different levels, that is, as in the Elm or Peach (Fig. 47). So, too, the leaves are in some cases very densely packed, as in a Plantain or Cabbage, when the "intervals" or spaces between the nodes are undeveloped or loosely scattered; usually they are more or less arranged in spiral lines.

Adaptation to Purpose.—It would not be needful to mention these details here were it not for the circumstance that the form and disposition of the leaves have a distinct connection with the work they have to do, with the necessity for literally "catching sunbeams," or availing themselves of the fresh air, and, moreover, that they are often the result not only of adaptation to particular purposes, but the outcome of a compromise in virtue of which each leaf does its best for itself, whilst respecting the rights of its neighbour. All these variations in size, that



Fig. 46.—Whorled Leaves of Oleander.

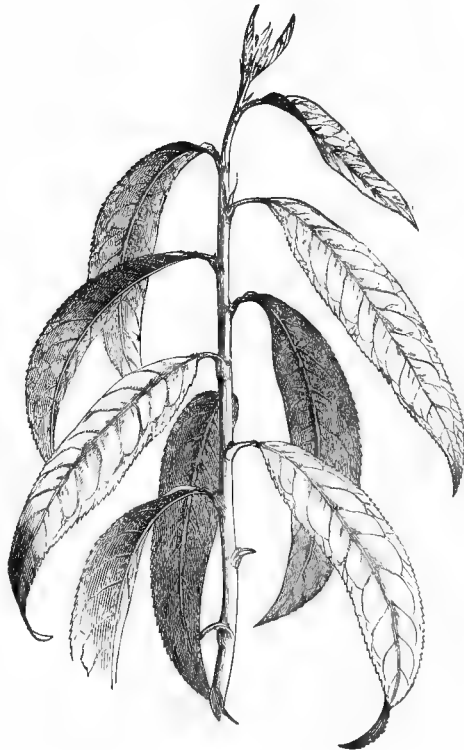


Fig. 47.—Branch of Peach, showing alternate simple leaves.

amazing diversity of form and appearance, all those twists and turns, those upward movements, those sidelong motions, have each a distinct purpose and significance. They are not mere caprices, but they represent the struggles of the plant for light, air, and supremacy, its conflicts and rivalries with its neighbours; or, if in some cases this adaptation of means to ends is not clearly marked out under existing circumstances, we may be sure that it was so once, and that what we see now are historical survivals from a period when these matters had a real significance.

Internal Structure.

—In like manner, the internal microscopic structure of the leaves shows a similar adaptation to purpose, and it is often easy to see a co-relation between the structure of the leaf, and the disposition of its elements, with the conditions under which it grows. The leaf of a plant growing in water (Fig. 48) is very different in structure from that of an evergreen exposed to full sunshine on a hill-side, or a succulent plant on a rock. The elements are, indeed, much the same, but they are differently arranged, and their degree of development is modified according to circumstances. For these reasons we can here only give a general statement with reference to leaf-structure, referring the reader to ordinary text-books for fuller information, and earnestly

advising those who have the opportunity to study for themselves the remarkable variations and adaptations of leaf-structure to the circumstances or "environment" under which they grow. In particular the comparative study of the structure of the leaves

the leaf is alike on both sides, and instead of the leaf being placed more or less horizontally, so as to catch the light on its upper surface, it is then often placed as in *Gladiolus*, more or less vertically, so that both sides get an equal chance of exposure. When, on the

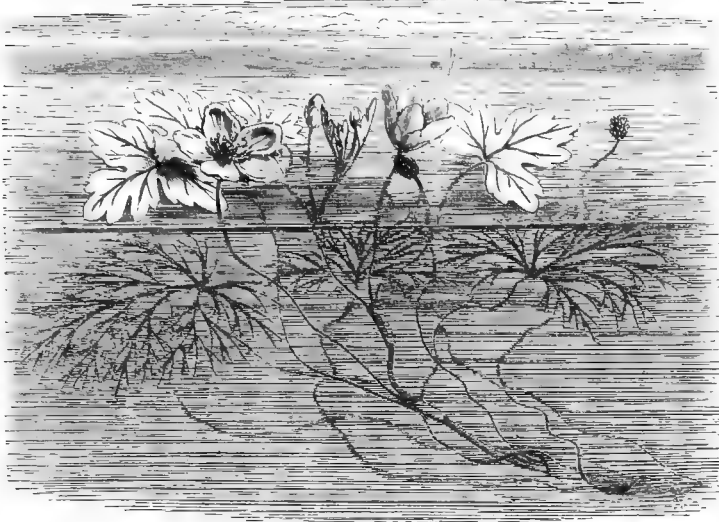


Fig. 48.—Floating and Submerged Leaves of *Ranunculus aquatilis*.

of epiphytal Orchids may be commended to microscopic observers, as not only intrinsically interesting, but as likely to lead to important cultural suggestions.

Speaking broadly, a leaf consists of a flat plate of cellular tissue, traversed by a framework of wood-cells and vessels, and covered on all sides by a skin or epiderm. Very generally the cells constituting the substance of the leaf are different in form and size in different portions of the same leaf. Thus those near the upper surface—the one most exposed to the light—are more densely packed, with few or no interspaces between them, and with more green matter (chlorophyll) in their interior. The cells near the lower surface of the leaf are usually more irregular in shape, more loosely aggregated, and with less green matter. When the leaf-structure is uniform on both surfaces, or nearly so, the colour of

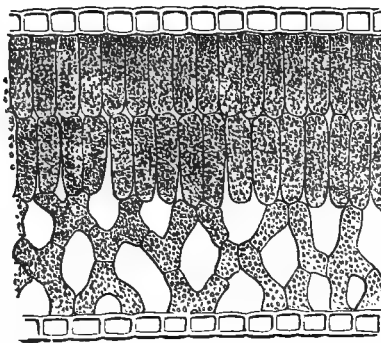


Fig. 43.—Section of a Leaf, showing the epidermal, palisade, and branching Cells (magnified).

contrary, the colour of the leaf is markedly very different on the upper and lower surfaces respectively, then it frequently happens that the "chlorophyll" is specially collected in a special layer of cells just beneath the upper epiderm, and appropriately termed "palisade" cells, from their resemblance to park palings (Fig. 49).

The Framework of the Leaf.—As regards the framework of "veins," or "ribs," or "nerves," it

is first of all necessary to disabuse the reader's mind of any idea that these organs have anything more than a remote analogy with the animal structures so named. They consist of wood-cells, which serve to stiffen and uphold the blade of the leaf, and of "vessels" of various kinds, which transmit fluid and air to and from the stem and leaf. The number and arrangement of these "ribs"

vary greatly in different cases, and these diversities serve, together with those connected with the shape and disposition of the leaf, as means of discrimination between different plants or groups of plants. It must suffice here to give one illustration only. In the majority of Dicotyledonous plants, those in which the seedling plant has two cotyledons, the group comprising most of our trees and shrubs, the ribs of the leaf, or their ultimate branches, are arranged in a reticulate or net-like fashion, so that there are angular spaces between them. In the larger number of Monocotyledons (Palms, Lilies, Grasses, &c.) the ultimate veins are not netted, but somewhat straight and nearly parallel, so that the interspaces are either long and narrow, or if angular, then four-sided, not polygonal. Even in cases where from the thickness of the cellular tissue, or the opacity of the epiderm, the veins are not readily conspicuous, the arrangement can be determined by simply tearing the leaf. Where the veins run in a nearly straight direction, as in an Iris-leaf, for instance, the edges of a tear will be nearly straight; but where they form net-like meshes, as in a Cabbage-leaf, then the edges of the tear will be angular and irregular.

The Skin of the Leaf.—It remains now to speak of the epidermis or skin. This, like the other parts of the leaf, is subject to variation in

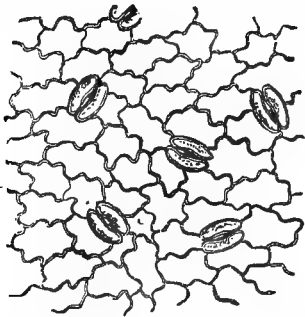


Fig. 50.—Epidermis of a Leaf (magnified) showing Stomata.

different plants, and it is usually somewhat different on the upper and lower surfaces respectively. It most generally consists of a layer of flattened cells, destitute of chlorophyll. Those on the upper surface are closely packed, with no interspaces between them. Those on the lower surface are interrupted by a greater or less number, sometimes by an immensely large number, of pores called "stomata" (Fig. 50). These are apertures communicating with the outer air, and affording access to the interior spongy por-

tions of the leaf, thus allowing of the passage into or out of the leaf, according to circumstances, of gases or liquids. The entry or exit is regulated by two or more "guard-cells," which encompass the aperture and close it or open it, according to circumstances. The guard-cells are enabled to do their work by differences in their degree of fullness; if full they are distended and the aperture is closed; if relatively empty, the orifice is unobstructed. In the case of water-plants there are no stomata, at any rate in the submerged portions. In thick-rinded, succulent plants, natives of dry and hot countries, where evaporation would be excessive were there not means to prevent it, there are few or no stomata. In cases where, as in the Iris, Gladiolus, or Pink, the leaf is of the same colour on both surfaces, there the number of these pores is about the same on both sides.

These few illustrations must suffice to show how the form, arrangement, and internal structure of leaves are co-related to the duties they have to perform, and to the circumstances under which their work has to be accomplished. The young gardener should lose no opportunity of familiarising himself with details of this character, which will furnish him, if properly used, with a clue to successful management more reliable than any book knowledge or precept.

THE HARDY FRUIT GARDEN.

By D. T. FISH, ASSISTED BY WILLIAM CARMICHAEL.

THE APPLE.

WITHOUT disparaging the worth or lusciousness of any other fruit, this is without doubt the most valuable of all our hardy fruits. It is likewise so popular and universally esteemed as to merit the distinction of being called the national fruit of Great Britain and Ireland. It merits this distinction on the double ground of its popularity and parentage. The Wild Crab (*Pyrus malus*), the not very remote progenitor of our cultivated varieties, is indigenous to Britain and large portions of the cooler parts of Europe, and our best Apples are but highly-developed Crabs — marvellous examples of the improvement of species by the gradual processes of evolution and cultivation.

The popularity of the Apple is so great that it is hardly an exaggeration to affirm that every one eats Apples, either raw, cooked, or preserved; and should any decline to eat them, they probably drink them in the form of cider, wine, or brandy. Apple wine, however, has never become popular, though cider has become a formidable rival to, and almost a com-

plete substitute for, beer in the Southern counties of England. Brandy can also be distilled from Apples. Bread has likewise been made of Apples, about one-third of them added to two-thirds of flour making a supporting and appetising loaf. When the price of flour is very low, Apple bread is not likely to be largely patronised; but the fact of Apple bread being possible may well give additional emphasis to the fact that Apples are sufficiently nutritive to merit the designation of food. So soon as public opinion grasps this fact, the consumption of Apples will be indefinitely extended, and the area of their cultivation proportionately augmented.

Even now home production does not by any means keep pace with consumption, and our Apple bill with America and other foreign countries probably averages something like a million a year. Our annual imports of Apples as such are annually increasing, while large quantities are also imported in the form of dried Apples, chips, rings, jellies, sweets, perfumes, &c.; and it seems almost a reflection on the energy and skill of British cultivators that not a small proportion of our finest Apples are received from America, though the Apple is not indigenous to that country. Not a few of our consumers prefer the Newton Pippin to the far-famed Ribston, the best of all English Apples. Like many good things, however, the latter has several drawbacks, the worst of which is its proneness or liability to canker, and its slow and rather uncertain bearing in a young state. Its American rival also far excels it in fertility and the durability of individual trees. The latter, however, is now of less moment, as by the modern and more expert means of propagation and cultivation trees are brought into bearing at two years old from the bud, and can be readily increased to any extent. Hence the length of life of individual trees is yearly becoming a matter of less moment. Though some of the hardier wilding Apples may live in thriving and fruitful conditions for a century or more, Apple-trees having even been heard of three centuries old, the average duration of individual trees would not greatly exceed a quarter of a century, the cultivated modern Apple-tree being by no means distinguished by longevity. Fruitful trees are also so much more easily and cheaply obtained, that so soon as the trees pass their best, it is more profitable to remove them and plant afresh, than to adopt any of the possible, but somewhat tedious, processes of resuscitation. Few things are more unsightly or unprofitable than is the retention of Apples or other fruit-trees in a state of exhaustion; and one of the most depressing sights in the South and West of England is that of the many orchards and fruit gardens in a condition of dilapidation. It is hoped that all this

may speedily be changed, and either the old Apple orchards and gardens may be replanted, or new ones formed, and that every amateur, mechanic, and cottage gardener may grow one or more Apple-trees. The Apple might also often be substituted for other and common trees in belts and hedges, thus adding greatly to the beauty of the landscape, and indefinitely increasing the home supply of this most useful of all our hardy fruits.

The hardness of the Apple is one of its greatest merits. Its constitution and power of endurance are greatly influenced by culture and climate, and much may be done to command success by a careful selection of varieties that experiences have proved to do best in given localities. Writing in general terms, the Apple also blooms later than either the Pear, Plum, Peach, Apricot, or Cherry. Hence it has a better chance of escaping the spring frosts; and it does. For example, the year 1884 was virtually Plumless, and gave us a very scant supply of Pears, while there was a good half-crop of Apples, and in many districts a full one. Greater immunity from the disastrous effects of spring frosts will probably be yet enjoyed as the raisers of new Apples develop new races from such abnormally late-blooming Apples as the Court Pendu Plat, which is dormant as December while most Apples have set their fruit. However, our present races of Apples are sufficiently hardy to yield average crops over the greater part of Great Britain and Ireland in ordinary seasons. Of course the climate varies widely over such a wide area, and many of the Apples that ripen well in the open air in the southern and warmer portion of the country, need the help of walls to perfect them in the North of England and Scotland. Even in Devonshire, however, some of the finest Apples, such as the Ribston Pippin, are fostered into larger size and higher quality by the aid of walls; and no doubt not a few of our finer Apples, such as the Ribston Pippin, Calville Blanche, the Melon, Mother, Northern Spy, Allen's Everlasting, and other Pippins, Pearmains, Scarlet and other Non-pareils, and Cox's Orange Pippin, well deserve a wall in cool localities. Such and other of the finer Apples would pay far better than many of the Pears and Plums that occupy, to little purpose or profit, so much wall-space in climates unfavourable to them.

PROPAGATION OF THE APPLE.

The Apple may be propagated in various ways, viz., by seeds, cuttings, layers, suckers, buds, scions. Practically, however, it is propagated by seeds and scions—that is, by grafting. However, as several of the other methods are practicable, and some of them are largely employed to produce stocks on which to

mount the more choice Apples for garden cultivation, it may be useful to take the least important methods of propagation first.

Propagation of Apples by Cuttings.—Most varieties of Apples may be increased in this way, the different sorts, however, varying widely in their time of rooting and the percentage of success. A few sorts, such as the Keswick and some other Codlins, root readily, and the Stubbar and creeping Apples almost as freely as Gooseberry or Currant cuttings. The majority of varieties, however, root slowly and with considerable uncertainty.

The cuttings may be inserted in the open air either in November or February, the former being the best season. The more free-rooting sorts may be placed on a shady border; those that root more slowly and shyly should be placed in sandy soil and covered with hand-glasses, and kept closely covered till rooted, which will probably not be till June or July. The glasses should be shaded during bright sunshine. So soon as rooted, gradually remove the lights or *cloches*, and expose the plants to the open air. Early in November transplant into nursery rows, fifteen inches asunder, and three or six from plant to plant.

There is yet another method of rooting Apple-cuttings. This consists in placing the cuttings in a bottom heat of 65° or so in February, keeping the top at least 20° cooler. The heat will stimulate vital action at the base of the cuttings, causing them to callus, and therefore form roots. By this method much time is saved, and the rooting is not only more rapid, but more sure. Cuttings, however, to be thus treated to heat, should be removed from the trees in the November previous, and if made at the same time they will root all the sooner in consequence.

This brings us to the sort of Apple-cuttings most likely to throw out roots. From six to eight inches long is a handy length, and each cutting should be heeled off—that is, it should be the bottom part of the current year's shoot, or of a small shoot, and a base or heel of older wood, half an inch or an inch in area, should be separated with it. If the separation is effected in a business-like way, the cutting, so far as its base is concerned, is perfectly made in its removal from the parent tree. Rather weakly and horizontal or pendulous shoots should be chosen in preference to stronger, vertical, or more succulent ones. Disbud the cutting of all buds excepting two, or at most three, at its upper end. If too long, the top of the cutting may be removed with a short clean cut, and from three to four inches of its base inserted in sandy soil. A pinch of pure sand under and around the base facilitates the emission of roots.

The firmer the soil is pressed around the base of the cutting, the more likely it is to root. Water the cuttings home after insertion, and let the surface dry a little before covering if hand-glasses are put over them. They will not be likely to need any more water till the spring.

Layers.—This is a simple and sure method, largely resorted to in the trade for the raising of immense quantities of plants for stocks. This is one of the oldest and most successful methods of propagation. The practical difficulty in relation to it is that, excepting in the case of dwarf varieties, such as the Paradise and other slender-growing sorts, it is a difficult matter to get the branches of Apple-trees down to the ground. The older cultivators tried to evade this difficulty by lifting pots of soil up to the branches to be layered; but as these frequently got baked up for lack of water, many layers thus came to grief. The introduction of horizontal or ground cordons is, however, likely to give a fresh impetus to the layering of Apple-trees. These being carried along at distances ranging from six inches to eighteen inches from the ground, nothing can be easier than to dip down the ends of the shoots, cut partially through, form a half-circular heel, place a wedge in to keep open, peg down to keep steady, cover with earth, and wait till rooted.

Properly manipulated, the layered Apple-branches are bound to root, for the layerant has a double string to his bow; he has converted his branch into a sort of cutting (see Rose-layer, page 216, Vol. I.; and that of the Apple is just the same); and he forces the tree to sustain the layer until it forms independent roots. When this happens he severs the connection and removes the layer, or rather a well-rooted Apple-tree.

I adopted a plan some years ago to make Apple cordons self-supporting, as well as more ornamental. Another and rather unexpected result followed. Where the branches rested on the ground it was found that several of the trees emitted roots and formed circular cordons of a very unique character.

Now that own-root Roses are all the rage, it is possible that a growing demand may arise for own-root Apple and other fruit-trees. This would get rid of all the complications incident to foreign stocks, and seems, in some varieties at least, to augment fertility to a greater extent than even the French Paradise or Doucin stocks. Amateurs, mechanics, and cottagers, who are often very enthusiastic about local varieties, and wax eloquent on the merits of particular Apple-trees, might make sure of perpetuating their favourite trees by propagating them from cuttings or layers. Possibly, too, plants

thus originated might prove the best for pot-culture and the most prolific for the smallest forms of the cordon.

Suckers.—As comparatively few Apples throw up suckers, it follows that this method of propagation can be but seldom resorted to in private gardens. There is also a well-grounded prejudice against the use of suckers, even if obtainable, for own-root Apple-trees. Plants raised in this way never seem to rise above their origin, and they often finally lose their tops in a perfect thicket of suckers, like producing like, to the injury and final destruction of trees raised thus. But the tendency of a few Codlins, the Creeping Apple, Burrknot, Stubbard, Paradise, and a few other varieties to produce suckers renders them valuable for stocks, and causes them to be grown for that purpose. It must also be borne in mind that any suckers thrown up from most cultivated Apples would be those of the wilding or other stocks, and not of the Apples themselves. Suckers are also a signal of distress to show that something is amiss with the tree; and hence, in removing them, a thorough examination should take place, that might often result in the saving or resuscitation of the tree smothered with suckers at the roots.

Budding.—This system is seldom adopted with Apples, though it is just as practicable with them as with Pears, or Peaches either for that matter. Still, fashion rules in these matters almost as despotically as within the domain of society and among ourselves; and for this reason chiefly, and also because Apples take so readily and are propagated with such facility by scions, budding is but little practised.

There is also another reason. Apple-buds are, as a rule, considerably later than those of Roses, to take the most familiar example. The buds of different varieties are likewise more irregular in their season of being sufficiently plumped up for budding. But these are mere matters of detail, and by seizing the most favourable condition of stock and bud, Apples may be propagated by budding exactly in the same way, and almost as easily, though not quite so successfully, as Roses. Another advantage of budding is that the stocks may be worked in a smaller state than it would be practicable to graft them. The wood also heals sooner, the union is more complete, and there is less liability to canker at the point of union—a point of considerable moment in varieties such as the Ribston Pippin, specially liable to this dire disease.

Propagation by Seeds.—It may seem like a digression to leap back from the budding of Apples

to the raising of them from seeds, as grafting seems to come naturally and logically after budding. It is obvious, however, that stocks must precede grafting, and as seedlings form the major portion of these, it is needful to provide the stocks before Apples can be propagated by scions. No doubt a good many stocks are provided by the three means of propagation already adverted to—cuttings, layers, and suckers—and some of these may have been used for budding; but seedling Crabs, Cider, and other Apples and Paradises furnish the great trade supplies of stocks. The raising of seedling Apples is also a compound means of propagation. It furnishes stocks for the scions of the best cultivated varieties, and it is almost the only means of originating new and superior varieties. Sports—that is, bud variations—are another method; but, so far as we know, the sporting power of Apples is far more limited than that of most other plants. Of course, should any such sports different or superior to good cultivated sorts appear, they should be carefully preserved and industriously propagated by some of the means already indicated, or by grafting.

In attempting to raise new and superior varieties of Apples from seeds, not only should the best sorts be chosen, but the finest examples of the best varieties. For instance, all Ribston Pippins or Cox's Orange Pippins are not equally perfect, and only the very finest fruit of these or any other first-rate sort should be saved for seed. Again, were these two Apples crossed, a better strain of Apples might be expected from the seeds than if either were sown pure. Numerous as are our Apples of good eating and cooking qualities, there is no reason to suppose that the vein of improvement is as yet worked out, or that the highest quality has yet been reached. Such distinct Apples as the Golden Pippin, Ribston Pippin, Devonshire Quarrenden, Scarlet and other Nonpareils, Golden Russet, Golden Renette, Claygate and other Pearmains, might be crossed in all directions with others of the most opposite character, and even with culinary Apples, to add to their percentage of sugar or their size. In many cases this might be done without losing their briskness. Of course, the crossing must be done while the Apples are in flower, and the stamens of the seed-bearing Apples should be removed, and pollen from the male parent be placed on the stigma. To insure any certainty, however, the stamens should be removed and the flower protected from bees, &c., before it is thoroughly opened, and for some days after the foreign pollen is applied. Without these precautions, which, though formidable on paper, are simple in practice, the flies, bees, and breezes render the cross-breeder's efforts so much labour lost. A record of the crosses should be kept, as furnishing

data for a pedigree book. The latter is invaluable, as furnishing a key to constitution and quality, and adds immensely to the interest and pleasure, and it may be profit, of raising new and superior Apples from seeds.

The sowing of these carefully prepared seeds need differ but little from those of the more common varieties for stocks, but the treatment of the seedlings must be widely different. There are two ways of hurrying forward seedling Apples to prove themselves as speedily as possible; one, and the most obvious, is to grow them as swiftly as possible in fairly good, but not over-rich, soil, leaving the seedlings full length and size till they fruit. The other and the swifter method is to graft the top of the seedlings so soon as large enough to form a scion on to a French Paradise or other dwarfing stock, or into a fertile tree in full bearing. The scion will be so far controlled by the fertile stock as to be compelled to fruit considerably sooner than if left on its own roots. There is yet another means of forcing fertility. Root-prune the seedlings somewhat severely at the end of the first or second year's growth, leaving the tops intact. This severe check will throw the top into fruit. These first fruits may not form a fair test of size, but they will give a fair measure of quality, and as such will form a guide to the selection of the more promising seedlings.

A rough-and-ready selection is often made from the character of the seedlings and the size and form of the leaves. Seedlings with thorny stems and those with narrow and sharp-pointed leaves are mostly worthless. The broader, shorter, and rounder the leaves, the better the prospect of quality among the seedling Apples. These, however, are mere preliminary tests; the others already pointed out are more trustworthy. Of course, the seedlings not good enough to grow may still be headed back and grafted or budded in the usual way.

The seeds of Crabs, Codlins, Nonsuches, &c., and Cider Apples are those most used for raising stocks. Careful growers select the finest Crabs, and those from the North of Europe were at one time preferred to those of English growth, as being more likely to impart vigour and hardiness to the constitution of the Apples worked on them. Be that as it may, there can be no question that stocks and trees alike might be considerably improved were more attention bestowed on the selection of Apple-seeds for stocks. The refuse of the cider-press is hardly the most promising field for hunting for prime seed for Apple stocks. By sowing the finer seeds of our best culinary and dessert Apples, the stocks would be more closely assimilated to the character of the scions worked on them, and the permanent trees

would probably be invigorated and improved in consequence of a more discriminating selection of seeds for stocks.

Seed-saving and Sowing.—This is done by wholesale and retail. Those whose object is to raise improved varieties from seeds mostly sow the seeds so soon as the Apples are eaten, or very soon afterwards. Such small sowings are better made in pots. Cover the seeds half or three-quarters of an inch deep with light soil, and place in a cool house or frame. In any case the seeds of Apples should not be kept out of the ground more than a few months, as they soon lose their vitality. Time may be saved in the growth of the seedlings, and their greater safety insured, by sowing in pots in the autumn or early spring, carefully numbering or naming each sort at the time of sowing. So soon as large enough to handle, pot off singly and nurse up under glass until well established, when they may be planted out; or the seedlings may be grown in pots in the orchard or green-house until proved.

The raising of seeds wholesale for stocks is performed in a more rough-and-ready manner. The seeds collected from the cider and vinegar presses are washed and dried, and sown in the open air so soon in the spring as practicable. They may either be sown in three or four-foot beds, or in drills about nine inches apart and an inch deep. If the former they must be covered with an inch or so of fine soil. The soil in which the seeds are sown should also be light and rich, a sandy loam well dressed a few months before with well-decomposed manure being the most suitable. The sweeter, finer, and within certain limits the richer the ground, the faster and stronger will the seedlings grow.

The seeds should be sown thinly, as, if of fair quality, almost every one will grow, and overcrowding, whether in rows or beds, is a great source of weakness; so injurious is it, in fact, that it is well to thin out the smaller plants in showery weather, and only leave the best for a crop; but it is best to prevent overcrowding by thin seeding.

Should all go well, the seedlings will be fit for lining out at the end of the year's growth. The process may be performed either in November or February. Rows thirty inches or a yard apart, with the plants from fifteen to twenty inches asunder in the rows, will afford room for their vigorous development to working size. Seedlings for young standards for orchards may have wider intervals between the rows; and some, to economise space and afford more room for working among the plants, plant them in double rows eighteen inches apart, at intervals of four or five feet asunder.

This, however, may be called the once-plant

system for stocks. Not a few transplant them several times before finally lining them out for grafting. The plants should not be beheaded when first lined out, unless in the case of very lanky seedlings. The top stimulates the roots, and the more of the latter, and also of leading and lateral shoots, the sooner the seedlings will be ready for grafting.

The time varies according to the climate, soil, and objects for which the stocks are required. These for standard or orchard trees will take three or four years to reach a height of five or six feet. Some stocks will need two or three years, whereas for dwarfs the stocks may be grafted a year after being lined out.

Grafting.—This is the general method for propagating all the varieties of the Apple. Any of the methods of grafting will answer for the Apple, but in practice only two of these are much used—crown grafting for larger stocks, and whip or splice grafting for the raising of young trees.* In the former from three to seven scions may be readily inserted into the crown of a beheaded Apple-tree; in the latter there is but one scion to a stock, and the nearer these two approximate to one size, the more certain the success, and the more perfect and complete the union of scion and stock into one tree.

Four things are needful to success in grafting—a healthy stock, a proper scion, uniting force, and good workmanship. Sufficient has been said about stocks. We have seen that they are raised from cuttings, layers, suckers, or seeds. So soon as grown to a diameter of about an inch they are fit for grafting. To prove successful, however, they should be vigorous, healthy, and hardy. It is this latter quality that gives peculiar value to the wild Crab as a stock for the Apple in the cooler parts of Great Britain. Neither the Nonsuch, Codlin, English or French Paradise are so hardy as the Crab; hence the preference for this stock for orchards and large trees for espaliers and walls.

The Time and Height of Heading down Stocks.—This may vary considerably, according to locality. The middle of January or early in February is, on the whole, the best time. It is important to head down before the sap moves much, as otherwise there may be a great waste of force. Others, however, defer heading down the stocks until the end of February or early in March, at which time the bark will run freely, and the beheading and grafting may proceed abreast. As to the height of stem left, that must be determined by

circumstances; from six to nine inches from the root is the best height for dwarfs. Half-standards may have a yard of stock left, and tall orchard trees five or six feet. Some cultivators, however, prefer to work all their stocks low, and allow the scions to form their own stems afterwards. It is good practice to behead the stocks within an inch or so of a bud, as this sustains vigorous vital action at a point where it is much needed to hasten and perfect the union between the stock and the scion. In the case of whip grafting it is equally important to stop the scion to a bud at the base of the sloping cut, and thus provide an active centre of vitality at the crown and base of the mutilated portion of the stock.

Scions.—First of all, these should be removed from the trees at the end of December at the latest, and laid in the ground in single file, with just the tips of the shoots left out. This is done to keep the growth of the stem a full month or so in arrear of the stock, and to insure that the scions when used shall be fully furnished with dormant and not moving sap. To make security doubly sure on this point, the scions should be laid in on a north border, and left in the ground till wanted for use.

Character of Apple Scions.—Young shoots of average size of the current year's wood form the most suitable size. Strong shoots, or what the French call *gourmands*, are to be rejected. The scions should also be well ripened. They may vary in length from six inches to a foot. If, however, suitable in other respects, the shorter almost the better. But Apples vary very considerably in the length of their internodes or spaces between the buds, and it is desirable to leave two or even three buds clear of this and above the uniting portion of scion and stock: an average of nine inches or so will be found convenient in practice. For crown grafting the size of the scion is not material, but for whip grafting the nearer the scion and stock approximate to one size the better. The middle portion of the shoot has also been held to form the best scion, and in almost all cases the base is removed and the top cut off.

But all this care about stock and scion would fail were there any deficiency or misplacement of uniting force. Assuming that grafting is properly timed, a sufficiency of vital force is insured; but failure may arise from misplacement of force, and hence the very great importance of placing the inner bark or cambium of the scion and the stock together along several points or the whole line of contact if possible. It is this perfect placing of uniting parts that commands the high percentage of success in whip grafting. With stock and scion of equal diameters,

* Pending treatment under the head of PROPAGATION, the general nature of both these processes may be sufficiently gathered from the paragraphs on grafting Roses (p. 213, Vol. I.).

the uniting forces of both are brought into full play along the whole line of contact, and the union is completed in the least possible time, and becomes so perfect as scarcely to be discernible.

At one time a union of bark was held to be all-important, but it has long been known that the cambium under the bark is the force that unites scion and stock into one tree. Hence the importance of fixing inner bark to inner bark in stock and scion to insure success.

Good Workmanship.—This includes swiftness, smoothness, stability, and impenetrability. From the time that the stock is beheaded not a moment should be lost in the manipulation of stock and scion. A sloping cut on each of equal length and equal diameter will, when the two are bound together, form the two into one diameter, as if nothing had happened. Only practice can give such proficiency as to enable the operator with two cuts to manipulate scion and stock into proper form; but when this can be done, a better fit will be insured than is possible by any amount of future whittling. Fresh wounds also unite much more quickly than those exposed to the air. Rapid manipulation also favours smoothness. Such cuts will generally slope at a regular angle from base to summit, and leave no irregular or jagged edges behind them; a perfect fit is thus insured. To insure stability, the tying should follow the fitting, and be completed at once. This can hardly be too tight, and care should be taken not to displace the two parts in the winding of the tie from base to summit of the wound. The good old plan of also fixing a support to the scion, to prevent its being displaced by the wind, is as much needed as ever, especially in the case of standard trees grafted high. A stake should be firmly fixed to the stock and carried up beyond the summit of the scion, and to this support the scion is securely fixed. The first tie gives perfect stability at starting, the second insures it until the stability resulting from growth renders artificial props needless.

The last aim of good workmanship in grafting is impenetrability. To hasten and consolidate a healthy union between stock and scion, light, air, and water should be excluded. The sap and young wood in a state of incipient formation—the extending roots, the bursting buds, and the expanding leaves—are the uniting forces employed. These have only to be protected from external attack or interference, and they will assuredly complete their work by moulding scion and stock into one tree. Hence the efficacy of all clays, cementings, and waxings is exactly in the ratio of their impenetrability. Their action is wholly mechanical, and in no

sense healing or medicinal; and thus it happens that one grafting composition is just as good as another, so long as it excludes rain, air, and, to some extent, light, till the wounded tissues have united. So soon as this happens, all such substances are better removed, either tentatively or at once.

So soon as the union is complete, and the scion starts into growth, there will also be an enlargement of the diameter of the young Apple-tree, and its demand for more room should be met with the prompt removal of the ties that bound the scion and stock together. Should there, however, be any doubt about the soundness of the union, a second or looser tie may be given for a time.

In this stage the disbudding of any wilding shoots from the lower portion of the stock; the suppression of suckers, if any; and the rapid development and careful moulding into form of the growing Apple-shoots, will be all the attention the tree will require during the first season. Of course, the ground will also be kept free of weeds, and the trees may be left in the rows in which they were worked for another season or two, or lifted in the autumn and placed in their permanent fruiting quarters, according to the wants or wishes of their propagators.

GREEN-HOUSE PLANTS.

BY WILLIAM HUGH GOWER.

Eriostemon.—A genus of compact-growing shrubs belonging to the order *Rutaceæ*. The name signifies “woolly stamen,” and is derived from the hispid hairs which clothe those organs. Eriostemons are plants of easy culture, delighting in a cool dry atmosphere. To secure handsome pyramidal plants the main shoot must be allowed to grow erect without stopping, but the lateral growths will require attention in order to keep the plant properly balanced. The flowers are somewhat short-lived. Pot in a mixture of peat, light loam, and sand, in about equal parts, and drain the pots well. They are all natives of Australia.

E. buxifolium attains a height of three to six feet, but, like all the species, flowers when quite small. The leaves are entire, ovate, furnished with a bristle-like point, and deep green; flowers axillary, numerous, somewhat star-shaped, white, more or less tinged with rosy-pink. Spring and early summer.

E. cuspidatum.—A robust plant, with lanceolate leaves of a glaucous hue, furnished with a recurved bristle at the point; flowers rosy-pink. Summer months.

E. intermedium.—The branches slightly downy;

leaves oblong, ending in a long bristle, glaucous; flowers white. Summer months.

E. linearifolium.—A densely-branched species, with linear-obtuse leaves, which are glandular and dark green; flowers star-like, white, suffused with a rosy-pink hue. Spring and early summer.

E. myoporoides.

—A robust plant; leaves large for the genus, linear-lanceolate, glandular and mucronate; flowers produced on short axillary racemes, three or four together, white. Early summer months.

E. neritifolium.

—Leaves lanceolate, glandular, and dark green; racemes three-flowered; flowers star-like, white, and tinged with pink towards the edges. Spring and early summer.

E. pulchellum.

—Leaves small, and dark green; flowers produced in great abundance, white. Spring months.

E. scaber.—

This is a handsome but somewhat delicate plant, and consequently it is more frequently grafted upon some strong-growing species; the leaves are linear, dark green, the glandular dots giving them a rough appearance; flowers numerous, white, tinged with pink. Spring and early summer.

Eucalyptus.—These plants are mostly gigantic trees, in some instances attaining a height of three hundred feet, with a proportionate girth. They are popularly known throughout the Australian colonies as Gum-trees. The Blue Gum-tree, *E. globulus*,

yields a fine quality of timber, and recently has acquired a European reputation as an antidote to malaria, and has been largely planted in marshy districts. The "Stringy Bark," *E. gigantea*, attains to an immense size, and its wood is a most useful timber. The name of "Gum-trees" comes from the

fact of many species yielding a quantity of gum which is used for various purposes. *Eucalyptus* belongs to the order *Myrtaceæ*. Their leaves are entire, thick, and leathery in texture, and, like the phyllodes of the *Acacias*, mostly stand with their edges to the branches, and not flat, as most leaves do. Their flowers are showy and the fruits are large, hard, and woody, variously shaped, and are exceedingly curious and interesting, but they are far too large to introduce to the majority of plant-houses. The species mentioned below, however, is an exception to this rule, and is well deserving of the attention of all those who appreciate fragrant leaves. Pot



GREVILLEA ROBSONIA.

in three parts of light loam and one part of peat.

E. citriodora.—A slender-growing plant, having small, oblong, bright green leaves, which are furnished with numerous glandular hairs, that give off a delicious fragrance, resembling that of the Lemon-scented Verbena. Australia.

Gasteria.—These are small-growing plants—sometimes called "Tongue Aloes." The name comes from *gaster*, "the belly," in allusion to the curved

tubular flowers, which are much inflated or bellied out towards the base. There is indeed little to distinguish them from Aloe, but they were separated from that genus by Haworth, who made these plants a special study. There are a considerable number of species; many of them have their leaves arranged in a two-ranked or distichous manner. The leaves are thick and massive, and rigid in outline, whilst some have a spiral habit of growth. The leaves are mostly tongue-shaped; some species have rough leaves, caused by little wart-like protuberances all over the skin; others again are smooth, shining, and very beautifully coloured. In addition to their highly-coloured leaves, the Gasterias produce long arched spikes of pendulous flowers, which are tubular and mostly some shade of red, tipped with green, and spring from the axils of the leaves during spring and early summer. All are natives of the Cape of Good Hope. For cultivation see Aloe.

The following are some of the most interesting and handsome species:—

G. anguina.	G. latifolia.
G. brevifolia.	G. levis.
G. brachyphylla.	G. lætepunctata.
G. Bowienna.	G. maculata.
G. carinata.	G. nigricans.
G. candicans.	G. obliqua.
G. conspurcata.	G. obtusifolia.
G. disticha.	G. pulchra.
G. ensifolia.	G. subnigricans.
G. formosa.	G. spiralis.
G. fasciata.	G. undata.
G. glabra.	G. verrucosa.
G. intermedia.	G. vittata.
G. lingua.	

Genetyllis.—This genus belongs to the natural order called Fringe-Myrtles, to distinguish them from the order of Myrtle-blooms, for although the foliage of the Genetyllis have the fragrance of the latter, there is no other resemblance between them.

The correct name of the present genus is *Darwinia*; it contains about a score of species; these, however, are all handsome plants, characterised by the large campanulate involucre encircling their flowers, which is highly coloured and very persistent; to this involucre, which many cultivators look upon as the flower, these plants are indebted for their beauty, whilst in reality the individual flowers are small and unattractive.

As before remarked, Genetyllis are all highly ornamental plants, and as the involucre are not easily bruised they bear removing well, and thus they are excellent subjects for exhibition purposes. They are plants that require considerable care and attention to grow into good large and well-furnished specimens. The soil we prefer for them is good fibrous peat, with a very little light loam added, and sufficient sand should be mixed with it to render the whole gritty. Good drainage is most essential; water judiciously, but enough should be given

to wet the whole mass through, and the roots must never be allowed to become quite dry at any time. The species here enumerated are to be found in some collections under the name *Hederoma*. All are natives of South-west Australia.

G. fimbriata.—A charming small-growing plant, which has the character of being a rather shy bloomer under cultivation; it is, however, so distinct and beautiful that it well merits a place in every collection; the bell-like involucre are light rose-colour, elegantly fringed around the mouth. Summer months.

G. Hookeriana—sometimes called *G. fuchsoides*—is a stronger-growing plant than the preceding; all the stems and branches are bright red; leaves small, dark green above, pale on the under side; the involucre are bright reddish-scarlet and very lasting. Spring and early summer.

G. tulipifera.—As its name implies, the large involucre of this species resemble inverted tulips; it is a strong grower and very free bloomer; the leaves are stout, about an inch long, and fragrant, dark green on the upper side, paler below; involucre white or pale yellow, flaked and striped with bright flame-colour and crimson. Spring and early summer. The correct name is *Darwinia macrostegia*.

Genista.—A large family of Pea-flowered plants, most of which are hardy and must be passed over in this place. A sprig of Genista was the badge of the Plantagenet kings, and from whence they derived the name, Genêt or Planta Genêt of the French, Gen being the Celtic name for a small bush. One species, *G. tinctoria*, in former times was in great repute as a dye-plant.

The green-house species, with which only we shall deal here, are free-growing and compact plants, admirably adapted for all purposes of decoration; the flowers are fragrant and mostly produced during the winter and early spring months, which greatly enhances their value. Genistas succeed well in a light loamy soil. After the flowering season is past they should be pruned back hard in order to induce lateral growth, and thus form bushy and well-furnished specimens. After the new growth is made remove the plants to the open air, so that the shoots may be well ripened, and a plentiful crop of flowers insured. They strike very easily from cuttings, and commence blooming when quite small plants.

G. Everestiana.—A compact plant with trifoliate dark green leaves, and long spikes of rich orange-yellow; fragrant flowers. Early spring months.

G. racemosa.—A somewhat tall plant; leaves trifoliate, racemes terminal on all the shoots; flowers bright yellow and fragrant. Winter months.

G. racemosa superba.—Leaves trifoliate, large, slightly hairy; flowers in long racemes, rich deep yellow. Winter and early spring months. This is one of the most useful of the whole family, and in many gardens is the only one grown. As the name imports, when well grown it is a plant of very fine effect.

Gnidia.—These are compact-growing Heath-like plants with slender branches, and somewhat resemble *Pimelea*. They require nearly the same treatment as *Ericas*, but their foliage is too soft to enable them to withstand full exposure to the sun in the open air, so that a good airy and partially-shaded position should be given them in the green-house, or if a cool frame can be devoted to them so much the better for the welfare of the plants. Peat and sand with a very little loam suits them admirably. The roots of *Gnidias* are very delicate, and are easily destroyed; therefore careful watering is necessary to preserve the happy medium between flood and drought.

G. pinifolia.—This is perhaps the handsomest species in the genus; the leaves are somewhat narrow and triangular, soft green; flowers in terminal capitate heads on all the shoots, soft creamy-white or straw-colour. Spring and early summer. Cape of Good Hope.

G. imberbis.—Similar to the preceding, but the leaves are shorter and more closely set; the capitate heads of flower are pale yellow. Early summer months. Cape of Good Hope.

Gompholobium.—A genus of *Leguminosæ*, containing some very handsome species. They are mostly slender trailing plants and rather delicate in constitution, but their beauty when in flower fully compensates for any extra care required in their cultivation. One species not introduced to cultivation in this country (*G. uncinatum*) has a bad reputation amongst the farmers of South Australia, who affirm that when sheep feed upon its branches it has a very injurious effect.

Gompholobiums when young should be potted in peat and sand only, but when the plants have attained some size and strength they will be much benefited by the addition of a little light sandy loam. The twining species of this genus should be trained over a balloon-shaped wire trellis if intended for exhibition purposes, but for ordinary green-house decorations a trellis in the shape of a column will have the best effect. All are natives of South and West Australia.

G. barbigerum.—An erect-growing plant and the largest-flowered species in the family; the stems are angular, bearing trifoliate leaves, segments linear, dark green; flowers yellow, solitary in the axils, about an inch in diameter. May and June.

G. polymorphum splendens.—A slender twining plant, with quinato leaves, leaflets linear, recurved at the edges, and furnished with a stiff bristle at the end; flowers bright crimson-scarlet and yellow, solitary in the axils of the leaf. Spring and early summer.

G. venustum.—A beautiful but rare species; a twining plant bearing smooth pinnate leaves of many pairs of leaflets: flowers rosy-purple, produced in a terminal corymb. Spring and early summer.

Grevillea.—The genus belongs to the Proteaceous family, and includes species remarkable as ornamental foliage plants, and others as flowering plants of great beauty, with flowers of singular structure. They bear quite cool green-house treatment, and are very desirable ornaments.

The soil should be fibrous peat and turfy loam, two parts of each, and one part of sharp sand. The pots should be well filled with roots before shifting into a larger size, as they do not like a large quantity of mould about them. If *Grevilleas* have the tops of the shoots pinched occasionally when young they will make close bushy plants, and will not fail to attract the lovers of flowers when in bloom.

G. alpestris.—One of the most profuse-blooming species we have, for although it makes a rather large shrub in its native wilds, it commences to bloom in the green-house when only a few inches high. The whole plant is more or less pubescent; leaves ovate, dark green, greyish below; flowers on racemes on all the points, hairy, dull red, tipped with straw-colour; almost a perpetual bloomer. Widely distributed throughout Australia.

G. Banksii.—This species is a bold and strong grower, attaining the height of fifteen feet and upwards. The leaves are pinnatifid, divided nearly down to the midrib, segments narrow, bright green above, silky below; flowers produced in large dense terminal racemes, rosy-red. August and September. Queensland.

G. ericifolia.—The whole plant slightly pubescent; leaves long and narrow, curiously twisted; flowers in racemes on all the shoots, bright red, tipped with greenish-yellow. Winter months. Australia; widely distributed.

G. fasciculata.—An elegant erect plant, some four feet high when mature, but it flowers in quite a small state; leaves narrow, about an inch or more long, upper surface rough and deep green, under side clothed with a brownish tomentum; flowers in racemes on the ends of all the shoots, red, tipped with yellow. May and June. Swan River.

G. macrostylis.—The peculiar foliage of this plant is another example of the protean forms taken on by the members of this order. In this plant the leaves

are broad and trifid, somewhat resembling a *Berberis*, armed with a spine on each lobe, bright deep green; racemes on all the shoots, few-flowered, bright red, passing into primrose-yellow; style very long. April and May. West Australia.

G. Preissii.—The foliage of this species is most elegant, segments very fine and narrow, and brilliant green; racemes terminal on all its shoots, dense; flowers slightly hairy, rosy-pink, tipped with green; an abundant bloomer. March and April. South-west Australia.

G. robusta.—This species is cultivated for its beautiful ornamental foliage only, and when young is admirably adapted for table or room decoration. It is the Silk Oak of the Australian colonist, and attains the height of one hundred feet, producing large panicles of orange-coloured flowers. In this country, however, it has never flowered. The leaves are much divided and light green. It produces the best effect when kept to a single stem.

G. rosmarinifolia.—A superb and robust-growing species, with narrow erect leaves, nearly two inches long, deep green above, hoary beneath; racemes produced on the points of all the shoots, many-flowered, colour rich deep red. February and March. New South Wales.

Habrothamnus.—This name literally signifies "gay shrub," and they are said to be amongst the most beautiful of all the Mexican plants. They belong to the order *Solanaceæ*, and are tall-growing plants, with long shoots, well adapted for covering pillars, rafters, or a back wall in a conservatory, but do not conform well to pot-culture. For soil, use peat and rich loam in about equal parts.

H. elegans.—A strong, robust plant, with large, alternate, entire, broadly-lanceolate leaves, which are dark green and slightly pubescent on the under surface; flowers tubular, produced in large, dense, terminal, drooping panicles, deep reddish-purple. These, if fertilised, are succeeded by bright rosy-red fruits, resembling large bunches of grapes; it flowers nearly the whole year round, but is specially prolific during winter and early spring. There is a variety of this plant with the edges of the leaves broadly margined with white, which affords a pleasing contrast, but it is rather delicate in constitution.

H. fasciculatus.—Leaves ovate, entire, pubescent, dark green; flowers in dense terminal heads, rich crimson-scarlet. Spring months. Like the preceding species, it is a native of Mexico.

Hardenbergia.—A family of climbing plants, producing beautiful Pea-shaped flowers, mostly blue, a colour that is always very acceptable. They are nearly allied to *Kennedyæ*, but their flowers are much smaller than any of the last-named family.

Hardenbergias are all plants of easy culture, and rapidly clothe a trellis or pillar in the green-house, and furnish a rich abundance of their beautiful flowers. For soil, use loam and peat in about equal parts, adding a portion of sand to keep the whole open.

H. cordata.—Leaves heart-shaped and dark green; racemes many-flowered; blooms pale blue. April and May. Swan River.

H. Comptoniana.—Leaves trifoliate; leaflets blunt-oblong, dark green; racemes many-flowered; bloom scarlet. Spring and early summer months. Australia.

H. monophylla.—Leaves simple, lanceolate, dark green; racemes many-flowered; bright blue. It blooms during the greater part of the season. South Australia. There is also a variety having its leaves variously blotched and striped with yellowish-white.

Haworthia.—A family of plants very much resembling miniature Aloes, and to which they are very nearly allied. They have been separated from that genus, and named in honour of the distinguished botanist, Haworth, and are characterised by their tubular flowers being erect, and the limb two-lipped, and by their seed-vessels being more or less ribbed. *Haworthias* require a little more attention than their near relations, the *Aloes* and *Gasterias*, requiring shade from the fiercest rays of the sun during the summer months, and a little more heat in winter than is given the ordinary denizens of the green-house, and they cannot suffer much drought without soon being injuriously affected thereby.

Some of the species have beautiful translucent leaves, others are plain and smooth, and some have curiously verrucose and variegated leaves, whilst another section, often called *Apicras*, have very crowded, stiff, cuspidate leaves, and an erect growth.

Haworthias should be kept in small pots, and these drained well; the soil to consist of light loam and broken brick and mortar rubbish; they are very slow in growth, and are usually increased by suckers.

The following list contains a selection of the most beautiful kinds:—

<i>H. albicans.</i>	<i>H. erecta.</i>
<i>H. arachnoides.</i>	<i>H. fasciata.</i>
<i>H. aspera.</i>	<i>H. foliolosa.</i>
<i>H. atrovirens.</i>	<i>H. imbricata.</i>
<i>H. attenuata.</i>	<i>H. luteo-virens.</i>
<i>H. Bolusii.</i>	<i>H. longiaristata.</i>
<i>H. bullata.</i>	<i>H. margaritifera.</i>
<i>H. concava.</i>	<i>H. mirabilis.</i>
<i>H. coarctata.</i>	<i>H. mucronata.</i>
<i>H. clariperla.</i>	<i>H. papillosa.</i>
<i>H. congesta.</i>	<i>H. parva.</i>
<i>H. cuspidata.</i>	<i>H. pentagona.</i>
<i>H. cymbæfolia.</i>	<i>H. planifolia.</i>

H. Radula.
H. recurva.
H. Reinwardti.
H. reticulata.
H. retusa.
H. rigida.
H. rugosa.
H. setata.

H. spiralis.
H. subulata.
H. subattenuata.
H. tessellata.
H. torquata.
H. translucens.
H. turgida.
H. viscosa.

Heliotropium.—The various species of plants belonging to this genus are of little importance in a decorative point of view; there is, however, one exception, and that is the popular favourite, *H. Peruvianum*, and its cultivated varieties, all of which are known to every one as “Cherry-pie plants.”

This plant and its varieties are extremely easy to cultivate, and from the delicious fragrance which they emit, they are much in demand for bouquet making and for mixing with any other cut flowers.

Heliotropes are low, shrubby plants, with entire oblong leaves, which are covered more or less with long rigid hairs; the racemes are densely set with small lilac, purple, or white flowers. They are frequently used for bedding purposes in the summer months. For the production of cut flowers a plant should be trained against a wall or pillar in the green-house. A light rich loam suits them best.

The following are a few of the best varieties:—

H. Beauty of the Boudoir.—Purple-shaded lilac.

H. Florence Nightingale.—Deep purple.

H. Souvenir de Léopold I.—Lilac.

H. the Queen.—Mauve.

H. Voltaireanum.—Deep purple.

H. White Lady.—Pure white; especially useful for winter blooming.

Hovea.—These are shrubby leguminose plants from various parts of Australia, but chiefly from the South-eastern and Western.

They are plants of easy culture, but being rather straggling in habit, they require extra attention in the matter of stopping, in order to form compact bushes.

For potting, a compost of three parts peat and one

of light loam, with about a sixth part of sharp sand, suits them admirably, and the soil should be used rough.

The flowers of Hoveas are all some shade of blue. They form brilliant ornaments in the green-house, and are well adapted for exhibition purposes; but, unfortunately, they have, to a great extent, been pushed out of our collections by the numerous soft-wooded plants now more frequently grown, many of which cannot compare, for grace and beauty, with what are termed old-fashioned plants.

H. Celsi.—A handsome plant, with alternate, broadly-lanceolate leaves, deep green; racemes erect, many-flowered, rich cobalt-blue. Spring and early summer.

H. elliptica.—Leaves oblong-ovate, deep green above, rusty below; flowers purple. Spring and early summer.

H. pungens.—A very free-growing species. Leaves linear, rolled the edges slightly harking back; flowers deep blue. Spring and early summer.

Humea.—*H. elegans* is the only species in the genus. It belongs to the order *Compositæ*, and is remarkable in this family for producing a

large terminal feathery inflorescence, almost resembling that of some of the grasses. The plant is a biennial, and attains a height of from three to ten feet, with ample stem-clasping leaves, which are thin in texture and bright green. When rubbed or brushed against, these give off a strong aromatic odour, which is highly relished by some, but much disliked by others.

The seeds should be sown about June or July, and when large enough to handle conveniently, potted into single pots and grown all the summer in the green-house, or, what is better, a frame, where the pots can stand on a cool bottom, and have a free current of air. During this time the plants should be re-potted as they require it; in the following spring they should be shifted into rather large pots. Being coarse feeders, it is necessary to supply them with an abundance of root-room, and from about the



HYDRANGÆA HORTENSIS.

time the flower begins to show, an occasional watering with liquid manure will be highly beneficial. The branching panicle is drooping and densely clothed with small rosy-crimson flowers, and presents the appearance of a beautiful fountain. The soil should be rich loam and thoroughly decomposed manure in equal parts.

It is also admirably adapted for surmounting flights of steps upon terraces in the open air and for general use in the sub-tropical garden. South-east Australia.

Hydrangea.—The plants belonging to this family are all very handsome, with bold dark green leaves and large terminal heads of flowers. Flowers are usually dependent upon the corolla for their chief beauty, but in the case of *Hydrangeas* the reverse is the case, as the corolla is nearly always wanting, and what is usually looked upon as such is an extraordinary enlargement of the calyx. The name comes from *hydor*, "water," and, as they certainly revel in a large supply of that element, they are popularly called Water-drinkers.

In some parts of the kingdom, more especially in Ireland, *H. hortensis* attains considerable proportions in the open borders, forming magnificent specimens from twenty to thirty feet in circumference; and although the heads of bloom are not so large as are obtained under pot-culture with young plants, they are nevertheless exceedingly beautiful.

As green-house plants, there are two distinct systems of treatment. If a bushy specimen is required, then every year after flowering they should be cut back, and afterwards shifted into larger pots. In this manner large plants may soon be obtained, which will produce a great quantity of their beautiful globular heads of bloom. These plants will lose their leaves in winter, and, if kept tolerably dry at the roots, may be stowed in a shed or any place which will exclude frost till returning spring again starts them into life.

The second and more usual method is to grow plants from cuttings each year, and confine them to a single stem. By this means immense heads may be obtained, measuring several feet in circumference. The details of this system are as follows:—In the month of March the cuttings should be inserted, and placed in a little heat, using for soil equal parts of loam, peat, and sand. As soon as rooted, pot them singly into small pots, and, when they are well established, again shift them into pots two sizes larger, using the same soil, but adding a little manure to their drink about once a week. They should be kept in the warmest part of the greenhouse during this time, until the terminal growth forms a knotty crown. After this, place them in

the open air, with full exposure to the sun, which will ripen the wood and set the flower-buds. Before frost can touch them, remove in-doors. Exclude them from frost and keep rather dry until some time in the month of February, when they should be started into growth, and again re-potted. In a short time after this the heads of bloom will begin to show themselves, and from that time forth liquid manure must be given once every week.

H. hortensis.—This plant, introduced from China by Sir Joseph Banks, has large, smooth, elliptical leaves, tapering at each end, toothed at the edges, and bright green. The flowers are produced in a large cyme, and usually of a lovely shade of pink, but sometimes blue. This latter colour the gardener is always anxious to produce, but there are frequent failures in the attempt. There is little doubt that this colour is derived from the presence of iron in the soil, and we have also found that a continuous use of alum in the water will bring about the desired result.

H. Thomas Hogg.—This is undoubtedly a variety of the preceding, and thrives under exactly the same treatment. In growth and size of blooms there is little to distinguish it, but the flowers are pure paper-white. Introduced to this country from the gardens of the United States of America.

H. paniculata, the finest of them all, may be used for out-door or in-door purposes.

THE FLOWER GARDEN.

BY WILLIAM WILDSMITH.

SPRING BEDDING AND SPRING FLOWERS.

FOR years past every branch of flower gardening has been growing in public favour, but none more so than that of spring bedding: a very natural piece of favouritism, seeing that this class of flowers are the first to greet us after the long and all but flowerless weeks of winter. There is another reason, and that is the late general revival of, and increase of interest in, hardy flowers of all descriptions; and, as a matter of course, as one gets to know the merits of the various sections, those that give us the largest amount of pleasure at the earliest season are bound to be prominent in the list.

This is just as it should be, but there is another side to the picture which in scores of cases hinders, and in some altogether prevents, the cultivation of spring flowers, at any rate in large gardens. This is that the *London season* extending over the whole of the spring months, and entailing the consequent non-residence of the gentry in the country, spring flower gardening is not a necessity; and, indeed, we know instances where it has positively been for-

bidden, and the order given to concentrate the labour on summer and autumn display. This fact those who disparage summer bedding would do well to take into account, for none will dispute that the owner of a garden has a just right to demand from a servant the carrying out of whatever branch of gardening is best suited to his arrangements.

The cultivation of spring flowers in permanent hardy flower borders, or in front of shrubbery clumps on the lawn and turf, or in large masses at the sides of woodland walks, is altogether a separate question. This way of growing them being virtually no expense in labour or otherwise, no employer can possibly object to their being thus grown in the greatest possible abundance; and every real gardener who has once got a taste for this way of growing them will not easily be diverted from the path. Of course to get a good and extensive display is a work of time and patience, yet repayment comes wonderfully quickly. Snowdrops, Primroses, Daffodils, Wood Anemones, and Wild Hyacinths are generally to be had by the thousand on all large estates, and only need collection and arrangement to produce grand floral effects in spring. What looks more natural than to see clumps of these on the turf, even in the most dressy parts? As a rule they have done flowering before mowing is needed. Or if not on the turf, why not in large clumps in front of shrubberies, and, still better, under deciduous trees? Add to the common kinds just named those that can be bought at an extraordinarily cheap rate—viz., Crocuses, Pheasant's-eye, and double Narcissus, Scillas, Dog's-tooth Violets, double and single Primroses, Polyanthus, Cowslips, double Daisies, Hepaticas, Pansies, Myosotis, Aubrietias, Arabis, and Alyssums—also the kinds that come readily from seeds, such as Wallflowers, Stocks, Silènes, Candytufts, Limnanthes, Collinsias, and many others, and it will be seen what a wealth of spring beauty is possible at a merely nominal cost. The planting of most kinds is of a permanent nature, the advent of each spring finding them of increased vigour and extent, producing a corresponding degree of pleasure in every lover of flowers, and especially in those that were privileged to plant them.

For villa and cottage gardens there is no better way of obtaining spring flowers than by planting them in permanent groups on the turf or in the borders round about the house; indeed, it is by this old-fashioned mode of planting that scores of our old-fashioned flowers (which are again becoming "new") have been preserved to us. Annuals and biennials must of course have border culture, but every description of bulbous-rooted spring flowers should be on turf or in the shrubbery border, for it is

there they look best, give least trouble, and, what is a consideration in small gardens, take up virtually no space.

Spring Bedding.—The above is one phase of spring gardening, the other and larger being that of spring bedding, a branch rendered the more necessary some few years back, owing to the general practice of summer bedding, a style of flower gardening that caused such a blank in gardens as soon as severe frost set in, that it was felt that "something must be done" towards remedying such a state of things. Hence the advent of *winter* and, more generally, of *spring* bedding-out, but neither has as yet received the universal adoption that the inexpensiveness of either would warrant. All, without exception, admit that one or the other is necessary to supplement summer bedding, the difficulty in many cases being which to adopt, a point that can only be decided by those most nearly concerned. The best aid to solution is to ask whether winter effectiveness and brightness shall be preferred to spring gaiety of flowers; and to this must be added that other consideration before-named—at which season is the family in residence? If longest in winter, then shrubs and hardy carpeting plants should stand before spring flowers, which, though they do furnish the beds in winter, are for the most part so small and uninteresting at that season as to be but a mere apology for furnishing. A combination of the two styles of planting is possible—i.e., shrubs and spring flowers—but at neither season does the garden look so well when thus planted, as it does when either winter or spring planting is adopted, each in its entirety; and being much more difficult to carry out, it is scarcely worthy of consideration.

It is presumed that the foregoing remarks show a sufficient reason for the adoption of spring bedding. To do the same well, the first essential is a reserve garden—that is, a plot of ground set apart for the transference of the plants at the end of the flowering season from the garden proper, to be prepared by division and other modes of propagation for the following season's use. The best site for such a garden is that of a shady border; north and east aspects are best, for the obvious reason that when the plants are lifted at the end of May or beginning of June, the weather is warm and dry, hence shade or a cool spot is indispensable to the early re-establishment of the plants. Besides, they grow best under such conditions, red spider and other insects being troublesome when grown in the full sun, or if they suffer from drought. It will be gathered from this that moisture and liberal culture are necessary to the obtaining of a healthy growth, without which

even the hardest would be liable to succumb in a severe winter.

Arrangement of Plants.—There is such a diversity and immensity of spring-flowering plants, that it is very difficult to give an arrangement likely to suit the generality of readers; and we shall only name one or two which, according to our judgment, are amongst the most effective. Simple groups and mixtures of colour look best, and they should be surrounded by bands or cushions of dwarfier-growing plants, such as *Cerastiums*, *Stone-crops*, *Sedums*, *Herniaria glabra*, variegated *Arabis*, or similar plants. The only "dotting" of flowers allowable in spring bedding is that of *Tulips*, *Hyacinths*, and *Narcissus*; all these look first-rate springing from a carpet of any of the mossy section of *Saxifragas*, and *Sedums*; and there is another advantage in this arrangement, which is that the *Sedums*, or whatever ground-work be used, look well the winter through, and serve also as protection to the bulbs. Such "carpets" should always be prepared in the reserve garden for lifting in flakes, turf-fashion, and be simply pressed down on the beds; thus the allotted space is filled out at once.

It is with spring as with summer bedding—that is, simplicity of design and quietness of colouring afford the greatest pleasure for the longest period. Strictly adhering to this principle, the following arrangements are given as amongst the best we have seen. And here it may be observed that three colours of flowers, or at the most five in the largest bed (exclusive of foliage plants), are all that should be used; more than this have the effect of destroying that sense of repose that should characterise all floral arrangements.

The following is an arrangement for a circular bed twelve feet in diameter:—A central plant of *Yucca recurva*; then two rows of dark and yellow *Wallflowers*, alternated; next, two rows of white and blue *Forget-me-nots*, also alternated; the outer two rows being white and coloured *Polyanthus* in mixture, and the edging *Sedum acre aureum*.

A spring "carpet" bed of like dimensions is as follows:—A ground-work over the entire bed of *Sedum acre elegans*, creamy-yellow; then two rows of scarlet *Tulips* or *Hyacinths*; next, two rows of white ditto, the outer lines to be light pink and blue *Hyacinths* alternated. Should the number of plants present a meagre appearance, white *Viola*—Mrs. Grey—may with excellent effect be thinly planted over the entire bed.

The following is also a most telling arrangement for a similar-sized bed, or even smaller:—White *Viola*—Mrs. Grey—*Cliveden Blue Pansy*, and *Silene pendula compacta*, pink, in regular mixture all over

the bed, with an enclosing band or edging of white and red *Daisies*.

Another arrangement is—variegated *Arabis* as a ground-work, and over the whole, the compact-growing blue *Forget-me-not* (*Myosotis dissitiflora*) and *Cliveden Yellow Pansy*, and white *Tulips*, or *Hyacinths*.

An excellent villa or cottage garden arrangement consists of scarlet and yellow *Wallflowers*, *Cliveden Blue Pansy*, and yellow *Viola (lutea)*; the edging to be *Sedum glaucum*.

From the foregoing it will be seen that preference is here shown for mixtures rather than masses of colour, a plan that, besides being more pleasing, has the additional advantage of concealing any defect that may arise through the failure or partial failure of any of the plants. Good bold edgings of some distinctive plant should be a primary consideration for every bed. Common *Primroses*, *Arabis*, hardy *Heaths*, variegated *Thyme*, *Daisies*, *Sedums*, and *Saxifragas*, and *Crocuses*, to be planted in the two last-named plans, are some of the best plants for edgings in spring bedding arrangements.

List of Plants for Spring Bedding.—These may be classed under three heads: first, *Perennials*, or such as are increased by cuttings and division; secondly, *Annuals* and *Biennials*, that can be raised from seeds; and lastly, *Bulbs*, and *Carpeting Plants*. best adapted for planting in conjunction with *Bulbs*.

PERENNIALS.

Allyssum saxatile.
A. saxatile variegata.
Arabis albidia.
A. albidia variegata.
A. lucida variegata.
Aubretia purpurea variegata.
A. Campbellii.
A. deltoides.
A. græca.
Caltha palustris.
Cheiranthus alpinus.
C. Cheiri (*Wallflowers*), purple, yellow, and red varieties.
Daisies, double red and white varieties.
Erica carnea.
Gentiana acaulis.
G. verna.
Iberis semperflorens.
I. gibraltaria.

Myosotis (*Forget-me-nots*), several kinds.
Omphalodes verna.
Pansies, many kinds.
Phlox subulata.
P. Nelsoni.
P. verna.
Polyanthus, a great variety.
Primroses, many kinds.
Saxifraga granulata flore pleno.
S. pyramidalis.
S. ligulata.
Stachys lanata.
Thymes, green and variegated.
Vinca (*Periwinkles*), green and variegated.
Violas—The *Czar*, *Queen Victoria*, and *Marie Louise*.

ANNUALS AND BIENNIALS.

Bartonia aurea.
Candytufts, purple, white, and crimson.
Collinsia bicolor.
C. verna.
Erysimum Peroffskianum.
Eschecholtzia californica.
Limnanthus Douglasii.
L. sulphurea.
Myosotis arvensis, blue and white kinds.

Nemophila atomaria.
N. insignis.
Saponaria calabrica.
Silene pendula.
S. pendula compacta.
Stocks, *Brompton* and *Empereur*.
Virginian Stocks.
Wallflowers.

BULBS AND CARPETING PLANTS.

Ajuga reptans purpurea.
Anemone apennina.
A. blanda.
Antennaria tomentosa.
Bulbocodium vernum.
Cerastium tomentosum.
Crocus verna.
C. imperati.
C. biflorus.
 Crown Imperials (Fritillaria).
Hepatica triloba, in variety.
 Hyacinths, all the single kinds.
Narcissus poeticus, and many others.
Ranunculus, all the Turban varieties.

Saxifraga hypnoides, and others of the mossy section.
Scilla siberica.
S. bifolia.
S. verna.
Sedum acre elegans.
S. glaucum.
S. Lydium.
S. corsicum.
 Tulips—double and single
 Duc van Thol, Tournesol, Pottebakker, Waterloo, Rosa Mundi, Royal Standard, Yellow Prince, White Swan, Queen Victoria, La Candeur, and Rex rubrorum.

needed till the plants are ready for transference to their flowering quarters.

ANNUALS AND BIENNIALS.

Emperor and Brompton Stocks, Wallflowers, and Sweet Williams are about the only kinds of biennials that flower in time for spring bedding, and therefore these kinds only are mentioned. They should all be sown before the end of May. Any aspect will do, but an eastern one is best. Sow in drills nine inches apart, and if the soil be heavy, scatter a little lighter and finer soil in the bottom of the drill and cover the seeds with the same, then water with a fine rose, and the process is complete. As soon as the plants are sufficiently large to handle, transplant on to well-prepared ground, the richer the better, and so far apart from plant to plant that there shall be no danger of the plants getting lanky or drawn, owing to want of space; from four to six inches apart is none too much.

The annuals named (the variety of which is ample for spring bedding) do not need one-half the attention that biennials do. Sow for early spring flowering from the middle to the end of September, and on a rather poor soil, six or eight inches in depth; and if the bottom be hard so much the better, as this will prevent the extension of tap-root, and the plants will then transplant with plenty of side-rootlets. No pricking out is needed, but the seedlings should be thinned out before there is any danger of injury from over-crowding, and all attempts at premature flowering should be momentarily checked by pinching out the points. The soil being poor and shallow, should the autumn be dry, mulching and watering will be indispensable.

Bulbs, and Carpeting Plants for them.—

As to the former, we have Tulips, Hyacinths, Narcissus, and Crocuses. The finest are those that are imported, and they are all purchasable at a very cheap rate; but for all that, some may not be able to invest yearly in them. This need not exclude their use, as excellent results can be had by preserving the old roots as follows:—Keep them in the ground till the tops have quite died down, then lift and dry them, and keep till planting-time in a cool dry place. When they are again planted out, give them a rich soil—well-decayed cow-manure, if possible—and they will flower just as freely, but not be so large and fine, as imported bulbs. The other bulbous plants named in the list should, if possible, be left *permanently* in the ground; or if this be impracticable they must be transferred to the reserve garden, to be again transplanted as early as possible in the spring arrangements.

The carpeting or ground-work plants for bulbs, as

Propagation and Summer Culture of Plants.—Taking these in the order named, first come the perennials, nearly all of which are most easily increased by division of plants, which operation is best performed when they are moved from the beds at the end of May or early in June. A border or plot of ground having an eastern exposure, and not over-shadowed by trees, is the best site; and the soil should be a free open loam, and be manured with vegetable or leaf soil in preference to stable or farmyard manure; then the plants are sure to make, and transplant with abundance of fibrous roots. The ground being thus prepared, division of plants may then go on till the desired number is had; and as there are usually plenty of plants to be discarded, the most vigorous only of these should be selected for increase of young stock. All the kinds should be planted in lines at such distances apart as habit or growth of the plants demands, a convenient distance for most kinds being a foot from row to row, and from six to nine inches apart in the row. Daisies and Primroses may be nearer than that. Well tread or press the plants in, and if the weather be hot and dry at the time, watering will be necessary till new roots have been formed.

The kinds that are best increased by cuttings are Pansies, Violas, double Wallflowers, Thymes, Iberis, &c.; and though a later date than June would do for putting in cuttings of these, that is undoubtedly the best time to get the finest and early-blooming plants. Frames or hand-lights placed on a north border, and the cuttings inserted in them, best insure a successful strike. The cuttings need not be more than three inches apart, because as soon as well rooted they should be transplanted to a more open border, south or west aspect, for in such a position only can they develop that hardy and well-matured growth that alone can insure early and free flowering. Mulching and watering in very dry weather, and picking off flowers and pinching out the points to encourage a branching habit, are about all the details of culture

per list, may be increased at any time most convenient between the time of lifting and the end of July, but this is the latest period they can be done, at least to get them effective for spring bedding. When the old plants are lifted, place them in any shady spot, and keep them supplied with water till they can be divided or split up into small pieces that can be pricked out with a pointed stick; the smaller the pieces, so much more vigorously do all of them start into growth. A warm border and rich soil are requisite, and the plants may nearly touch when first put out, because all this class of plants should be encouraged to make a growth sufficiently dense to be pared off with a spade, or turfing-iron, with a sufficiency of soil adhering to render it unnecessary to plant, but simply to press firmly into the soil, thus producing immediate effect, and at the same time saving the labour of planting.

ORCHIDS.

By WILLIAM HUGH GOWER.

Ansellia.—As a genus, this is characterised by its oblong fleshy sepals, which are spreading and free; the petals resemble them, but are broader and straight. The lip is sessile, three-lobed, the middle lobe the smallest and verrucose. The stems, like pseudo-bulbs, are erect, terete, sheathing, bearing towards the summit numerous plicate leaves. Pollen masses, four, the two dorsal ones very small.

Ansellias are epiphytes naturally, but thrive best under cultivation when grown in pots, and these require to be large in order to accommodate their numerous roots. Pot in peat and sphagnum, and water freely during the growing season. East Indian House.

A. africana.—A robust plant, attaining a height of several feet; leaves plicate, dark green. The panicle is produced from the summit of the pseudo-bulb, pendulous, much-branched and many-flowered; the sepals and petals yellowish-green, transversely blotched with brownish-purple; lip yellow, the side lobes barred with purple. Its peculiar-coloured flowers are very welcome during the winter months. This plant is abundant on the island of Fernando Po, and also on the mainland of Africa opposite. A variety called *gigantea*, from Natal, produces a very much larger and brighter-coloured flower, although not distinguishable from the species botanically.

A. africana, var. *Rollissonii*.—This plant seldom attains a height of more than twelve to fifteen inches. The pseudo-bulbs are stout. The panicle is small, but the individual flowers are much larger

than the normal form, and more spreading; sepals and petals yellow, profusely blotched with purplish-brown. Winter months. Natal.

Arpophyllum.—This genus contains a few very handsome and distinct plants. They have slender stem-like pseudo-bulbs, and thick, coriaceous, arching leaves. The flowers individually are small, but they are densely set upon long, erect, cylindrical spikes, resembling in outline the brush of the fox.

Arpophyllums are strictly cool-house Orchids; one species (*A. alpinum*), which has never been brought alive to this country, we are told is found on the branches of alders on Mount Totanicapan, in Mexico, at an elevation of 10,000 feet. Here it luxuriates in an atmosphere too cold for the Mexican Oak to exist.

These plants have not been very popular with Orchid-growers, on account of their blooming somewhat shyly. This, however, has been entirely the fault of the cultivator, through keeping the plants in far too high a temperature. Experience has proved fully that if Arpophyllums are grown with full exposure to the sun's rays, and with very little artificial heat, they thrive vigorously and bloom profusely.

Pot these plants in rough peat. Give a plentiful supply of water during the period of growth, but reduce it to a very small quantum when at rest. In the growing season keep them in the Mexican division, but remove to the Peruvian House during the resting season.

A. cardinale.—This is undoubtedly the most beautiful of the species yet introduced, and at the same time is extremely rare in cultivation. The rhizome is creeping, pseudo-bulbs erect, stem-like, some six to eight inches long, and clothed with stout sheath-like scales; they bear a solitary arching leaf, eighteen to twenty-four inches in length, and upwards of an inch and a half in breadth; these are thick and leathery in texture, and bright green; the erect flower-spike springs from between a large sheath at the base of the leaf, and is upwards of a foot in height; flowers dense, rather small, the sepals and petals rosy-pink; lip destitute of any fringe, bright reddish-crimson. It blooms during spring and early summer. Mexico and Guatemala.

A. giganteum.—A bold-growing plant, with very much the appearance of the preceding species; it is, however, more robust, the leaves are longer and broader, whilst its erect flower-spikes are longer and more massive; flowers very numerous, sepals and petals rosy-lilac; lip ovate, fringed in front, and deep rosy-purple. April and May. Mexico and Guatemala.

A. spicatum.—This species has been introduced to

cultivation nearly fifty years; it is decidedly the smallest of the kinds here enumerated. The growth and habit is similar to the others, but the spike seldom exceeds eight or nine inches in height; flowers dense, deep rosy-purple. Winter and early spring. It is found growing on the Oak-trees in Mexico, at an elevation of 7,000 to 8,000 feet.

Barkeria.—These plants are nearly allied to *Epidendrum*, from which they differ only in having a broadly-winged column; they, however, form a very natural section, and are all beautiful plants of slender growth, well deserving the attention of Orchid-lovers. *Barkerias* are best grown upon bare blocks of wood, or at least with a very little sphagnum bound on to fasten them. They make large fleshy roots, and during the growing season must have a bountiful supply of water. When growth is complete, withhold the water to a great extent, only giving sufficient to keep the slender, terete pseudo-bulbs from shrivelling, but avoid starting the young growth prematurely. The Mexican division is best suited for these plants during the season of growth, shading them somewhat, but keeping plenty of moisture in the atmosphere for the roots to absorb. After growth is finished, keep them somewhat cooler. *Barkerias* are deciduous.

B. elegans.—This is perhaps the most beautiful species yet introduced to cultivation. Pseudo-bulbs slender, fusiform, six to eight inches high, bearing two or three narrow-lanceolate leaves; peduncles slender, erect; flowers drooping; sepals and petals spreading, nearly equal, deep rose; lip large, flat, creamy-white, with a large deep crimson blotch in front; the raised disk yellow, ornamented with spots and dots of crimson. September, October, and November. Mexico.

B. Lindleyanum.—A somewhat taller and more robust plant than *elegans*, the stem-like pseudo-bulbs attaining a height of a foot or more, and bearing numerous sheathing, oblong-lanceolate, deep green leaves some three to five inches long; scape slender, terminal; flowers lax; sepals and petals similar, the latter slightly the larger, of a uniform soft rich purple; lip broad and flat, with a little point in front (apiculate), same colour as the petals, except the disk, which is white, with three narrow purple lines. September and October. Costa Rica.

B. Skinnerii.—This very fine species is found in quite cool places in its native country. The stem-like pseudo-bulbs are about twelve inches high, bearing numerous lanceolate-acuminate leaves; scape terminal, many-flowered, sometimes twenty to thirty; flowers large, flat, and spreading; sepals and petals nearly alike, the latter slightly broader, and all deep rose-colour; lip ovate-acuminate, deep rosy-purple,

with a few yellow lines towards the base. Winter months. Costa Rica.

B. spectabilis.—In its native country this is called "Flor de Isabel;" the stem-like growths bear two to three oblong leaves; raceme terminal, lax, many-flowered; sepals lanceolate-acuminate; petals broader, rosy-pink; lip ovate, deep rose, dotted with crimson. June and July. Guatemala.

Batemannia.—Originally established to include a plant from Demerara (*B. Colleyi*) with inconspicuous flowers, but latterly several fine species have been assigned to it, and in some instances different genera have been mixed up with the *Batemannias*. The majority of the species are cool-house plants, which require an abundant supply of water: indeed, they should never be allowed to get dry; they are also lovers of shade. Pot in fibrous peat and sphagnum moss, and never allow any stagnant water or decaying vegetable matter to remain about the roots. Peruvian House, except when otherwise named.

B. Burtii.—The leaves of this plant are two-ranked, oblong, ligulate, and tapering to a point, about one foot in length, upwards of two inches in breadth, and intense green; peduncles about six inches long, bearing a single large flower on the summit; flowers nearly three inches in diameter, thick and waxy in texture; sepals and petals about equal, spreading, oblong, tapering upwards, the lower part bright yellow, terminating suddenly, and the upper portion being rich cinnamon, with a few regularly arranged spots of yellow on each; the petals, in addition, have a large dark brown blotch radiating from the base; lip three-lobed, the middle one much the largest, white at the base, but same colour in front as the sepals; the column is curved over like a hood, white, tipped with green. This is a very showy species, which should be placed in the Brazilian House. Spring and summer. Costa Rica.

B. grandiflora.—Although a very handsome plant, this species does not produce such conspicuous flowers; pseudo-bulbs ovate, furrowed, supporting a pair of large leathery leaves, which are broadly-lanceolate and acute; the scape is short, bearing several flowers; the petals are rather smaller than the sepals, all are spreading, olive-green, streaked with bright brown; lip three-lobed, middle lobe the largest, acute, and prettily fringed, white, streaked with reddish-purple, rich orange at base; column arching, winged at the sides. Spring and early summer. New Grenada, about 4,000 feet elevation.

Bletia.—These are terrestrial Orchids, with deciduous leaves. They have much the appearance of *Phajus* to the casual observer, but differ from the members of that genus in having a lip which is

jointed with the column and destitute of a spur; they also resemble somewhat some of the *Cymbidiums* in habit, but differ from them in having round and compressed corm-like pseudo-bulbs.

The majority of the species forming this family are natives of tropical America, where they grow in moist ravines and swampy places, but some few are also found in the Eastern Hemisphere, among which may be noticed *B. hyacinthina*, from China, and *B. hyacinthina albo-striata*, from Japan.

Bletias do not require elevating above the rim of the pot, but should be potted similarly to an ordinary stove plant, the pseudo-bulbs being covered with about an inch of mould. The soil best adapted for the growth of these plants is a mixture of leaf-mould, loam, and peat in equal parts, with a little sand added; drain the pots well, and during the growing season water abundantly, but when the leaves have fallen withhold the supply entirely, and remove to a cooler temperature than that in which they were grown. Brazilian House.

B. gracilis.—Leaves oblong-lanceolate, plaited. Scape branched, many-flowered; sepals and petals reddish-lilac, lip purple. Autumn months. Mexico.

B. patula.—Leaves lanceolate, plicate, and dark green; scape many-flowered; flowers spreading, and of a uniform dark purple. Early spring months. Jamaica.

B. Shepherdii.—This is by some authors placed as a variety of *B. verecunda*. It is, however, a distinct and handsome plant. Leaves broadly-lanceolate, plaited; scape erect; sepals and petals rich rosy-purple; lip same colour, with a streak of yellow down the centre. Winter months. Jamaica.

B. Sherrattiana.—This is undoubtedly the finest species in cultivation. Leaves lanceolate-acuminate, plicate; scape erect, bearing nine to twelve flowers, which are large and spreading, and of a uniform rich deep rosy-purple, the lip being ornamented with three parallel golden-yellow lines. Spring months. New Grenada.

Bolbophyllum.—An extensive genus of epiphytes, deriving their name from *bolbos*, "a bulb," and *phyllon*, "a leaf." They are confined to the tropics of Asia and Africa, and are nearly allied to *Dendrobium*; indeed there is little structurally to distinguish them saving the two lateral bristle-like teeth which terminate the column.

Sarcopodium is a genus containing a few species which are usually referred to *Bolbophyllum*, and as the differences are so slight we have retained them here.

Although this genus contains upwards of a hundred species, very few are worthy of cultivation for their beauty. There are, however, many that are

very curious in their formation, which will afford deep interest to those who delight in the wonderful as well as the beautiful in nature. These plants should be placed upon a block of wood, with a little sphagnum moss round them; water well during the growing season, but give them a good period of rest. East Indian House.

B. barbigerum.—This exceedingly curious plant is dwarf and spreading. The small pseudo-bulbs produce a single thick and leathery oblong leaf. The appearance of the flower cannot be better described than in the words of the late Dr. Lindley himself. He says: "The three sepals are narrow, and taper to a point; pale green externally, dull chocolate-brown in the inside; the petals are minute, slender pointed scales, shorter than the column, and not discoverable without disturbing the sepals. The column is dwarf, and terminated in part by two long curved horns. The anther is a little round lid, beautifully studded with crystalline points. The lip is one of the most extraordinary organs known even among Orchidaceous plants. It is a long, narrow, flexuose, sharp-pointed body, closely covered with a yellow felt; just within its point there is a deep purple beard of exceedingly fine compact hairs; on the under side, at a little distance from the point of the lip, is another such beard; and besides these there is, at the end of the lip, a brush, consisting of very long purple threads so exceedingly delicate that the slightest disturbance of the air sets them in motion, when they wave gently to and fro like a tuft of threads cut from a spider's web; of the last-mentioned hairs, some are of the same thickness throughout, others terminate in an oblong club, so that when the hairs are waving in the air (and I do not know that they are ever entirely at rest) a part floats along gracefully and slowly, while the others are impelled by the weight of the glandular extremities to a more rapid oscillation. Nor is this all; the lip itself, with its yellow felt, its two beards, and its long purple brushes, is articulated with the column by such a very slight joint that to breathe upon it is sufficient to produce a rocking movement so conspicuous and protracted, that one is really tempted to believe that there must be something of an animal nature infused into this most unplanted-like production." Summer months. Sierra Leone.

B. Dayanum.—A close-growing plant, producing somewhat globose pseudo-bulbs, which are greenish-purple, and support a single, short, thick coriaceous leaf, which is oblong-obtuse, deep green on the upper side, purplish below; raceme short, three and four-flowered; sepals obtusely-ovate, large and spreading, fringed at the edges with long yellow hairs, tawny-yellow, ornamented with numerous rows of reddish-purple spots; petals narrow, linear-oblong, fringed

at the edges, reddish-purple, with a narrow marginal band of tawny-yellow; lip small and inconspicuous, same colour as the petals. Summer months. Moulmein.

B. Lobbia (Sarcopodium).—Pseudo-bulbs ovate, some three inches high, smooth, and light green, bearing a single oblong, thick, and leathery leaf, flower large and spreading, upwards of four inches in diameter; sepals lanceolate, the dorsal one acuminate, soft yellow, streaked with lines of purple dots, lateral ones falcate, streaked with purple dots, and shaded with same colour; petals same as dorsal sepal and the same colour; lip somewhat cordate, recurved, yellow, freckled with orange. Summer months. Java.

B. psittacoglossum (Sarcopodium).—Another very handsome dwarf-growing plant, pseudo-bulbs ovate, enveloped in a beautiful fibrous network, and bearing a solitary, broadly-oblong, thick, and fleshy leaf, which is deep green on both surfaces; scape short, seldom more than two-flowered; sepals and petals ovate, nearly equal in size, yellowish-green, and streaked with red; lip three-lobed, ovate, middle lobe recurved, yellow, mottled with red. Summer months. Moulmein.

B. reticulatum.—This species must certainly take first rank in this family, which is not remarkable for the beauty of its members. The pseudo-bulbs are small, situated at intervals along a slender stem-like rhizome; leaves solitary, petiolate, cordate in shape, with a sharp point; the ground-colour pale green; the veins being dark green on both surfaces; the beautifully reticulated appearance, from which its name is derived; spike short, bearing about two flowers; sepals and petals white, streaked with broad lines of reddish-purple, dorsal sepals largest; lip curiously recurved, white and yellow, spotted with purple. July and August. Moulmein.

Bollea.—A small genus of plants, bearing much affinity with the older genus *Zygopetalum*, but yet sufficiently distinct, from a horticultural stand-point at least, to merit the separation. *Bolleas* are plants with the habit and appearance of *Batemannias* and *Pescatorias*, and require about the same treatment. Peruvian House.

B. Lalindei.—This is an extremely beautiful species. It is, however, apparently very variable in colour; leaves oblong-lanceolate, tapering to a point, upwards of a foot long by two inches broad, plaited, and bright green; peduncle much shorter than the leaves, bearing on the summit a single spreading flower, upwards of two inches in diameter, and thick and fleshy in texture; sepals broader than the petals, varying in colour from rose to bright



BLEZIA PATULA.

violet; the tips and lower edges of the lateral sepals pale yellow; lip ovate, hastate, the edges recurved, orange-yellow; the disk furnished with numerous raised plates; column hooded, deep purple. Summer and autumn months. New Grenada.

B. Patinii.—A less robust plant than the preceding; leaves lanceolate-acuminate and deep green; peduncle pendulous, one-flowered; sepals and petals all spreading, the lateral sepals much the larger, light blue, with pale yellow tips; lip furnished with numerous raised plates on the disk, yellow; throat deep blue; column hooded. Summer months. New Grenada.

Brassavola.—This genus commemorates Antonio Musa Brassavola, a Venetian nobleman and botanist. It is characterised by the sepals and petals being about equal in size and free. The lip is entire, hooded, and encloses the column; column clavate, and eared in front; pollen masses, eight.

The species comprising this family are not first favourites with Orchid-growers, probably on account of their want of colour; and as they get much neglected, they have not bloomed freely. Brassavolas are found in the tropics of America only, and do not like cold treatment. They thrive best on blocks of wood, and enjoy an abundant supply of water when growing. Most of the species are fragrant. Brazilian House.

B. acaulis.—A dwarf plant with straight, terete, dark green leaves, and little or no stem; flowers solitary, very large, white, freckled with rose; sepals and petals linear-acuminate, about equal; lip large, cucullate. Summer months. Central America.

B. cucullata.—This species has long and slender terete leaves, from the base of which the long peduncle springs, bearing a single large and handsome pure white flower; sepals and petals about equal, long and strap-shaped; lip cordate-acuminate, lengthened out into a tail-like point, and fringed round the edges. Summer months. West Indies.

B. Digbyana (or, more correctly, *Lælia Digbyana*).—In habit this plant resembles a *Cattleya* or *Lælia*, with its erect pseudo-bulbs and single, thick, fleshy leaf, which is light green and very glaucous; flowers solitary; very large sepals and petals, strap-shaped, creamy-white; lip large and spreading, the sides forming a hood over the column, white, deeply fringed round the edges. Winter months. Honduras

Other species of *Brassavola* are *glauca*, *Martiana*, *cuspidata*, *lineata*, *venosa*, &c. &c., all of which have white or greenish-white flowers.

Brassia.—This genus, named in honour of Mr. Brass, a plant collector, contains some twenty or thirty species and varieties. It is extremely near

Oncidium, from which it is only distinguishable by its very short earless column, and entire bilamellate lip, and by the elongated lateral sepals. In *Oncidium* the inflorescence is usually branched, but in *Brassia* it is invariably simple, with the flowers arranged in a two-ranked manner.

In the earlier days of Orchid culture anything belonging to this order was considered a great rarity and curiosity, and in those days Brassias found great favour in the eyes of gardeners and amateurs. Now, however, that the number of species have so largely increased, it has become absolutely necessary to discard some of the less showy kinds, and many of the members of this genus have been put on one side. There are, however, some few species with their quaint and weird-like forms, combined with their peculiar colours, which are well deserving of a place in every collection.

Brassias may be grown in either pots or baskets. We prefer the former, as they are robust and bold-growing plants, and require more water than can conveniently be given them under other treatment. Pot in rough peat fibre and sphagnum moss.

One or two species of *Brassia* (*B. cinnamomea* and *B. glumacea*) are found at considerable elevations growing with *Odontoglossums*, &c.; the others are all from warmer localities, and should therefore be grown in the Brazilian House.

B. brachiata.—This, although not a gay-coloured flower, is very remarkable for its long tail-like sepals, which often measure twelve inches from the point of the dorsal to the end of the lateral ones. Pseudo-bulbs, oblong, compressed, bearing two short, obtuse leaves; raceme many-flowered; sepals and petals linear-acuminate, the latter much elongated, pale green, richly spotted with brown; lip large, heart-shaped in the upper part, and furnished with several smooth thin plates. Winter months. Guatemala.

B. caudata.—As its name implies, this species has the sepals lengthened out into very long tail-like appendages, whilst the petals are short, not longer than the lip, which is ovate, oblong, subulate, and slightly hairy towards the base; colour fawn-yellow, profusely blotched with brown. June and July. West Indies.

B. lanceana.—In this species the lateral sepals are not so much elongated; the flowers are bright yellow, spotted and blotched with brown, and sweet-scented. *B. lanceana* and its varieties are nearly allied to *B. caudata*, but the sharp awl-like termination of the lip is entirely absent. Spring and early summer. Surinam.

B. lanceana, var. *macrostachya*.—The flowers of this variety are much larger than the type, lateral sepals are pointed, and five inches long, sometimes

even more; sepals and petals rich yellow, with a few brown spots or blotches; lip pale yellow. This variety usually flowers twice in the season—in spring and again during the autumn months. Demerara.

B. Lawrenceana.—This species differs from *B. Lanceana* in being destitute of the toothed plates on the lip. The flowers are bright yellow, with cinnamon-brown spots, and sweet-scented. Autumn months. Brazil.

B. Lawrenceana, var. *longissima*.—A grand variety, and perhaps one of the very best of the genus; spikes some two feet in length, many-flowered; the sepals and petals rich deep yellow, marked towards the base with a few reddish-purple blotches; the sepals lengthened into tail-like appendages some seven inches or more long; lip ovate-lanceolate, some three inches long, soft pale yellow, spotted with purple towards the base, which is furnished with two slightly hairy ridges. September. Costa Rica.

B. maculata.—Flowers large, pale yellow, with a white lip, which is spotted with purple. Spring and early summer. Jamaica.

B. verrucosa, var. *grandiflora*.—A form much larger than the type; it produces a many-flowered scape; sepals and petals greenish-white, spotted and blotched with blackish-purple; lip white, bearing numerous green warty protuberances. Spring and early summer. Guatemala.

Broughtonia.—A genus nearly allied to *Lælia* and *Cattleya*. It is thus characterised:—Column distinct, or at the very base united with the unguiculate lip, which is lengthened at the base into a tube, connate with the ovary; pollen masses, four, parallel, with a granular caudicle reflexed upon the masses. It has not yielded kindly to the persuasive powers of the cultivator up to the present time, perhaps on account of its treatment; it naturally grows fully exposed to the sun and open to all the winds that blow. Therefore the Mexican division should suit it best.

B. sanguinea.—The only species, that appears to be almost peculiar to the islands of Cuba and Jamaica, and should be grown upon a block, with a little sphagnum moss. Although somewhat difficult to grow, the colour is rare and attractive, and amply repays for any extra attention. Pseudo-bulbs somewhat compressed, dark green, bearing a pair of oblong-acuminate coriaceous leaves of the same colour; peduncle terminal, about a foot high, ten to twenty-flowered; flowers of a uniform deep crimson, slightly tinged with yellow at the base of the lip. June and July. Jamaica and Cuba.

Burlingtonia.—A genus of epiphytal plants with small pseudo-bulbs and oblong, coriaceous

leaves. Named in honour of the Countess of Burlington. They are nearly allied to *Rodriguezia*, but have some marked points of distinction, such as a very large and deeply two-lobed lip, the sepals and petals being furnished with a claw-like appendage, and in its convolute flowers, as well as natural habit. Burlingtonias are all natives of the warm parts of Brazil, and thrive best upon blocks of wood, or in wooden baskets; very little sphagnum should be used about them, as the thin wiry white roots do not appear to like confinement. Cork is frequently used to fasten these plants upon, but our experience is not favourable to the use of cork for this purpose, the plants never remaining long in a healthy state on this material.

These plants enjoy an abundant supply of water and a moist atmosphere during the growing season, and, although less will be necessary when they are at rest, water must never be entirely withheld, or the plants will soon shrivel. When this occurs it is frequently very difficult to restore the plant to its former vigour.

The white scale is a great enemy to Burlingtonias, and must be sharply looked after whenever the plants are taken down to be watered, the sheathing base of the leaves providing a safe retreat for this pest from the eye of the careless cultivator. Brazilian House.

B. candida.—Pseudo-bulbs small, bearing two to three oblong-obtuse, coriaceous, dark green leaves; spike pendulous, dense; flowers large, entirely white, like frosted snow, saving the upper part of the lip, which is citron-yellow; sepals and petals obtuse; lip hastate, and furnished with two rows of fleshy ridges. The flowers are deliciously sweet, appearing frequently twice in a year—in April and May, and again towards autumn. Demerara.

B. decora.—This beautiful species is very rambling in habit; it forms long slender stems, from which at intervals are produced small oval pseudo-bulbs, bearing a single lanceolate leaf, which is deep green; the base of the pseudo-bulb is partially enveloped in a small sheathing leaf; spike erect, bearing five to ten flowers, converging, and forming a hood, soft rose-colour, spotted with red; lip large and spreading, deeply two-lobed, and pure white; spur short. It blooms at various seasons of the year, but usually in winter. Brazil.

B. decora, var. *picta*.—A beautiful variation from the normal form; indeed, the species appears to be very variable. In this plant the leaves are shorter and more acute; the flowers are also produced in greater numbers, and are deep rosy-red, spotted and blotched with deep purple. September and October. Brazil.

B. fragrans.—A compact plant, with small pseudo-

bulbs, and long, sheathing, dark green, coriaceous leaves; raceme many-flowered; flowers very fragrant, resembling Hawthorn, large and pure white, middle of the lip pale yellow. April and May. Brazil.

tivation, but nevertheless very elegant. It is a dwarf and compact grower. Pseudo-bulbs small, bearing several dark green sheathing coriaceous leaves, and pendant racemes of pure white flowers,



BURLINGTONIA DECORA.



B. Knowlesii.—A beautiful dwarf plant which succeeds best upon a block of wood. In general appearance it resembles *B. venusta*, but differs from it in having the white sepals and petals suffused with rosy-pink. Autumn and winter. Brazil.

B. venusta.—This is the commonest species in cul-

slightly fragrant. Sepals and petals pellucid, the lip stained on the disc with pale yellow. The racemes of bloom are admirably adapted for decorating a lady's hair for ball or evening party. The flowers are produced at short intervals almost all the year round. Brazil.

THE KITCHEN GARDEN.

BY WILLIAM EARLEY.

SIMULTANEOUS CROPPING.

SIMULTANEOUS Cropping is no new plan or practice, the exigencies of space having forced many growers to adopt its principle in connection with a limited number of subjects. In the following remarks I explain how more than one crop can be grown together on given areas with reasonable success.

Asparagus and Lettuces.—Asparagus-beds are generally maintained so rich by surface mulchings, &c., with decomposed manures, as often during rainy seasons to cause a soured soil. An excellent corrective of this is to grow a crop of surface-rooting vegetables thinly upon it. As few subjects suffer so much from the occasional droughts of early summer as do Lettuces, these latter also succeed wonderfully well sown upon such a rich surface. It is a profitable practice, therefore, to sow seeds of the Paris White Cos Lettuce broad-cast over the beds during the last week of March in each year. When the young seedlings are large enough, thin them out greatly, and in such manner that only a single plant remains at even spaces all over each bed, and as far as possible between the exact crowns of each Asparagus-plant. Very fine-hearted Lettuces will form, but it will be absolutely necessary to pull them immediately they are ready for use, or a greatly additional and unnecessary tax will be made upon the beds.

Asparagus and Radishes.—The several forms of Turnip Radishes, but more especially the more highly appreciated Olive-shaped or French breakfast Radishes, will succeed admirably as a second early spring-sown crop upon Asparagus-beds. The seeds must be sown thinly; or if they come up too thickly or irregularly, must be immediately thinned out. Whilst the crop does not greatly tax the bed, it develops quickly into crisp succulency, owing to the open, airy, exposed sites of Asparagus-beds. It is important, however, that the entire crop be drawn immediately it is large enough for use.

In very limited gardens, a thin sprinkling of Lettuces and Radishes may indeed be made together, which, with reasonable and proper thinning out and quick use, would yield a welcome supply of both.

Beans (Broad) and Potatoes.—It is a very old practice to grow Broad Beans thinly in or along with Potatoes in the row—a plan which, owing to the downward-rooting habit of the Broad Bean, detracts very little from the Potato crop. The Broad Beans should be planted thinly, to avoid shading the

Potatoes. At the time of planting the Potatoes, dibble in the seeds between the sets in the row at distances of about fourteen inches apart, or rather more, and along every other row only. It will be desirable when dibbling each seed in to beat the soil down over it firmly with the dibble, as this particular crop is partial to a firmer root-hold than is desirable for the Potatoes.

Immediately Broad Beans show flower, remove the upper end of the shoots—that is, top them. This simple process will give encouragement to the crop, whilst it will throw less shade upon the Potatoes. By this method the Dwarf Mazagan Broad Bean may be sown and grown along with the earliest kidney or round Potato crop on the south aspect, giving to all who are partial to such produce an early and plentiful return from a limited area.

Beans (Broad) and Seed-beds.—With many market-garden farmers a belief exists that the Broad Bean proves, when grown between the young plants in seed-beds, consisting of any variety of the extensive family of Brassicas, a sure antidote against the Turnip fly, which very often, and especially during periods of aridity, devours and is very injurious to them. Whether this be so or not, certain it is that such things may be conveniently grown together, on the score of greater economy of space, and in the early months of the year to insure earliness by protection to young seedling plants.

For instance, Broad Beans may be sown in any limited-size bed, eight inches asunder all ways, either in the autumn or during the month of January. Thus a bed about three feet wide by five feet long would take thirty plants or more, which is about the number required in practice to give a dish of produce at a gathering.

Subsequently, or early in the month of March, sow seeds, as requisite, amongst this young Bean plantation, of Cabbages, Coleworts, Brussels Sprouts, Broccoli, &c., of the tenderest kinds. First deeply hoe the ground, sow such seeds as are desirable, and sprinkle over with a little rich soil. The growing Bean plants will prove a protection from cold winds and late spring frosts.

Beans (Broad) and Radishes.—By an arrangement similar to the above, the earliest outdoor Radish-bed may be greatly protected. It is remarkable how great a protection such a system of studded uprights affords.

Both in this instance and in connection with the seed-beds above explained—especially in allotment grounds, or where protected sunny southern aspects do not exist—it will be good practice in connection with all to sow during either November or January

two rows of Broad Beans across a "quarter" at the distance of thirty inches asunder. Sow them if possible in a line north-west by south-east. Radishes and other somewhat tender kinds sown between these two rows will then receive great protection from the more northerly winds and cold generally. In these instances long-rooted Radishes may be sown by contrast with such as may be grown upon the Asparagus-bed above referred to.

Beans (Broad) and Parsley.—Parsley, where it is much in demand, can readily be grown on the same ground as the Broad Bean, especially so the sowings of the latter made during mild weather in the months of February and March. This may also be a convenient system to follow in connection with early sowings of Lamb's Lettuce, Australian Cress, Chervil, &c. The Bean-stalks may be readily pulled up so soon as the crop is gathered, leaving the space free for the other crops.

Beans (Broad) and Ridge Cucumbers.—Wherever the Ridge Cucumber is grown plentifully and well under field culture, it is nursed by rows of Rye sown at proper distances in rows on either side. In instances where Ridge Cucumbers or Gherkins are grown in the open quarters of garden or allotment ground, similar protection may be given to the young seedling plants of the two latter, by sowing two rows of Broad Beans three feet apart during autumn or very early spring. During the subsequent month of May, a nice rich soil may be added and dug into the ground, so as to form a ridge between the rows of Beans, into which the Cucumber-seeds may be inserted in rows, such Beans forming a screen from cold winds during such time as the young seedling plants form, and at the subsequent early stages of growth.

Celery and Lettuces.—It is an excellent plan to throw out the Celery trenches as early as ground can be spared for the purpose. Upon the banks of soil between the trenches Lettuces may be sown or transplanted. This is especially a good place for transplanting the latter in the summer or autumn. The depth of good soil thus placed beneath them tends to keep the ground more moist and cool, thus producing finer heads than could grow on shallower soils. Whenever Lettuce-seeds can be sown in such a position early enough, the seedling plants may be thinned out efficiently; such as are drawn being used for dibbling out, to secure a larger bulk and longer succession of produce.

Celery and Endive.—The foregoing remarks concerning Lettuces apply with equal force to both

the curled and smooth-leaved or Batavian Endives. Sown and treated similarly, the best of results are obtainable. By the time that the more permanent earthing up is requisite in regard to the Celery, it will be necessary to take up these duplicate crops and store them in pits, frames, or similar places, for winter protection.

Celery and Radishes.—The best Radishes, sold in immense quantities in the metropolis, are grown upon the mounds between Celery trenches thrown out early on the largest of suburban Celery farms. In such a position they succeed admirably, and few better practices are within the reach of small growers. The sowings of autumn Cabbage-plants for spring use may also, where space exists, be conveniently grown on such sites.

Brussels Sprouts and Potatoes.—Shortness of garden ground forces upon growers many expedients. That favourite vegetable, the Brussels Sprout, requires to be planted out early, and a whole season of uninterrupted growth, to insure nice sizeable sprouts. Spare ground is not always to hand at the particular season when seedling plants are large enough for transplanting, yet it is important to do so, that they receive no check. Wherever Potatoes are planted at reasonable distances apart, especially early sorts, or such as have not too rampant haulms, room may, under such circumstances, be found for a few rows of Brussels Sprouts. Choose strong young seedlings, and do not plant too thickly. Good results often follow. These remarks apply occasionally also to Kales and winter Broccoli.

Cauliflowers and Peas.—Upon the principle that staked and growing early rows of Peas afford protection and warmth in the very earliest months of spring, it is an excellent practice to transplant autumn-sown Cauliflowers, whether out of frames or bell-glasses, between the earliest rows: it may be done about the first week in April, or somewhat later if the weather is very cold or inclement. This situation is, moreover, a desirable one, on the score that the site has been deeply and well prepared for the Pea crop, and is therefore very suitable for Cauliflowers. Besides, it is a quick spring crop, and will come off the ground as soon as the earliest Peas, thus giving room for succeeding subjects in a quick and convenient manner. Besides which, the Cauliflowers will make their growth and prepare for flowering, before the Pea crop becomes too top-heavy or overshadows them too much.

Cabbages and Potatoes.—In some of the best-managed market-garden farms (the one particu-

larly to which a *compère* and myself awarded the first prize in a competition for prizes offered by the Royal Agricultural Society of England), it is a practice to plant Cabbages a little wider than usual in view of securing a fine crop of exceptional produce, and at the earliest season convenient to plant rows of Potatoes of strong-growing kinds between them, so that when the Cabbages are drawn or used a Potato crop is ready for moulding, and a change, as if by magic, takes place upon the ground. This simple system is one which may well be followed wherever the space of ground is too limited for cropping in the usual way. Dig up the ground in a row narrowly between each two rows of Cabbages, removing any very large leaves which spread too greatly, and dibble the Potatoes in a row between. The variety of Potato known as Reading Hero, being so strong and upright, is well suited for such a purpose. So soon as the Cabbages are used, hoe or fork along their whole standing-ground, and subsequently draw the soil up to the rows of Potatoes.

Late Broccoli and Vegetable Marrows.—

The Vegetable Marrow is usually nursed and coaxed upon manure-heaps, following pot-growth, into excessive leaf-formation, and late limited fruit supplies. The system of growing them, indeed of sowing the seeds and growing throughout upon bare and exposed fields, followed by market-garden farmers, gives as a rule a much earlier and better crop. In connection with all late spring Broccoli crops some will "head in" earlier than others. Pull such plants up for use, then place a couple of forkfuls of good manure upon the vacant space, dig it in deeply and well, and sow therein three Vegetable Marrow seeds an inch or two apart. These if sown during the last week in the month of April will come up, form strong plants, and be prepared to range over a good space of ground when the general crop of Broccoli is removed. Meantime, if the kind of Broccoli be a late one, the slowest ones to "head in" will afford good protection to the Marrows.

Peas.—Limited areas may be made the most of by sowing two sorts of Peas—viz., tall and dwarf growing together. This suggestion is not a new one, and answers well. Thus the dwarf Pea, Maclean's Blue Peter, may be sown in the same row as Dr. Maclean's Marrow. By this means the former would come in for use first; the haulm may be pulled up with the last gathering from it, and the whole space devoted to the ultimate full development of the latter. Again, William I. and Telephone may be sown together when the sowings are deferred until the month of March, by which means the former will come in early, and the other follow in quick

succession. By pulling up the haulm of the former when the last pods upon it are "fit," room will be given to the latter, of branching habit, to spread and develop its fine podding capacity. There are several other examples which may be united in a similar manner. The seeds of both varieties selected to be grown together should be sown in equal quantities, and the ground well prepared for them. A nice mulching of decomposed manure along both sides of the row, after the final earthing up and sticking has been done, will make them do all the better.

Onions and Lettuces.—The often-practised process, consisting of growing a few Lettuces upon Onion-beds, has much to commend it, especially as all Onion-beds are, or should be, prepared deeply and well, in a manner to suit the growth and higher development of this invaluable member of the salads. So soon as the bed is sown with Onion-seeds, scatter a few seeds of any desirable kind of Lettuce over the bed. Every care must be taken, however, ultimately, when the seedlings are large enough, to thin them out to a foot or more apart, and to choose such as are to remain owing to their being placed between the rows of Onions, and not likely to cause excessive injury to any part of this, the primary, crop. Such Lettuces should also be drawn for use when young, or so soon as fit for use in a small state.

Spinach and Peas.—The Spinach crop being a rapid-growing one, requiring besides good deep rich ground and early use, is often conveniently grown between two rows of Peas. The seeds are simply drilled into the ground in a row between the Peas at the time of sowing, the hoe being used simultaneously between both crops in all after-culture as needed.

Rhubarb and Sea-kale.—By growing these two crops near together, or as regards dwarf-growing early Rhubarb, one row of it planted alternately with two rows of Sea-kale, an opportunity will the more conveniently exist for forcing both of these together, where the method of doing so consists in the use of pots for covering the crowns with, and fermenting materials. The upper or leaf surfaces of such Rhubarb-leaves as encroach unduly on the space allotted to the Sea-kale may be cut away occasionally, letting the stalk remain to die down, when no injury would be done to the ultimate strength of the stools.

Mushrooms and Sea-kale.—By keeping the Mushroom house shut up close and darkened, Sea-kale roots placed in a bed of soil within it force

admirably. The same results may be secured by planting the crowns in a bed of soil therein, well watering them and covering over to the depth of a foot or more in dry light materials or sand. The same method will insure the necessary early crops of Rhubarb and Chicory. During the winter months an internal heat of from 60° to 70° will be necessary to insure this.

Mushrooms and Melons.—At such time as any crop of Melons are “set,” and so far advanced as to necessitate the withholding of root-waterings, if pieces of spawn-brick are inserted into any heap of fermenting material that is employed to grow the Melons upon, a crop of Mushrooms may ultimately be produced.

Strawberries and Onions.—These two crops—running abreast upon the same area—must at first sight be considered almost as incongruous as any two that could well be harnessed together, and yet they are much alike in regard to time and space.

Instead of sowing Onions at the usual distances apart, sow them in drills at two feet or thirty inches asunder. Treat in the usual way until July, and as soon as the earliest runners can be obtained from Strawberry-beds or rows, take them off so soon as partially rooted, and plant between each row of Onions. The ground being kept clear between the Onions, and well cultivated during the summer, may first be slightly hoed over. The plants speedily lay hold and grow rapidly, and by the time the Onions are cleared off there is a good crop of Strawberry-plants on the ground, and these are found to fruit exceptionally well the following year.

Nor is the benefit of this dual culture confined to the Strawberries: the Onions reach their fullest size and highest quality under this simple method of abnormally wide culture. This plan, however, may be modified at will, thus: two rows of Onions, nine inches or a foot apart, may be grown in the centre of the space between each two rows of Strawberries. Of course, so soon as the Onions are removed, the space between the Strawberries is kept clear and well cultivated, and in the autumn a liberal mulching of manure may be applied, which greatly strengthens the plants, and adds to the bulk and quality of the crop of Strawberries next year. When runners are late, those of last season may be used, and these may be planted soon after the Onions are sown or fairly up. But once this system is fairly adopted, there is seldom any scarcity of fine runners, these being chiefly obtained from the young plants.

FLORISTS' FLOWERS.

BY RICHARD DEAN.

The Gloxinia.—Who shall attempt to depict the beauty and usefulness of the Gloxinia? The original species of Gloxinia was imported from South America about 1815, and the gardeners of that day, finding that it produced seeds, set about raising seedlings, and from these have sprung a race of hybrids of great beauty and variety. Having been imported from the warm regions of South America, it is a stove plant, requiring stove treatment to bring it to perfection. The generic term Gloxinia is derived from being named after P. B. Gloxin, a botanist of Colmar; and it is interesting to observe that the original form of *G. speciosa* had the tube of the flower deflexed or drooping. But a race has been obtained, originating in a garden sport, in which the blossoms stand erect; and now the varieties of the Erect-flowered section greatly exceed those of the Drooping-flowered. But as to where and with whom this new departure originated, we have no data to show.

There is this peculiarity about the Gloxinia: that, by means of a little judicious management, it can be had in flower for a considerable period of the year. By not a few growers, a quick system of cultivation is adopted; that is to say, they sow their seeds in January, February, and March, filling pots with a very light, sandy soil, and spreading the seed, which is very minute, thinly over the surface. The pots are then placed on a brisk bottom heat, and a piece of glass placed over each. The seed soon germinates, and, as soon as the tiny plants are large enough to handle, they should be pricked off into other pots of fine, light, sandy soil, putting some twelve or fifteen plants in a pot, placing these, in their turn, in bottom heat, and encouraging the tiny plants to grow as rapidly as possible. By doing this, by potting the plants singly into small pots as soon as it can be done, and again shifting them into forty-eight-sized pots, bulbs will be obtained that will flower in July, August, and September, and by sowing a little seed again in July, there will be young plants to flower the following spring. There must be a moist, brisk heat to bring on the plants in, or they cannot be had in flower in the short time named above. Very few Gloxinias are now named—that is, named as sale varieties. The strains in cultivation are so good, that seedlings are equal to named varieties in not a few instances. One great advantage obtained from seedlings is, that they secure an almost endless variety of colour. By means of careful fertilisation, many new shades and combinations of colour have been introduced, and they are generally singularly handsome. The Erect-flowered

varieties are most popular, for as the tube of the flower is turned upwards, one can look right into it,

illustration represents one of the older varieties, which not a few high authorities consider superior to



GLOXINIA MACULATA.

and take in its peculiar beauty at a glance. Some of the Drooping-flowered varieties are very handsome, and it is well to have in a collection a number of each, as it lends a desirable variety to it. The

many more modern ones; it is still to be found in some gardens, and has of late been specially commended and again sought for, like many other fine old flowers.

A suitable soil is a matter of great importance. The best is a light compost made up of soft fibrous loam, with a little peat and silver sand added. It will be observed that we do not recommend the addition of manure; it is best to water with some weak manure-water, twice a week, at the flowering season. This adds to the size and intensifies the colours of the flowers. And let it not be forgotten that the plants love shade. Many plants are spoiled by permitting the sun to shine upon them; they must have a moist atmosphere if they are to be healthy and flower well. We have seen not a few plants destroyed by keeping them in too dry an atmosphere; they soon become covered with red spider, and the leaves turn yellow. A moist atmosphere, with a temperature of about 60° to 65°, suits the plants, but on no account must they be allowed to suffer for want of water. We not long since saw in Messrs. Sutton and Sons' nursery, at Reading, many hundreds of plants, in small forty-eight-sized pots, about five or six months from seed, and carrying from six to fifteen beautiful flowers, some of them of enormous size, and finely proportioned.

The Gloxinia being a stove perennial, the leaves die away at the end of the summer, the roots resting during autumn and winter. How they can best be preserved during the dead season of the year, is a desirable inquiry. It must be carefully done, as losses frequently occur during the winter. It is important that the plants should not be "dried off" too quickly; they should be placed in a light airy position, and then, by a gradual reduction of moisture, the leaves will fall off naturally. When the leaves have withered, and the soil become pretty dry, the roots should be turned out of the pots, and placed in boxes or large flower-pots, in a mixture of cocoa-nut fibre and peat in equal parts, keeping them on a shelf in a dry shed, in an even temperature of about 50°. Excessive dryness must be guarded against, while too much damp is equally objectionable. It will be necessary to pot these in early spring. The bulbs should be taken out of the boxes, and placed on a cocoa-fibre bed, in a brisk moist heat; those that are the quickest in showing signs of growth should be potted first into small pots, treated much as one would seedlings, be carefully shifted into other pots, and be kept near the glass, as, with warmth and moisture, light is essential to a rapid and luxuriant growth.

A neighbour of ours makes a rare display every summer by planting out a bed of Gloxinias in a stove-house. He states that the plants grow so much more luxuriantly, and flower so much more freely, than they do in pots, lasting also much longer in flower. This is a very happy idea. One result is, he is able to cut a large number of flowers

for decorative purposes within-doors; and, to adopt his own phrase, he "can cut and come again."

The following and other choice varieties, though everywhere known in gardens as Gloxinias, are strictly all forms of *Sinningia speciosa*:—

ERECT-FLOWERING VARIETIES.

Avalanche.	Lady Musgrave.
Boule de Feu.	Lord Derby.
Brunette.	Louis van Houtte.
Crassifolia alba.	Mr. Gladstone.
Comet.	Mrs. Bause.
Diadem.	Ne Plus Ultra.
Duchess of Connaught.	Purity.
Fabiola.	Vesta.
Flambeau.	William Goldring.

ERECT VARIETIES, WITH SPOTTED FLOWERS

(a very beautiful section).

Argus.	Lady Marriott.
Ariadne.	Madame Hugo.
Clytis.	Marian.
Cordelia.	Mrs. Atkinson.
Coronet.	Mrs. Peplow.
Jubilee.	Rob Roy.

VARIETIES WITH DROOPING FLOWERS.

Duchess of Teck.	Marquis of Lorne.
Gamos.	Miss H. de Rothschild.
Insulaire.	Prince Leopold.
James Barber.	Sir John Lubbock.

The Hollyhock.—The botanical name of this noble plant is *Althea rosea*, and it belongs to the natural order *Malvaceæ*. In the botanical catalogues it is described as a hardy biennial with red flowers, blooming in August, indigenous to China, first known in England in 1573. But how did it come to acquire the common name of Hollyhock? The old English writers spelt the word *Hollihocke*, *Holyoak*, and *Holyock*, whence it is supposed to have been derived from the Saxon *Holihoc*. The word seems somewhat difficult to explain. The originally introduced Hollyhock was, no doubt, a single form; but it was soon taken in hand and cultivated. Gerard states that at the end of the sixteenth century it was sown in gardens almost everywhere. About 1724 it is described in Miller's "Gardener's Dictionary" as a plant of considerable variety, bearing red, white, purple, black, and other coloured flowers; and there were double varieties in those days. One of the first of English florists to take in hand and improve the Hollyhock was Charles Baron of Saffron Walden, a shoemaker by trade, unversed in garden literature, but with a great liking for the flower. By concentrating his attention on this plant alone, he soon distanced all competitors, and originated flowers of more perfect form, greater substance, closer arrangement of petals, and greater proximity of flowers on the spike. Later on, the Pauls of Cheshunt, Chater of Saffron Walden, and others, took up the work of improvement, and were so

successful in raising new and improved varieties, that they became as approximately perfect as it seems possible for them to be.

For some years past a peculiar and destructive fungus, named *Puccinia malvacearum*, has worked sad havoc with the Hollyhock, destroying the leaves and corroding the flower-stalks. It was at first supposed to be more virulent in dry than in moist weather; but later experience now points to the reverse. It is worthy of note that though the summer of 1884 was a hot and dry one, the ravages of the disease were much less marked in this than in preceding years. One of the best means of neutralising the effects of the fungus is to deeply trench the soil in which the plants are to grow, placing plenty of cow-manure just below the roots; and, after planting, mulching the surface with a good dressing of the same.

Any good old garden soil well trenched will grow the Hollyhock well. If the subsoil be a wet one, the plants will thrive in it during summer, but will doubtless suffer in winter, as wet at that season of the year is injurious to them. Planting out should be done in March and April, according to the weather, and they will bloom finely in August if carefully attended to. Hollyhocks make an imposing back line to a mixed border; but if any one desires to grow a collection to perfection they should form a bed or plantation, and be planted not less than four feet apart each way, or not less than three feet apart in the row; if grouped in beds the plants should be the same distance apart. Hollyhocks will grow well in a place where the shade of distant trees can fall upon them, but they should not be near enough for the roots of the trees to rob the Hollyhocks of any moisture or nutriment in the soil. In May or June, when the spikes of bloom have grown a foot or two high, they should be thinned out if good flowers are required—and it is all the more necessary if the plants are weakly; if they are extra strong and vigorous, as many as four spikes may be allowed to remain; should the grower want some especially fine flowers for exhibition purposes, but one spike should be allowed to a plant; and before the spikes become too high they should be carefully staked, and securely tied to the stakes, at the same time allowing the plants perfect liberty to grow. The most robust-growing variety does not require a stake more than four or five feet in height. As a matter of course, to have fine flowers there must be special cultivation, and the soil about the plants should be mulched with short dung; and liquid manure, or guano, rendered as soluble as possible in water, may also be administered twice a week. We may give these further directions to intending exhibitors: to grow the flowers finely, cut away

all lateral shoots thrown out from the spike, thin out the flower-buds if too much crowded together, and take off the top of the spike when it has developed three feet of flowers. As a matter of course, by topping the spike the grower increases the size of the individual flowers, but he will also shorten the duration of the blooming of the plant. This is one of the sacrifices which have to be made in order to obtain show-flowers.

There are three ways of propagating the Hollyhock—by seeds, by cuttings, and by dividing the roots. No one should sow seed unless from a good strain, and it is best to do this in January or February, in pans of light free soil. At this time of the year, the seeds germinate freely in a gentle bottom heat. As soon as large enough, they should be potted, singly, into small pots, and re-potted into a larger size as soon as they gain strength and size; and, when they have filled the pots with roots, be planted out in well-trenched and highly-manured ground about the middle of May, doing this, if possible, during showery weather. A large number of the plants will flower the same year, and thus a season's growth is saved. The general practice is to sow the seeds in July or August, placing the pots or pans in a cold frame, and then planting out in autumn in good ground, to flower the following season. Propagation by cuttings is the best mode of obtaining plants of good varieties, and the practice may be carried on from March to October. Most of the old plants give an abundance of young shoots early in spring, and, as soon as these become a little hard, they may be cut off close to the stem, and four or so placed round the sides of a five-inch pot, in a light sandy soil. They should be plunged in a close frame, where in a few weeks they will have formed new leaves and roots, and may be potted off, each in a separate four-inch pot. As fresh shoots form on the old plants, they may be treated similarly up to midsummer, after which period it is best to leave the wood to become quite hard before making any more cuttings. Propagation by division of the roots is best carried out in autumn, immediately after the flowering season. A large plant may sometimes be divided into several, but in general it is best not to exceed three or four. Every separate piece should carry with it a good share of roots, and these can be potted up and kept in a cold frame during the winter, and then planted out in spring, or else planted out in autumn in light well-drained soil.

As we have briefly referred to Hollyhocks being exhibited at flower-shows, we may observe that there are two ways of showing them: as single flowers, and as spikes of bloom. Of late years, the ravages created by the fungus tended materially to

reduce the number of blooms seen at flower-shows ; but the last year or two has seen a decided increase, both in point of numbers and quality. For the information of exhibitors, we may state that, in judging spikes of flowers, the first point noticed is the individual flowers, the perfection of which consists in the petals being thick of substance, the edges smooth and even, the florets occupying the centre full and compact, closely arranged, rising high in the middle, and of globular form, with a stiff guard petal, forming the base of the flower and extending about half an inch or so in proportion to the size of the centre ball ; so that the different parts of the flower present a uniform appearance.

A few years ago we saw the foregoing varieties finely grown at Mr. W. Chater's Hollyhock nursery, at Saffron Walden ; and we have reason to believe they have all been preserved to the present day.

The Pansy or Heartsease.—The dear old Heartsease of our gardens is *Viola tricolor*. Scholars inform us that *Viola* is from the Greek *Ion* ; Nicander, in his "Geoponics," states that the Grecians called it *Ion* because certain nymphs of Ionia gave the flower first to Jupiter. Others, however, say that it was called *Ion* because when Jupiter had turned the young female whom he loved into a cow, the earth brought forth this flower for



GROUP OF PANSIES.



The arrangement of flowers on the spike needs to be regular, not being crowded together in a confused mass, nor loosely hanging with open spaces between each bloom, but so disposed that the shape of each may be distinctly seen when fully blown, the uppermost covering the top ; and nothing can add more to the beauty of the spike than a few green leaves between the flowers, which give it an elegant and graceful appearance. A further important point is colour ; the brighter, stronger, and more distinct the flowers the better.

We have reason to fear that several of the fine named Hollyhocks of a few years ago have become lost to cultivation, so we give the names of a few leading varieties subject to this contingency :—

Alba superba.
Alfred Chater.
Beauty of Walden.
Bullion.
Elegans.
Incomparable.
Joshua Clarke.
Leah.

Le Grand.
Leviathan.
Peri.
Prince Arthur.
Supreme.
Walden King.
Walden Queen.
William Chater.

her food, which, being made for her sake, received her name. Such is the fabulous account of its name. The *Viola tricolor* has been known in this country by a variety of names, as Herb Trinity, in allusion to the three colours frequently contained in one flower ; Heartsease, Pansy, Love in Idleness, Call me to you, Call me Sweet, and Three Faces under one Hood. And now why called Heartsease ? It is considered that this term should be accepted as meaning "a cordial," as in Sir Walter Scott's "Antiquary," ch. xi. : "buy a dram to be eilding and claise, and a supper and heartsease into the bargain," and given to certain plants supposed to be cardiac ; at present to the Pansy only, but by some authorities to the Wallflower equally. The most probable explanation of the name is this :—There was a medicine "good," as Cotgrave tells us, "for the passions of the heart," and called *garioflé*, from the Cloves in it (*L. carophylla*). The Wallflower also took its name from the Clove, and was called *giroflé*, from the same Latin word. The cardiac

qualities of the medicine were also extended to it, and the name of Heartsease; and, as the Wallflower and the Pansy were both comprehended among the Violets, the name of Heartsease seems to have been transferred from the former to the species of the latter now called so. Pansy is undoubtedly from the French *pense*, "thought." Many will remember poor Ophelia's melancholy gift, "There is Pansies, that's for thoughts." There is no plant, perhaps, that has obtained so many names and curious sobriquets.

The Heartsease is considered to be indigenous to this country. An ancient writer states that the Pansy is found growing in a wild state on Mount Baldus in Italy; and Lobel says that it grows wild in Languedoc, in France. It is also said to grow wild in Japan. Nevertheless, it is generally considered to be a native of England, at the first found growing upon the tops of high hills. Gerarde states that in his time he had not seen it so growing, from which it appears that the plant was not at that period very general in this country, in a wild state, if even a native.

The Heartsease is one of the most popular flowers in our gardens. It ornaments those of the rich and poor alike. We have turned to an illustrated gardening work, published fifty years ago, to take note of some of the best varieties of Pansies cultivated in those days. Though thought a great deal of at that time, they are represented by what we should consider poor, thin, ungainly, and weakly-coloured flowers, that would now be looked upon as weeds. But the work of improving the Pansy was only commencing in those days. Since then, under the fostering care of the florists, wonders have been performed; and the Pansies of the present day are as really perfect as one can well imagine them to be.

There are three sections of Pansies. First come the English or show varieties, which are divided into White grounds, Yellow grounds, and Sels. In the White grounds there is a large, dense, central dark blotch round the eye; then a ring of white, cream, or straw-colour, denominated the ground; and this is edged with blue, purple, or plum, or purple-maroon. The Yellow grounds have pale or deep gold grounds in the place of the white, and are belted or margined with bronze, reddish-bronze, and velvety maroon. The Sels are either white, primrose, yellow, blue, maroon, or black; but the blue Sels are generally regarded as bedding Pansies; all the varieties of this class have been raised in the United Kingdom, and especially in Scotland, where the Pansy has long been a foremost florist's flower.

Next come the Fancy or, as they used formerly to be called, Belgian Pansies. They are generally of strong growth, very large in size, and extremely rich in colour, partaking of curiously blended shades of

white, purple, gold, crimson, mauve, blue, orange, red, and various tints. It is not to be wondered at that they are so popular, and especially in spring and autumn, when the weather is cooler and moister, for it is then the rich colours shine out with exceeding beauty. These Fancy Pansies appear to have originated in France or Belgium thirty years or more ago. Then they came into the hands of the English florists, by whom they have been greatly improved, and in Scotland especially, very fine varieties are usually raised. Continental florists have not been backward in the work, and though their strains are inferior to those found in this country, they yet contain many fine varieties, especially of a striped character.

Then there are what are called Bedding Pansies and Violas. These are generally of hardy, stocky, free-branching growth, the flowers in most cases self-coloured, and they are very useful in the flower garden during spring and summer. For some time there appeared to be an intelligible distinction between Bedding Pansies and Bedding Violas; but they have now grown so much the one into the other, that it is difficult to say what are Pansies and what Violas. Violas have been bred up from such species as *V. cornuta* and *V. lutea*, and the former with its pretty mauve flowers is still grown in many gardens, where it is very effective. Bedding Violas are generally of dwarf, close, bushy, free-branching growth, continuous in bloom, standing hot weather well, and having small well-formed flowers, in most cases self-coloured, without central blotches, and being produced with remarkable freedom.

Pansies and Violas of all sections are readily produced from seeds, and they can be sown at any time of the year. It is a good plan to sow some seed early in spring, and some more about June, which will give two crops of flowers in a season. We sow our seeds in pans of light soil, thinly, and only just covering them, and then place them in a cold frame, where the seeds soon germinate, and the plants grow on into size. As the well-being of the plants, after they are planted out to flower, depends much on their being well-rooted, we adopt the plan of pricking off the young seedlings into other boxes three inches apart, and when they have made nice balls of roots, with the soil adhering, plant them out in a well-prepared bed in the open ground when the weather is dull and showery. The Pansy and Viola alike throw out many thread-like roots which penetrate a good distance into the soil in search of food. Therefore the soil should be deep, free, and gritty, so that the roots can travel freely in it. Grit is essential to the well-being of the Pansy; road sand and sweepings, horse-droppings, decayed vegetable soil, refuse turves, sandy loam, coarse sand, gravel siftings, are all favourable to the good development

of the Pansy. When they are planted it should be done deeply, and the soil pressed firmly about the roots, as Pansies like a firm soil, provided the underneath portion be of a quality in which they can root freely. And as the plants are continually being renewed by means of fresh growths thrown up from the roots, it is well to top-dress the plants two or three times. We do this by taking some refuse soil from the potting-bench, mixing some sand and leaf-mould with it, also some decomposed manure and cocoa-nut fibre, laying it about the plants, and especially close to the stems, to the depth of two inches. This has a wonderfully sustaining and fertilising power during hot dry weather.

Pansies can also be propagated by means of cuttings made of the young growths put forth in July and August, and pricked out in sandy soil in any cool shady place. A temporary bed made up under a north wall, that is the side of the wall facing the north, suits them well, or they can be put in pots of light sandy soil, and the pots placed in a cold frame. But the soil must be pressed firmly about the cuttings in all cases. These quickly make root, and by October make excellent plants for placing out in autumn. Another good way of propagating is by lifting the plants at the end of August or September, choosing a moist time for doing so, and dividing them, in doing which it will be seen that many of the shoots have made roots, and a vigorous plant will sometimes make fifty or sixty when so divided. If these are planted out in a prepared bed they will soon grow into useful plants. Any young plants so obtained in autumn are useful in the flower garden, because they flower early in spring.

Any one who may be disposed to grow a few Pansy blooms for exhibition must give them special treatment. The bed should be raised a little above the level of the ground, and some good manure and leaf-mould mixed with the soil. The top-dressing used should be decidedly richer than for ordinary plants; and a fortnight or so before show flowers are wanted for exhibition, they will be all the finer if some weak liquid manure be given once or twice a week. In the case of White and Yellow ground Pansies, the great thing is to have the belting or marginal colours as perfectly defined as possible, and, to secure this, it is necessary to keep the blossoms shaded from the sun.

A good selection of English show Pansies will be found in the following.

YELLOW GROUNDS.

- | | |
|------------------|--------------------|
| Amy. | John Paton. |
| Bronze Queen. | Lord F. Cavendish. |
| Chancellor. | Master Ord. |
| David Dalgleish. | Mrs. Melville. |
| James Black. | Perfection. |
| James Malcolm. | Sultan. |
| John Harper. | Thomas Ritchie. |

WHITE GROUNDS.

- Brora.
- Cupid.
- Devonia.
- Elsie Thomson.
- Fair Maid.
- Janet Lees.
- J. Douglas Dick.

- Jessie Laird.
- Lady Frances.
- Mina.
- Miss Meikle.
- Mrs. Gair.
- Mrs. Henderson.
- Wizard.

SELFS.

- Dark.
- Andrew Miller.
 - Artemus.
 - Dr. Caird.
 - James Skinner.
 - Prince Leopold.
 - Rev. D. Taylor.
 - The Mahdi.
 - W. B. Hope.

- White and Cream.
- Alpha.
 - Christina.
 - Flag of Truce.
 - Gazelle.
 - Highland Mary.
 - Jenny Anderson.
 - Mrs. Galloway.
 - Mrs. Wm. Wilson.
 - Peerless.
 - Queen of Whites.

- Yellow.
- Archibald Rolland.
 - Canary.
 - Dr. Masters.
 - Gem.
 - Gomar.
 - Maranta.
 - Mrs. Menzies.

- Blue.
- Alexander Scott.
 - Blue Beard.
 - Blue Stone.
 - Dr. Gray.
 - W. J. Rawlings.

FANCY PANSIES.

- Alexander McKinnon.
- Bella Forbes.
- Catherine Agnes.
- Charming.
- Donald Sinclair.
- E. W. Smith.
- Endymion.
- George Carlow.
- Havelock.
- Helen Wood.
- Harry Veitch.
- John Hampton.

- John Bryce.
- J. D. Stuart.
- Lord Rosebery.
- Mary Anderson.
- Miss Lizzie Matthews.
- Mrs. Forbes.
- Mrs. Barrie.
- Mrs. Birkmyre.
- Princess Beatrice.
- Robert Duncan.
- The Pilots.
- William Melville.

BEDDING PANSIES.

- Adonis.
- Beauty.
- Cloth of Gold, yellow.
- Crossbat Rival.
- Holyrood, blue.

- Le Grand.
- Starter.
- Warden.
- White Queen, white.

BEDDING VIOLAS.

- Archie Grant, rosy-purple.
- Bessie Clark, light mauve.
- Blue Bell, blue. [white.
- Countess of Hopetoun,
- Countess of Kintore, purple-blue and white.
- Duchess of Sutherland,
- bright lilac.

- Goldfinder, deep golden-yellow.
- Pirig Park, white.
- Queen of Purples, purple.
- Queen of Spring, yellow.
- Souvenir, rich lavender.
- True Blue, blue.

FERNS.

BY JAMES BRITTEN, F.L.S.

The Cheilanthes.—Even among the *Pteridea*, a tribe of ferns containing such pre-eminently garden genera as *Pteris*, *Adiantum*, *Pellaea*, and *Lomaria*, the *Cheilanthes* holds a high position. Assuredly few more beautiful ferns exist than some of the members of this highly interesting and rather extensive genus. The species, which are scattered over the tropical and temperate regions of both hemispheres, number over sixty. They are much varied in aspect, most being dwarf-growing tufted plants, with more or less compound fronds, the under surface in some cases being covered with gold

or silver-coloured powder, as in *Gymnogramma*. In size, habit, and general aspect *Cheilanthes* approaches very closely to *Nothochlana*, the principal difference between the two being in the presence of an indusium in the first-named genus, whilst in the latter the sori are non-indusiate, or naked. Owing, however, to the different degrees in which the margin becomes attenuated or reflexed, it is at times very difficult to draw the line between the two. This will readily explain why in different gardens some of the plants here mentioned are referred to *Nothochlana*. As it would be useless to enumerate

a large number of species, however beautiful or interesting many whose names we omit may be, only a selection of those which have already found their way to cultivation is given below. The names adopted are those contained in the last edition of the "Synopsis Filicum." *C. argentea* has deltoid, tripinnatifid fronds, three to four inches in length by two inches in breadth, surmounting wiry, polished, dark chestnut-brown stipes, about six inches long. The upper surface of the frond is green, the

lower is thickly covered with white waxy powder. This species has a wide range, being found in Siberia, from the Altai to Kamschatka, Japan, China, the Malayan Archipelago, and Khasya. Taken as a whole, there is a wide range of forms of this species, the fronds differing a good deal in size and shape, and in the thickness and colour of the ceraceous coating. The variety *chrysophylla*, from Khasya, has narrower and longer fronds than the type, densely coated with yellow powder on the under side. *C. chlorophylla*, instead of being of a densely-tufted habit, like the last-named species, has a stout rhizome covered with chaffy scales, strong, erect, glossy, dark chestnut stipes, twelve to eighteen inches long, and ovate-lanceolate finely-cut fronds, from twelve to eighteen inches long by four to eight inches broad; it is confined to South America, where it occurs from New Grenada southward to Monte Video.

C. farinosa is a near ally of the first-named species (*C. argentea*), but has lanceolate fronds of a subcoriaceous texture, the under surface being densely coated with a pure white powder; in size it is large, the fronds sometimes attaining a length of twelve inches by a breadth of six inches at the broadest part. As a mere list of the countries in which *C. farinosa* is found would occupy far too much space, its geographical distribution may be summed up in the words "Everywhere in the tropics." *C. fragrans* is so named on account of the delightful odour of newly-mown hay given off and

retained for a long time by the bright green fronds when dried. This also is of tufted habit, with wiry stipes, one to three inches long, densely clothed with reddish-brown linear scales, the ovate-acuminate fronds being green on both surfaces, and two to three inches long by an inch in breadth; it ranges from South Europe to Afghanistan and North-western Himalaya (at elevations of 5,000 feet above sea-level). The South African *C. hirta* has strong, erect, tufted stipes, two to four inches long, densely



CHEILANTHES ARGENTEA.

coated with spreading, bright reddish-brown, woolly hairs; the ovate-lanceolate, finely-cut frond is more or less hairy on both surfaces, and measures from four to twelve inches long by two to five inches broad. In *C. lendigera* the upper surface of the beautifully-cut fronds is smooth, and the lower hairy; the strong, erect, polished, chestnut-brown stipes are from three to twelve inches long, and are clothed with a copious rusty-brown tomentum; the lanceolate fronds are from four to twelve inches long by two to four inches broad. This species is a native of Mexico (where it ascends to elevations of 11,000 feet above sea-level), southward to the Andes of New Grenada and Ecuador. *C. microphylla* has a slightly-creeping rhizome, and wiry, zigzag, polished, dark chestnut-brown stipes, two to six inches long, and ovate-lanceolate fronds, green and glabrous on both surfaces, three to nine inches in length by two

to three inches in breadth; this is a native of tropical America, from Mexico and the West Indies southward to Peru. *C. myriophylla* has strong, wiry, densely-tufted stipes, three to six inches long, thickly clothed with pale woolly tomentum and ovate-lanceolate fronds, four to six inches long by one and a half to two inches broad, cut into an infinite number of small roundish bead-like segments. The rachis is also clothed with tomentum, like the stipe; the upper surface of the frond is green and pilose, the lower densely matted and scaly. It is a native of tropical America, and has also been lately discovered in the Neighgeries. *C. elegans* is a mere form of this species, with the ultimate segments reversed pear-shaped, instead of roundish.

The tropical American *C. radiata* has strong, erect, glossy, blackish, tufted stipes, twelve to eighteen inches long, with six to nine pinnae, radiating from a common centre, similar to the spokes of a wheel.

Cultivation.—In a state of nature nearly all the *Cheilanthes* inhabit dry rocky situations, and many of them come from considerable elevations. If these facts are borne in mind, and treatment founded on these data followed, success in cultivation will not prove difficult of attainment. All are especially impatient of too much water at the roots, and syringing overhead is particularly injurious, both to those with hairy fronds and the ones with the gold or silver-coloured dust on the under surfaces. All do well in a cool or temperate house, and should not be grown in company with ferns which require any great amount of atmospheric moisture. They

can scarcely have too much light, and should in all cases be placed as near to the glass as possible. Only during very bright sunshine, when the young fronds are being developed, is any shading necessary. Constant ventilation is also a requisite. Good fibrous peat, or a mixture of that and leaf-mould, with sharp sand and a number of pieces of sandstone or lime rubbish, in order to insure rapid drainage, is all that is needed in the way of soil. They probably all do much better when planted out amongst stones,

in a porous compost, close to the glass. A collection in good health under similar conditions to those above sketched may be seen planted out on one of the shelves of the Temperate Fernery in the Royal Gardens, Kew.



CHEILANTHES ELEGANS.

The Gleichenias. — The genus *Gleichenia*, containing about thirty species, and the nearly allied one, *Platyzoma*, with a single representative from tropical

and sub-tropical Australia, together constitute the sub-order *Gleicheniaceae*, one of the most interesting and singular, as well as one of the most handsome, groups of ferns. In *Gleichenia* the involucre is absent, the sori are dorsal, of few (from two to ten) capsules; these open vertically, and are surrounded by a broad, transverse, complete ring. The caudex, in the majority of the species, is creeping, and the stem dichotomous. The fronds are rigid, generally large, and dichotomously branched, frequently bearing axillary buds. The distribution of the genus is a rather wide one, as species are found in both hemispheres, principally throughout the tropical regions. A good many have not yet found their way to cultivation; those mentioned in the

following list are the best and most distinct of those which are now to be met with in British gardens.

G. circinata is a dwarf species, with the lobes of the pinnæ ovate or subrotund, more or less glaucous beneath; the capsules are superficial, three or four in number, and the branches and rachis are either smooth or clothed with a chaffy pubescence. *C. circinata glauca* is a handsome form, with the young growths and the under surfaces beautifully glaucous. It differs from the type, too, in its fronds

being of a thicker texture, and in the plant being altogether of more robust habit. This makes a splendid exhibition plant. In a wild state, *G. circinata* has been discovered in Australia, Tasmania, New Zealand, New Caledonia, and Malacca. In some nurseries and gardens it is found under the names of *G. microphylla*, *G. semivesitita*, and *G. Spelunca*. *G. Cunninghami*,

from New Zealand, has from two to four capsules in a sorus, and erect, leathery, fan-shaped fronds, which attain a height of about three or four feet; in colour these are a bright green above and very glaucous beneath. In its native country this fern is known as the Umbrella Fern. Unfortunately this handsome species is somewhat rare, owing to the difficulty experienced in propagating it, or even in establishing imported roots. *G. dicarpa* has scandent, dichotomously divided fronds; the branches are pinnate, and the pinnæ are divided into small orbicular segments, with recurved margins. The capsules are about two in number, and are concealed within the almost slipper-shaped lobes. It is a native of Australia and New Zealand,

where it is a common fern. The variety *alpina*, from the high mountains of Tasmania, New Zealand, and the islands of the Malayan Archipelago, differs from typical *G. dicarpa* in being very much smaller and more compact in habit, and in the ferruginous rachis being clothed with chaffy scales. The entire fronds in this form only measure from three to twelve inches in height, and the plant is one of the best for the cool fernery and for an in-door rockery of limited extent. *G. dichotoma* is a most distinct

species, with zigzag, repeatedly dichotomously or even trichotomously branched stipes, the ultimate branches bearing a pair of forked pinnæ; a distinct pair of pinnæ also arises from the base of the forked branches (not of the frond). The segments are never decurrent. The fronds vary in length from two to four feet, and are bright green above and glaucous beneath. This species is almost universal



GLEICHENIA CIRCINATA.



in tropical and sub-tropical regions in both the Old and New Worlds, and occurs as far north as Japan. As might be expected, on account of its very wide geographical distribution, a considerable number of slightly varying forms are met with; they differ in the size of the pinnæ and the shape of the segments. In being more or less glabrous or densely tomentose beneath, in the texture of the fronds, &c.; but the pairs of accessory pinnæ at the base of a fork are invariably present. Perhaps *G. dichotoma* succeeds best in a stove temperature, but it grows well under cool treatment. *G. flabellata*, from Australia, Tasmania, and New Zealand, has sub-membranous, dichotomously fan-shaped branches, and very proliferous fronds, which sometimes attain a height of

five feet and a circumference of about twelve feet. It is of tolerably easy culture, and makes a very fine exhibition plant. *G. longissima* is a magnificent species, recently introduced from Japan, with tall, branched, gracefully drooping fronds of a delicate light green on their upper surfaces, and glaucous beneath. The young growths are densely clothed with very dark chaffy scales. In addition to Japan, *G. longissima* is found in China, Bengal, the Malay Islands and Peninsula, the Sandwich Islands, West Indies, New Grenada, Mexico, and Guatemala.

Just as *G. dichotoma* is the solitary representative of one well-marked section of the genus, so is *G. pectinata* of another. It is common everywhere in tropical South America, and is not to be confounded with any other species. The stipes are zigzag, branched, the branches bearing from one to three pairs of forked divaricating pinnæ. The segments, as in *G. dichotoma*, are never decurrent. It is hardly so strong a grower as the species just named, neither are the fronds so many times divided, but they are much more glaucous beneath. Stove treatment seems best adapted to attain success with *G. pectinata*. The South African *G. polypodioides* is a comparatively recent introduction to British gardens; the lobes of the pinnæ are ovate, and the capsules, three or four in number, are sunk in a cavity forming a flat-topped sorus. Both on account of the beautiful light green of the upper surface of the beaded fronds, and the slender graceful habit, this is readily recognised and distinguished from any other of the Gleichenias in cultivation. *G. pubescens*, unfortunately a somewhat rare plant in British gardens, is abundant enough in tropical America, and is a rather variable species; the lobes of the frond are more or less decurrent, and the branches and rachises are either naked or clothed with woolly tomentum and scales, the latter condition being that most generally met with in gardens. In the tropical fernery this grows rapidly, and soon forms a specimen of great beauty. *G. rupestris*, from Port Jackson and North-west Australia, has glabrous fronds of coriaceous texture; in habit it is more dense and symmetrical than most other species. The reddish-purple stems contrast rather strikingly with the beautiful rich green of the upper, and the very glaucous colour of the under surface of the fronds.

Cultivation.—Except for the species which are specially mentioned as doing best in the temperature of a stove, all the Gleichenias thrive well in a cool, airy house in which the temperature during winter is not allowed to descend below 45° Fahr. Even some of the thoroughly tropical kinds succeed fairly well in company with, and under the same treatment as, those which require to be grown in the cool

fernery. During the period of growth very liberal supplies of water are necessary at the root, but syringing overhead should not be practised at any time. With an atmosphere fairly moist such a course is not needed, and the fronds last much longer than when periodically wetted. As the species are evergreen and frequently last half a dozen years or more, increasing in size the whole time, owing to the development of the buds in the axils of the forks of the branches, it is important to prevent injury to them, and to keep the plant clear of scale, which is sometimes a cause of considerable trouble, particularly in warm houses. When grown in cool, airy, light structures, scales and other insect pests do not prove nearly so troublesome. Most of the Gleichenias thrive best in fibrous peat and silver sand; and as all are shallow rooters, they should be grown in well-drained pans, in preference to pots. The stronger growers like an admixture of good fibrous loam and pieces of charcoal. As a rule propagation is effected by dividing the clumps, but Messrs. Veitch have been successful in raising stocks of *G. circinata*, *G. rupestris*, &c., from spores. A goodly number of species, however, have not yet been raised from spores in this country, and an interesting field is open to the gardener in this line of work. A considerable period elapses before the spores develop into plants with characteristic fronds, and, indeed, before the prothallia spring into existence; still, with care, no great difficulty should be experienced in obtaining a stock by means of spores. This is all the more desirable as even old, well-established specimens do not take kindly to being divided. Few ferns make more splendid exhibition plants than the Gleichenias, and good large-sized specimens can be grown with but limited root-room, a great advantage when the plants come to be moved about much; moreover, they travel remarkably well.

The Genus Pteris.—Accepting the somewhat comprehensive views of specific distinction adopted by such pteridologists as the late Sir William Hooker and Mr. J. G. Baker, the number of species belonging to the genus *Pteris* is about a hundred. A very considerable proportion of them, however, have not yet been introduced to cultivation, and only a selection of the most desirable and distinct of those which are to be met with in English gardens are given in these pages. Not a few of these are amongst the most useful and least exacting of garden ferns. The genus, as understood by the author of the "Synopsis Filicum," comprises several groups which have been, and even now, by some authorities, are still regarded as genera. The genus, as restricted by some authors, to the species in which the veins are all free, the

stems cæspitose, and the involucre single, contains about fifty well-marked kinds; as representatives of this section we may mention *P. arguta*, *cretica*, *fiabellata*, *laciniata*, *longifolia*, *quadriaurita*, *serrulata*, and *tremula*. Of the group *Pasia*, with free veins, a creeping rhizome, and a more or less distinctly double involucre, only four species are known, and one of these is the common Bracken, *P. aquilina*, one of the most widely distributed of all ferns; a second is the handsome New Zealand species *P. scaberula*, one of the most graceful of cool-house kinds. In *Doryopteris*, characterised by the small sagittate or subpedate fronds, the veins anastomose copiously; less than a dozen species are known, which are referred to here; of these *P. palmata* and *P. sagittifolia* are not unfamiliar examples. About five-and-twenty species belong to the section *Litobrochia*, which, with the general habit and aspect of *Pteris* proper, has fronds with copiously anastomosing veins. In addition to the sections already mentioned, *Amphiblestra*, *Campteria*, and *heterophlebium* are also now included under *Pteris*.

Altogether *Pteris* is a cosmopolitan genus, and includes plants of almost every kind of division and venation.

STOVE KINDS.

There are comparatively few species which absolutely require stove temperature for their successful management. Most accommodate themselves readily to either stove or green-house temperature. In the case of widely distributed species, those individuals introduced from a tropical climate would no doubt thrive better in warmer houses, whilst examples of the same species brought from temperate latitudes would most likely prefer the cooler atmosphere and the general conditions which are obtained in the green-house.

P. comans is confined to the Southern Hemisphere, where its geographical range is a rather extended one; it has naked, erect, glossy stipes, surmounted by bipinnate fronds of a thinly herbaceous texture; the rachis and both surfaces are smooth. *P. crenata* is a distinct and handsome species, with dark green, rather leathery, bipinnate fronds from a foot to a foot and a half in length, by six to nine inches in breadth; the specific name was given on account of the crenated margins of the pinnae. This is found in Hindostan, from the Himalayas to Ceylon, Chusan, and Loo-choo Islands; southward to tropical Australia; eastward to Samoa and Fiji. In general aspect *P. deflexa*, from tropical America, comes between *P. quadriaurita* and our common English Bracken; it has strong erect stipes, two feet or more long, and broad fronds, somewhat coriaceous in texture, from two to four feet long. This, when

planted out in the warm fernery, makes a fine object where sufficient space can be allowed it. *P. heterophylla*, a native of the West Indian Islands and Brazil, was introduced to Kew many years ago from Jamaica; it has small, dark green fronds, feathery in cutting, &c., reminding one of our native Parsley Fern (*Cryptogramma crispata*), or the common Wall-Rue (*Asplenium Ruta-muraria*), much enlarged. It is a compact-growing plant from six inches to a foot in height, and is one of the best for a small or moderate-sized fern-case. *P. incisa* is a very variable species, widely distributed throughout tropical and temperate regions of both hemispheres; it exhibits a considerable range of differences in size, cutting, texture, and venation, and is often scandent with long, spreading, rigid branches—in a wild state it is said to now and then attain a length of ten yards. *P. laciniata* has a distinct and somewhat striking aspect; the large tripinnatifid fronds, herbaceous in texture, are of a beautiful light green colour, and are borne on stout, erect, very hairy stipes, a foot or more in length. *P. leptophylla* is a vigorous-growing Brazilian species with firm, erect, straw-coloured stipes from six inches to about a foot in length, and deltoid, herbaceous fronds nine to twelve inches long, by as much in width at the base. *P. longipinnula* is a near ally of *P. quadriaurita*, with which, from a purely botanical standpoint, it might be united. From a garden point of view, however, it is distinct enough; it has erect, naked, yellowish-green stipes from two to three feet long in fully-developed plants, and sub-coriaceous fronds one to three feet long by twelve to eighteen inches broad. It is a native of Hindostan (ascending in the Himalayas from 2,000 to 4,000 feet), Malayan Peninsula, Borneo, and Japan.

P. ludens, from the Malayan Peninsula and Philippine Islands, has polished, nearly black stipes, those of the barren fronds three or four inches in length, and those of the fertile frond about three times as long. The barren frond varies in shape from triangular with two slightly deflexed basal lobes, to spear-shaped with two basal and two large spreading lateral lobes with entire margins; the fertile fronds measure from four to six inches each way, and are cut down into five linear-lanceolate, or lanceolate lobes (one erect, two spreading, and two deflexed), all of which, except the last, are sometimes again forked.

P. quadriaurita is a beautiful evergreen fern, a thoroughly useful and easily-managed species, which should find a place in every collection. It is found all round the world within the tropics, and a little beyond them. What we may here regard as the type (for the species is a widely variable one) has fronds from one to three feet in length, the end of each pinna being lengthened out into a long tail,

which imparts a distinct and striking aspect to the plant. The very finest of the variegated ferns (even in the genus *Pteris*, which has produced nearly all the variegated forms at present known in cultivation) are varieties of *P. quadriaurita*.

P. argyrea and *P. tricolor*, when well grown, cannot fail to win the admiration of every one who has any love for plants. The first-named is much the easier of the two to manage, no particular difficulty being experienced in growing it thoroughly well. The greater part of the area of each pinna is occupied by a broad band of white, and as young plants are readily raised from spores, and soon become very ornamental objects, it is not likely to lose its hold on popular estimation. *P. tricolor* is a still more handsome plant, though unfortunately one which is not nearly so easy to grow; the centre of each pinna, in characteristically coloured plants, is a bright rosy-red with a margin of white on each side, which contrasts strongly with the deep glossy green of the other portion of the fronds. *P. sagittifolia*, a native of the New World (from Venezuela southward to Brazil), is an excellent subject for the Wardian case, and thrives well in the green-house. It has erect, polished, blackish stipes four to six inches long, and dark green sub-triangular fronds four to six inches long from the top of the stipes to the apex.

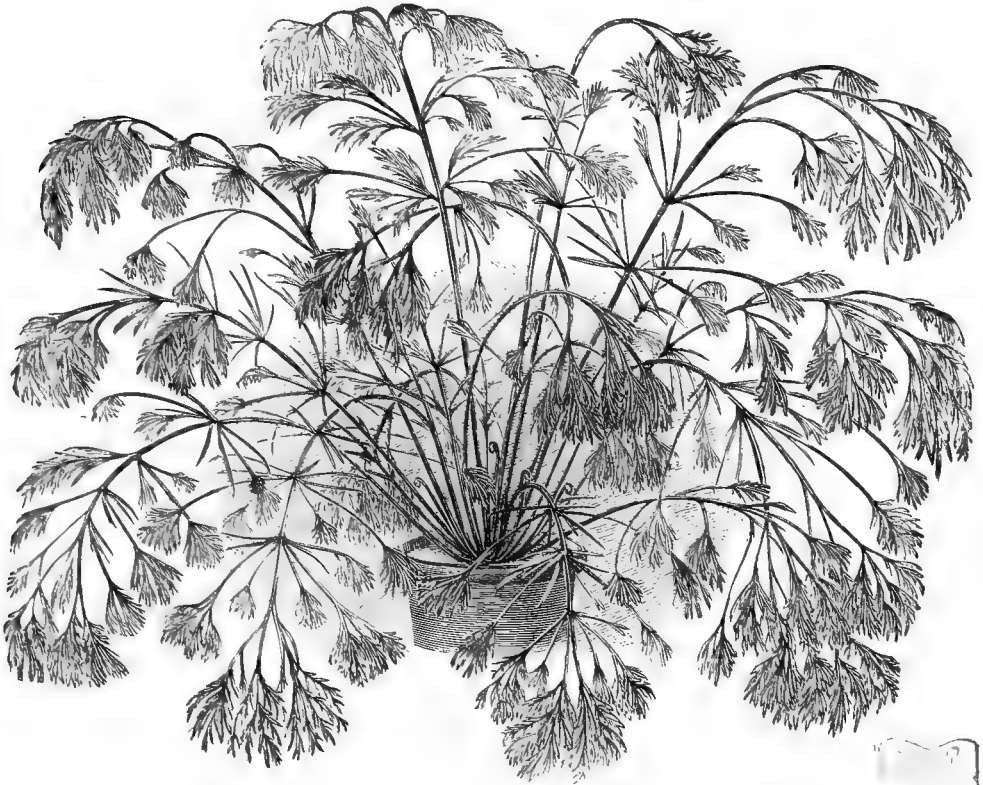
GREEN-HOUSE SPECIES.

None of the species mentioned under this head refuse to grow under stove treatment, and some develop much more rapidly in the warmer atmosphere of the stove; some are very nearly hardy, and are invaluable for conservatory decoration and for the indoor unheated fernery. *P. arguta* is a handsome evergreen kind from Portugal, the Azores, Madeira, and the Canary Islands; it succeeds admirably when planted out in the cool conservatory, and allowed plenty of space; under these conditions it not unfrequently attains a height of five feet, the strong, erect, glossy, straw-coloured or reddish-brown stipes measuring about half the entire length of the fronds. *P. Cretica* is far from being peculiar to Crete, as its name would seem to imply. In fact few ferns have a more extensive geographical distribution. It ranges from Turcomania in Uralian Siberia, through Southern Europe, the Mediterranean and its islands, Arabia and Abyssinia, most parts of India, from the hot plains to the Himalayas at elevations of 6,000 feet above sea-level—Mauritius, Penang, Java, Luzon, Ceylon; and from the United States, south through Mexico to Guatemala and Brazil. The pinnate fronds are upwards of a foot in length, and are very bright green in colour. Enormous numbers of this species are annually sent to Covent

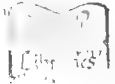
Garden Market by some growers, and the species is one of the ferns most largely used in general decorative work during the London season. Large showy plants are readily grown, even with comparatively limited pot-room, and if simply attended to in respect to watering, the fronds retain their bright green hue for a long time even in the gas-laden atmosphere of London drawing-rooms. A variegated form of this *P. Cretica*, var. *albo-lineata*, though hardly so useful as the green-leaved type, is a handsome evergreen kind, with a broad band of white running up the centre of each pinna; this was introduced to Kew many years ago from Java, and was figured in the *Botanical Magazine*—5,194. It has, however, been collected in several other widely-separated countries. *P. flabellata* is a near ally of the species first named under the heading of green-house ferns, viz., *P. arguta*, perhaps the best character by which to distinguish it from that being the longer and narrower sori of *P. flabellata*. It is found in Cape Colony, and northward to Mauritius, Abyssinia, and Fernando Po. *P. longifolia*, an inhabitant of tropical and warm temperate regions all over the world, is the representative of a very small section in which the lower pinnae are linear and undivided. It is a well-known evergreen species, of the easiest cultivation, reproducing itself freely by spores either in the stove or green-house, wherever it can find a surface more or less constantly moist enough. In the rockery, under glass, or upon moist stonework, &c., it makes a very pretty object with its dark green fronds one to two feet in length; these remain fresh for a long time in water when cut. Although somewhat common, the species altogether is a very useful one, and ought not to be omitted from any fern collection. *P. scaberula* was accidentally introduced into this country many years ago, a number of young plants appearing amongst the soil in which a case of plants from New Zealand (of which country the species is a native) had been packed. As stated at the commencement of these notes, *P. scaberula* is a near ally of our common Bracken. Like that plant, it produces its elegantly-cut fronds from creeping rhizomes. It is one of the most distinct and handsome of cool-house ferns, and should find a place even in the most select collection of green-house plants. Few ferns make more elegant objects for baskets than this, and the fronds last a long time in water after being cut. One of the commonest of cultivated ferns, *P. serrulata*, a native of China and Japan, is so well known that a description is unnecessary. None of its allies have been more profoundly modified by cultivation than this deservedly popular species. It has been raised in such quantities from slightly varying forms, that now any number of varieties can

often be selected from a single crop of spores. Some of the more remarkable of these have received distinctive names, and are in many respects preferable for general decorative effect to the ordinary and widely-grown type. Amongst these may be especially mentioned *maxima*, *angustata*, *cristata*, *Leyi*,

general aspect; it is, however, a much larger plant, with a conspicuously-winged rachis, and several compound pinnæ. When planted out in the open border of the cool conservatory, it makes a fine specimen, and requires no attention beyond a good supply of moisture to the roots during the growing



PTERIS SERRULATA CRISTATA.



and *polydactyla*. *P. straminea*, a comparatively recent introduction of Chilian origin, is a very beautiful species, with moderately firm naked fronds of an intense bright green colour. Perhaps it is better known under its garden name of *P. crispata*, a descriptive title which alludes to the wavy or crisped margins of the pinnatifid pinnæ. *P. tremula*, a native of Australia, Tasmania, and New Zealand, has bright green fronds, sometimes as much as five feet long, the bright, chestnut-brown, polished stipes being a foot or more in length. Grown in pots, however, it rarely attains the dimensions just given.

P. umbrosa somewhat resembles *P. Cretica* in

season. In a wild state, it is found in tropical and temperate Australia.

HARDY KINDS.

Perhaps the only *Pteris* which can fairly claim to be considered absolutely hardy in this country is our native *P. aquilina*, which is found all round the world, both within the Tropics and in the North and South Temperate Zones. In Lapland it just passes within the Arctic Circle, ascending in the Highlands of Scotland to 2,000 feet, in the Cameroon Mountains to 7,000 feet, in Abyssinia to 8,000 or 9,000 feet, and in the Himalayas to about 8,000 feet above sea-level. In the Andes, Dr. Spruce has seen

it about fourteen feet high, and even amongst thick underwood in copses in this country we have seen it attain dimensions not much less. Undoubtedly this species—probably because it is so common—is somewhat neglected by gardeners. Under suitable conditions, and with proper restrictions, it makes a very handsome garden plant. As a pot plant in a small state—and no fern is more readily raised from spores—we have seen it used with great success for “furnishing.”

The New Zealand *P. scaberula* is also hardy in many places in this country, the only attention it requires in the out-door fernery being a layer of dry leaves over its slender rhizomes during the winter months. For several years, too, in anything but a very favoured locality, we knew of a fine plant of *P. umbrosa*, which flourished in an open fernery with no care whatever. The two successive severe winters which caused such widespread loss amongst half-hardy and even hardy trees and plants generally some few years ago, proved, however, too much for this stranger from the Southern Hemisphere.

Cultivation.—Most of the species of *Pteris* mentioned in the foregoing pages require no great skill in order to manage them successfully. The stronger-growing kinds thrive in a mixture of loam, leaf-mould, and sand; the more delicate ones do better in peat and sand. All require a goodly supply of water to the roots during the growing season, and although not very averse to overhead wetting, it is perhaps better to abstain from syringing except on the afternoons of bright hot summer days. A good many are by no means particular as to shading, and will succeed with no more attention in this respect than is found necessary for ordinary stove or greenhouse plants grown under glass. Periodical waterings with weak liquid manure (that obtained from cow-dung being perhaps the safest and best) are highly beneficial, particularly to the stronger-growing kinds. The method recommended for raising spores of *Adiantum* does admirably for all the species of *Pteris*, and scarcely more than six or eight months are needed to obtain a good stock of thoroughly serviceable plants of such as *P. Cretica*, *P. serrulata*, &c. *P. tricolor* dislikes water on its beautifully-coloured fronds, and this should properly—in order to develop the brilliant hues of the fronds to their fullest extent—be grown under a bell-glass in a light open position. Not a few ferns suffer from the prevalent idea that light is to be guarded against; during the dull winter months, particularly in sunless weather, most ferns can scarcely have too much light, and these remarks fully apply to the genus now under consideration.

THE FLOWER GARDEN:

BY WILLIAM WILDSMITH.

KEEPING AND GENERAL CULTURE.

TO some—perhaps to most people—perfection of keeping in a garden may appear to be simply a matter of pounds, shillings, and pence. But it is not so. Ample labour or assistance certainly goes a long way in the direction of the attainment, but this must be supplemented by a determination that every job shall be done at the right time, and in such an effective manner as to last for the longest periods. The pulling out of seeding weeds only, sweeping up the thickest rubbish, clearing out the worst corners, and such-like slipshod ways of working, however ample the labour, will never result in neatness or good keeping. Personal appreciativeness of all that is orderly and neat, as well as thoroughness in the practical performance of the work, alone can insure that high degree of keep that makes “a thing of beauty (the garden) a joy for ever.”

Neatness.—Lest it may be thought that undue prominence is being given to this subject of neatness, let us regard the keep of an ordinary flower-bed planted after the simplest bedding-out pattern. If the bad flowers be kept constantly picked off, decaying leaves the same, and a peg inserted here and there to fill up gaps, and the edging of grass round it be regularly trimmed, it may always be viewed with satisfaction; and, into the bargain, a constant succession of flower is a greater certainty, simply because there is no waste of energy by the plants on seed-production. Apply these remarks to the flower-beds as a whole, and it will be seen what real neatness is, and what it means or conduces to in plants, viz., to greater floriferousness, robustness, and lasting properties.

Then as to neatness in other departments of the garden—walks, for instance. Nothing so readily tells tales of general slovenliness as weedy, neglected walks; and the opposite we have invariably found to hold good, viz., that clean, well-kept walks are, as a rule, a true index to the general good management of all other departments of a garden. Here it may be remarked that thoughtlessness, rather than intended negligence, must have at least part of the credit for much lack of neatness. The edgings of grass verges are left too long uncut, consequently the Grasses, Clovers, Plantains, and other weeds seed, and as a matter of course spring up in the walks; all of which trouble is preventible by timely attention to trimming of edgings. One hour of such work would in many instances save days of labour in walk-weeding.

Lawn and Shrubberies.—As to neatness in respect of lawn and shrubberies, the latter are too frequently left to take care of themselves; but it is a mistaken policy, not only on the ground of appearance, but on that of the well-doing of the shrubs. Thistles, Nettles, Couch, and other rampant-growing weeds, are not the best associates for shrubs that are required to do their duty towards beautifying a garden, and ought not to be neglected, when a few hours' work with the hoe, in dry weather, at once insures neatness and the more kindly growth of shrubs. The keeping of a lawn in good order has, by the introduction of such excellent mowers, been reduced to such a minimum of trouble that there can be no valid reason for neglect of this branch of garden work. Perhaps the operation of mowing is, in a few cases, carried to an extreme, both as to extent of plot that is kept mown and the frequency with which it is done: but these are solely matters of taste, that may safely be left in the hands of those most nearly concerned. But at any rate there should always be a determination to mow with sufficient frequency as to at one and the same time insure neatness and prevent seeding of the grasses.

Keep of Flower-beds.—Incidentally we have alluded to the keep of flower-beds, but it may be well to enter into details of requirements to obtain the best effects. The various kinds of soil that suit certain plants were mentioned in former chapters, so that it is not necessary to again refer to that; but planting out, being an operation to be done not only well but neatly, may claim a place in the category of keep. Plants cannot thrive as they ought unless they are transferred to the beds carefully, that is, in a proper state as to moisture—rather wet than dry—and are well pressed, not pounded, and surrounded with soil by using one's hand instead of trowel or dibber—of course, for filling in only. This done, the next important operation is

Mulching—that is, covering the surface of the beds with some kind of material which reduces the necessity of watering to the minimum point, and prevents the soil cracking or baking on the surface, thus checking the growth of the plants. The neatest material for mulching flower-beds is cocoa-fibre refuse, and being procurable at a very cheap rate, those who can spare the time to mulch should procure this material. Horse-droppings, spent Mushroom-beds, and other manures are all very well to use as mulchings to shrubs and trees, but for flower-beds the manure has such an appearance of untidiness, and the birds frequently play such havoc with it, that it ought never to be used. Of course, many kinds of plants do well without mulching, but

they always do better with it; and what is more, considering our short summer season, they fill up their allotted space in a shorter time.

Watering.—As before observed, this is not so frequently required when the beds are surfaced with cocoa-fibre as soon as planted; but, when it is done, it ought to be effectively so; a real soaking once a week is of far greater service to the plants than daily sprinklings, which unfortunately is the prevalent plan. A syringing over in the evening after hot sunshine of such tender bedding plants as *Alternantheras* and *Coleus*, and such hardier kinds as *Fuchsias* and *Calceolarias*, is certainly beneficial, particularly in keeping down thrips and spiders, but such syringings should never be allowed to interfere with heavy waterings to the same kind of plant, otherwise the syringings will prove of little account.

There is another phase of watering that should be mentioned, and it is this: during long spells of drought, supplies sometimes fail, or at any rate run very short. Now, when an occurrence of this nature seems imminent, watering should be wholly discontinued rather than the beds should have a meagre supply, which has the undesirable effect of drawing the roots to the surface; which roots, the first scorching day, meet with dire destruction, and the plants are checked in growth. On the other hand, had the plants been left to take care of themselves, they would naturally have gone deeper in search of moisture, and have been out of harm's way as regards scorching by sunshine; and though, under these circumstances, the growth of the plants would not be so rapid as if abundant supplies of water could be given, it would at any rate be of the best description—that is, hard and floriferous—and they would do as well as the case admits of.

Pegging, Tying, and Pinching.—These three items of keep may be classed under the same head, seeing that virtually they each have the same object, namely, that of insuring the plants presenting the best possible appearance. Pegging is essentially necessary in the earlier stages of growth for nearly all descriptions of plants used in carpet beds; and if this is not needed pinching or stopping is. The great charm of such beds is keeping them *true to design* by pegging or pinching. Without that labour, they are far more objectionable than are the masses of *Pelargoniums* so common in some gardens; but this labour given, no other description of bedding-out excels it for effectiveness in *all weathers*. Tying is imperatively needed not only in bedding-out for standard or dot plants, and for sub-tropicals, but for most of the hardy flowers in the mixed borders. For the former no word as to

the manner of tying up is requisite, except it be to say that the stakes should not be visible, or if they are, not conspicuously so, and in tying sufficient space should be left for the swelling of the stems—a remark that is very necessary in regard to Ricinus, Castor Oils, Tobacco, Wigandias, and other rapid growers. The tying up of herbaceous plants is usually of the worst possible description; some one has well described it as “Birch-broom-like.” One stick, and one tie, to a large mass of Delphiniums, growing some six feet high, is not a likely object to win over an opponent of *mixed* flower gardening; but happily there is a better way of supplying supports. As a rule, one stake is ample for a large plant, however spreading it may be; for if the stake be put in the centre of the plant, and the string or matting be secured to the stake, and instead of one tie round the entire plant, the tying is divided into *three* or more equal parts of the plant, all stiffness will be avoided, and the plants will present a natural appearance. The stakes in all cases when possible should be quite hidden from view.

The constant removal of seeding and decayed flowers, weeding when needed, the trimming up of Box and other edgings at the right time, complete the round of operations that is demanded of all who aim at the highest keeping of the flower garden.

DECORATIVE USE OF FLOWERS.

BY JAMES HUDSON.

DINNER AND OTHER TABLE DECORATION.

THE decoration of the dinner-table, or of the dining-room, for breakfasts, dinners, and suppers, has of late years made most rapid and progressive steps, both in the quantity of material utilised and in the systems of arrangement.

The “Marsh” Stand.—It requires no great stretch of memory to look back some twenty years or more, when what for many years since have gone under the name of the “Marsh” stands were first introduced to public notice. These were a new departure from the massive and cumbrous epergues of that day, without which hardly any large dinner party was considered complete. The “Marsh” stands, or glass vases, had this term applied to them from an exhibit of decorations by a family of that name, and were much sought after for a considerable period afterwards. They have a beautiful effect when arranged in a light manner with suitable subjects, and since their introduction to public notice, great additions have been made to the glass department of flower-vases. There is now no lack either in size

or quality, and a handsome glass vase may be purchased for a few shillings, wherewith many, in ever so humble a way, may beautify and render more cheerful their dinner-tables and living-rooms. The “Marsh” stands consist of a glass dish as a base, with a slender glass stem, from a foot to fifteen inches in length, on the top of which rests a smaller glass dish, and from the centre of this a cornucopia, or trumpet-shaped vase. The advantage of a properly-made stand of this kind is the facility with which it can be taken to pieces when not required for use, and then be stowed away in safety.

The bases of these stands are easily arranged, and readily adapted to almost any kind of flowers. The stems look well with a climber entwined around them, when using all but Lilies and kindred subjects; but with these latter we decidedly prefer the Ornamental Grasses and Sedges, as being more appropriate. The upper dish of the two is the one in which mistakes are most often made in arrangement. The flowers in this dish should be kept as *low* as possible, for them to be seen by the guests surrounding the table, not mounded up around the stem of the cornucopia, as is frequently done. In this latter manner an obstruction is caused in the line of sight, which, by using flowers with short stems, is avoided in a great measure. A few pendent flowers look exceedingly pretty suspended around the edges of this dish.

The cornucopia should be filled with light flowers, on slender stems. Those with spike-like form, as in the well-known *Astilbe japonica* (generally grown under the name of *Spiraea japonica*), are the best. Ornamental Grasses are very light and pretty for the same purpose. When these are used, we generally prefer to arrange a sufficient quantity in the first instance, when a few flowers can be dotted among them, such as the Rhodanthes (pink and white). A few fronds of Maiden-hair Fern, small and light, should fringe the edge of this top glass, as also the central one, only with rather larger examples. Of the less-known Adiantums, *A. amabile* is very pretty for [the top glass, and *A. concinnum* for the central dish. Both flowers and foliage should graduate from the base to the top, *i.e.*, the largest and boldest of each should be used at the bottom, and smaller forms upwards. In colours also it is well to shade off from the bottom to the top. Take any blue flowers, for instance; the darker shades should be placed at the base, and lighter ones upwards to the top.

Many of the smaller forms of Orchids, such as the Oncidiums of the lesser section, and the Odontoglossums with small spikes, are very well displayed in these vases. Individual flowers of the Moth Orchid (*Phalænopsis*) look beautiful when suspended from the central dish. The slender and delicate



Fig. 3.—A GLASS STAND OR VASE WITH SINGLE CORNUCOPIA.

catkin-like spikes of *Platycodon filiformis* are most pleasing in union with these, or interspersed with the *Lapagerias* (*rosea* and *alba*). Spikes of the *Calanthes*,

being bolder, can be better displayed at the base, where the blossoms of the handsome larger types of *Cattleya* are best placed. The *Odontoglossums* also,

which develop a somewhat large spike, are best seen in the same position.

Other Glass Vases.—Another form of vase, a modification of the "Marsh" type, and which we think is preferable to that for several reasons, is one with a base similar to the "Marsh," but a trifle smaller. From the centre of this rises a slender stem, expanding into a larger-sized cornucopia than in the case of the "Marsh." This is, we think, one of the best forms of glass vases for the dinner-table that have yet been brought out. The long slender stem of the cornucopia is no obstruction to the line of sight, and the arrangement of the base is all the better displayed by the omission of the upper dish. Flowers of larger forms can be more advantageously arranged in such as this, whilst spikes of small size from the *Gladiolus* and the Iridæceous plants are just adapted for such a form of vase. The large handsome blossoms of the Cactus (*Cereus speciosissimus*) and the White Water Lily, with hosts of other flowers of bold outline, are effectively arranged in the base, whilst there is room for a display of appropriate foliage interspersed amongst them. When climbers are used for the stems, they also will be seen to better advantage with the greater length of glass to be clothed.

Long drooping spikes of slender outline will look well around the edge of the trumpet—such, for instance, as *Thyrsacanthus rutilans*, *Plumbago rosea*, *Chorozeia Chandleri*, and the pendulous forms of the tuberous-rooted Begonias. The individual blossoms of the smaller kinds of Passion-flowers (*Passiflora*) are extremely pretty. *P. kermesina* of the stove species, and *P. cœrulea* among the harder kinds, are two of the best, and will both have good effect when used in a similar manner to the other flowers just mentioned. A small spike of *Humea elegans* or *Spiræa Aruncus* will look well in the trumpet, with a few colours to contrast. The top arrangement can well afford to be carried to a fairly good height, to prevent any dumpy appearance when finished.

Fig. 3 is drawn from such a vase of flowers specially arranged to illustrate this article. The base thereof is arranged with a mixed assortment of flowers, most of which are readily discernible in the engraving. Of exotic flowers there are *Eucharis amazonica*, *Anthurium Scherzerianum*, and *Dendrobium nobile*; of bulbous plants, the Poet's Narcissus, Red Tulips (Vermilion Brilliant), Campanelle Jonquils, Lilies of the Valley, and *Anemone fulgens*. The foliage used in conjunction with the flowers is, of Ferns, *Adiantum cardiochlena*, *A. macrophyllum*, and *A. cuneatum*; the carpeting or undergrowth consisting of *Panicum variegatum*. The cornucopia is filled with flowers of *Begonia*

manicata and *B. nitida odorata*, with *Thyrsacanthus rutilans* and *Deutzia gracilis* as pendants; and, of foliage, a long trailing growth of *Passiflora thalictrifolia*, with fronds of *Adiantum cuneatum*, and one or two medium-sized Begonia-leaves.

There are also trumpet-shaped glass vases without any means of arranging flowers at the base. With such it is easy to contrive a temporary receptacle for these ends by placing the vase in an ordinary dinner-plate, and firmly fixing it there with some string. We have often done this, and it answers the purpose as well as a properly constructed vase. When used without the bottom arrangement, these trumpet vases form an excellent medium whereon to arrange extra long shoots of climbing plants—such, for instance, as *Cissus discolor*—allowing the shoots to trail on the cloth. *Asparagus plumosus nanus*, again, would be extremely pretty in the same position, whilst in the trumpet itself a shoot or two of the narrow-leaved Crotons of pendulous growth would be well placed. The tufts of the *Cyperus alternifolius*, with a good length of stem, could also be used in unison with a few flowers of spike-like formation or of drooping habit, such as the slender spikes of *Chelone barbata*, and the Pentstemons, or a small panicle of one of the smaller forms of Liliium during the summer months. In the early spring the slender spikes of the Roman Hyacinth, with the many and varied forms of Narcissus, to be followed by Solomon's Seal, of which the smallest growths are preferable, will each and all be found adapted for such an arrangement.

The essential point in all dinner-table decorations of this description is to secure for the trumpet arrangement as light an appearance as possible. This is very frequently overlooked by decorators in filling their vases. These would have a far prettier effect in many cases if about two-thirds of the flowers were never used at all. We have often seen the trumpets of such designs out of all proportion to the rest of the stand, looking somewhat like a huge bouquet placed on the top. The great secret with these and all other decorations is, to know when to leave off, and without this gift the utmost effect cannot be extracted from any given amount of material.

Of glass vases that ought to be avoided in dinner-table decorations, it is necessary to say at least a few words. It is a mistaken idea to think that, because a flower-vase is a flower-vase, it is therefore adapted for the dinner-table. Such is by no means the case. Many designs are met with which are very pretty of themselves, and when filled with flowers also look well, but are not suitable for table decorations by reason of the density of appearance they present, thereby causing an obstruction of view across the table to a most considerable extent. Such

a design, if ever used, should only be placed as a single arrangement on the centre of the table, but is far more appropriate in the drawing-room. All obstruction in the line of sight when seated at the table should be reduced to a minimum; such designs, therefore, as require filling at the height of the eye are not well suited for the purpose. Not unfrequently glass vases are to be seen with three and even six cornucopias branching from the base of the stem. These are certainly not suited for a dinner-table, for the reasons just given. Having once two such vases to fill, we removed the six cornucopias which clustered around the central one. This left us with the exact design we have just recommended, viz., a base, with one tall central trumpet arising out of the same. It was, in fact, this occurrence that first led us into this design, which we were one of the first to adopt; since, then, however, it has come into more prominent notice.

Another pattern of glass stand not suited for the dinner-table is that which has little ornamental glass baskets suspended in lieu of the side cornucopias just mentioned; neither is any pattern advisable that stands on a foot, and thus elevates the vase to any considerable extent from off the cloth.

It is well also to observe that glass vases are at least as well suited for any kind of decoration when of *plain workmanship*. Highly-finished vases, with beautifully-figured designs thereon, are not in any sense preferable to their more modest and less pretentious rivals; in fact, we prefer a plain pattern at all times, bearing in mind that the flowers are the ornaments to the vases, not the vases to the flowers. Coloured glass is now much in use, in various shades and tints; but we fail to see any real advantage in these new departures; either the foliage or the flowers will often clash with the colour of the glass, causing unnecessary restriction in the selection of material. Plain clear glass, or that of a smoky or milky-white tint, is, in our opinion, the best in all cases.

Glass troughs of varied patterns are likewise to be met with, but they afford very little scope for artistic arrangement, or diversity in the method of filling the same. In such the flowers have to be used with needlessly short stems, which often destroys their natural beauty to a certain extent. Plateaux of looking-glass are employed as a representation of water surface; but who ever saw a lake or pond standing on legs? The place for such designs is certainly on the ground, and nowhere else.

Specimen Glasses.—Great improvements have been made of late years in the patterns of specimen glasses, and these are now to be seen in numerous pretty shapes and sizes. We would prefer those with

a solid glass base, as affording greater security against being toppled over, and likewise of a medium height, so that the flowers placed in them are fairly elevated from the table for them to be seen to the best advantage. The small globe-like glasses which are now in frequent use on dinner-tables, are only adapted for flowers with short footstalks. The blossoms of the Camellia are very well suited to this pattern, and small sprays of the Indian Azalea will also look well in them. This shape of glass, we find, is rather difficult to handle when the necessary amount of foliage is used to display the flowers; they have one merit, however, in not being easily upset. A good selection of specimen glasses affords the decorator a means of utilising the flowers at command in times of scarcity with the utmost possible effect; they also help to fill up what might possibly be blank spaces were it not for their presence. Good examples only of flowers should be used to fill them when there is sufficient choice, and the least semblance of overcrowding should never be allowed. Single individual flowers of good size are ample; thus of the Roses one blossom is sufficient, with its own foliage and buds attached. One blossom of *Eucharis amazonica*, with a small spray of Scarlet Bouvardia as a contrast, is quite enough. Three flowers of the Gloxinias make a pretty filling for a specimen glass of fair size, and are among the best-suited flowers that can be had for such purposes. With a frond or two of *Davallia bullata*, again, take one bloom of the Dipladenias or of the Allamandas, and you have quite sufficient. These handsome flowers need no other accompaniment than the Fern. The spikes of *Astilbe japonica* are very useful also in these glasses, with one flower of another shade; such, for instance, as one spathe of the Flamingo Plant (*Anthurium Scherzerianum*). Many of the Orchids are just adapted for such glasses; as, for example, the handsome blossoms of the Cattleyas and Lælias.

When a few finger-glasses can be spared, they can be turned to good account for Water Lilies; and the glorious blossoms of the Granadilla (*Passiflora quadrangularis*) also look well placed in the same, though they must of necessity be inverted from their natural hanging position to do this.

Baskets.—Very beautiful arrangements of flowers can be displayed in rustic baskets, and are very well suited for tables of but moderate size. The baskets should not be of more than average dimensions when required for the dinner-table. Suitable sizes, of oblong shape, with a slender handle, are about the best. We prefer those with the handle, as it affords a medium for entwining a climber around the same. These baskets are well

adapted for groups of Rose-blooms, with a climbing Rose around the handle, or a few sprays of the variegated Honeysuckle. The Chrysanthemums, too, will be easily adapted to these baskets, taking a small form of Ivy, with bronzy-tinted foliage, in this case, for the handle. During the spring-time the Tulips will give another change, working into use for the handle in this case a small spike or two of Solomon's Seal, or the Daffodils with their own foliage.

Of baskets without handles attached to them, the round form will be as good as any; these afford us the means of keeping the arrangements as low as possible. By the use of Ornamental Grasses or Fern-fronds in a free manner, the otherwise flat appearance will be in a measure reduced. This kind of basket would be very pretty if filled with Snowdrops and Crocuses in the early spring, or with Primroses and Polyanthus a little later on. Those lovers of floral decorations who reside in the pure air of the country have a great advantage over such as dwell in the vicinity of large towns and cities, in the far greater choice of material at their command from amongst our British Wild Flowers and Mosses. Such as these will be found to be appropriate subjects for rustic baskets, as a change from the well-known plants of our gardens and hot-houses. For all baskets we would advise a tin receptacle to be fitted to them, for the better preservation of the flowers placed therein, and to avoid all needless risk of injury to the cloth.

Epergnes.—In the arrangement of flowers in epergnes of silver or other metal, there is a wide field for improvement. Many epergnes are unnecessarily heavy and cumbrous in make and outline; with such it requires an exercise of judgment in the selection of material wherewith to fill them. With such as are of good height, an excellent opportunity is afforded to make good use of fronds of *Polypodium subauriculatum*, sprays of *Asparagus plumosus*, and long trailing shoots of *Ficus repens*, each of which may be allowed to droop down, nearly or quite touching the table-cloth. Moderate use only should be made of these subjects, so that each individual frond or shoot is seen to advantage; they should not be allowed to spread out too far and interfere with other surroundings. Resting on this foliage some sprays of flowers of pendulous habit could be well displayed. Several Orchids that yield long drooping racemes of their choice flowers are well adapted for this kind of decoration. Some of the best are *Dendrobium thyrsiflorum*, *D. densiflorum*, *D. Wardianum*, and *D. chrysanthum*. *Odontoglossum Alexandræ* and the Oncidiums, with long arching spikes, are also extremely pretty for the same use. *Phalænopsis Schilleriana* could not well be surpassed, whilst many of the *Ærides* would be most fit subjects.

Of the stove plants when in season the following could be used with good effect:—*Thyrsacanthus rutilans*, with its slender pendants; *Euphorbia jacquinæflora*, with its showy sprays; and *Hexacentris lutea*, with its distinct panicles, and many other things of similar habit. The long shoots of *Deutzia gracilis*, when forced and expanding their flowers, can be worked in with good effect, *Dielytra spectabilis* being an excellent contrast thereto. Of plants from the open border there are *Spiræa Lindleyana*, and *S. ariæfolia*; the feathery sprays of these two shrubby species are very pretty for the purpose. In a somewhat large epergne the Clematis would afford us shoots and flowers that could be effectively used. Other examples from many genera could be named, but these are sufficient to illustrate our method.

When flowers are used in this drooping manner around the glass dish or dishes of the epergne, it is not necessary to arrange nearly so many in the dish itself, and what are placed therein should be arranged in a light and easy style. All symptoms of formality of outline should be carefully avoided, and the flowers in the top of the dish should in a measure agree with those that are suspended therefrom, as Orchids with Orchids, stove and green-house flowers with stove and green-house flowers, and so on. It does not follow that this line need be strictly adhered to, but it will be a safe guide to follow out in a measure. Certain flowers are always a help in their season in almost any design; such, for instance, as the well-known *Astilbe japonica* and Lilies of the Valley. This style of filling epergnes will be found far more effective than the plan frequently adopted of concentrating the majority of the flowers in a compact mass on the dish itself, in which manner many of them cannot possibly be viewed to advantage. We have seen many epergnes which, when completed, have had twice as many flowers used over them as were really needed to produce a good display, the object apparently having been to obtain effect by quantity alone.

Use of Plants Alone.—In lieu of using either glass stands, baskets, or epergnes, we would sometimes advise the adoption of a distinct kind of decoration without any exterior aid, other than a few dinner-plates and saucers, in which all the arrangements can be easily made. This system might fairly be called *au naturel*, nothing but plants, flowers, and foliage being observable in a decoration carried out entirely in this way. A selection of the most graceful palms is necessary; the well-known *Cocos Weddelliana*, *Euterpe edulis*, *Areca lutescens* (more correctly *Chrysalidocarpus lutescens*), and *Chamædorea graminifolia* are all very suitable for the purpose. When grown for this special use it is necessary to

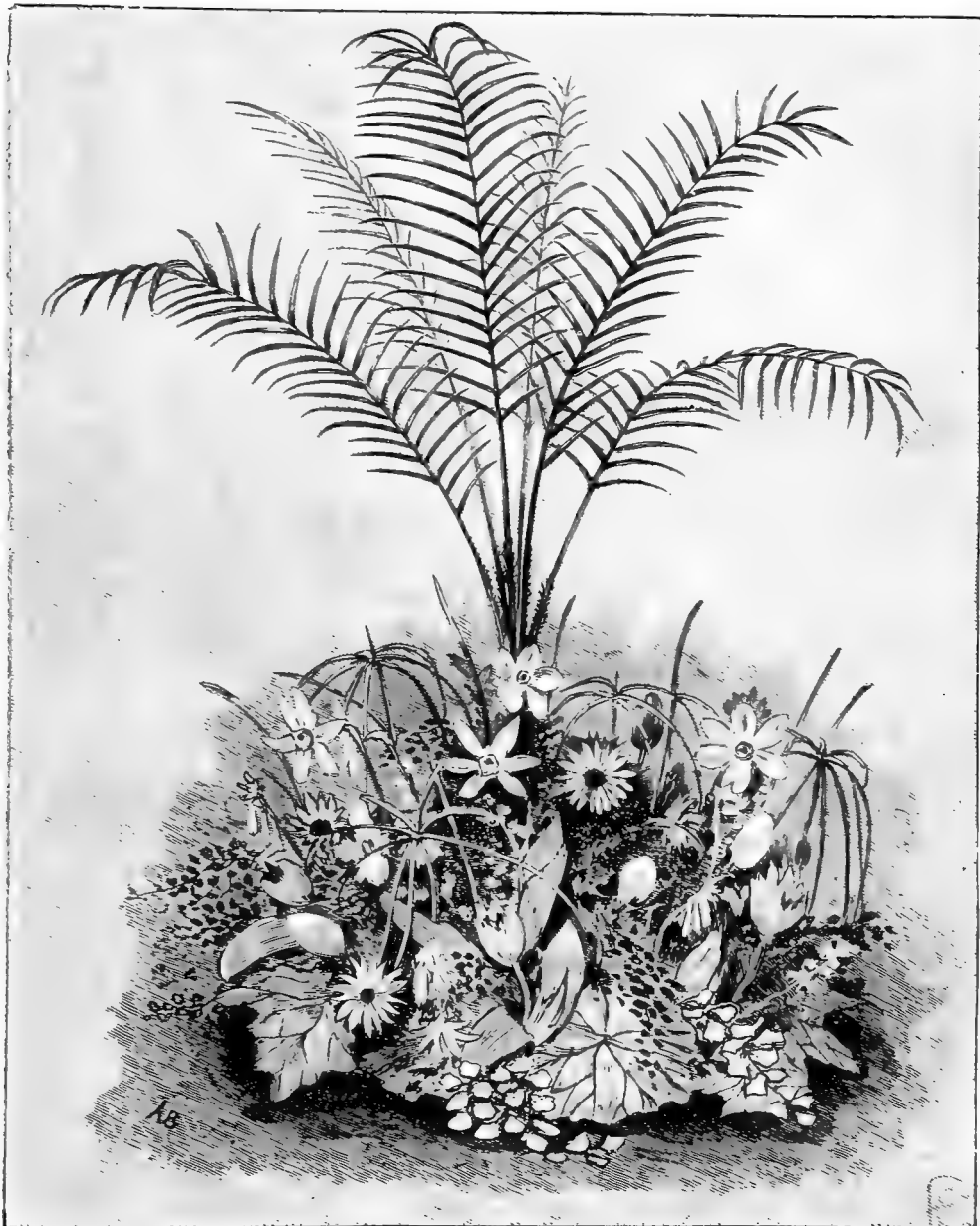


Fig. 4.—COCOS WEDDELLIANA, WITH FLOWERS AND FOLIAGE AT BASE.

obtain a well-developed plant in as small a pot as is possible, this being more easily accomplished than many imagine. It is surprising what a beautiful

object either of these Palms (and others too) will make, even when in a three-inch pot, under good cultivation. The Cocos named is, perhaps, the most

popular of any; certainly it is one of the lightest and most elegant of all Palms when in a small state.

As an example, suppose we take a well-balanced plant of this Cocos in a three or four-inch pot, which will be large enough, unless required as a centre-piece to a very large table; place this plant, pot and all, on a dinner or soup plate, and mound up around the pot with wet sand nearly to the rim; then cover this surface with either green Moss or *Selaginella denticulata*, otherwise called *S. Kraussiana*. The variegated form of this Selaginella (*S. K. aurea*) is most pleasing during the spring-time; later on its tips lose in a measure their colour. On this carpeting we may proceed to arrange a few Fern-fronds around the base as a fringe to rest on the cloth; or as a variety, instead of Fern, the foliage of *Begonia metallica* and a silvery form with it may be used. With the addition of a few Maiden-hair fronds we may then dot in a moderate quantity of flowers as a finish, and to impart colour. For this purpose a few blooms of *Eucharis* are useful; the Indian Azaleas, as well as the "Ghent" and "mollis" types, too, are very pretty when in season. Some Gloxinia blooms, or *Vallota purpurea*, each in their season, have a good effect with the *Eucharis*. Roses also will look exceedingly well in such a decoration as this, allowing the groundwork of Selaginella to be seen between each blossom. Single flowers of the many hardy Lilies and their allies are also effective; the single forms of Dahlias likewise are suitable, having the advantage of a fairly long stem, which enables the flower to be kept well above the Moss. Small flowers, such as the Rhodanthes, the Blue Corn Flower, and others, are not striking enough in themselves without the aid of bolder kinds, but as an intermixture they are of good service; so also are the Forget-me-nots and *Gypsophila elegans* when they are to be had. Camellias are also excellent for this kind of design, not omitting their own handsome foliage. If flowers are scarce, berries could be chosen in lieu thereof, or if the Selaginella be of the best, both may be dispensed with as a change. For this method the golden-tipped variety would make an excellent covering, with a few leaves of *Begonia metallica* as a fringing to the same, the contrast between these two subjects being most effective.

Fig. 4 is drawn from such a design put together to illustrate this article. In this arrangement the flowers are selected from bulbous and tuberous-rooted plants entirely, all of them having therefore a certain amount of affinity. They consist of the Poet's Narcissus, Campanelle Jonquils, red and yellow Tulips, Lilies of the Valley, *Lachenalia tricolor*, and *Anemone fulgens*. Besides making use of the foliage of the foregoing flowers,

some tufts of *Cyperus alternifolius* (the exotic Sedge-grass) and *Adiantum Capillus-veneris* (the British Maiden-hair Fern), with a few Begonia-leaves around the base, and a carpeting over the sand (in which the pot of the plant is plunged) of Selaginella or Club Moss are also used. This might be termed a *vernal* or *spring* arrangement. If this design is required in a larger form as a centre-piece to a fair-sized table, the Palm may be from about three feet to three feet six inches in height, and even taller, if the table is of extra width and length. We have used them three feet or more in height with good effect, entwining a climber around the stem, or using an extra long spike of an Orchid, as *Oncidium sphacelatum*, instead. Nothing exceeding a six-inch pot should be allowed for the largest plants in this kind of work. We avoid even this size as far as we can, for the simple object of keeping the base as low as possible, to avoid any heaviness in appearance. Many who attempt these designs fail in this important point at the commencement of their work, it being necessary to keep the mounding of Moss or Selaginella as dwarf as can be, so that it is in proportion to the width at the base—say, for instance, if the height be five inches or thereabouts, the width should be about double, and with the addition of foliage to rest on the cloth another eight inches will have to be added to the diameter, which will not be any too much.

As a centre-piece to a table capable of dining from twenty to twenty-four persons, an oval dish, about the middle size, is better than a plate, as it affords the means of extending the base towards the ends of the table by keeping the dish lengthwise. The pot of the plant that is used must not exceed the six-inch diameter, even with this dish in lieu of a plate; room will, however, be found for two or three tiny Ferns, *Pandanus Veitchii*, when well developed in a small state, or the small *Caladium argyrites*. Plants of the Chinese Primula, when flowered in three-inch pots, can also be used, but taking them out of their pots for the occasion. Take, for instance, an arrangement during the spring-time, having one of the afore-named Palms as a centre, with a surrounding of two small Pandanus, a few tiny Ferns, and three or four Primulas, all from the smallest pots. When these have been fixed in the sand, the intervening space can be covered with Moss, and some few cut flowers and foliage added to complete the arrangement, such as a few blooms of Tulips like Vermilion Brilliant, Chrysolora, or the distinct self-coloured Duc van Thols; two shades of colour being sufficient, and five or six blossoms quite enough to use. A few spikes of Lilies of the Valley or flowers of the Daffodils would be a suitable addition.

From the stove, in place of these that we have

quoted, the following flowers could with advantage be displayed. Of the *Eucharis* a few blossoms, with three or four spathes of the *Anthurium Scherzerianum*, or spikes of *Centropogon Lucianus*. The upright forms of *Gloxinia* are also very suitable, and should the arrangement be for use in the day-time, the beautiful blue of *Eranthemum pulchellum* would be a valuable addition. Around the edge of the dish, a few pieces of the fronds of *Adiantum cardiochloana* would be a useful help, with here and there a trailing shoot of *Asparagus plumosus nanus*, and a few leaves now and again of one or two sorts of the broad-leaved *Crotons* or the fine-foliaged *Begonias*, of medium size only.

Small Plants.—With respect to the smaller sizes of plants, for placing in tea-saucers and the like, these are of great value for placing down the sides of the table, when this is of extra length. These will best arrange in pairs or fours of each kind. *Pandanus Veitchii* again comes to the front as one of the best of its kind, and when well-coloured, in a very small state, is not easily surpassed on the dinner-table. Small Ferns and Palms in pots of about two and a half inches diameter, or not exceeding three inches, will also look well. In this small state, one of the prettiest of Ferns that can be used is *Asplenium cicutarium*, which might be more extensively cultivated; and among the Palms, *Geonoma gracilis*, *Hyophorbe Verschaffeltii*, and *Areca Herbertii* (*Acanthopanax crinitus*), with *Chamaedorea elegantissima*, may be added to the list of those kinds already given. With these small plants, the dressing around the pots must be kept as small and close as can be done in an ordinary tea-saucer. Fronds of *Davallia bullata*, or other small-growing Ferns, as *Maiden-hairs*, &c., should be used. If the Moss or other material to cover the sand is nice and fresh, it would be quite optional whether any flowers are used besides the Fern foliage just referred to; we have done it in both ways, and in either manner the effect has been pleasing. With the *Pandanus*, we have dotted in a few blossoms of *Ipomea Horsfallia*, the rich colour of which contrasted well with the green and white of the *Pandanus*. The lovely shade of colour in *Franciscea calycina major* would be an excellent change from the *Ipomea*. *Cyclamen* flowers, too, would be very pretty around the Palms, and from the herbaceous border the *Aquilegias* or *Columbines* of the improved types could be used with very good effect. The hardy species of *Primulas*, *Anemone fulgens*, and the *Chrysanthemum frutescens*, or *Paris Daisies*, would all work in for these little arrangements with other similar flowers at different periods of the year.

As a farther addition, instead of using any specimen glasses, take a few nice compact tufts of

Selaginella from three-inch pots, and cut away the lower half of the ball, after which place the same in any available receptacle, or on a thick piece of cardboard, if nothing else can be got; then on each of these one specimen flower could be dotted, as a *Rosebud* or *Camellia* for instance.

This description of a system of dinner-table decorations, without the aid of either costly epergnes, choice glass or china vases, or other accessories, will be sufficient to show that none of these supposed necessities need be relied upon entirely, or at all. Each of the systems can be combined with good effect, but, in our opinion, the flowers and foliage should be the central point of attraction, and costly exterior aid regarded as entirely superfluous.

General Arrangement.—Whatever method of arrangement may be decided upon for any given occasion, due consideration must be given to the other necessary adjuncts of a well-ordered table, so that everything when completed has no appearance of being overcrowded. The placing of the dessert must receive proper attention, and room be allowed for the same accordingly, within easy reach of the guests. Except for the top and bottom ends of the table, no dessert-dishes ought to be placed in a line with the central arrangements, in which position they would be difficult of access. For general purposes, glass dishes for the fruit are as useful, or even more so than those of china and other material. They have a light appearance when filled, not being as a matter of necessity so heavy in make as the china. Glass baskets are extremely pretty for small fruits, and when carefully filled with such, as *Figs*, *Strawberries*, and *Cherries*, they form a distinct and somewhat novel feature on the table.

A stand or design of flowers in the centre of the table would be sufficient when intended for from eight to twelve persons. After allowance has been made for the dish of fruit at each end, should there be too much space still left, if no lights have to be used, two pairs of small plants could be placed in a line with the centre, dressed around with Moss, &c., as previously explained. Four more dishes of fruit should at least be allowed for, being two on each side; any remaining space to be filled up could be done with either specimen glasses or dot plants, according to the size of the table. As this increases in length to seat from twelve to twenty or more persons, the two designs on each side of the centre-piece must be correspondingly increased in dimensions, to make them more prominent, but still retaining the central stand as the most conspicuous. More than three prominent groups are hardly ever necessary, even to seat twenty-four persons. If it is deemed requisite to have any addition through the

centre, two slender Palms, of well-proportioned outline, would be the best to choose, in order to avoid any density in appearance when looking from end to end. The dishes of fruit should also be increased in proportion to the table, but avoid placing two dishes to flank the centre-piece if possible, filling up any spare space as before. If the flowers be plentiful, some suitable selections may be placed on or against each napkin, such as Rosebuds, for instance.

For smaller tables either one stand or vase of light design would be ample, or a well-grown plant instead could be used as a centre-piece. We rather prefer the latter, leaving the flowers to be displayed in small specimen glasses. These dinner-table plants are all the better preserved in good condition if changed every day, or at least three times a week. We practise the "every-day" change, having a good reserve to choose from. Tables that seat from four to six persons are most pleasing in appearance, we always think, when of circular form.

Dessert.—With regard to the dessert, some few remarks are necessary in respect to the arrangement. The system of intermixing both fruit and flowers on the same dish has no good quality to recommend itself to our notice. Many kinds of fruit require most careful handling to preserve the bloom intact, as Grapes, for instance; these in the mixed-up way would most likely suffer. Perhaps also the kind of fruit most wanted could not be taken without disturbing some others. We much prefer keeping each kind on a separate dish, unless only a very limited quantity is desired. In laying Grapes on a dish, the best plan is to hold the dish up on its end in one hand, and then place the bunch against it, whenever it is of extra size. The bunch will thus take all its bearings at once, and friction between the berries will be diminished. The plan sometimes followed of cutting up the bunches into small pieces ought never to be allowed. With Pine-apples, if the fruit is likely to be consumed at once, it had better be broken up with a fork than cut with a knife; the juice being thus better retained in each piece. Very delicate handling is most requisite with Peaches, Nectarines, Strawberries, and Pears with clear skins.

For dishing up the dessert, no leaves surpass those of the Vine for general use. Small leaves of the Bay-tree look very well for Oranges, but on the whole Vine-leaves are the best when obtainable. These have no equal, as some kinds assume their beautiful tints with the ripening of the wood during the late summer and autumn. When any large quantity has to be supplied, it is the best plan to have a reserve Vine for that purpose in the open air, trained against a wall. The Esperione and Parsley-leaved Vines would thus be ornaments as

well as being useful. A few fronds of Maiden-hair Fern might be added here and there for special occasions, or small leaves of other plants with distinct coloration to those of the Vine. When all deciduous foliage has fallen, we can resort to the leaves of Berberis, Ivy, Aucuba, and the common Laurel, with the "Portugal" too. Except the first-named, all the other foliage had better be picked a day or two before wanted for use, in order to reduce the strong smell arising from them. The leaves of some deciduous trees could be kept for a long time after having fallen; those of the Scarlet Oak (*Quercus coccinea*) would be of considerable use in this way, if kept pressed out flat. To keep Vine-leaves fresh and free from curling, they should be laid between two plates or dishes, which is better than placing them in water.

General Design.—In the decorations of the dining-table it is much the better plan to carefully consider all arrangements beforehand, so that one can, as it were, see the completion in his mind's eye previous to the commencement, at least to a certain extent. The colours also must be chosen to suit the light, blue being allowed only to a limited amount in those designs to be viewed under artificial light. Two or three shades of the same colour should not be used in close association. Single flowers are in most cases preferable to double forms, and unless it be in circumstances of emergency we like to keep them apart. Take for an instance the flowers of the Eucharis, the Pancratium, the Vallota, the Agapanthus, the Amaryllis, the Liliium, the Cactus, the Azaleas, the Dipladenias, the Allamandas, the Passion Flowers, the single Dahlias, the single Anemones, the Iris, the Bouvardias, and Chinese Primulas (single), let alone the Orchidaceous plants and others that might be cited—there are no double flowers comparable to them for effective and artistic displays. Double flowers may look showy, but there is an amount of heaviness about most of them that cannot be effaced. Those who may not have practised the use of single flowers by themselves, could with advantage make a start in that direction, and compare the results for themselves.

We would also advocate the occasional employment of what may be termed *distinctive* arrangements. By this we mean the carrying out of a design with nearly, or quite, all the flowers being gathered from one genus, admitting only those that bear a resemblance. Thus, Roses by themselves; the Chrysanthemums the same; Bouvardias too, in distinct colours, make a striking arrangement; Gloxinias also, with a liberal mixture of Maiden-hair Fern; Begonias with their own handsome foliage, varying in shades from the pale green of

B. manicata to the lustrous metallic leaves of *B. metallica*, and from the silvery foliage of *B. Princess Charlotte* to the reddish-brown of *B. incarnata purpurescens*. In Begonias alone there is a wide field for exercising one's abilities in decoration. They are not the best of flowers for keeping fresh for any length of time, but this must not always be regarded as an essential property. We have made very effective groups with the leaves of *B. metallica*, and the panicles of bloom from *B. nitida odorata*, the pure white flowers being seen to advantage with the dark foliage. Take again the foliage of a silvery-leaved variety, and the flowers of a pink kind, either by itself or blend another colour with it, and you have a good display. The host of tuberous-rooted varieties yield an abundant choice in colour during the summer months. All Begonias will keep the better if arranged with long stems in water only.

As another example we will direct attention to what may be termed the "aesthetic" flowers now so much in request. Many of these are very distinct and effective; such, for instance, as *Rudbeckia Newmanni*, *Chrysanthemum frutescens*, or Paris Daisies (yellow and white), the single Pyrethrums, the Star-worts or Asters, of which *A. leucanthemum* is one of the best whites. *Harpalium rigidum*, similar to the Sunflowers, but of more convenient size, and the Gaillardias, are both useful in this class of decoration. The many shades of single Dahlias afford plenty of choice for such work. These and other similar subjects would be of close resemblance in character, yet harmonising well together by a judicious choice of colour.

Another system of arrangement, which is as effective as any we know, is obtained by selecting flowers from closely-allied families of plants; which we would designate "characteristic arrangements." Of such as this, no better example can be given than that to be had from the numerous Liliaceous plants of varied habit and colour, not necessarily resembling one another in any way, yet when brought into close unison with each other they are most strikingly effective. Take for instance the red, white, and blue of the Vallota, the Eucharis, and the Agapanthus, or the White Water Lily, with the German, Spanish, and English Iris. Take the same Water Lily again, with some small spikes of Gladiolus, or the Scarlet Turk's Cap Lily, and in either case you have an effective display, by adding suitable foliage, not forgetting the Sedges (*Carex sp.* and *Cyperus sp.*). *Schizostylis coccinea* in the late autumn is excellent in company with the Eucharis or with the slender spikes of the Roman Hyacinth. Lilies of the Valley with *Lachenalia tricolor* and *Astilbe japonica* are very pretty. The latter is in fact useful in all such

arrangements as we have just commented upon. The Forget-me-nots, too, are very suitable with Water Lilies, the summer-flowering varieties being in perfection at the same time, and to be found in catalogues under the name of *Myosotis palustris* and *M. azovica*. One spike with about two open blossoms and a bud ready to expand of *Lilium longiflorum* would be well placed in an upright and natural manner against the stem of a glass stand, not each flower cut off and laid flat, but used entire with a good length of stem. Around this, but lower, about three spathes of *Anthurium Scherzerianum*, and the same number of a blue Iris, with a few flowers of the White Water Lily at the base, would afford a good example of this style of decoration.

Some such system of arranging flowers is much to be preferred to what is most commonly seen carried out, under what we call indiscriminate arrangements. By this we mean the grouping together of a few pieces of this, that, and another kind of flower, that do not harmonise and blend with each other. It may be fairly termed the mixed-medley style of doing the work; the operator relying for effect, such as it is, on the greatest variety of form and colour that can be in any way got into one design. This is the more to be condemned when several stands have to be filled for placing in the same apartment, imparting a sameness or similarity that is wearisome to the eye. Even where one vase only of more than average size has to be filled, this collecting together in one incongruous or indefinite mass of many flowers, which have no affinity in any way, is still to be condemned. The same rule holds good in all arrangements throughout the house in this respect. We have noticed more than once that the decorations have looked the best when the supply has been *short* wherewith to do the work. The temptation to use more flowers than are really necessary is not so easily resisted when any considerable quantity is at hand. It is also a mistake to spend too much time in dressing the stands or vases; some of the prettiest that we have done have been when pushed for time to complete them.

Flowers with powerful perfumes should not be extensively used in any table decorations; and some that we have quoted have a tendency in this direction. Of such we advise but few to be worked into any one set of designs at the same time. Gardenias, Stephanotis, and other strongly-scented flowers, should never be made free use of in the dining-room for any purpose whatever. There are plenty of ways in which such as these can be utilised in other apartments.

Preservation.—After the flowers have served their purpose, should there have been much gas consumed, or the temperature of the room rather high, it will much revive them if they can be taken to a

cooler place, and slightly bedewed with a fine rose of a water-pot or a syringe, when the table is cleared. If any are only resting temporarily in their place, without having the means of obtaining sufficient moisture, these should be placed in water till again required. With close attention to these and minor details the flowers can be greatly economised for future use when the demand too nearly approaches the supply. These remarks apply more forcibly to the system, sometimes followed, of laying the flowers on the table-cloth, and working out designs thereon with the same, in which case the flowers will quickly suffer if not again placed in water. This custom of laying the flowers on the cloth has not the slightest good quality to recommend it; all natural habit and style of growth being, so to speak, lost. We have not thought fit, therefore, to advocate this system in any way, beyond stating that when such means are employed it should only be to fill up a vacancy where no suitable receptacle can possibly be placed conveniently; but long shoots of trailing plants look very pretty when allowed to rest on the cloth, in attenuation, as it were, from either of the designs.

Finally, our remarks on dinner-table decorations have all been made under the assumption that the cloth was of the usual or ordinary colour. When such is not the case, and coloured strips are laid through the centre of the table, it requires more careful judgment in the selection of both flowers and foliage, to avoid any clashing between one and the other. The colour of cloth most to be avoided is green; other shades do not so much matter; but in no case do we think any shade surpasses a white damask cloth in its entirety.

THE LIFE-HISTORY OF PLANTS.

BY DR. MAXWELL T. MASTERS, F.R.S.

WHAT THE LEAVES DO—THE SAP.

IN the animal kingdom the work of nutrition, at any rate in all the higher groups, comprises several secondary processes, such as the prehension of food, its mastication, solution, and digestion. When at length, after a series of changes, the food gets converted into blood, it is requisite that the new or crude blood, together with that vitiated and rendered impure in its transit through the body, should be exposed to the atmosphere or to the oxygen in it. This is effected, in the higher animals and man, by its passage through the lungs, where, by the agency of respiration, the crude and impure fluid becomes oxygenated, and then, in the form of red arterial blood, is pumped by the heart's action into every part of the body. In plants the same general results

are brought about in a simpler fashion, as might have been anticipated, from their simpler structure, and the terms circulation and respiration can only be made use of in a general sense, and not as implying exact identity of process. The roots and the leaves may roughly be compared with the organs of prehension of animals. The roots avail themselves of the water in the soil, and, in addition, they exert a solvent action, which enables them to render the inert and insoluble matters suitable for the nutrition of the plant. In this sense the roots seize and manufacture what they require. The leaves have a similar action. They lay hold of the gases in the atmosphere, absorb them, and transmute them. Sometimes they absorb liquid or vapour; under given conditions they always exhale it. The result of the conjoined action of the roots and of the leaves is the formation of food—true food—fitted for the nourishment of existing tissues and the creation of new ones.

The "Sap" and its Course.—Hence there must be some communication between the roots below and the leaves above. But—and this is a point upon which the greatest stress must be laid—that communication is indirect. There is in a plant no continuous system of pipes or tubes, such as exists in the case of the blood-vessels of animals. The blood of an animal is of the same constitution throughout, according to its twofold nature—that is to say, that while the venous blood keeps its character, the arterial blood is, in its turn, uniform in composition, into whatever part of the body it may flow. It is not so with the juices of plants. They are not uniform in all parts of the plant, but they have one composition in one place or at one time, another in another situation or at a different period.

It is necessary to insist upon these points, for the old doctrine of the circulation of a crude ascending sap, passing in regular channels and currents from the roots to the leaves, and then down again in the form of "elaborated" sap, is one to which gardeners cling tenaciously, though the scientists, without any exception, have long ago either greatly modified or entirely abandoned it. Modern research has shown that the facts observed by the gardener are susceptible (even where the observation itself is accurate) of a very different interpretation from that which he is accustomed to put upon them.

We may here quote what we have said elsewhere on this subject (Henfrey's "Elementary Course of Botany," ed. 4, p. 564): "In spring, when vegetation is most active, or at other times when special circumstances favour growth in particular places, a current of watery sap, containing relatively little of the matters formed in consequence of leaf-action, is specially manifest; and as the ends of the shoots

and buds are at this period centres of activity, so the flow is mainly an upward one. In autumn, when consolidation of tissues and storage of nutritive matters are the chief operations of the plant, there is an increased necessity for the presence of matters formed in consequence of leaf-action, and the flow is then, to a large extent, a downward one. But there is no absolute difference between crude and elaborated saps, and no absolutely fixed course for them to take. The ascending sap consists of water pumped up from the roots to supply the requirements of the growing cells and the chemical changes going on in them, and the excess of it is evaporated when the leaves expand; but, though mainly watery, it contains some mineral matters, and also some ingredients which must have been derived from the action of the leaves of the preceding season."

In what manner the fluid absorbed by the roots is taken up has been explained; how it passes as it, or some of it, does, against gravity, from the roots to the leaves of the tallest tree, is still, to a considerable extent, a matter of controversy. The assigned causes are diffusion, before explained; capillary attraction, or the adhesion and upward movement of fluids in tubes of minute bore; atmospheric pressure, or that exercised by the elasticity of the cell-walls, or by the expansion by heat of the bubbles of air mixed with the fluid, which in their expansion push the fluid before them; the swaying to and fro of branches, &c. When so many explanations are given, it is pretty certain that we have not yet arrived definitely at the true one.

Bleeding of Vines.—In spring, when the increasing temperature stimulates the roots to renewed action, the plant becomes gorged with water, because at first there is no transpiration from the leaves to balance the influx, and the air within the tissues becomes consequently compressed. If now the plant be wounded, the sudden expansion of the air pushes up the fluid, and much of it escapes, as in the so-called "bleeding" or "tears" of the vine. The analogy, however, whether between the ascending sap and the blood, or between it and tears, is almost wholly fanciful, as the fluid in question has few of the characteristics of those whose names it bears. The ascending sap consists almost entirely of pure water, with traces of mineral ingredients, and sometimes with a notable quantity of sugar. Attfield has lately shown that the tears of the Birch (of which in one day 63 lb. were collected from one tree, and 1,486 lb. from November to May) contained 99 per cent. of water, with 1 per cent. of solid matter, eleven-twelfths of which latter consisted of sugar. The sugar had probably been washed out from the cells during the upward rush.

At any rate, were this so-called ascending sap a highly nutritive fluid, its loss in such large quantities as sometimes happens (as in the collection of Maple-sugar) would be productive of much more serious results than is usually the case, for the fears of gardeners as to the ill-effects of bleeding in the Vine are, if not wholly without foundation, at least not proportionate to the observed consequences.

Tissues through which the Sap Passes.—

The so-called ascending sap has been ascertained to pass up through the soft young wood, either through the cavities of the cells, passing from one to the other by osmosis, as happens in spring, when the tissues are gorged, or by imbibition through the walls of the cells, mounting thus from cell to cell as the water mounts in a piece of blotting-paper, the lower end of which is soaked in water.

The fluid contained in a leaf may, therefore, be considered to have been derived from the stem, which, in its turn, acquired it through the agency of the roots. Under certain circumstances, no doubt, leaves, or even stems, may themselves absorb water or watery vapour directly from the atmosphere, as is proved by the effects of syringing after a hot dry day; but for the present purpose water so obtained may be disregarded, and we may confine ourselves to the juices in the leaf which have been derived more or less circuitously and indirectly from the root. These leaf-juices undergo various changes as a direct consequence of their exposure to the atmosphere. They take in some gases; they give out others. In this broad sense leaves are like the lungs of animals, and have a corresponding office. But the processes are not strictly identical, and the leaves have work to do which is not required of the lungs. It is no part of the lungs' duty—at least it is not a primary duty—to get rid of the superfluous water from the system; that is done by the skin and kidneys. On the other hand, it is one of the chief duties of the leaf to exhale and evaporate superfluous moisture. The juices are modified by the changes which take place in the leaf, according as certain gases are absorbed or exhaled, and according as a larger or smaller quantity of water is evaporated from their surface. But this is not all; the leaf is not only exposed to atmospheric influence; it is during the day-time subjected to the influence of light, of course conjoined with heat; and this combined effect of light and heat produces a series of changes and transformations in the juices of the plant to which there is no parallel in the animal kingdom, unless perhaps in the lowest groups, which partake, to some extent, of the characteristics of both kingdoms, but which may be left out of consideration for our purpose. A leaf, then, unites

in itself the functions of the skin, of the kidneys, of the lungs, of the digestive organs, and of the manufacturing glands. No wonder physiologists wince when they see a gardener cutting off Strawberry-leaves, or engaged in cutting away what has been formed at such an expenditure of power, and which itself contains so much latent force for use when required. Nevertheless, the gardener may, from his point of view, be quite correct. His requirements are not the same as those of the plant in a state of nature, and long experience has taught him how to make the plant subservient to his wishes. If the physiologist carried out his principles he would subordinate the man to the plant; the gardener's aim is just the reverse.

In considering the work done by the leaf, then, we may treat of it as: 1, an organ of perspiration; 2, of breathing; 3, of manufacture; 4, of digestion.

The Leaf as an Organ of Perspiration.—

It needs no elaborate apparatus to demonstrate this action of the leaf. Place a leaf under a bell-glass, expose it to the sun, and shortly the inner surface of the glass will be bedewed with moisture; so it will be if kept in the dark in a sufficiently warm place. If this simple experiment be objected to on the score that, as the leaf is detached from the plant, it is not a fair test, there are plenty of other means of showing it not open to this objection. The inside of a green-house or of a Ward's case will show the fact, though in these instances the evaporation is partly from the soil; but the most convincing proof of all is afforded by the withering of leaves that takes place on a hot, dry, sunny day. See how the Phloxes in the garden and even the Mangels in the field hang their leaves under such circumstances. The scientists can prove the fact beyond dispute, and they can likewise measure its amount under different circumstances very exactly, but in practice we have no need for such nicety. The amount given off is very large, varying according to different circumstances. It is greatest when the plant is simultaneously placed under the influence of bright light and high temperature, and lowest under the opposite circumstances. When, however, the atmosphere is saturated, temperature has no effect in increasing the amount of evaporation from plants. Blue light and next to it red light are most efficacious in promoting transpiration. Yellow light is much less so, and green light is not more effective from this point of view than darkness itself.

The texture and construction of the leaves modify the amount of transpiration very materially—the younger and more delicate the structure, the greater the amount of transpiration. The older the leaf, or the thicker its skin—as, for instance, in succulent

plants—the less is given off. Under normal circumstances, where the quantity of fluid given off is not materially greater than can be replaced by root absorption, or furnished from the stores in the plant, probably no harm arises from this transpiration, and the flow of water may probably facilitate some of the chemical changes which go on concurrently in the leaf. But where the balance is disturbed, the sufferings of the plant become evident. It may be that, provided water be supplied, little or no permanent harm may accrue; but, considering the amount of force or energy expended in the process, and the loss of temperature involved in it, it is obvious that if transpiration be excessive or frequently repeated, the plant will suffer. It is more than probable, though it has not been definitely proved, that much of the ill-effect arising from a plant having experienced a "check" during growth may be attributed to excessive or disproportionate transpiration. Fortunately that is a matter easily avoided by the gardener who has water-supply and means of shading at command. The use of green glass in conservatories, as at Kew, may in part be explained by the check it imposes to too vigorous leaf-action.

How the Leaves Breathe.—In the case of the lungs of animals, the inhalation of atmospheric air and its passage through the lungs is effected by means of powerful muscles and contractile tubes. A different set of muscles promotes expiration. In plants there is no such machinery available, unless it be in the case of the stomata or pores (*ante*, p. 162), which contract or open according to circumstances, and so regulate both the emission of water and the entrance of gases. For the most part, however, the entrance of air into the plant is due solely to the power of penetration or diffusion which gases have, and which has the closest analogy with the process of osmosis formerly spoken of, and by virtue of which the gases pass through the skin of the leaf when not too thick or obstructed by waxy exudations. The breathing process in plants presents many analogies, some say it is identical, with that of animals. In both it is a continuous process going on day and night; but while in the case of the animal it is limited to the lungs or gills, in plants it takes place over the whole surface, where the texture is favourable to the passage of gases.

Atmospheric air when pure has the following average composition:—

	Volume per Cent.
Oxygen	20·970
Nitrogen	79·000
Carbonic acid	0·030
	<hr style="width: 100%; border: 0.5px solid black;"/>
	100·000

On the moors of Scotland, Angus Smith found 20·99 per cent. of oxygen in the atmosphere, as contrasted with 20·74 in the pit of a theatre, or the tunnels of the Metropolitan Railway, and 20·14 in mines. When the volume falls to 18·50 the light of candles is extinguished. Carbonic acid varies in proportionate volume, according to the same observer, from 2·50 per cent. in some Cornish mines to as little as ·033. The significance of these figures will become more apparent further on; all that need be said here is that by the agency of the respiratory process the plant obtains the oxygen necessary to insure the activity of the protoplasm. Without it life is brought to a standstill by suffocation, just as in the case of an animal similarly deprived. Every separate portion of the plant, moreover, must have its own independent supply, and cannot trust to receive it from any other portion. There are, indeed, certain *Bacteria* which appear to thrive without oxygen; but we need not further allude to these exceptional cases, as they do not, so far as we at present know, concern the ordinary gardener. There is at the present time a difference of opinion between chemists as to whether the process of respiration in vegetables is identical with that in animals, or only correspondent, for while some assert that there is no fixed relation in plants, as there is in animals, between the quantity of oxygen absorbed and the volume of carbonic acid emitted, others, like MM. Bonnier and Mangin, maintain the reverse. The production of the carbonic acid gas from leaves when they are plunged in an atmosphere of hydrogen or nitrogen without any oxygen at all, is a proof that in these cases the elimination of the carbonic acid is not a respiratory act, but the result of changes in the composition of the tissues of the plant.

The proportion of oxygen absorbed increases with the temperature, so that it may be said, if we required to make a plant breathe deeply, all we have to do is increase the temperature. But the amount of oxygen absorbed varies under like conditions in different plants. Succulent plants like *Agaves* absorb least, evergreen leaves more, and ordinary deciduous leaves most (De Saussure). A flower takes up more oxygen in proportion than a root or a leaf, and the stamens of a flower take up more than the outer parts. Young leaves of the same plant absorb more than older ones. The effect of this continual influx of oxygen is to "oxidise" certain of the substances in the plant, and to give rise to changes of the utmost importance, but which it falls to the lot of the chemist rather than of the botanist to explain.

Two points, however, we must allude to as necessary concomitants or consequences of oxidation, and these are the elimination of carbonic acid gas

concurrently with the inhalation of oxygen, and the production of heat. The entrance of oxygen and the emission of carbonic acid gas are simply the beginning and the end respectively of a long and complicated series of changes in the plant—changes but very imperfectly known at present. These chemical transmutations are attended with the production of heat. A certain amount of heat is requisite to insure the activity of the molecules or ultimate particles of the protoplasm, and if this be not forthcoming, the protoplasm remains inactive, and sooner or later dies. This internal heat generated in the living plant (or animal), and essential to its life, is a necessary consequence of oxidation. Oxidation, then, maintains the internal heat of plants, and while it is the source and origin of some substances within the plant, it tends at the same time to destroy the tissues in the same way that they would be destroyed by fire, but of course without flame. Respiration is thus a destructive process, which of itself would destroy the plant were the waste so caused not compensated for by the nutritive processes.

Chlorophyll.—Perspiration, as has been stated, takes place, subject to a few exceptions, from all or any part of the surface of a plant, by day and by night; in plants like fungi, which have no green matter, as well as in those which do possess it. In those plants, however, which contain green matter (chlorophyll) changes go on during the day-time (that is, when the green matter is exposed to the light) of exactly the opposite nature to those mentioned under the head of respiration. Oxygen gas is now given off and carbon is now retained in the plant to build up its structure. If a leaf be placed in water and exposed to the sun, in a very short time bubbles of gas may be observed to collect on the leaves, and by appropriate chemical means it may easily be shown that these bubbles consist principally of oxygen gas. Here again the aid of the chemist is necessary, and for the full consideration of the matter recourse must be had to chemical works.

Food of Plants.—The substance of which the tissue of plants is composed consists of "cellulose," and is composed of certain proportions of carbon, of oxygen, and hydrogen, in combination with water. This cellulose forms the membrane of the cells in the cell-walls, within which is the protoplasm before alluded to, and which latter contains, in addition to the substances just mentioned, a quantity of nitrogen. Besides these four elements just mentioned, which are indispensable to all plants, as the constituents of cellulose and protoplasm, there exist minute quantities of phosphorus and sulphur,

and various mineral matters already alluded to under the head of root-action, such as potassium, calcium, iron, &c., which are also in their degree indispensable, and others that are less so. In considering the manner in which these substances are introduced into the plant, we shall gain an idea of the interdependence of roots and leaves, and in tracing their combinations in the plant we shall of necessity learn something of the nature of leaf-action, and especially of the influence of the green matter called chlorophyll. In the first place it must be repeated that the elements above referred to are some of them introduced by the agency of the roots and root-hairs; others by the mediation of the leaves. In neither case are the elements received in their uncombined state, but in combination with other elements.

These matters are often spoken of loosely as constituting the food of plants. Plants are said to feed on carbon, oxygen, hydrogen, and nitrogen, together with the mineral matters above mentioned. Strictly speaking this is an error. These elements do not, as taken into the plant, suffice to nourish it any more than the oxygen, nitrogen, carbon, &c., of which beef and bread are made up, directly nourish us. In our case even the beef and the bread are not of themselves foods. It is not till they have undergone in the stomach and intestines certain complicated chemical changes that they become actually fit to serve as food. They furnish the material out of which food is made, but they are not the food itself. So with the plant, it is not till the materials taken in by the root and by the leaf conjointly have undergone chemical changes carried on in, or at least in connection with, the green matter, when exposed to light, that they become fit to nourish the plant, repair its waste, and form new tissue. The leaf, then, or the green matter in it, under the conditions we have mentioned, is the great agent in converting the materials of food into food itself. Let us, then, have a little more respect for the leaves, tend them, keep them clean and unobstructed, especially their under surface, and afford them every facility for fulfilling their office as purveyors, cooks, builders, and purifiers of the plant.

The Use of Chlorophyll.—It will be noticed that, in speaking of the leaves as the concoctors and digesters of food, we have laid special stress on the green matter, and for the reason that in some way or another, exactly how is still a matter of controversy, this chlorophyll plays an essential part. But chlorophyll is not a universal constituent in plants. It is not found in every cell even of green plants. It is entirely wanting in all the great host of fungi. How, then, do cells destitute of chlorophyll live? How do

fungi feed in the absence of this green matter? In answer to these questions, it may be said that the colourless cells of green plants live at the expense of their more richly endowed neighbours. They are, as it were, parasitic upon them. Thus, in the case of fungi we know but too well that they do not collect and prepare their own food, but that they either live a parasitic existence on other plants, or derive their nourishment from the decay of animal or vegetable substances. The green plants absorb the raw material, and, under the agency of light, transform it into food. The fungi feed upon the matter already manufactured by others, and are thus comparatively independent of light. Cells destitute of chlorophyll can feed and grow in the dark, but they cannot collect raw material nor manufacture it into food for themselves. Cells provided with chlorophyll can grow and digest in the dark, but they cannot convert the inorganic matter derived from soil or atmosphere into food unless exposed to light.

Reverting to the raw materials of plant-food, it may be repeated that the carbon is derived by the leaves from the atmosphere in the form of carbonic acid, the hydrogen and oxygen as water are absorbed by the roots, and in a gaseous form, in combination, by the leaves. Nitrogen gains access in the form of nitrates or as ammonia salts, also by the roots, by which likewise the various mineral ingredients are taken up as previously explained. Oxygen is thus taken up both by the leaves and by the roots: in the former case from the atmosphere, as a gas essential to respiration; in the latter case in combination with other matters, and destined to take part in the transformation of the food-material into food.

Influence of Light and Heat.—The first and most striking effect observed when chlorophyll is exposed to light is, as has been above said, the emission of oxygen gas. This is supposed to result from the splitting up or disintegration of the carbonic acid gas of the atmosphere into oxygen, which is given off, and carbon, which is retained, the proportion between the carbonic acid absorbed and the oxygen given off being in this case definite. As the solid matter of plants consists in by far larger proportion of carbon than of any other ingredient, the desirability of giving leaves free access to light becomes obvious, and in the laboratory the chlorophyll is found to do its work most thoroughly when subjected to the yellow or light-giving parts of the spectrum, and least so when exposed to the chemical rays, such as violet or blue. The amount of exposure required varies according to structure and other circumstances; shade-loving plants, like the Ferns,

which we may assume to resemble cold-blooded animals, requiring far less full exposure to light than others. This is a matter which the gardener finds out by rule of thumb, but it is certain that an investigation of the microscopical structure of leaves would in many cases afford him a sure basis of fact for his guidance. The structure of the leaves of Orchids has impressed this conviction strongly on the mind of the present writer. May it not be long ere those who have the requisite leisure and means will work out this question, so important to the practical cultivator!

The changes we have alluded to are not solely dependent on light, but also on heat, there being a degree below or above which the changes in question do not take place, and between the two extremes one under which the change is carried out under the most favourable circumstances. These circumstances vary in the case of individual plants, and although, for practical purposes, they may be often guessed at, yet experience and experiment alone can determine them with any degree of certainty.

Although we cannot in this place attempt to enter into detail on such a matter, we may say that the chlorophyll, which till lately was supposed to be the prime agent in the decomposition of carbonic acid, the elimination of oxygen, and the changes consequent upon them, is now by some considered not itself to be the main factor in the series of changes which go on in the leaf when exposed to light. Pringsheim finds in chlorophyll a substance called *hypochlorin*, which he considers to be an immediate derivative from carbonic acid, and the only one which cannot be formed in the absence of light. Chlorophyll itself, he says, is not decomposed during the assimilation of carbon, and is independent of the **absorption** and even of the presence of carbonic acid. Its decomposition is effected by the absorption of oxygen in respiration. If this absorption of oxygen in the process of breathing be carried too far, the chlorophyll is destroyed. If the balance between oxidation as carried on constantly in the breathing process, and de-oxidation as carried on in the green tissues under the influence of sunlight be upset, and oxidation be carried on disproportionately to de-oxidation, then the plant suffers. According to Pringsheim, it is the green colouring matter, the chlorophyll, which regulates the two. By absorbing, as it does, the chemical rays of light, it lessens the energy of the breathing process, and it is owing to the protecting screen afforded by the chlorophyll that the amount of carbon received into and stored in the plant in daylight is greater than the quantity consumed by the respiratory process. The decomposition of carbonic acid, on this view, would be effected by the protoplasm. The question affords an

additional reason for the microscopical study of the leaf, with a view to obtain hints for the rational cultivation of plants deduced from their anatomical structure, such as the presence and thickness of the palisade cells, and its relation to the chemical changes that go on in the leaf.

The Leaf as a Factory.—Whatever be the exact work done by the chlorophyll, its presence seems essential to the preparation of the food and to the construction of new tissues, and we must briefly allude now to its work in these directions. The substances absorbed by the roots and leaves, acted on by solar light, supply all the materials requisite for the formation of new cell-walls, new protoplasm, and new cell-contents of all kinds. These substances, however, are not all direct productions from chlorophyll, but result from transmutations of one substance into another, and from the reciprocal action of one upon another. The exact nature and sequence of these changes is at present very imperfectly known, though of the first consequence in enabling us to understand what goes on in the living plant. We can here only allude to some of the better-known phenomena.

Starch.—The first product in the chlorophyll cells exposed to light is generally admitted to be starch; some substance chemically allied to it, such as sugar; or some fatty matter. Starch, as we have already shown, exists largely in the tissues of most plants, especially in the reserve organs. Its presence is easily ascertained by the aid of the microscope, or by soaking the leaves in alcohol to remove the chlorophyll, and then immersing the colourless leaves in a strong solution of iodine, which turns the starch blue. By these means it has been ascertained that the same leaf may contain very different quantities of starch at different periods of the day, or according to the state of the weather, the increase or decrease being very rapid. In the dark, or when a portion of the leaf is protected by an opaque body from the light, the starch disappears. Moreover, the starch formed in the day-time under the influence of the light disappears from the leaves at night. This depends on the degree of temperature, and on the health of the plant. It may be proved by dividing a growing leaf lengthwise into two halves, at night-fall, after a bright day. One half may be removed, the other half allowed to remain during the night. The half-leaf removed, if at once tested by iodine as above described, will be found full of starch; the remaining half-leaf, if tested early next morning, after having been exposed to darkness, will be found to contain very little.

Again, if the leaf be cut in halves at sunrise no starch is found in the half-leaf that is cut away; if

the other half be allowed to remain on the plant all the day so as to be exposed to the sun, and be tested at nightfall, abundance of starch will then be found.

It would seem, therefore, at first sight that the formation, or at any rate the action, of diastase in dissolving the starch must take place at night only; and this would be consistent with the now well-established fact that new growth (not mere extension of old) takes place principally at night, or in the dark. The change from the insoluble starch to the soluble glucose goes on, however, during the day as well as at night, though these changes are less evident because during the day more starch is formed than is abstracted. Sachs has endeavoured to estimate the proportionate amount of starch produced in a given area of leaf-surface. By combining his experimental results, and taking note of all the circumstances, he "concludes that twenty to twenty-five grammes of starch per day may be produced by one square metre of leaf-surface as an ordinary occurrence." (One gramme is equal to 15 grains; one square metre, to 1.09 square yard.)

It is clear that some very important practical deductions may be drawn from these facts. If the amount of starchy contents of leaves varies during the day, and still more so at night, the period at which such leaves are cut for food or forage becomes a matter of great importance. The afternoon or evening would thus be indicated as the best periods for cutting vegetables for salad, for cooking, or for medicinal purposes, so as to secure the produce of the day before it is drafted off elsewhere.

The rapidity of production of the starch depends upon the intensity of light and the quantity of carbonic acid gas, the production being much more rapid in intense light, and when the carbonic acid gas is in large proportion. If there be no carbonic acid gas at all, no starch is produced, even if the leaf be fully exposed to the sun; moreover, any starch that had been formed previously disappears as it would do if the leaf were kept in the dark. Starch is a ternary combination of carbon, hydrogen, and oxygen; and by combining with the nitrogen, absorbed by the roots as ammonia or nitrates, it forms the albuminoid substances like protoplasm, the cell nucleus, &c., containing varying proportions of carbon, hydrogen, oxygen, and nitrogen. On the other hand, by the progressively increasing loss of oxygen, it may form some of the vegetable acids, and ultimately of the hydro-carbons, such as resins, in which oxygen is entirely absent. The cellulose of the cell-wall is formed, according to some observers, directly from starch or sugar, of which it has the same chemical composition, while others consider it to be formed from the protoplasm. Gum, mucilage, and various substances of that character, are direct transforma-

tions from cellulose, as probably are the jelly-like substances in fruits. Chemists must, however, advance this portion of their science materially before it can be made available for practical purposes.

The Leaf as an Organ of Digestion.—The starch alluded to in the last paragraph is insoluble. It is requisite for it to be removed from the factory, where it would be in the way and where it would prevent the continued formation of fresh supplies, and that it be stored up in the warehouse for future use if not wanted immediately. To effect this it must be dissolved, taken out of the leaf along the leaf-stalk (where present), and thus conducted to the place of consumption or to the bark, the seed, the tuber, or other reserve organ, as explained in the earlier chapters. This solution of the starch is effected by a nitrogenous substance formed in the protoplasm, and called "diastase." Why the diastase dissolves starch it is impossible to say; but, under certain conditions, of which the presence of an acid is one, it does so, converts the starch into dextrose, and afterwards into glucose or Grape-sugar. Thus, in the germination of seeds, the starch in the white perisperm is dissolved by the diastase in the embryo, converted into sugar, and in this form is absorbed by the embryo, and used up in the formation of the growing tissues. The same thing happens when a bud commences to grow, or a Potato to sprout. The solution of the starch in bread is effected by a similar ferment in the saliva.

This process of digestion is apparently universal in plants, but subject to various modifications, one of the most striking of which is that afforded by the *Dionæa*, the *Drosera*, and other so-called carnivorous plants. In these plants, when an insect or any substance containing nitrogen comes into contact with the leaf, an acid fluid is poured out by the leaf, which effects the solution of the insect just as the gastric juice dissolves matters in the stomach, and puts them into a fit condition to be absorbed. In addition to diastase there are other ferments formed in the cells, which effect the conversion of starch to sugar, and the production of alcohol from the latter, as in the yeast fungus. The reason why some fungi effect this or corresponding changes, while others do not, is that the former—e.g., *Penicillium*—contain a ferment, while the latter—e.g., *Mucor*—do not (Van Tieghem). "Pepsin," found in the leaves of so-called carnivorous plants, effects the decomposition of albuminoid matters, and converts them into peptones. Its presence in the juice of the Papaw-tree or Fig explains the fact that meat wrapped in the leaves of these plants becomes tender.

Fatty matters, which are often stored up in place of starch, are acted upon in a similar manner by a

ferment, which converts them into a soapy fluid, capable of absorption.

"Asparagin," and certain nitrogenous substances of like character, seem to have the property of combining with ternary compounds, and of thus creating new protoplasm. When the ternary compounds are deficient, the asparagin collects in the cells; but when the compounds in question reappear, then the asparagin combines with them to constitute new albuminoid or protoplasmic matters. But this, again, is a matter demanding further elucidation by the chemist.

The Descending Sap.—The substances concocted in the leaf in the manner briefly alluded to have to pass from the leaf to the place of storage, to the spot where they are required for immediate use, or from the store-place to the growing points after an interval of greater or less duration. In any case these fluids constitute what used to be called the "descending sap," an expression it would be better to abolish, because it is likely to mislead into the belief that it is a fluid of uniform constitution, travelling in a definite direction. In fact it flows in any direction where there may be a stimulus or a call for it, and where the structure of the plant permits its passage. It must not be supposed that it does not sometimes descend, but it is not limited in the direction it takes; thus, while it goes down from the leaves to the haulm of the Potato to aid in the formation of the tubers, it must needs go up again to form the new haulm which springs from the tubers. So in the Wheat plant the "elaborated sap" must needs go up from the leaves into the ear. Again, in the pendulous branches of a Weeping Ash, for instance, the so-called "descending sap" must necessarily rise from the leaves. But while the direction of the current is thus variable according to circumstances, and often different in different parts of the same plant at the same time, there is a greater degree of fixity as to the particular places and tissues in which it may be found; thus, in an ordinary tree, while the ascending current of water flows, or is forced upwards, chiefly through the wood-cells of the young wood, the so-called elaborated sap is chiefly to be met with in the innermost layers of bark, and in certain special tissues such as the sieve-tubes, the latex-canals, &c. In most trees the principal growth in diameter is brought about by increased cell-formation on the outer side of the wood and on the inner side of the bark respectively. The position of the "cambium," "descending sap," "organisable matter," or whatever it be called, is thus seen to be most appropriate. When a bud is inserted as in the operation of "budding," it is placed in the midst of this store of food and building material.

GLASS STRUCTURES AND APPLIANCES.

PITS.

THESE may be described as fixed glass frames placed on brick or other walls. The idea of being sunk into the earth is also associated with that of pits. But, in fact, there are surface as well as sunken pits, and any permanent wall spanned with a glass top is technically and correctly a pit. It is the fixity of the walls, in fact, rather than that of the roof, that forms the pit; for hundreds of pits are covered with movable sashes, exactly the same as those on frames. Generally, pits may be said to be fixtures, while frames are portable.

The chief feature of frames is their portability. Pits, from the nature of their material and character of construction, are more of fixtures. Built in the ordinary way, of brick, stone, cement, or concrete, they are landlord's fixtures; that is, no matter who built or paid for them, so soon as up they become the property of the landlord; and this even though built of wood, if fixed in position by stakes driven into the ground. All pits, however, may be converted into tenant's fixtures by the simple device of building them upon, rather than into, the earth. In these days of the rapid increase of horticultural glass-houses and other appliances, and frequent changes of residence, it is important to bear the distinctions between common and tenant's fixtures in mind. The latter can hardly be said to be fixtures at all. Were the tenant to remove every three months, he could take such pits or glass-houses with him, without legal let or hindrance. To constitute any building a tenant's fixture, a plank or baulk of timber or a bar of iron must interpose between it and the earth. To be built on the surface merely, without being sunk in the ground, is not sufficient. A horizontal barrier of some kind must interpose. This cuts through the legal right of landlords to appropriate as their own the property of tenants placed by the latter on their land.

Such unpleasant contingencies may, of course, be averted by previous agreement, the landlord agreeing to take tenant-built structures and appliances at a fair valuation. But agreements are not always practicable nor satisfactory, and in this respect they are less needed than formerly, for most builders now so thoroughly understand the law of tenant's fixtures, and have so moulded their pits, green-houses, conservatories, summer-houses, &c., that they continue from first to last the property of the tenant. Nor is this all, for not a few of them are so constructed that they may readily be taken to pieces and reconstructed with a minimum amount of labour, risk, and cost.

The name of pit suggests the idea of a structure or place partially under-ground. This was so generally recognised in the older pits that the major portion of them were under-ground. Sunken pits are warmer than those partially or wholly above-ground. The earth is partially frost-proof in our climate, at least a very little straw litter around the pit makes it so to all intents and purposes. The soil even becomes a source of warmth to the pit, as its average temperature is about 45°.

Sunken pits were also less exposed to wind and weather, and the surface of the glass far more easily covered in severe weather, than those wholly or in part above-ground. With the solid earth as a buttress all round, less material is needed for their construction than for above-ground pits. Against these substantial advantages of cheapness of first cost, the utilisation of the natural and, compared with the air, uniform warmth of the earth, and greater facility of managing and working sunken pits, there are the dangers and difficulties of dampness—the deeper the pits the damper; and though thorough drainage of the base, careful and peculiar construction of the side walls, skilful ventilation, and artificial heating do much to vanquish or diminish the evils of damp, no doubt the prevailing and destructive tendency of the latter in deep pits did much to raise them nearer, and in not a few instances place them upon or even above the ground surface. Nor is this to be wondered at, as for one plant killed by cold in pits, a hundred—it may be a thousand—have been crippled, disfigured, or destroyed by damp.

Hence, though deeply-sunk pits are still to be found, and in not a few cases, and in exposed localities, these prove the best of all pits, yet so general has the raising of pits nearer to the surface become, and so common are those on the surface, that the idea of a sunken place is no longer essentially identified with pits. Any structure with stable sides and a movable glass roof may be called a pit. Even this description may be held to be imperfect, for not a few pits have fixed roofs. Generally, however, pits are covered with glass lights; the latter are movable, and access is had to the plants through the roof rather than through the ends or sides. Pits with fixed lights and doors in the ends are transformed into houses, whatever they may be called.

Wooden pits, again, differ from frames in being fixed by stakes driven into the ground. Neither sides nor ends can be lifted off without the nails or screws that fix them to the ground being first withdrawn.

Wooden pits, however, once so common, are now out of fashion. Formed of two layers, and the interstices of six inches or a foot between the boards filled in with sawdust, tan, chaff, or other non-con-

ducting material, they were at once dry and weather-proof. Such pits were even used in France for Pine-growing.

The walls of pits are mostly built now of stone, concrete, turf, bricks; even iron has been tried for both pits and frames. The three first are not liked, and iron is very seldom used. Turf is efficient against all weather severities in our climate, but it is too perishable for permanent pits, though most useful for temporary ones for the protection of semi-hardy plants, vegetables, salads, &c., in winter. Turves of fibrous grass or peat, from two to three inches thick, and from fifteen to eighteen inches wide, will form a temporary frost-proof—as far as the walls are concerned—pit that will prove most useful for an infinite variety of purposes in most gardens. It may either be covered with glass lights, laid on rafters let into the upper or finishing rows of the turf, or with opaque frames of canvas, oiled calico, or reeds. Such rough-and-ready structures are invaluable for the temporary protection of flower-garden—or what are technically known as bedding—plants in the spring and early summer months.

But bricks are at once the most popular, useful, and efficient of all materials for building pits. A brick wall, fourteen inches thick, in a vertical position is practically frost-proof in our climate. For pits of smaller size, brick walls four and a half or nine inches in thickness will suffice. In the case of very large pits, such as are often used for Pine-culture, from seven to nine feet high at back, and from five to seven feet high in front, with covering lights eight or twelve feet long, eighteen or twenty-two-inch walls will not prove excessive for the weight and wear-and-tear to which they will be subjected. The strain is far heavier and more constant on the walls of pits than on those of houses, owing to the constant motion and friction of the movable lights. Hence the necessity of specially thick and strong walls for large pits, though the tendency of the day is to limit and even reduce the size of pits, and convert the larger ones already in existence into houses with fixed roofs.

The walls of pits are also frequently left hollow. The practice not only economises material, but probably strengthens the walls at the same time, while it is certain that the enclosed air is a less powerful conductor of caloric than solid bricks. Hence the common saying that hollow walls are warmer than solid walls is strictly true, though not expressed with scientific accuracy.

For all common-sized pits, nine and fourteen-inch brick walls are sufficiently thick and strong. Four-and-a-half-inch walls should never be used, for unless fortified by a free use of fourteen-inch pillars at

frequent intervals, they are not sufficiently strong to bear the wear-and-tear of pit-management; and besides, four-inch cannot be trusted to exclude twenty or thirty degrees of frost. The lower portions of the walls of pits are also very generally pigeon-holed, that is, a certain number of the headers are left out, and thus any quantity of four-inch openings are left right through the walls. Other pits rest on pillars, fourteen inches or more square, and from two to four feet high; or wood or iron pillars are placed at intervals of four feet or so along the front and back walls, and York or other slab-stones, or slates, are carried along from one to the other. These may be a foot or more wide, and the upper wall of the pit is

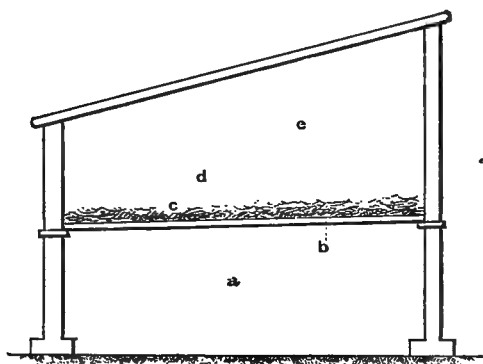


Fig. 15.—PIT BUILT ON PILLARS.

Showing wooden battens covered with brushwood, over hot-air chamber. *a*, chamber; *b*, batten; *c*, brushwood; *d*, space for soil; *e*, space for Melon or other plants.

These may or may not differ greatly in size, form, or structure. They must differ in temperature, and with the object of enabling them so to differ with greater facility and despatch, certain structural peculiarities are introduced. For example, the oldest plan of heating pits—some practitioners would still call it the best—viz., by the use of fermenting materials, while possessing many elements of danger and uncertainty, had at least the merit of keeping them warm for a long time without attention, and of giving out moisture as well as heat. This, however, was associated with one very constant and considerable drawback. In the further decomposition of the heating materials they lost bulk as well as caloric. Now in all pits this was an evil—the deeper the pit the greater the evil. In pits a yard or four feet

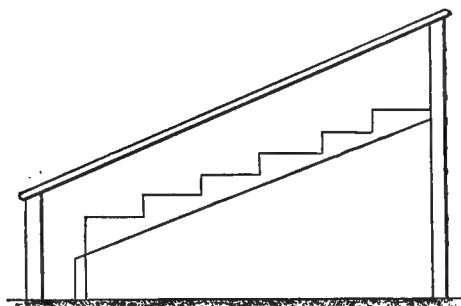


Fig. 16.—PIT WITH STAGES.

Showing how the stages are arranged near the glass for the storage of plants, or the culture of Kidney Beans, Strawberries, &c.

built along the centre of the slab, leaving a projection on either side for the reception of a temporary bottom to the pit, and a covering for the lining or space all around it.

Instead of the pillars and stones, some turn arches of brick along the front and back walls, which save material and afford equally free access as the pillars to the chamber underneath the pit. These methods of building have other merits, besides the economising of material. They divide the upper and lower portions of the pit into separate parts; afford facilities for reaching the base at any season without disturbing the upper portion; and keep the growing plants all the year round within almost the same distance of the glass, the last being a matter of the highest cultural importance.

With the object of treating each subject as much as possible on its merits and by itself, it is thought best to add as little as possible here about the heating or warming of pits. Every one, however, knows that there are cold pits, dung-pits, Pine-pits, &c.

deep the loss of bulk did not matter much; but in pits double those depths the loss of bulk carried the plants so far from the glass as to seriously injure and weaken them. Hence chiefly the origin of pits with second or false bottoms. These, as already stated, divided the depth of the pit into two equal or unequal portions, and kept the plants at a uniform distance, or nearly so, from the glass through all their stages. These false bottoms are formed of slabs of stone or slate, wood, or bars of iron; but the simplest, best, and most efficient are those formed of rough wooden battens, with a layer of brushwood on the top of them (Fig. 15). These will last one or two seasons, according to quality, and afford thorough drainage to the plunging material, such as cinder-ashes, in which the pots are plunged, or to the soil in which Melons, Cucumbers, or other plants grow. Such a porous bottom is also most favourable for the passage of heat from the bottom chambers or lining into the upper portion of the pits. The stout battens rest on the inner projections of the slabs

that cover the distance between the two rows of pillars at back and front, and thus sufficient solidity and strength is obtained to uphold the soil and plants in the upper portion.

In pits used for the storage of plants in pots, or for the culture of Strawberries or Kidney Beans, stages are often introduced to keep the plants near to the glass and at an equal distance from it through all their stages, as shown in Fig. 16. Any heat required is thus also enabled to circulate freely around the plants, while the risk of over-heating from fermenting material is reduced to a minimum. Stages are also often introduced into what are termed cold pits, for the safe wintering of Carnations, Picotees, Auriculas, or other choice florists' flowers.

Different Sorts and Sizes of Pits.—Pits, as already hinted, are mostly divided into cold, temperate, hot, or dung-pits, according to their temperature or uses. They are also characterised by the method of culture pursued, and the character and names of the plants grown in them. Hence, such names as store, forcing, propagating, Pine, Melon, Cucumber, and other pits, so distracting to amateurs, are rather indicative of the different uses to which the same pit may be put than of any structural peculiarities of the pits themselves. The same pits, with a few modifications as to less or more of heat, would probably answer equally well for any or all of these purposes. The tendency of the present day is to trust less to structure and more to skill for success in all departments of horticulture. The store-pit, however, as we have already seen, is at once the simplest and the most generally useful. Any kind of structure that will exclude frost, will suffice to store many plants in through the winter or spring, that would probably perish without such protection. It is mostly, however, built on the surface, with four or nine-inch brickwork, and covered with glass lights, that may or may not need covering in very severe weather, according to the nature of the plants stored in it.

Such pits are seldom or never empty, summer or winter. In fact, in not a few gardens they are more crowded in summer than in winter. Generally placed in a protected position, with a northern aspect, they afford shelter as well as shade to many plants in summer that cannot endure the mid-day sun's broad glare. Having flat rather than steep roofs, the latter has little power over store-pits. This is of equal importance in winter as in summer. Most of our glass roofs are so formed as to gather up and utilise to the utmost every feeble ray of sunlight in winter. Not so the store-pit. The more light and the less heat such pits admit the better. The plants are stored away in them not to grow, but

to rest *in statu quo*. The one thing to be guarded against is growth. In order to avoid that, a cool temperature, a northern or north-eastern aspect, and a low pitch of roof are provided. The combined influence of these non-exciting conditions is that the plants remain as they were, and the triumph of successful storing is to bring the plants out of store as they went in several weeks or months previously.

As the angle of the roof of pits is of much importance to their character or uses, it may prove useful to give some further particulars concerning it here. It is practically determined by the size of the pit and the disparity of height between its front and back walls. To prevent drip, one of the most constant and trying of all nuisances in pit-culture, the roofs of pits are often pitched at steeper angles than they otherwise would be. Fluted sash-bars are also used in the case of Pine-pits, to receive and carry the condensed moisture right out at the front or lowest part of the pit or house. Taking six feet wide as one of the more useful sizes for store-pits, and an angle of twelve or fifteen degrees as sufficient to freely shed the rain off them, to insure these angles the back wall must exceed the front in height by fifteen inches and eighteen inches. For every foot added to the width of the house, an additional three inches must be added to the back wall over the front to keep the roof at the same flat angle. As the angle increases, and the roof becomes more steep, the disparity of height between the front and back walls rapidly mounts up, so that at an angle of twenty-six and a half degrees the difference in height of the back wall over the front in a pit six feet wide would be three feet. The latter would prove injurious for a mere store-pit, but would be barely sufficient for a forcing-pit.

Forcing-pits.—These, as their name implies, are, in their more vital properties and uses, complete counterparts of store-pits. In the latter, the plants find safety and security in standing still; in the former, the faster they may be made to move the better. For many plants the safest, as well as most potent moving force, is light. This has not seldom been lost sight of, and without doubt many bulbs and other plants, such as Valley Lilies, and some shrubs, such as Lilacs, may be forced into bloom by heat only or chiefly. But in all such cases the mere bloom, and not the strength and future welfare of the plant, is what is chiefly desired. Where, however, both must be insured, as in the forcing of fruits, Roses, Azaleas, Rhododendrons, and other valuable plants, then light becomes of equal or more importance than heat; and it is a well-known fact, abundantly proved by the widest

experience, that the steeper the angle of the roof the more light passes through it. Hence angles ranging from thirty to forty-five degrees are mostly chosen for early Vineries, Peach-houses, and other forcing-houses. As pits frequently require additional covering over the glass, and these become very difficult to apply or keep on very steep roofs, forcing-pits with a slope ranging from twenty-five to thirty-five degrees are often used, and are found to answer well.

Angle and aspect are of small moment in the forcing of bulbs and such plants as those already indicated. Heat and moisture develop the flowers of such even in the dark, and any excess of light seems to lower rather than foster such growths. But the case is widely different with what may be called the forcing of superior plants, and hence good preparation must be made for the application of artificial heat when needed, and for the full utilisation of the light and warmth of the sun, by the use of clear glass at a sharp angle, and the placing of it full south. More light, and also a larger amount of sun-heat, may often be secured in forcing-pits by altering their form from that of lean-to, to hip, quarter, or full-span pits. Lean-to pits are with-

out doubt the warmest. The back wall proves a good absorber and a fine retainer of heat, and being placed where it cannot escape being heated, it returns its heat freely into the atmosphere when it is most needed. The hip-span pit has a small portion of the roof formed into a span at the top. The quarter-span has a quarter as much roof at back as at front, whereas in the regular span the two sides are alike. Any of these forms admit more light to the pit than the common lean-to pit, which is perhaps, on the whole, the warmest and the best for forcing.

The Propagating-pit.—This may, as a rule, be lower and have a flatter roof than the forcing-pit. Free light is wanted, undoubtedly, but almost the less sun-heat the better. Among the first conditions of successful propagation (as will be more fully shown in special articles) is that the heat shall be regular and under complete control; for few things are more disastrous to the safe and speedy rooting of cuttings than heat by fits and

starts. Valuable beyond everything as solar heat is to horticulture, it is somewhat erratic and wilful in our climate. Now it bursts forth with a fierceness sufficient to wither up all parts of plants into a crippled condition, such as are cuttings at the best; and, again, it is withdrawn for hours, days, weeks, it may be months. Hence the roof of the propagating-pit had better be so flat as to be little influenced by the sunshine. A northern or eastern aspect is also quite as good or better for it than a southern one. The light of the sun should be welcomed; its heat cannot be trusted to root difficult cuttings with safety. Such a pit as that shown in Fig. 17 is admirably adapted for propagation.

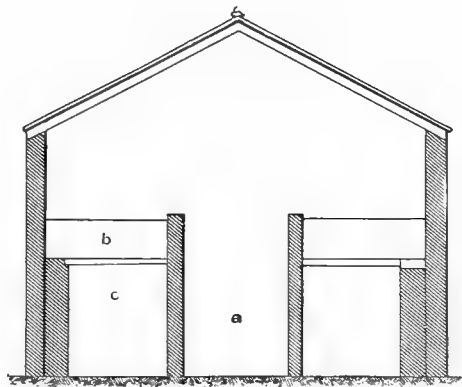


Fig. 17.—SPAN-ROOFED PROPAGATING-PIT.
a, Central path; b, plunging-bed, over c, hot-air chamber.

Pine-pits, on the contrary, should be so constructed as to receive all the sunlight possible to our climate in winter. This plant of the light, heat, and moisture-loving tropics can ill endure the fog and darkness of our wintry skies. Hence the best glass, a considerable pitch, and a southern aspect should be chosen for Pine-pits. The Pine-plant also grows tall, some of them, such as the Providence, running up to four or five feet, and good Queens to a yard or more. Hence Pine-pits

should be deep and roomy. Some of the older ones were nine or ten feet wide, and seven feet to ten in depth. Those were the days when hot dung, tan, and leaves in bulk were trusted to as the great sources of bottom and top heat. Considerable masses of these were needed to maintain temperatures of 55° to 75° in pits, with the external air at zero. Pine-pits are less relied upon and important than they were. Some now fruit their Pine-plants in pits, and pits and houses alike are now generally warmed by hot water. Still, there are yet good Pine-growers who do grow a considerable proportion of their succession plants in pits and in fermenting materials. Hence one or more Pine-pits exist in most gardens where Pines are grown, and some of the finest Pine-apples that have yet been produced in this country have been grown in common dung-pits. Roots and top alike enjoy the genial warmth and the nourishing forces evolved from decomposing materials such as horse-dung, Oak-leaves, spent tan. These prove food as well as heat to them. They may be said to be medicine as well, for it is seldom

that either mealy bug or scale thrives on Pines on a dung-bed.

Melon and Cucumber Pits.—These have been made of every possible form and size. Constructors at one time almost ran wild over Melon-pits. Machinery was even erected to lift up the growing beds by block and tackle, as the materials of which they were composed lost bulk through their decomposition. No amount of mechanical ingenuity was spared to arrest the sinking away of the plants from the light. Most of the old pits were far too deep to start with. As a crop of Melons may easily be finished within four or five months from the time of sowing, and as, moreover, they can only be grown to any good purpose in the early spring, summer, and autumnal months, it follows that Melon-pits need

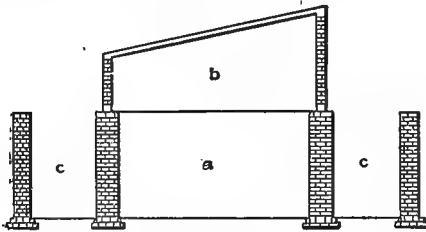


Fig. 18.—MELON OR PINE PIT.

Heated by dung linings. a, b, pit; c, c, linings.

not be nearly so deep as those for the culture of Pines. A depth of from four to five feet is ample for Melons where decomposing materials are wholly depended upon for the supply of artificial heat. In cases where hot water is used, less depth is needed. But for the culture of Melons, as well as Cucumbers—and the pits for the one will answer equally as well for the other—the mixed plan of heating—that is, hot water and hot dung or leaves—is the best.

Though the question of heating pits, and also other structures, is reserved for separate treatment, it is almost impossible to make our description of Melon and Cucumber pits intelligible without reference to linings, which provide the means of warming such structures. Melon and Cucumber pits are mostly built of nine-inch brickwork, solid or pigeon-holed, or fourteen-inch hollow walls. It is essential that the walls should be strong, and that the pits should be so constructed as to enable heat to be thrown in from the outside to the inside of the pit with ease and despatch.

Linings are constructed for this express purpose. These consist of spaces, two, two and a half, or even three feet wide, running all round the pit at times—always along the front and back where not all

round. They reach to the base of the pit and up to the ground-level, often beyond it. The linings are also not seldom six inches or even a foot narrower at bottom. The off-side of the lining is finished with four-and-half or nine-inch brickwork, according as the soil is difficult or easy to keep out of the lining. Our illustrations of Melon-pits with linings will assist in the understanding of the text. It is obvious at a glance that this blank space may readily be filled in with litter or with hot manure, and in either case it would afford a lining to its outer walls so far as it surrounded them, cold-proof in the one case, and an active source of heat where manure, leaves, or dung were used. The parts of the pit thus surrounded could hardly at any time of the year fall below 45° or 50°. But by the use of hot manure a temperature from 60° to 100° might be got up and sustained around the pit.

This being so—and no one conversant with the

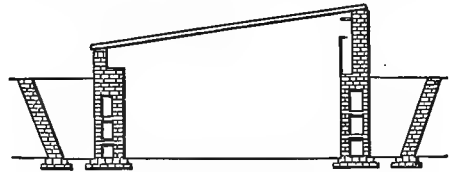


Fig. 19.—FLAT-ROOFED PIT, LINED.

Showing hollow walls, and linings wider at top than bottom.

heating power of manure in a state of decomposition will question the fact—the next structural point of importance in regard to our Cucumber and Melon pits is how to get this external heat inside the pits, and a second question of almost equal moment is how to regulate its amount so as to turn it to the highest practical account. Heat can be forced through a brick wall, but considerable waste is involved in the process. Hence the origin of what are called pigeon-holed walls, double walls, arched, pillared, and other pits. Nearly all these aimed, more or less successfully, at the solution of the compound problem already stated, viz., the warming of Melon and other pits by decomposing materials, and the forcing of the heat into regularity and semi-permanency.

The dung linings were, in fact, almost the only heating furnaces known to our fathers. Their covering shutters were the furnace-doors by which they checked waste, and by cutting off the draught regulated the production. The stable-yard, or heap of Oak-leaves or tan, was their never-failing coal-heap; the vapour and heat of these materials, and peculiar structure of their pits, their hot-water pipes, tanks, &c. They had only these, and their achieve-

THE THICK-LEAVED CLEISOSTOME (CLEISOSTOMA
CRASSIFOLIUM).

A very pretty hot-house Epiphyte, from the East Indies, belonging to the natural order of Orchids. It is remarkable for its thick tough aloe-like leaves and panicles of dense sea-green flowers, singularly enlivened by a rose or violet lip. The inflorescence, too—although, as is customary among Cleisostomes, consisting of small flowers collected into dense spikes at the ends of the branches—has a peculiar curved or drooping appearance, by which the species may be known irrespective of its foliage.





THE THICK-LEAVED CLEISOSTOME.
(CLEISOSTOMA CRASSIFOLIUM.)

ments in the frame-culture of flowers, fruit, and vegetables have never been surpassed; and those modes of heating are even yet, in these days of hot water, steam, and telephones, still within reach of every amateur in the land. A load or two of manure, tree-leaves, spent tan, cocoa-fibre refuse, and the sense to use them aright, are all that are needed to grow Melons and Cucumbers to the highest perfection; and when these have done their good work, the residuum, enriched with house-slops, forms the best manure for the kitchen and flower garden.

How many even keep a horse and trap in their business, who cannot afford to purchase either boiler or pipes to heat pits, or houses to grow Melons or Cucumbers! Nor need they. With a glass pit, six or seven feet wide, built on pillars, and from four to twelve feet in length—that is, a one, two, or three-light pit—the manure from horse or pony would suffice to keep it warm enough for the purpose. Let it be thrown into the lining as taken from the stable-doors, and occasionally the whole mass should be turned over, allowing the steam to rise against the false bottom in the pit. If any excess of heat should arise, the shutters could be left off till it evaporates; if not sufficient, a little more or better manure must be thrown in. But, on a small scale, the frequent supply will sustain the temperature sufficiently high for the wants of the plants. On a larger scale, heaps of manure are kept in a prepared state for the renewal of linings; the whole system of preparation and compounding of materials being elaborated into something like a caloric science, so that heat may be given to or withheld from pits warmed with decomposing matters, with almost as much despatch and precision as the turning off or on of a hot-water tap.

The Shading of Pits.—Of all sorts of fixed shading, such as that of “sun-cloud” showered on with the syringe, whitening or paint brushed or stippled over the glass, or permanent lath or wooden shading, so often seen in France, it may be said they do more harm than good. Still at times, and during such tropical weather as we have in some summers, with few or no clouds for months, and the sun reaching 90° or more in the shade for nearly weeks together, more or less shade is often of the highest value to plants in pits. The northern aspect affords sufficient shade for store-pits; but Pine-apples, Melons, and Cucumbers cannot be grown in a northern aspect in our climate. The leaves of the former, though they seem so hardy, almost horn-like, are easily scorched, and when once scorched they are ruined alike functionally and in appearance. Cucumbers, again, are better for shading in bright weather, and unless such sun-loving plants as Melons are occasionally slightly

shaded towards the finish, they are apt to lose their foliage prematurely, a *contretemps* which is quite fatal to their perfect finish and full flavour. Portable shading of thin canvas, tiffany, or hexagon or other netting is the best.

The Covering of Pits.—This is generally needful in very severe weather. It is of little use guarding the front and back and side walls securely if the frost is allowed free course through the weakest parts of pits, the glass lights. A very thin covering suffices to check the loss of heat by radiation. During severe weather a thicker covering will be needed to hinder the pits from being emptied of their caloric through conduction. Mats are still the most popular of all coverings for pits. They are, however, about the worst. Double mats, with a layer of hay, straw, or other litter between, are ten times as efficient. But reed or straw frames, a little larger than the lights, so as to cover the entire surface, rafters and all, are the most efficient. Rolling straw or reed mats, made specially for the purpose in long lengths, are almost as efficient. These, however, as well as mats, need heavy rails at the top and bottom of frames to keep them on in windy weather.

The Giving of Air to Pits.—Without entering into the vitally important question of ventilation, which shall have separate treatment, it may be stated here that the worst mode of ventilating pits is that of pushing every alternate light down a few inches and dragging the next one up almost to the same extent. This creates and sustains a through draught, the worst possible for the growth and health of plants in pits and frames. The almost equally common practice of pushing down every light, or every other one, six inches or a foot, as the case may be, is almost equally bad, as this enables the cold air to tumble down headlong on to the crowns of the plants. The safest, simplest mode is to tilt every light, or every other light, up one or more inches with a thin wedge-shaped piece of deal; and in order that these may be always at hand when wanted, they should be tied or chained on to the wall-plate at the back of each light, with fasteners sufficiently long to enable them to be used without being detached. This may seem a small matter, and so it is, but it is on a series of such trifles that success or failure in the culture of plants in pits—and, indeed, in all other places out of doors or in—turns.

Finally, in this matter of giving air to plants in pits, remove all air from tender plants, such as Pines, Cucumbers, Melons, early—say by 4 p.m.—and, *per contra*, leave the lights of store-pits wedged up all night, unless during the coldest weather.

The simple method described of giving air will enable this to be done without admitting the rain, a point of vital importance to success.

Of course, in what are called really cold pits the lights may be wholly removed, unless in cold or wet weather.

Special Culture of Plants in Pits.—As they are placed or grown in these either for convenience, or because these are the best places for them, it may be added that the culture recommended for each family in this work will suit them in pits as well as in houses or out of doors. The chief points to guard against in pits are excess of moisture, either in the soil or atmosphere, and sudden and severe changes of temperature. The smaller the area enclosed with glass, the greater the danger of sudden alterations or extremes of either heat or cold. However, not a few of the greatest victories won by cultivators have been achieved through the aid of pits and frames; and notwithstanding the run upon hot-houses and green-houses in lieu of these more simple and primitive structures, pits will ever hold a permanent place in the past history and future triumphs of horticulture.

ORCHIDS.

BY WILLIAM HUGH GOWER.

Calanthe.—A genus of terrestrial plants containing some very handsome and showy species; the name comes from *kalas*, "beautiful," and *anthos*, "a flower"—hence we have "beautiful flower." The leaves are for the most part broad, plaited, and dark green; the lip is spurred and united to the column its entire length; the pollen masses are eight, waxy, and adhering in fours.

Calanthes may be divided into two sections—viz., *evergreen* and *deciduous*. The first-named do not require a resting season—that is to say, although less water will be given during winter, they must never be allowed to get dry—whilst the deciduous kinds must have a long rest after the flowering season is past.

These plants require to be grown in pots, and the evergreen kinds should be potted in the ordinary way, and not elevated above the rim, using for soil about equal parts of loam, leaf-mould, peat, and dried cow-manure, adding a little sharp sand; the pots must be thoroughly drained, and during the growing season supplied freely with water. The deciduous section must be treated in the manner previously described for potting Orchids, and during the time of growth will be much benefited by the

application of a little liquid manure once or twice a week; until the pseudo-bulbs are mature we prefer giving the temperature of the East Indian House, but afterwards they should be removed to a cooler situation.

SECTION I.—EVERGREENS.

C. Dominiana.—This is the result of a cross between *C. masuca* and *C. veratrifolia*, and is both handsome and free-blooming. It is rather singular that Messrs Rollissons, of Tooting, obtained a plant exactly the same as did Mr. Dominy at Messrs. Veitch's, by using the same parents, and thus we find this variety in some collections under the name of *C. Mylamiana*, but they are identical. The leaves are broad and plaited, dark green; sepals and petals soft lilac, with a deep purple lip. Spring and early summer. Garden hybrid.

C. Masuca.—Of this species there are several forms, the best being called *grandiflora*. The leaves are large and bold, much plaited, and dark green; the flowers are produced on a tall, erect stem, and are very numerous; sepals and petals deep violet, whilst the curious lip is deep violet-purple. It blooms nearly the whole summer. Northern India.

C. veratrifolia is a bold and strong-growing plant, with large, plaited, dark green leaves, and an erect many-flowered raceme, which lasts long in full beauty if the flowers, which are pure white throughout, are not shaken together; if this occurs they will speedily turn black, as the blooms are very delicate and easily bruised. June, July, and August. Northern India.

SECTION II.—DECIDUOUS.

C. porphyrea, rich purple and yellow. Garden hybrid.

C. Regneri, white, with rosy-pink eye, Cochinchina.

C. vestita.—The pseudo-bulbs ovate-obtuse, and of a peculiar glaucous hue, bearing two or three broadly-lanceolate leaves, which are membranous, plaited, and pale green. The flower-spike issues from the side of the pseudo-bulb near the base; and the raceme is somewhat pendulous. This species and its varieties should be shaken quite out of the old soil every season, and repotted during March and April; and when the flowering season is over they may be laid on one side in a cool place to rest. These plants lose most of their leaves by the time they flower, which mars their effectiveness to a great extent; to obviate this, seedling Ferns should be pricked in between the pseudo-bulbs, which will be a great relief to the bare stems.

The blooms of these varieties are exceedingly useful for all purposes from November to March. The following are the best varieties:—

C. vestita cuprea.—Creamy-white, with bronze eye.
C. vestita gigantea.—Creamy-white, with fiery-red eye.

C. vestita lutea.—Creamy-white, with lemon-coloured eye.

C. vestita nivalis.—Pure white throughout.

C. vestita rubra.—Creamy-white, with deep crimson eye.

C. vestita Turnerii.—Creamy-white, with pink eye.

C. Veitchii.—This is the result of a cross between *Limatodes rosea* and *Calanthe vestita*, and is a truly beautiful plant. The pseudo-bulbs are flask-shaped, with a very long neck, and bear large membranous leaves; the spike attains the height of one to three feet, bearing a profusion of its lovely rich rose-coloured flowers. It blooms all through the winter months. Garden hybrid.

C. Williamsi, white and rosy-pink, lip deep rosy-crimson, with darker eye. Cochin China.

Catasetum.—An extensive family, producing extremely curious flowers, but on account of the colours being of a somewhat sombre hue, they are not very popular with the present race of Orchid-growers; some few kinds nevertheless are sufficiently showy to deserve a place in the most *recherché* collections.

The plants included in this genus were formerly divided into three genera—viz., *Catasetum*, *Myanthus*, and *Monacanthus*; but as upon several occasions the three forms have been produced upon one spike, the two last-named have not been retained; the forms of the various sections, however, vary rather considerably.

As a genus *Catasetum* is distinguished by its thick fleshy pseudo-bulbs, which bear large membranous plaited leaves; the flowers are produced in long racemes, which are sometimes erect, but more frequently drooping; these racemes spring from the base of the pseudo-bulbs, which are deciduous.

The flowers of the true *Catasetum* are thick and fleshy in texture, the sepals and petals often become hooded, whilst the lip is continuous with the column, and often cucullate; the column is pointed at the apex, and bears near the middle a pair of cirrhi; in *Monacanthus* the column is destitute of these cirrhi; in *Myanthus* the cirrhi are produced at the base of the column, and the lip is oftentimes flat and lobed. In each section the pollen masses are thrown forward with great force to a considerable distance, and being glutinous they adhere very firmly to any object on which they alight. Sir R. Schomburgh, who first discovered the three forms upon one spike, was of opinion that *Myanthus* was the male flower, and *Catasetum* the female, as the latter only produced any seeds, and he has been borne out in this sup-

position by the observations and experiments of the late Mr. Darwin.

Catasetums are naturally terrestrial plants, and should be potted in rough fibrous peat; during the growing season they enjoy a liberal supply of water, but require a thorough period of rest.

C. atratum.—Pseudo-bulbs three to five inches high, leaves somewhat lanceolate, narrowest at base, membranous and dark green; the scape rises from the base of the young pseudo-bulbs, and the flowers open about the time that the growth has attained maturity; flowers large and numerous, dark green, profusely blotched with purplish-brown; lip beautifully fringed, and spotted with brown at the base, passing into yellowish-green. May and June. Brazil.

C. Bungeirothi.—This is quite a new discovery, and the grandest of all the known species; the flowers are borne upon nodding racemes, and are very large, pure ivory-white, with an orange-coloured cavity in the lip. Ecuador.

C. cernuum.—Similar in many respects to *C. atratum*; but its flowers are larger and brighter; sepals and petals bright dark green, profusely spotted with purple; lip yellowish-green, bearing numerous spots of red and black; the apex orange. Spring and early summer. Brazil.

C. fimbriatum.—In this species the sepals and petals are reddish pink, and slightly spotted with red; lip broadly heart-shaped, creamy-white, and beautifully fringed at the edge. Summer months. Brazil.

C. incurvum.—This is not only one of the largest, but one of the most extraordinary forms in the genus. In describing this plant, the late Dr. Lindley says: "The flowers are dull green, streaked and stained with purple; the great blossoms resemble nothing so much as some portentous Arachnid, seizing upon the shaggy ear of an unhappy animal, and turning it inside out in the struggle to grasp it, till a pair of horns with which the Arachnid seems furnished could be plunged into the ear, in order to hold it fast." June and July. Guatemala.

C. longifolium.—As its name implies, this species produces very long and linear strap-shaped leaves; the flowers are handsome, the colour of the sepals and petals being deep crimson; the lip somewhat darker, tinged with violet at tip, and profusely dotted with yellow. Summer months. It is found growing upon river-banks and low grounds in Demerara.

Cattleya.—Named in honour of Mr. William Cattley, the happy possessor of the first species that flowered in this country, who had a fine collection of these plants in his garden at Barnet; and it

is very remarkable that the first species (*C. labiata*) still ranks as one of the finest and rarest of the genus, notwithstanding the immense quantities of this family which have been imported since that time (1824). As a genus *Cattleya* is distinguished by its sepals and petals being fleshy, the former equal and spreading, the latter often the larger; labellum three-lobed, sessile, cucullate, covering the half-round column; pollen masses, four. *Cattleyas* all produce pseudo-bulbs; in some instances these are short and stout, bearing a single leaf, but in others the pseudo-bulbs are slender and stem-like, bearing two or more leaves.

The plants comprising this genus are peculiar to the Western Hemisphere, where they are found occupying the forks and branches of the forest trees, and also upon the face of rocks, from the Organ Mountains in Brazil, right up through Central America, to the heart of Mexico. Having such a wide range, it is not to be wondered at that we find such an infinite variation in their colours and times of blooming. In the earlier days of our knowledge of the genus we had no *Cattleya*-bloom after *labiata* was over in the autumn, until the two-leaved section, such as *intermedia*, opened in the spring; but now there is no interval—*Cattleya*-blooms may be had every day in the year.

Cattleyas produce the largest and most gorgeous flowers of the whole order, and, large as the genus is naturally, the cultivators at home have considerably increased it by cross-breeding, and have by this means given us some of the grandest flowers in the family.

These plants have always found favour with Orchidologists on account of their extreme beauty and the comparative ease with which they are managed; and, although not essentially cool-house plants, they nevertheless thrive in a quite enjoyable atmosphere. There is, however, one exception to the rule; it is the remarkable *C. citrina*, which thrives admirably in the coolest house. It must, however, be placed on a block of wood and hung head downwards, for although it grows freely if allowed to crawl down, nothing will induce it to grow when placed upright; this plant is a native of Mexico, where it enjoys the euphonious name of "Corticatozote coxochitl."

The majority of *Cattleyas* thrive best when grown in pots, although some of the smaller kinds must be placed upon blocks and suspended from the roof. The pots to receive them must be well drained, and the soil should be good peat-fibre, some chopped living Sphagnum, and a little sharp sand. The soil should be elevated above the rim of the pot, and the plants should sit upon it, in order that the water may run quickly away from the eyes. During the

growing season *Cattleyas* enjoy a fair supply of water to their roots; the soil must not be kept in a state of saturation, or the roots will be destroyed, but the atmosphere should be kept well charged with moisture. We do not approve of syringing for *Cattleyas* in pots, because the large leafy sheaths which envelop the young growths hold the water and cause the immature growth to decay; but when these plants are grown upon blocks they may be syringed, for then the water runs off as it does in a state of nature. In fact, those plants which are upon blocks may be syringed with advantage, and, in addition, must be taken down and dipped in tepid water two or three times a week. After growth is complete, water must be gradually withheld, both from their roots and in the atmosphere, but they must not be subjected to such a drying as to cause the pseudo-bulbs to shrivel, or the plants in all probability will be seriously injured. Naturally these plants do not grow fully exposed to the rays of the sun, but in some instances, when found upon the face of a rock, they have full exposure, and in such places the growth is always short and stunted, but they produce flowers in abundance, which fully proves the beneficial results derived from a thorough rest.

Cattleyas are subject to attacks of white scale, from which they must be kept free by washing with a sponge and clean water. Beetles will also eat their roots unless these pests are kept out of the houses as we have previously recommended.

C. Aclandia.—A dwarf plant, seldom exceeding six to eight inches in height; pseudo-bulbs, slender, stem-like, and furrowed; leaves in pairs, ovate, thick and leathery in texture, and dark green; scape terminal, erect, usually two-flowered; sepals and petals about equal, broadly-lanceolate, chocolate-brown, suffused with a purplish tinge, and transversely banded with greenish-yellow; lip large and spreading, panduriform, lateral; lobes small, leaving the column exposed; it varies in colour, rich rose to deep purple, and sometimes pale purple, with deeper-coloured veins; the disc ornamented with yellow. Spring and summer months. Brazil.

C. amethystoglossa.—This is a superb plant; it attains a height of from two to three feet; pseudo-bulbs stem-like, thickening upwards, furrowed, and bearing on the summit a pair of spreading leaves, which are linear-oblong, thick and leathery in texture, and deep green; scape stout, erect, springing from between a sheath in the apex of the pseudo-bulb; bearing numerous handsome flowers, which are about five inches in diameter; sepals and petals white, suffused with rosy-lilac, and very beautifully spotted with purple; lip broad, of a uniform rich deep violet-purple or amethyst. It blooms during

the spring months, and lasts several weeks in perfection. Brazil.

C. bicolor belongs to the same section as *C. Aclandie*, in which the lateral lobes of the lip are too small to cover the column. The best forms of this species are very handsome. It does not appear to be widely distributed in its native country, where it is found high up on the trunks of the largest forest trees. The pseudo-bulbs are slender and stem-like, one to two feet high, bearing upon the apex two oblong-lanceolate, coriaceous leaves; peduncle terminal, bearing five to ten fragrant flowers, upwards of four inches in diameter; sepals and petals greenish-brown; lip deep rose-purple, with a white fringe in front. It remains a long time in full beauty. August and September. Brazil.

C. citrina.—Pseudo-bulbs small, oval, and, together with its two narrow leaves, very glaucous; flowers mostly solitary, and of a uniform rich bright yellow, saving the front of the frilled lip, which is white, and in some varieties the disc is stained with orange; the flowers are very fragrant, and thick and fleshy in texture, consequently they last long in perfection. This plant must be grown on a block and hung head downwards in the coldest house. May and June. Mexico.

C. Dawsonii.—It has been suggested that this plant is a wild hybrid between *C. labiata* and *C. Mossie*, but it more resembles a very fine variety of *C. speciosissima*; it is undoubtedly one of the finest of the genus. It is beautifully figured in "Warner's Select Orchidaceous Plants," with the following description:—"The stems are one-leaved, and bear a spike of several highly-coloured flowers, which are fully seven inches across; the sepals and petals are of a delicate rose, the former lance-shaped and plane, the latter very broad and much undulated; the lip is large, spreading in front, the margin much undulated, and the apex deeply divided; the front portion of the central lobe is of a rich deep crimson, which is carried backward towards the base in the form of streaks; the front part of the lateral lobes is white, narrowly bordered with rose, and the centre is yellowish." Summer months. It is supposed to be a native of Brazil.

C. Devoniensis.—This is the result of a cross between *Lelia crispa* and *Cattleya granulosa*. It partakes most of the *Cattleya* habit, and is a very handsome variety, specially useful as an autumn blossom; pseudo-bulbs slender, stem-like, and thickening upwards, bearing on the apex a pair of thick and fleshy leaves some six or eight inches long; peduncle bearing numerous showy flowers five inches or more in diameter; sepals white, tinged with pink; petals undulated, white, suffused with a bluish tint; lip wedge-shaped, deep purple, lateral

lobes tipped with purple. September to November. Garden hybrid.

C. Dominiana.—The name is given in honour of its raiser, whose great abilities have been well known in the horticultural world for many years, and to whose exertions we are indebted for so many of the grand novelties which have originated in the nurseries of the Messrs. Veitch of Chelsea. This, like the preceding, is the result of a cross between a one-leaved and a two-leaved plant, viz., *Cattleya labiata* and *C. amethystina*. In habit of growth it resembles the latter. The flowers are some six inches in diameter. Sepals and petals thin and membranous, wavy, the latter much the larger, pale rose-colour; lip rosy-purple, margined with white, stained pale citron in the throat. There are several varieties of this plant, such as *lutea* and *alba*. It blooms during the autumn months, and lasts a long time in full beauty. Garden hybrid.

C. Dowiana.—Only a few years ago Orchid-growers were set rejoicing by the announcement that a grand *Cattleya*, which had been discovered years ago by the celebrated traveller Warszewicz, had at last been introduced in a living state. Since its introduction it is found that a little more warmth is requisite for it than for the majority of *Cattleyas*. In habit and appearance the growth resembles that of *C. labiata*, but it can easily be distinguished from that plant. Pseudo-bulbs slender at the base, much swollen above in the shape of a club, furrowed, and about eight inches high, bearing a single oblong-obtuse leaf, which is broad, thick, and fleshy, about a foot long, and dark green; peduncle enveloped in a large spathe, bearing three to six large and gorgeous flowers, upwards of six inches in diameter; sepals lanceolate, smooth; petals very much larger, ovate, waved, and, like the sepals, of a clear bright nankeen colour; the lip very large and spreading, beautifully frilled at the edge, rich velvety purple, shaded with violet and streaked with lines of gold. It flowers in the late summer and autumn months. Costa Rica.

C. Dowiana aurea.—In habit resembling the typical plant, its sepals and petals are soft clear yellow; lip deep velvety purple shaded with crimson, and veined with rich yellow. Colombia.

C. Eldorado.—A very charming species, with short clavate pseudo-bulbs, bearing a single oblong-ligulate coriaceous leaf some six inches in length; peduncle issues from a blunt spathe, bearing three to four flowers nearly six inches across; sepals lanceolate; petals double the size of sepals, ovate, and soft rosy-pink; lip broad in front, rosy-pink outside, rich amaranth in front, and stained with orange on the disc. September and October. Rio Negro.

C. Eldorado, var. *virginialis*.—In habit of growth

this resembles the type. The flowers are of a uniform pure white, the throat of the lip being conspicuously stained with orange. September and October. Rio Negro.

C. ecomiensis.—This is another of the Dominy hybrids, and assuredly no more beautiful flower in its way can be raised. It is the result of a cross between *Cattleya Mossie* and *Lælia purpurata*. With two such grand parents it was impossible to have an inferior offspring. The pseudo-bulbs are clavate, and bear a single oblong-obtuse coriaceous leaf, the peduncle issues from a rather acute sheath, and bears four to five large flowers, fully six inches or more in diameter; petals more than double the size of the sepals, all of soft rosy-lilac, the former beautifully waved and frilled; lip very large and spreading, cordate, waved and crisp round the edge, rich purplish-crimson in front, then a band of white, and the throat golden-yellow, whilst the edge is narrowly margined with white. August and September. Garden hybrid.

C. gigas.—Of this grand species there are many forms. The pseudo-bulbs are stout and clavate, bearing a single oblong-obtuse leaf, which is very thick in texture, slightly bi-lobed at the apex, and deep green; the peduncle issues from a long acute spathe, bearing three to six flowers some seven inches in diameter; sepals lanceolate; petals ovate, more than twice as broad as the sepals, and soft pale rose-colour; lip deeply bi-lobed in front, very large and broad, deep rich purplish-crimson, then a band of white, the throat golden-yellow, with numerous purplish lines on the disc. April and May. New Grenada.

C. gigas Sanderiana.—A free-flowering and superb form, equal to the type in size, with a rich deep purplish-magenta lip. July and August. Colombia.

C. guttata, var. *Leopoldii*.—A bold-growing plant belonging to the two-leaved section, having terete, furrowed, stem-like, pseudo-bulbs, which attain a height of one to two feet; the peduncle issues from

a small acute sheath, and bears usually from six to twelve flowers, but in fine examples double that number have been produced; sepals and petals about equal, brown, with a greenish tinge, and profusely spotted with crimson; lip spatulate, reddish-purple. Summer months. Island of St. Catherine, Brazil.

C. intermedia.—This is a charming old species, but too often slighted since the larger-flowered kinds have been introduced, yet still well deserving a place in the best collections. The pseudo-bulbs are slender, and attain a height of about one foot, bearing two and sometimes three coriaceous dark green leaved; peduncle four to six-flowered; sepals and petals about equal, white, or soft delicate rose; lip broad, frilled in front, rich purple. May and June. Brazil.

C. labiata.—This is the species upon which the genus was established, and which still remains rare in collections. The pseudo-bulbs are stout, and somewhat club-shaped, furrowed, and bear a solitary, broad-oblong, coriaceous leaf, which is deep green above, and slightly tinged with flesh-colour beneath; peduncle stout, bearing from three to four flowers, which are oftentimes seven

inches in diameter; sepals linear-lanceolate acute, rich rosy-lilac; petals same colour, but double the breadth of the sepals; lip obovate, emarginate, beautifully crisp, deep ruby-red or crimson. October and November. Brazil.

C. labiata, var. *pallida*—sometimes known by the name of the "summer-flowering *labiata*"—is a plant which resembles the preceding, but both foliage and flower are lighter in colour, sepals and petals pale pink; the lip is crimson, with a beautiful, crisp, white edge. July and August. Brazil.

C. Mardelli.—A fine garden hybrid, raised from *C. speciosissima* and *C. Devoniensis*. In growth it much resembles *C. superba*. Sepals and petals bright magenta; lip three-lobed, the side lobes spreading, soft magenta, pale towards the middle, middle lobe rich deep magenta in front, broadly streaked with yellow in the centre. June and July.



CATTELEYA MOSSIE.

C. maxima.—The pseudo-bulbs of this plant are somewhat stem-like, slender at the base, but thickening upwards, furrowed, a foot or more high, and bearing a thick and fleshy oblong leaf, which is about eight inches long and pale green; peduncle five to ten-flowered; sepals linear lanceolate; petals obovate, waved at the margins, all a uniform rich deep rose-colour; the lip large, convolute, middle lobe spreading, beautifully crisp at the edge, the ground-colour white, disc ornamented with a broad orange-coloured streak, the remaining portion being profusely decorated with forked lines of dark crimson; the frilled margin is white. Late summer and autumn months. Columbia.

C. Mendellii.—During the past years vast numbers of *Cattleyas* have been sent home from New Grenada under the names of *Trianae*, *Chocensis*, *Mendellii*, &c. &c.; but we are under the impression that these are only variations of one species, and that the typical plant is *C. Warscewiczii*. These variations in colour, however, are so great that from a cultural point of view distinctive names are requisite. In the variety *Mendellii* there are numerous grand forms; it is a bold-growing plant, with a stout clavate pseudo-bulb, and broad-

oblong, coriaceous leaf; the peduncle is three to seven-flowered, each flower measuring six or seven inches in diameter; sepals and petals broad and spreading, varying from pure white to pink, rosy-pink, and deep rose; lip large, the middle lobe spreading and beautifully crisp, varying from a deep rich purple to crimson and magenta. It continues in full beauty a long time. Spring and summer. New Grenada.

C. Mossie.—In this we have a magnificent species; but so variable are they in the markings of the labellum that it is hardly possible to obtain two plants exactly alike; but all the forms are beautiful. Pseudo-bulbs clavate, furrowed, bearing a solitary coriaceous leaf; peduncle three to six-flowered, each flower measuring four to six inches in diameter; sepals lanceo-



CATTELYA TRIANAE.

late; petals much broader, somewhat oblong-ovate, the margins waved; lip three-lobed, obovate, with a beautiful crisp margin; the sepals and petals vary in colour from pure white to blush and to deep rose, and the lip varies also; the ground-colour is usually deep rose, the front lobe being rosy-purple, crimson, or rich violet, stained with orange in the throat. The differences in colour render many of these very distinct, and there are at least half a hundred forms

distinguished by special names. The flowers are produced from May to August; they are very fragrant and last long in full beauty. La Guayra.

C. Regnellii.—This very elegant plant must be grown upon a block in the warmest end of the Brazilian House; it is similar in appearance to *C. Aclandiae*, but is more robust in growth; it, however, does not belong to the same section of the genus as the last-named species, for in the kind now under consideration the lateral lobes of the lip form a complete hood over the column. The pseudo-bulbs are clavate, and some four or five inches high; leaves short, usually in pairs, although sometimes three are produced from the top of the stem; they are oblong-obtuse, coriaceous, and dark green; scape erect, three to five-flowered, each flower some four inches in diameter; sepals and petals nearly equal, with wavy margins; ground-colour pale green, tinged with olive, transversely spotted with dull purple; lip large, three-lobed, the side lobes white, tinged with purple, deep purple within; middle lobe large, flat, obovate, narrow at the base, where it is yellow and distinctly marked with five parallel lines; front portion rich bright purple, with a white marginal border; middle lobe finely toothed. It blooms twice in the year—first about June or July, and again in September or October. Brazil.

C. Skinnerii is an old inhabitant of our gardens, and a universal favourite. Mr. Skinner, in honour of whom it is named, says that "it inhabits the hot, damp coasts of Guatemala, and is always found on high trees, seldom bearing any lichens, so that the moisture from the heavy rains soon passes off; neither does it seek shade, but rather likes exposed places." This specimen is the *Flor de San Sebastian* of the Guatemalense; it should be grown in the warmest part of the Brazilian House; the pseudo-bulbs are clavate, twelve to eighteen inches high, and bear a pair of pale green coriaceous leaves; the peduncle bears six to twelve flowers, which are of a uniform soft rosy-purple, saving the base of the lip, which is white; quite recently we had a pure white form introduced, which has been named *C. Skinnerii alba*; it is, however, a rarity at present. March to May. Guatemala.

C. superba has always been found a difficult plant to manage. It is found in the southern parts of Essequibo, growing on the trees which skirt and overhang the rivers. It requires to be grown upon a block, and enjoys plenty of heat and moisture; the East Indian House will suit it well when growing. The Indians call it *Oponopodoti*,—the Duck's mouth. *C. superba* seldom exceeds a foot in height; the stems are slender at the base, thickening upwards, furrowed, and bearing a pair of nearly round, coriaceous, dark

green leaves; the peduncle is erect, bearing three to six flowers, which are thick and fleshy; sepals and petals deep rose; lip rich magenta, or crimson, except the base, where it is yellow, veined with rose and white. It flowers from the young pseudo-bulbs when about half mature. Another form has been found on the banks of the Rio Negro; it is called *superba elegans*; the parts of the flower are longer and the leaves are more oblong than in the original form; flowers larger, about the same colour. June and July. British Guiana.

C. Trianae.—Under this name we have an immense variety of grand forms, all of which are winter bloomers. The plants in question are bold growers, something in the way of, yet distinct from, the *Mendellii* group. They have stout clavate pseudo-bulbs, bearing an erect, broad, dark green leaf; the peduncle bears from three to six flowers, which measure five to six inches in diameter; the sepals and petals are usually very broad, and vary from pure white through all shades to deep rose; the lip varies in intensity, the large front lobe being deep rose to deep velvety-purple, with a more or less large and high-coloured stain of yellow or orange in the throat. Winter months. New Grenada.

No species has given rise to a greater number of attractive varieties than *C. Trianae*, and some of these were formerly considered as true species. One of these, formerly known as *C. quadricolor*, was at one time described and figured as a species, with a suggestion that it might be a natural hybrid. Mr. Bate-man, who in describing it adopted Dr. Lindley's MS. name, said: "The pseudo-bulbs are from six inches to a foot long, perfectly upright, narrower and more compressed than in any other allied species; leaves one on each stem, narrow, strap-shaped, acute, usually about ten inches long; peduncle issuing from a large spathe, and bearing one or two flowers about four inches across, but not so much spread open as is usual in this genus; sepals pure white, oblong-lanceolate obtuse; petals slightly spatulate, three times wider than the sepals, and of the purest white; lip undivided, cucullate, but not much opened out at the apex, which is somewhat curled, and of a deep purple; below this is a band of white, then streaks of yellow, the residu being rosy-lilac." The variety known as *delicata*, or *C. Warscewiczii delicata*, has flowers six inches in diameter, pure white except the disc of the lip, which is fringed with rose and stained with yellow. It resembles *C. Trianae* in habit of growth, and is a most superb plant. Hundreds of forms of this variety have, however, been introduced, too numerous to mention more in detail; but with few if any exceptions, all the varieties come from New Grenada.

C. velutina.—In its growth this species resembles

C. bicolor, but the flowers are very distinct from any other; they are also deliciously fragrant; sepals and petals pale orange, tinged with green, and spotted and streaked with purple; lip ovate, deep velvety-rose, veined with rich purple; throat yellow. Autumn months. Brazil.

C. Wagnerii.—Although described as a species, there can be little doubt that it is a variety of *C. Mossiae*. It was originally found growing with that species, which it resembles in every detail saving colour; the flowers are pure white, with a stain of deep yellow in the throat. June and July. La Guayra.

C. Walkeriana.—Sometimes found in collections under the name of *C. bulbosa*. It is a charming species of dwarf habit, and requires to be grown upon a block; pseudo-bulbs short, stout, and oval, bearing a solitary coriaceous, oblong, deep green leaf; peduncle erect, one to two-flowered; flowers five inches or more in diameter, and deliciously fragrant; sepals oblong-acute; petals much broader, ovate, with wavy margins; all clear bright rose-colour; lip rosy-purple, stained with yellow towards the base. It lasts a very long time in full beauty. The flowering season is May and June, but sometimes it blooms twice in the season. Brazil.

C. Warnerii.—This evidently belongs to the *labiata* section, to which indeed it is a dangerous rival. The original form introduced proved it to be one of the very finest of its race, but more recent importations have shown that it is subject to great variation. With something of the *labiata* growth, the peduncle bears three to five superb flowers, full six inches in diameter; sepals lanceolate-acute; petals ovate, very broad and crisp at the edges; all deep rose, shaded with lilac; lip very large, deeply bi-lobed in front, where it is intense rich crimson and beautifully fringed; behind this it is creamy-white, and the throat is orange. It is named in honour of Mr. R. Warner, of Bloomfield, Chelmsford—a worthy monument of his great love for these plants. Summer months. Brazil.

Chysis.—A small genus of remarkably showy plants. The name comes from *chysis*, “melting,” and refers to the pollen masses, which have the appearance of being run together or fused.

Chysis may be known by their stout spindle-shaped pseudo-bulbs, which are sometimes upwards of a foot long, and clothed with large leafy bracts; the leaves are large, membranous, and plaited, light green, and deciduous; sepals slightly connate; petals conforming to the sepals; lip three-lobed; column deeply channelled at the base; pollen masses, eight—four stout and four thin. These plants are found as epiphytes, growing on the forest trees, but though

they thrive admirably in cultivation upon blocks, their great weight renders it necessary to place them either in baskets or pots; the material should consist of rough peat fibre and living Sphagnum Moss, and a few pieces of charcoal. The flower-spike comes up with the young growth, and the blooms expand when the shoot is about half-grown; during this time they require an abundant supply of water, but when the pseudo-bulbs are fully matured they may be kept quite dry, and in a cooler temperature than when growing. Brazilian House.

C. bractescens.—The stout pseudo-bulbs are enveloped in large leafy bracts; the spike is rather short, bearing three to six flowers; sepals and petals thick and fleshy, pure waxy-white; the lip white, stained with yellow at the base. April and May. Mexico.

C. levis.—A handsome species. The raceme is many-flowered; sepals and petals clear pale yellow, suffused with orange; lip three-lobed, the side lobes yellow, forming a hood over the column; front lobe crisp round the edge, orange-yellow, blotched and streaked with crimson. It blooms during May and June, and retains its full beauty for several weeks. Guatemala and Mexico.

C. Limminghii.—This beautiful species inhabits the branches of the forest trees near the sea-coast. The pseudo-bulbs are shorter and more ovate than the previously enumerated kinds; scape five to six-flowered; sepals and petals of great substance, nearly equal; blush-white suffused with rosy-pink, which passes into purple towards the tips; lip three-lobed; the lateral lobes are too small to cover the column; yellow, streaked with crimson; middle lobe flat, fleshy, pinkish-lilac, streaked and lined with purple. March to May. Province of Tabasco, Mexico.

Cirrhopetalum.—The name is derived from *cirrhus*, “a tendril,” and *petalon*, “a flower-leaf,” in allusion to the peculiar ligulate sepals. It is a large family, and very nearly allied to *Bolbophyllum*, from which it is chiefly distinguished by the very long lateral sepals and umbellate inflorescence. The formation of the flowers of *Cirrhopetalums* is very singular, and this, coupled with their bright colours, renders them favourites whenever seen. In the earlier days of Orchids, a lover of these plants thus records his first impressions of *C. chinense*. He says: “There is no longer any occasion for speculative minds to occupy themselves with the important investigation of the cause that may have induced the Chinese to invent strange figures of men and women, with their chins in perpetual motion, for here is the explanation. We have here a plant from China, one of whose lobes is so like a tongue and

chin, and so unstable, as to be in a state of continual oscillation. The flowers are arranged in a circle, and all look outwards, and on whatever side the umbel is regarded it still presents to the eye the same row of grinning faces and wagging chins." *Cirrhopetalums* have seldom lived any length of time after being imported, yet their requirements are few; they thrive best upon blocks, with a little Sphagnum Moss, or in shallow baskets well drained; and enjoy plenty of heat, moisture, and light, but not full exposure to the sun. During the resting season never allow the plants to suffer from drought, for we are fully persuaded that this has been the stumbling-block to the cultivators of this genus. East Indian House.

C. chinense.—

The rhizome is creeping and rooting at every joint; pseudo-bulbs small, ovate, bearing a single, oblong-obtuse, dark green, leathery leaf; scape stout, erect, as long or longer than the leaves; bearing an umbel of large flowers of a most peculiar appearance; the lip and upper sepal are purple; the lateral sepals are very much elongated, and tawny-yellow. June and July. China.

C. Cumingii.—This is a less robust plant than the preceding; pseudo-bulbs small, oblong; leaves solitary, oblong, thick and leathery, and dark green above; scape slender, much longer than the leaves, bearing an umbel of beautiful reddish-purple flowers, the peculiar arrangement of which must be seen to be understood. Spring and early summer. Philippine Islands.

C. Pahudii.—A bold-growing species, with narrowly-oblong pseudo-bulbs, which spring at intervals from a creeping rhizome, and are enveloped in a large sheath; the leaves are large, broadly-lanceolate, tapering at the base, and bright green; scape radical, shorter than the leaves, bearing several large sheathing scales. Umbel of flowers six to twelve; these are very large; the dorsal sepal is about four inches long, reddish-brown, dotted with deep red; petals and lateral sepals about half the

length of the dorsal; the former directed backwards with the dorsal sepal, and, like it, prolonged into a slender cylindrical tail; lip ovate-lanceolate, and, with the column, deep purple. Summer months. Java.

Cœlogyne.—A large genus of epiphytal plants, exclusively Asiatic; some of the species are natives of the tropical islands in the Indian Archipelago, but by far the greater number are to be found in the sub-tropical regions of Northern India. The name *Cœlogyne* signifies "hollow-stigma," and this

is really its chief feature of distinction; they all produce pseudo-bulbs, and many of them large and showy flowers, and as these in many instances appear in the very depth of winter and early spring they become doubly valuable.

The majority of the species should be grown in pots, for although all will grow upon blocks, they do not make such fine specimens under this latter system. *Cœlogyne*s enjoy a moderate amount



CHYSIS BRACDESCENS.

of heat during the growing season, especially towards autumn, in order to finish up their pseudo-bulbs, when a cooler temperature is necessary, and when, as a matter of course, less water must be given them. The soil for these plants should be fibrous peat and living Sphagnum Moss in about equal proportions, with the addition of a little sharp sand, whilst the drainage must be kept in thorough working order.

These plants commence to grow immediately after the flowers are past, and any surfacing or re-potting necessary should be done at this time, in order that the new pseudo-bulbs may reap the full benefit of the change. The mountain species from Northern India will thrive best in the Brazilian House, but the kinds from the Indian Islands require a little more heat, and should therefore be placed in the East India House.

C. cristata.—This is perhaps the finest and most admired species in the genus, and no one who commences the cultivation of this order of plants



CORLOGYNE CRISTATA.

should be without it. It is an evergreen, dwarf in habit, and remarkably free in flowering; pseudo-bulbs somewhat oblong, smooth and light, shining green, bearing on the summit a pair of rather narrow-spreading, dark green, leathery leaves; the raceme is produced from the base of the newly-formed pseudo-

bulb, drooping, and bearing five to eight flowers measuring from three to four inches in diameter; sepals and petals pure snow-white; lip also white, but stained in the middle with rich yellow, and ornamented on the disc with several fringed lines of golden-yellow. These flowers are admirably

adapted for shoulder-sprays or bouquets, and will last for a very long time after their removal from the plant. It blooms from December to February. It is found in the mountains of Nepal and Sikkim, &c., at an elevation of from 5,000 to 6,000 feet.

C. cristata alba.—A rare variety, in which the flowers are of a uniform pure white without spot or blemish of any colour. Nepal.

C. cristata, var. *citrina*.—A variety highly appreciated by many; when flowering it is very distinct, as the lip is marked with a blotch of soft lemon-colour instead of yellow, and as it is invariably later in opening its flowers, it extends the time for the enjoyment of these charming blooms.

C. corrugata.—As the specific name implies, the pseudo-bulbs are much wrinkled; they are apple-green in colour, ovate, bearing on the summit a pair of oblong, somewhat acuminate leaves, which are erect and dark green; the racemes are erect, slightly shorter than the leaves, and bear from three to six flowers; these are pure white, except the disc of the lip, which is yellow, veined with orange. Autumn months, lasting long in full beauty. Neilgherries.

C. flaccida.—Pseudo-bulbs oblong, two-leaved; the racemes pendulous, many-flowered; sepals and petals white; lip white, stained with yellow, and streaked with crimson. The odour of this plant is peculiar, and not appreciated by some; independent of this, however, it is a very fine-flowering and showy species. Winter and spring months. Nepal, &c.

C. fuscescens.—A remarkably handsome species; pseudo-bulbs three to four inches high, somewhat stem-like, bearing a pair of broadly-oblong, plicate leaves, which are some nine inches long, dark green above, paler below; raceme nodding, about the same length as the leaves, bearing three to six or eight large flowers; sepals and petals narrow, white, tinged with yellowish-brown; lip yellowish, white in front, stained with rich brown at the base. Winter months. Moulmein.

C. Gowerii.—An elegant small-growing species which succeeds best upon a block of wood. Pseudo-bulbs ovate, shining deep green, bearing a pair of narrowly-lanceolate leaves some six inches long; racemes pendulous; sepals and petals pure snow-white; lip white, stained on the disc with a pale lemon-coloured blotch. This rare species blooms during winter and spring. Assam.

C. Lowii.—A warm-country plant, also known by the name of *C. asperata*; its pseudo-bulbs are somewhat flat, and, like its leaves, are dull green, and attain a height of about two feet; racemes pendulous, about a foot long, many-flowered; flowers nearly three inches across; sepals and petals creamy-white; lip creamy-white, crested in the centre with orange,

and streaked with yellow and chocolate. It blooms during the summer months. Borneo.

C. odoratissima.—This is a small-growing and beautifully fragrant species. It is dwarf in habit, with small clustered pseudo-bulbs, bearing a pair of erect narrowly-lanceolate leaves. Racemes slender and pendulous; flowers pure white; the lip slightly stained with pale yellow. It blooms during the spring months. Neilgherry Hills, at considerable elevations.

C. pandurata.—Pseudo-bulbs large, broadly-ovate, compressed, shining green; leaves in pairs, broadly-lanceolate, about eighteen inches long, plaited and bright green; racemes pendulous, about as long as the leaves, many-flowered, each flower about three inches in diameter; sepals and petals flat and spreading, bright apple-green in colour; lip same colour with a broad blotch of black in front, and the raised lines on the disc fringed with black. Green flowers are not usually attractive, but in this case they are so conspicuous and attractive that no collection of Orchids should lack this species. June and July. Borneo, where it is said to grow on trees in very shady places, and usually on those overhanging water.

C. Parishii.—Another green-flowered species; the pseudo-bulbs are somewhat stem-like; the flowers resemble the last species, but are smaller. It is desirable on account of its colour and its associations. The Rev. Mr. Parish has been a most indefatigable collector and discoverer of new Orchids, and amongst all the grand species he has sent home, surely some finer kinds could have been found to commemorate his keen industry and love of these beautiful plants than the few which have been dedicated to him.

C. speciosa.—In this plant the colours are strikingly different from the species previously enumerated; pseudo-bulbs oblong, bearing a single broadly-oblong lanceolate leaf; flowers in pairs, each flower upwards of three inches across; sepals and petals olive-green tinged with brown; lip yellow, veined and fringed with dark red, and tipped with white in front. Its usual time of flowering is in summer, but it is almost an all-the-year-round flowerer. Java.

THE KITCHEN GARDEN.

BY WILLIAM EARLEY.

MONTHLY CALENDAR OF WORK TO BE DONE.

ALL real success connected with the work of the garden depends almost in an equal degree upon two considerations, *i.e.*, doing things well and at the proper season. It is for the latter reason that calendars of work to be done are so valued

and sought after. Moreover, amateurs find readier means to an end by reference to such data contained under monthly headings in seasonable suggestions, than by reference to the details, concerning different subjects, spread through the body of even such a work as this. Though it may occur to many, therefore, that given dates have only a partial bearing on ultimate success, we would suggest that they be kept to as nearly as possible. By indifference to this matter valuable crops well grown, &c., may be too early, or too late, for standing the inclemency of winter, or for ingathering before winter sets in; or so late in the spring months, that they will be incapable (in certain instances) of growing to proper bulk before the dry season sets in, which causes premature bolting or running to seed, &c. These suggestions, furthermore, should assist all amateur growers and others who can only devote a certain amount of time and forethought to the subject. It were well to remark, however, that all such work must be more or less influenced by the weather; hence due allowance should always be made for such diversity as our climate is liable to. This calendar is written, further, in connection with the copious explanatory articles on each culinary subject contained in other parts of the work. The two taken together give, it is hoped, more practical details and explanations regarding such matters than any other work on vegetable-growing extant.

January.

Commence the year by seeing that all walks and the drains associated with them are in perfect order. It is only by attending to the re-gravelling of walks during the winter season, or turning them as may be necessary, that freedom of pedestrianism is possible throughout the year, without which the real pleasure of periodical visits is wanting, and the needful work in connection is made greatly more laborious. The turning of walks at this season secures to them the rains of winter and attendant time, which combine to make them smooth-surfaced, hard, firm, and mudless, during the chief part of the whole year.

All vacant ground should be manured. It is desirable to choose a frosty period, and when the ground is hard, sufficiently so, in fact, to bear the weight of the loaded wheelbarrow, in which to do this. In all instances when, owing to the exigencies of time, &c., it is desirable to wheel manure on to the ground at other periods, wooden planks should be used, not only in view of saving labour, but also to avoid undue traffic over the soil. So soon as ground is manured, spread such manure over the surface, and trench or dig it in as soon as possible, taking care to apply at least double the quantity of

manure to ground which is to be trenched in comparison with that which is to be dug only. During both the operations of trenching and digging turn the soil over as lightly as possible, letting it lie in the same lumpy form as turned over. Do not, as is so commonly practised, chop down all lumpy portions. Nature, with its ameliorating influences—frosts, air, &c.—will do this best, disintegrating it thoroughly and well. Half the fertility of soils comes from these pulverising influences.

Following severe frosty weather, which generally occurs about Christmas or the New Year, many parts of green vegetable crops such as Brussels Sprouts, Broccoli, &c., show signs of injury. Let all decayed and decaying leaves, &c., be removed during the first dry-weather period. To permit them to remain upon the plants is to court further and increased injuries.

During a mild period take up a successional batch of Lettuces and Endives, and plant in pits or frames which have been denuded in process of use of earlier-planted ones. Take care during the process of transplanting to take each plant up with a ball of earth, and to transplant with the same in its entirety. See that the protection around and upon such pits or frames is efficient, but give air to each at the back at all moderately mild periods, and remove the lights or sashes from over them, should such weather occur as will permit of the operation.

Where forcing-materials were not placed over plantations of Rhubarb and Sea-kale last month, it may be done this. I refer the reader to the calendar for the month of November for particulars how to proceed. Those who commenced forcing such a month or two since, should see that the fermenting materials are kept at a proper degree of warmth, &c. This must be secured by turning some portion of such materials over, or by adding to them, should any be found, by aid of the test-stick, to have lost heat. The crop will be found most advanced in the centre of the heap of fermenting materials, and when used it will be desirable to remove some of such materials from the centre, and place it upon the outer sides. Do not, however, quite uncover the space. With an extended plantation of either Rhubarb or Sea-kale, the pots from which the produce has been taken may be removed and placed upon others; fresh materials being also placed over them by extending the dimensions of the heap. Oftentimes the heat within such fermenting materials may be maintained during severe weather by placing a covering of straw or other light litter over it. Snow is a great neutraliser of the heat within such, and when it falls heavily, save during such time as severe frosts occur also, it is desirable to remove it from the surface of the materials, and

not permit it to thaw and so destroy the heat within by an excess of cold water. When no further need exists for materials to remain over such portions of plantations as crops have been taken from, in view of assisting the heat upon other portions, they should be removed and cleared off. Place a thin layer of light material over each root afterwards, however, to neutralise the injurious tendency which subsequent severe frosty weather may have upon the previously heated and now wounded crowns.

Prepare a heap of fermenting materials with which to make up an early frame bed, whether for Cucumber or Melon growing, or for purposes of propagation, &c. Such materials take some time to prepare and to sweeten, and unless they are collected during the present month and placed in a heap, to commence fermentation, the operation will be behindhand a month or two hence. The process of "sweetening" mixed materials is very simple. See that the materials consist of stable litter, or sweepings, and old collected tree-leaves. Throw them lightly together into a conical heap. When fermentation is at its highest—steam issuing freely from the apex of the heap—then commence at one side and turn the whole of the materials over into another similar-shaped conical heap. Take care in doing so to place the materials that were previously on the outside of the heap in the centre at each turning, and thoroughly shake all apart. Should any portion of the centre be very dry, it might be sprinkled over with clear water. Three such turnings are generally requisite to properly sweeten materials prepared during the winter months.

Occasionally, even during the month of January, a fine dry period exists wherein young plantations of Lettuces, Endive, Spinach, Winter Onions, &c., may be neatly hoed amongst. Should the opportunity offer take advantage of it, as much benefit will accrue to all such crops so treated at such a season. At the same time hoe between and give such additional mouldings to Peas and Beans (Broad) as are already through the ground. In moulding up Peas at this season take care, without drawing the soil too near to the base of the plants, to make such a mound or ridge of soil on either side, and especially the cold or windy side, as is likely to prove a protection to them.

During fine weather towards the end of the month all who aim at early crops may make sowings of Peas, such as William I., First Crop, Kentish Invicta, or other quick-podding early kinds, Broad Beans of the Long-pod variety, or early Mazagan.

Young Cauliflower plants under hand-glasses will only require protection during very severe frosty weather. Give air during all mild periods, and when cold winds and moderate frosts only exist keep the hand-lights constantly shut down. Where shallow

frames exist utilise them by fixing on a warm sunny border, and sowing Lettuce, Radishes, Carrots, and Onions, should the latter be valued in the form of salading. Mustard and Cress, continue to sow in boxes as necessary. Make also sowings of Dwarf Beans for forcing, as may be desirable.

Keep up a brisk warmth of about 75° in Cucumber houses. Make the most of all sunshine to brace up the plants by a little fresh air and fresh atmospheric moisture. Give with great care root-waterings when necessary only, in such manner that the drying influence of the lower heating pipe be neutralised, yet that the bed be not caused to be at any time unduly moist. Remove all decayed flowers, aged leaves, tendrils, &c., stopping shoots occasionally, so as to insure fruitfulness, yet so as to permit of a tolerably free and uninterrupted growth, without which successful winter culture is not possible.

February.

The month of February ushers in what should be the busy season of the vegetable-grower. January work in the kitchen garden, however commendable and desirable it may be, is too generally only practised with thoroughness in large gardens, and where labour is constant. The amateur is, perforce, content with later ground-digging, manipulation, and general preparation. Let none, however, who value good returns for labour given delay beyond the advent (or as soon after as possible) of the current month. To dig up ground during the month of March succeeding, especially if it be ground of naturally light or poor characteristics, is to risk, during dry spring weather, having a great want of moisture and subsequent necessary firmness, until after such time as seed-sowing and young plant-growth should have taken place; and the result, thin crops, and poor. It is highly important, therefore, to have all ground-work performed this month, that the needful seeds be sown early in the next. In connection with this it is well to repeat that ground intended for Peas, Potatoes, Cauliflowers, Beans, Onions, &c., should be generally deeply and well manured and worked up.

On the other hand, such spaces as are intended for Carrots, Parsnips, Beet-root, Salsafy, and similar crops, will be best with the manure deeply dug in, or placed from six to eight inches deep in layers. This can be readily done by keeping a good trench open, and digging deeply, the manure being evenly spread over the surface of the ground. About the first week in the month lay all early Kidney Potatoes out singly on airy shelves; here they will form robust sprouts, and during the third or fourth week plant them on to an open sunny aspect. Take care to plant them with the young sprouts upon them uninjured and perfect. Prepare the main crops of Potato sets for

subsequent planting by laying them out thinly in an airy place. Early planting with sets in perfect order alone gives successful crops generally. Old decomposed manure should be used for Potatoes, and the crop does well upon such ground as Celery, Broccoli, Spinach, &c., have been previously grown upon. Plant strong-growing sorts two feet and a half apart.

Where previously-sown crops of Peas, Beans, Carrots, Lettuce, &c., are not advancing, sowings of all should be made during the first fine weather in the month. On the contrary, where young crops exist make successional sowings of such as are desirable during convenient weather about the third week in the month. Procure Pea-sticks, sharpen, and prepare them before the busy season arrives.

Towards the end of the month plant Garlic, Shallots, and Seed Onions; divide Chives; mulch herb-beds; sow Parsley, Leeks, and Spinach; transplant autumn-sown Lisbon Onions, taking advantage of the first fine day in the month. Choose a rich piece of ground, and only dibble the roots firmly into the ground. Watch them subsequently, and should worms draw any out of the ground, re-plant with expedition.

Make up autumn-sown and planted Cabbage-beds, and hoe deeply between them, earthing them up subsequently as necessary. Look over all Broccoli plantations, bend over the leaves of all about to flower, to maintain their colour, and pull up all which are fit before they become too old or discoloured. Hoe between young Cauliflower plants under hand-lights; make successional sowings of Short Horn Carrots, Radishes, Lettuce, &c., early in the month, or otherwise, accordingly as previously-sown crops exist, and are advancing in growth. Plant Jerusalem Artichokes on any out-of-the-way sunny piece of ground, also upon a favourable site Sea-kale and Rhubarb, according to directions given under the respective headings. Make also new plantations of Horse-radish.

About the beginning of the month build up the necessary beds of fermenting materials for the frame-growth of Cucumbers and Melons, securing young plants of both as may be necessary (*vide* the articles on the "Cucumber"). Frame-beds should also be made, and planted or sown with Potatoes, Wood's Early Frame Radish, and French Horn Carrots.

Give manurial waterings to Mushroom-beds in full bearing, and collect materials for the early formation of new Mushroom-beds out of doors.

March.

Having the ground prepared as advised, Pea sowing demands immediate attention. So soon in the month as possible make, simultaneously, at least three sowings, consisting of as many varieties.

These should comprise first and second, early and main crop varieties. By sowing them thus together they will come in excellent succession for subsequent use. Again, in three weeks' time, or so soon as these are well through the ground, make another similar sowing. Take advantage of any showery weather, if possible, to earth up each row so soon as the young plants are well through the ground. Stick earlier ones after having drawn additional soil up to them.

It is important to make sowings of the following during the first or second week in the month—*i.e.*, the main crop of Parsnips, Spanish Onions, Turnips. This is especially necessary should the weather prove dry, else in less favoured localities the seeds sown later during a continuance of dry weather may not germinate, and the result will be a very thin or indifferent crop. Sow also moderate breadths of Intermediate and French Horn Carrots, Broad Beans, both Long-pod and Broad Windsors. Of the former the "Seville" is a good variety when obtainable true to name. Radishes, sow upon a warm site about every tenth day. During the second week make also sowings of Asparagus wherever it is desirable to grow on young plants for future permanent planting. Give a good mulching also to the Asparagus-beds early in the month, after having first hoed them over and freed them from all seedling weeds, which may even thus early be forming. It should be mulched with well-decomposed manure only.

Towards the end of the month, forcing having been completed in connection with Rhubarb and Sea-kale, remove the fermenting materials, pots, &c., leaving a slight manurial mulching only, and cut all portions of the roots of Sea-kale which protrude above-ground away down to the ground-line. To neglect this will be to cause very shapeless and irregular crown-growths for the following season.

Make sowings in pans or boxes, placing them in a little heat, of Celery, Tomatoes, Capsicums, Chilis, Egg-plants, &c. Thin out the young plants of Cauliflowers grown under hand-lights. Transplant such on to a piece of sunny and rich ground. Well stir the soil amongst such as remain within the hand-lights, and give manure waterings should the weather prove warm and dry. Unless the ground is cold and too wet, it will be well to plant the main crop of Potatoes during the latter half of the month—early varieties to be planted first, and late varieties last.

Sow the following seeds late in the month in small beds for future transplanting: Savoys, Cabbage, Brussels Sprouts, Veitch's Autumn Giant Cauliflower, Broccolis, such as Snow's Winter White, Walcheren, &c., and Summer-hearting Lettuces.

Mould or earth up frame Cucumbers and Melons as they advance in growth; attend to the linings in view of maintaining a nice heat. Give root waterings as necessary. Sprinkle the plants overhead and shut the sashes down tightly about 2 p.m. daily. Again, give a thin wedge of air at the back of the sashes about 5 p.m. daily. Shut the sashes down tightly again about 7 a.m. each morning, opening them again as the sun gives warmth or the day advances. Transplant autumn-sown winter-grown Lettuce and Endive, hosing well amongst these, Spinach, &c., to increase the growth of all. Give a good mulching to all herb-beds, using good decayed manure. Divide and transplant the rooted layers attached to Thyme, Sage, &c., dividing also the stools of Marjoram, Mint, and so on, in all cases where new or extended beds have to be made. Give the necessary attention to walks, edges, &c. Remove the exhausted remains of winter vegetable crops.

April.

Peas are such an important crop, and the maintenance of a constant supply in season so desirable, that it behoves all to make successional sowings to meet such demands. It will be well, therefore, to make a goodly sowing during the first week of the month, and another during the third week. To dispense with dates, however, and work upon another and most effectual principle, is to sow successional crops immediately the plants from preceding sowings are well through the ground. At this sowing the taller varieties may be used, especially Telephone, which is an excellent variety for general purposes. Do not sow too thickly. One pint of seed will be ample for a row twelve to fourteen feet in length. It is judicious, also, at this season to sow two or three distinct kinds, which may comprise those of medium height along with such as are tall.

Earlier crops will need sticking. Do this by anticipation of the needs of the crop, as such sticks prove a protection, and at the same time an incentive to growth. Take care, in sticking Peas, not to place the two rows of sticks too close together, bearing in mind the fact that the plants are intended to be grown between the two rows of sticks, and that if the sticks are placed too close together they grow out at the sides, and are liable during wind-storms to relax their hold upon them and fall away.

In like manner, the young Pea-crops, so soon as through the ground, must be earthed up freely and well.

During the first week of the month, those who have not sown Onions in sufficient quantities, as advised last month, should do so. At the same time

Turnips, Parsley, and successional sowings of Broad Beans should be made. Between the middle and third week of the month sow Beet-root, Scorzonera, Salsafy, the main crop of James's Intermediate Carrots, and during the last week Scarlet Runner or White Dutch Beans.

Such suggestions are made subject to fine-weather periods, as it is always desirable, so far as is possible, to sow such main crops of seeds during fine weather, and when the ground is in nice, dry, working order.

Sow also at a similar date seeds of Ridge Cucumber, or Gherkins, and Vegetable Marrow, in pots for early transplanting into the open ground; also such tender herbs as Bush and Sweet Basil, Knotted Marjoram, Summer Savory, &c., in pots to undergo a similar process; a bed of Borage being sown in the open ground, along with such successions of Radishes, Lettuces, and smaller Salads as may be necessary.

Make new plantations of Asparagus, the best time to do so being when one-year-old plants commence showing signs of growth in their seed-bed. Seeding Cabbages, Lettuces, and Cauliflowers, whether autumn or spring-sown, transplant finally or into nursery beds, according to age and size of the seedlings. Procure young crowns of Sea-kale for planting where desirable, or sow seeds moderately thick in a seed-bed to form plants for next spring planting.

Carefully fork between plantations of Sea-kale and Rhubarb, so soon as the young growth shows where the rows which have been forced are. Do not fork deeply, so as to injure the roots, but in such manner alone as to free the surface of the soil and check seedling weed formations. Should the month prove a dry one the various young seedling plants will require root-waterings, especially Celery transplanted on to a mound of fermenting material, covered over with rich soil. Having advised planting Potatoes early or during the preceding month, it is only necessary to say here that where, owing to the exigencies of weather, this has not been done, it will be well to do so as early as possible during the present.

Give especial attention to the hoeing of all crops. Such aid is always very beneficial to growth, owing to the process of soil-stirring over their roots, &c. Besides which, the season has again arrived when it is absolutely necessary to do so, to check weed-growth.

Make up Mushroom-beds with the materials previously collected, as advised, and sweetened by drying or fermentation. The only good position for them at this season is out of doors under the extreme branches of trees, or against dry walls, &c., and where, should a rainy season follow, a certain

amount of protection from such rainfall exists. It is a matter of little importance what shape they are, providing the material is from two to three feet deep at its central or thickest part. Cover the beds over, when made, with a sufficient depth of litter or straw to keep them quite dry during the six weeks or so in which the spawn is working within them.

Give air very freely during fine warm days to Cucumbers. With the thermometer at 75° Fahr. in the sun, and a warm air, it will be well to raise the sashes high at the back. Keep all the laterals pinched back at one leaf beyond where fruits show. Sprinkle the plants over with tepid water about 3 p.m., shutting the sashes down close, but again giving half an inch of air at the back towards 7 p.m. Take this air off about 6 o'clock the next morning for an hour or so; then commence air-giving for the day, according to its warmth or otherwise. Attend to the linings of the frames when the crop is frame-grown. About the end of the month it may be necessary to renew the linings either back or front, and in doing so to damp the drier materials within them, adding a little fresh fermenting material in process, as a slight bottom heat will be required for some time yet.

May.

Sow during the first week in the month Dwarf Kidney Beans, making if possible a small sowing upon a warm sunny-aspect border and a general one in the open quarter. Sow also successional crops of Peas, Broad Beans, Turnips, and all kinds of salading, also a successional sowing of Walcheren Broccoli, Cauliflower, and Coleworts, of which the Rosette variety is a desirable one.

The month is at once a busy and a highly important one from a culturist's point of view. The hoe should be freely worked amongst all growing crops, especially those consisting of young seedlings. This is desirable after nice growing showers of rain. In connection with this beneficial practice of hoeing, or soil-stirring, comes the equally important one of crop-thinning, or "setting out," as growers have been wont to describe it. Thus in process of hoeing the young seedling crops of Onions, Turnips, Parsnips, Carrots, &c., may be rapidly thinned by the intelligent use of this handy tool. It is important to complete this thinning out process as soon as possible after the young seedlings are large enough for the purpose, and in doing so use every effort to save the strongest young plants for this purpose. This probably is more important in connection with such root-crops as Carrots, Parsnips, and so on, the strongest young plants upon which possess the most robust under-ground growth. Nevertheless the needful thinning out of Onions, Turnips, &c.,

requires also to be done when the plants are young, to obviate their being drawn and weakened by too close contact too long a time. When hoeing such crops, do not be satisfied with simply chopping up weeds, or thinning out the seedling plants only, but take care to hoe somewhat deeply, and so move the soil as well as possible all amongst the crops.

Habitually cold nights with more or less frost are experienced until the 20th of the month. It will be desirable, therefore, to wait until such date is past, then to plant out into their summer quarters such plants of the following as have been sown in pots, potted off, and duly hardened in readiness—*i.e.*, Tomatoes, which succeed best against warm walls, or fences, Ridge Cucumbers, Vegetable Marrows, Capsicums, Chilis, &c. Take care to prepare the ground for all of these some time before the time of planting arrives. Too frequently this matter is wholly neglected. Should cold winds, &c., prevail, some slight temporary protection may with advantage be placed over them. When due preparation as above has not been made, by sowing seeds of Cucumbers and Vegetable Marrows in pots, seeds of such may be inserted into the prepared spaces about the same date. Make second sowings of Brussels Sprouts, Veitch's Giant Cauliflower, Snow's Winter White, Grange's and Sprouting Broccoli also towards the middle of the month. Such sowings will produce nice thrifty-growing young plants, in readiness for finally transplanting on to such vacant spaces as are formed by the removal of early summer crops, and they will prove more thrifty than the older ones, should any remain in seed-beds from the earlier sowings. So soon as the young seedling Leeks are large enough, transplant on to deeply enriched ground. Continue to prick out and bring on Celery plants, so as to insure a nice lot of forward ones in readiness for finally planting out anon.

Do not omit to thoroughly root-water all growing vegetables should the weather prove dry. Good vegetables are only secured by this means, and able culturists make a point of giving all one good root-watering per week during all dry-weather periods. Where this aid is proffered, however, let it be given freely and well, else it will do more harm than good.

Earth up Potatoes. First of all hoe deeply on both sides of each row, then draw such loosened soil freely up to the sides. Immediately plants from the early sowings of Cabbages, Lettuces, &c., are large enough, thin the largest ones out from amongst their kind and transplant either permanently or in nursery beds. The chief object in connection with all good vegetable-growing should be to give all a free and uninterrupted growth throughout.

Cucumbers treated as directed last month will require beyond, during this month, to have a thorough

overhauling. Cut away all old ripened leaves not needed, so as to make room for succeeding young ones. At the same time, should a free growth be made, and abundant haulm, with free fruiting, an occasional length of aged haulm, which has done its duty, may be cut away altogether. This done, add a surfacing of fresh soil to the whole internal surface of the bed, an operation which it is well to do. Tying up Lettuces and Endive, drawing Radishes immediately they are fit for use, covering over the heads of Cauliflowers forming their bloom-heads, drawing them in good time for use, picking Peas immediately they are ready, sweeping and rolling walks, &c., all require periodical attention.

GREEN-HOUSE PLANTS.

BY WILLIAM HUGH GOWER.

Imantophyllum.—A genus of Amaryllids of great beauty, now merged into *Clivia*. They are robust-growing plants, with stout lorate leaves, which are arranged in a two-ranked fashion (distichous), and sheath at the base; colour deep green.

These plants should be potted in rich loam, and during the growing season an abundant supply of water is necessary to their well-being; but when growth is complete it should be partially withheld. The name is sometimes written *Imatophyllum* and also *Himantophyllum*.

I. cyrtanthiflorum.—A very fine plant, with erect scapes, longer than the leaves, many-flowered; flowers tubular, drooping, reddish-orange in colour. Various seasons. South Africa.

I. Gardenii.—This is a winter-blooming variety, bearing large umbels of tubular flowers, which are drooping, much curved, and rich orange-red in colour. Natal.

I. miniatum.—Flower-scape erect, longer than the intense deep green leaves; umbels many-flowered; flowers broadly campanulate, pale red and orange.

There are several varieties of this species, of which we may enumerate *miniatum superbum*, and *Martha Reimers*, the latter a magnificent form; but all are good. Spring and early summer. Natal.

Knightia.—A genus of *Proteaceae*, which contains but one species, which is a tall thin tree, attaining a height of from eighty to a hundred feet. Its wood is esteemed for its colour, which is red and brown, curiously mottled, and which takes a good polish, and is extensively used in cabinet-work. It requires the same treatment under cultivation as *Banksia* and *Dryandra*.

K. excelsa.—"The New Zealand Honeysuckle." Leaves linear-oblong, entire, upwards of six inches in length, and more than one inch in breadth, and bluntly toothed at the edges; the texture is hard and harsh, dark green above, somewhat ferruginous beneath; flowers in dense axillary racemes, velvety-brown. In a young state this plant is extremely ornamental. Northern Island of New Zealand.

Lapageria.—This genus contains only one species, and with the genus *Philesia* comprises the order *Philesiaceae* (now merged into *Liliaceae*). *Lapageria* is a climbing plant, and perhaps one of the most beautiful ever introduced to cultivation.

In some parts of England it has proved hardy, but although it is a lover of a very cool and moist situation, there are few places that will suit it without protection. The soil should be used very rough, and consist of equal parts of loam and peat. It is nearly related to the *Smilax* family, and, like the members of that genus, must have the most open drainage it is possible to provide.

L. rosea.—This beautiful scandent plant succeeds admirably on a north wall in a cool green-house, but if grown in a pot it should be trained on either a large balloon or umbrella-shaped trellis; the leaves are hard, alternate, cordate in shape, and dark shining green above, paler beneath; flowers large, produced from the axils of the leaves, thick and fleshy in texture, bell-shaped, with a spreading mouth, rich rosy-crimson in colour, spangled with white on the inside. It blooms during summer and autumn, several months in succession, and lasts a long time in full beauty. Chili.

L. rosea, var. *alba.*—A variety of the preceding, from which it differs in nothing but the colour of its flowers, and these are pure waxy-white. It is a most exquisite plant. Chili.

Leschenaultia.—A small but very ornamental genus belonging to the order *Goodeniaceae*; they are soft in texture, with closely-set, dark green, Heath-like leaves, and brilliant flowers; they also much resemble the Heaths in the treatment they require in order to produce good specimens; there is, however, a little difference necessary in their management, for although they enjoy plenty of free air and light, full exposure to the sun in the open air does not suit them. During the winter *Leschenaultias* must be kept near the glass so as to prevent the shoots from drawing, all superabundant moisture must be guarded against, and if the weather proves dull and heavy, an occasional dusting with sulphur will tend to prevent mildew from fixing upon the foliage.

The soil should be very sandy peat, with just

a small portion of light loam dusted amongst it; in potting, press the soil firmly down, for, like most very fine-rooted plants, they cannot grow in loose soil. In the matter of watering, follow the instructions given for the hard-wood Ericas.

All are natives of South Australia.

L. Baxterii.—Flowers deep salmon-colour. June and July.

L. biloba major, sometimes called *L. grandiflora*.—A rather strong-growing species for the family, with rich deep blue flowers. May and June.

L. formosa.—A dwarf and close-growing plant; flowers bright orange-scarlet. May and June.

L. splendens.—A somewhat robust kind; flowers bright scarlet. June and July.

Leucadendron.

—A genus of Proteaceous plants; all natives of the Cape of Good Hope and its neighbourhood; they require the same treatment as *Banksia*.

L. argenteum.—We give this species only. It is a very beautiful plant, though seldom seen in our gardens; it is the Silver Tree of the colonist, and was called "Wit-bloom" by the early Dutch settlers; it is, however, becoming scarce in its habitats through being cut down for firewood.

The leaves of this plant are narrowly-lanceolate, closely set upon the stems, both surfaces being densely clothed with pure white, shiny, silky hairs; the flowers are yellow, borne on large terminal globose heads.

Leucopogon.—A large genus belonging to the *Epacris* family, which may be treated in a similar manner. The name is derived from the white-bearded flowers; they are very hardy, and are valuable for cutting, as the flowers last a long time in water, and are well adapted for bouquet-making.

Leucopogons are robust-growing plants, attaining a height of from four to twelve feet in their native country; the leaves are mostly lanceolate, hard, and bright green; the flowers of all the species are white,

produced on axillary racemes in great abundance. The following are the most ornamental species:—

L. australis.—Winter months. South Australia.

L. ericoides.—Spring months. New South Wales.

L. juniperoides.—Winter and spring. New South Wales.

L. lanceolatus.—Winter and spring. New South Wales.

L. Richei.—Winter and spring. Tasmania.

L. verticillatus.—Winter to midsummer. New South Wales.

Lisianthus.

—A small family of plants belonging to the Gentianworts, consisting of handsome flowering under-shrubs, which, however, have always been found extremely difficult to cultivate; but whatever labour or care may be expended in order to bring them to perfection is amply repaid by their indescribable beauty.

Many of the species are annuals only, but *L. Russellianus* (named in honour of the Duke of Bedford) is a biennial; it may be perpetuated by cuttings; seedlings, however, make the best plants.

This plant, though included in the green-house division, in reality requires a little more than green-house treatment, yet cannot suffer to be confined in the stove; the old-fashioned hot-bed, however, will suit it admirably during the time that it requires a little bottom heat.

L. Russellianus attains a height of between two and three feet; the leaves are opposite, ovate, smooth, and glaucous-green; flowers axillary, with a funnel-shaped tube, and five-parted spreading limb of the most beautiful purplish-blue.

The best season to sow the seed is some time in the month of March. The soil should be composed of equal parts of light loam, leaf-mould, peat, thoroughly decomposed manure, and sharp sand; it should be used in rather a rough condition in all stages of the plant's growth. The seeds sown on this soil should not be covered with mould, but have a



LAPAGERIA ROSEA ALBA.



bell-glass placed over them until germination takes place. When the plants are sufficiently large to handle without injury, put them singly into small pots, using the same soil as before recommended. A hot-bed is the best for them from this time up to the autumn, when a warm corner in the greenhouse, with plenty of light, will prove to be the best winter quarters; during this time careful watering is very requisite, and special attention will be required to keep away mildew.

When the plants are about twelve months old, shift them again, this time into the flowering-pots, using the same compost, and remove back to the hot-bed.

Treated in this manner they will produce their beautiful flowers about midsummer, and continue in full beauty for a considerable time. As the plants decline, attention should be paid to preserving the seed. Mexico.

L. princeps.—This truly exquisite plant, always rare has very nearly again slipped out of cultivation. As will be seen by our figure, it is totally different in shape to the preceding species, and is one of the very grandest plants known.

The leaves are ovate-lanceolate, and deep green; flowers, several together, on the points of the shoots; these are tubular, some five inches or more long, swollen in the middle, with a spreading five-lobed limb; the colour is rich crimson-lake, passing into golden-orange at both ends, the segments of the limb being vivid green. It blooms during the summer months. New Grenada.

Lomatia.—A genus of Proteaceous plants, more remarkable for the beauty of their foliage than their flowers. They have pinnate, or more frequently bipinnate and tripinnatifid leaves, the segments being finely toothed, and thick and leathery in texture. They make handsome bushes, and are simply invaluable for cutting, as they last a very long time in the open air when used with button-hole flowers.

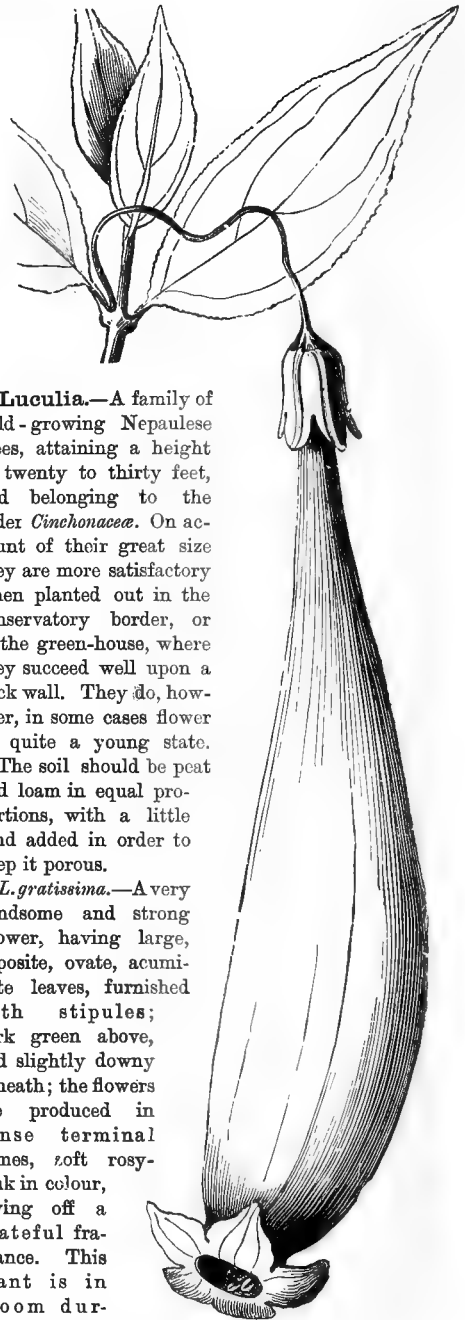
For soil, use sandy loam and peat in equal parts; drain well.

Lomatias are rather slow-growing when young, but after they have attained some age and strength they bear cutting well.

L. elegantissima.—A dwarf plant, having thick, leathery, bipinnatifid, Fern-like leaves, which are bright dark green above, slightly paler below. New Zealand.

L. ferruginea.—Leaves much divided; segments ovate, with trifid ends, dark green above, rusty-brown beneath. Chili.

L. silaifolia.—The leaves of this species are very prettily veined and bipinnatifid; segments wedge-shaped; dark green on the upper side, glaucous beneath. South Australia.



Luculia.—A family of bold-growing Nepalese trees, attaining a height of twenty to thirty feet, and belonging to the order *Cinchonaceae*. On account of their great size they are more satisfactory when planted out in the conservatory border, or in the green-house, where they succeed well upon a back wall. They do, however, in some cases flower in quite a young state.

The soil should be peat and loam in equal proportions, with a little sand added in order to keep it porous.

L. gratissima.—A very handsome and strong grower, having large, opposite, ovate, acuminate leaves, furnished with stipules; dark green above, and slightly downy beneath; the flowers are produced in dense terminal cymes, soft rosy-pink in colour, giving off a grateful fragrance. This plant is in bloom during the winter months.

LISIANTHUS PRINCEPS.

L. Pincoana.—Similar in general appearance to

the preceding. The individual flowers, however, are much larger, and the limb is pure white. Winter months.

Macleania.—Handsome shrubs, nearly related to *Thibaudia* and *Vaccinium*. They, like all the allied plants, are extremely handsome when in flower; but, as before remarked, rather difficult to cultivate. For treatment see *Ceratostema*.

M. pulchra.—An evergreen plant, with large, alternate, deep green leaves, which are tinged with rosy-pink when young; flowers on axillary racemes, long and tubular; tubes angular; orange-scarlet, tipped with yellowish-green. May and June. New Grenada.

M. speciosissima.—A pendulous shrub, with ovate leathery leaves, which in the young state are of a beautiful port-wine tint, changing to deep green as they acquire age; flowers tubular, drooping, sharply angled, brilliant scarlet, tipped with yellow. Spring months. Columbia.

Magnolia.—This genus of magnificent hardy trees contributes one or two species towards the ornamentation of our green-houses and conservatories.

They thrive in a mixture of rich turfy loam and good peat.

M. Campbellii.—This grand species, after many failures, was first introduced in a living state about the year 1865.

It is described as being a fine deciduous tree, attaining a height of 100 to 150 feet, and producing its very large crimson and white flowers before the leaves appear. Although asserted by some to be hardy in this country, there is no doubt that it will always require the shelter of the green-house or winter garden. Native of the mountains of Sikkim.

M. fuscata.—A dwarf-growing plant, with small oblong leaves, which are bright green. The young branches are clothed with a ferruginous tomentum;

the flowers are rather small, but deliciously fragrant. Spring months. China. Now called *Michelia fuscata*.

Mandevilla.—A genus belonging to the *Apocynææ* or Dogbanes, containing a single species only, and this is a very handsome plant. When first introduced it came to us under the name of the "Chilian Jasmine."

The soil for its cultivation should be composed of rough loam and peat in about equal parts.

M. suaveolens.—One of the finest of green-house climbers when planted out, but no amount of care or attention has yet proved of any avail in the efforts to induce it to grow and flower as a pot-plant; it should therefore be planted in the border and encouraged to make a good free growth. In autumn the long shoots may be pruned back hard; treated in this manner, about the month of June the points of the shoots will be covered with their large trumpet-shaped, pure white, and fragrant flowers. Buenos Ayres.



LUCULIA GRATISSIMA.



Mesembryanthemum.—A large family of succulent

plants, popularly known as "Fig Marigolds" and "Hottentot Figs," many of which are of great beauty. The majority of the species are natives of the Cape of Good Hope, their natural habitats being dry sandy plains and barren rocky places, the thick fleshy leaves enabling them to withstand unharmed the severe drought which surrounds them.

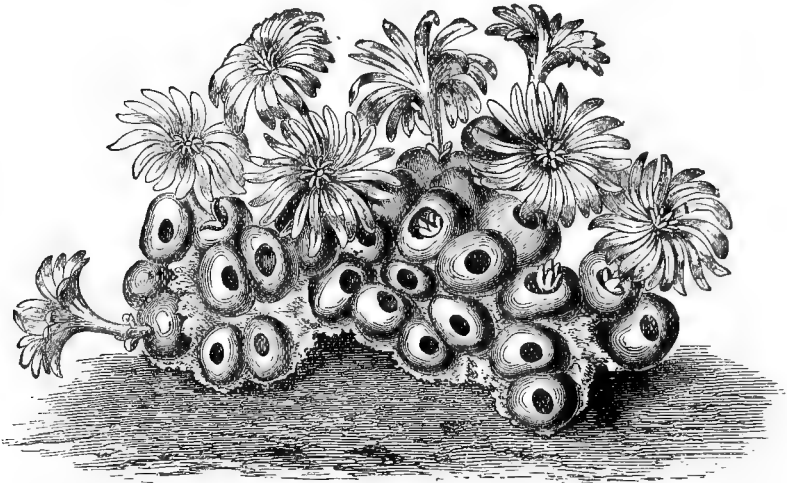
The generic name comes from two Greek words, which signify "Mid-day Flower," as the blooms always remain closed in the absence of sunshine. One species, *M. crystallinum*, is a rambling member of the family, being a native of Greece and the Canary Islands, as well as South Africa. Its leaves are gathered in large quantities, and from them is obtained an alkali much esteemed in the manufacture of glass. It is known in English gardens by the name of "Ice Plant," on account of the leaves being

covered with large watery pustules or blisters, which glisten in the sun as if frozen into ice. This produces a very cool and refreshing effect, and hence the plant is extensively grown for garnishing purposes.

Amongst the numerous species of this family may be found plants to suit the tastes of all lovers of nature; thus, those who love bright and showy flowers can here indulge their fancy; again, those whose chief delight is the tasteful arrangement of the geometrical beds in the parterre can here find numerous species admirably adapted to their wants. if no other situation for their culture is available

water sparingly; in winter little or none is necessary. At this season the atmosphere must be kept free from damp, and at all times expose them to the full benefit of sun and light, with abundance of air. The following list contains some of the most beautiful and curious species:—

- | | |
|----------------------------|------------------|
| M. albidum. | M. imbricans. |
| M. barbatum. | M. latum. |
| M. blandum. | M. linguisforme. |
| M. calamiforme. | M. lupinum. |
| M. caedens. | M. maximum. |
| M. caninum. | M. minimum. |
| M. caulescens. | M. murinum. |
| M. cordifolium variegatum. | M. mustellinum. |
| M. conspicuum. | M. nuciforme. |
| M. curviflorum. | M. obcordellum. |



MESEMBRYANTHEMUM MINIMUM.

but the cottage window, Mesembryanthemums will adapt themselves to the circumstances, and bloom as freely as if situated in the best-constructed greenhouse; whilst those who delight in the curious can here find structural grace and beauty *ad libitum*, for amongst the smaller-growing kinds we have leaves resembling the mouths of wolf, tiger, leopard, fox, dog, cat, weasel, and mouse; then there are long tongues, blunt tongues, great tongues, and soft tongues; club leaves, hatchet leaves, and finger leaves; bulls' horns, herons' beaks, and hedgehogs; white eyes, and golden eyes, and a host of other extraordinary forms too numerous to mention in the limits of this article.

The cultivation of Mesembryanthemums is of the simplest. As before mentioned, they delight in dry, arid situations, and this knowledge should give the cultivator the key to their management. For soil use light sandy loam and old brick rubbish, broken tolerably small; drain well, and during the summer

- | | |
|------------------|-----------------|
| M. crystallinum. | M. octophyllum. |
| M. densum. | M. polyanthum. |
| M. digitiforme. | M. prspingue. |
| M. dolabriforme. | M. reflexum. |
| M. echinatum. | M. retroflexum. |
| M. emarginatum. | M. roseum. |
| M. falcatum. | M. rostratum. |
| M. felinum. | M. rubricaulis. |
| M. fibuliforme. | M. scalptratum. |
| M. fissum. | M. spectabile. |
| M. formosum. | M. stillatum. |
| M. geminatum. | M. taurinum. |
| M. glaucum. | M. tigrinum. |
| M. grandiflorum. | M. uveiforme. |
| M. Haworthii. | M. vulpinum. |

Mitraria (*M. coccinea*).—The only known species of the genus, which belongs to the Gesnerads. It is a very handsome plant, requiring the warmest end of the greenhouse, and should be potted in equal parts of peat and loam, and about an eighth part of sharp sand. The plant is dwarf and compact in habit, with small, closely-set leaves, which are usually opposite and deep green. The flowers are borne singly on long pedicles, and are tubular,

bright scarlet, and very showy. It blooms during the summer months. Chiloe.

Mutisia.—A singular genus of climbing *Compositae*, which are very ornamental when trained upon a pillar and well grown; otherwise they do not make a favourable impression. *Mutisias* require a cool part of the green-house, and indeed so little require heat that we believe they will be found hardy in some sheltered positions in the West of England, but are well deserving the attention of all lovers of plants, as ornaments to the green-house and conservatory. They should be potted in rough peat and light loam, in about equal parts, with a small portion of sand added. If these simple requirements are attended to, and the necessity for a rather cool air be borne in mind, they require very little attention except as noted below.

M. decurrens.—This species attains a height of six to eight feet; the stems are not much branched, and it, therefore, should be frequently stopped at the points to induce the growth of laterals. Leaves entire, oblong-lanceolate, decurrent; they are deep green above, slightly glaucous beneath, and furnished

at the ends with a long tendril, by which they attach themselves to surrounding objects. Flowers produced singly from the axils of the leaves, measuring upwards of four inches in diameter, and rich deep orange in colour. Summer months. Chilian Andes.

M. ilicifolia.—Like the preceding, the leaves of this plant are entire, and furnished with a long tendril, by means of which they support themselves. They are sessile and sometimes decurrent, deep green on the upper side, tomentose beneath, and furnished with spines on the edges; flowers produced singly from the axils of the leaves, about three inches in diameter; soft pink. Summer and autumn months. Chili.

THE HARDY FRUIT GARDEN.

By D. T. FISH, ASSISTED BY WILLIAM CARMICHAEL.

APPLES.—PLANTING.

IN so far as planting is affected by sites, soil, sorts, it has already been treated with considerable fulness. But such vital factors to success as preparation of the soil, time and distance to plant, and methods of planting, will form the subject of this chapter, and sufficient will be found in them to explain the causes of many orchards not thriving as had been hoped and expected.

Preparation of the Soil.—The importance of drainage has already been pointed out. Apples cannot thrive with their roots in sour soil or water, but the opposite extreme of excessive drought must also be guarded against, and the Apple, as a rule, will not be found to thrive for long together, nor reach to the stability of a permanent crop, in localities where the rainfall fails to reach twenty-five inches in the year. The farther south Apple-cultivation travels, the greater the risk of injury from drought; the farther north, the greater the danger from excess of water.

It is most important to bear this in mind in the choice of a site and the preparation of the ground for Apple-culture. Apples might perish from drought on the summit of rising ground in the South, while finding sufficient moisture half-way down, or in the trough of the valley. Whereas in the North, where the rainfall may be double, the same site would drown the trees, and the highest available point could not prove too dry for them. Hence the importance of regulating the character and extent of drainage by the rainfall of the locality as well as the quality of the land to be drained.

Having selected a site for the Apple garden,



MITRARIA COCCINEA.

sheltered if possible from the east and north, and with a good depth of (say) two or more feet of calcareous slightly-holding loam, as free from iron as possible, the next point is to proceed to trench it over. The soil should, however, first of all be tested by chemical means if needful, but practically by the last crop grown upon it. If that is poor, the chances are that the loam is rather too *lean* for Apples. In that case a liberal dressing of well-rotted farmyard manure may be trenched into the soil. When this is necessary it will, however, be better to crop the ground very widely with Potatoes, say a row four feet apart. Early varieties should be chosen, so as to get them up and well work the ground before the planting season commences. Mangolds or Swedes may be substituted for Potatoes, only they cannot be cleared off the ground so early, and hence are not nearly so efficient as cleansing, sweetening, and manure-mixing crops.

As a rule, however, no manure is needful. But if the ground is fresh brought under cultivation, it is good practice to take a green crop off it the first year, as this, by its sweetening and ameliorating influence, hastens the growth and is more favourable to the health and longevity of the Apple-trees. These first crops are not only useful mechanically, but for removing the grosser feeding substances out of the soil. Rank growths are not to be fostered in Apple-trees either by the richness of maiden soil, or by adding strong manure. For such growths mostly run into sterility, or degenerate into canker, serious drawbacks to the pleasant or profitable culture of the Apple or other fruit-trees.

In the trenching of the ground over either with or without manure, the first point to be determined is the depth to trench it. This must be largely determined by the soil itself. Supposing the suitable soil is only a foot deep, it would be folly and wholly injurious to force its depth, as is sometimes done, by incorporating another foot of barren or worthless subsoil with the surface tilth. On the contrary, where sand, clay, or gravel is found so near to the surface this should be removed, and an additional foot of good loam added to that on the spot. This will give an average depth of two feet, which may be safely accepted as the mean depth for Apple-trees, though on dry sites from six inches to a foot in addition, or a total depth of a yard, will not prove excessive.

It is important, however, that on level ground, or sites with a regular fall, the depth should be uniform throughout. Hence, in trenching, if the surface tilth proves of an irregular depth, as it often does, the subsoil should be removed, and the good earth supplemented by fresh loam to make up the Apple tilth to a depth of two feet or thirty inches. Before dismissing the question of depth it may be added

that the drier the site and the climate the deeper the soil should be, the more moist the shallower. In Cumberland or Westmoreland a foot or fifteen inches may suffice to grow good Apples; in Devonshire and Cornwall a yard, in East Anglia a yard or more, may not prove excessive.

In trenching to secure uniformity of depth it is also important that the top of the subsoil should be made as even as the surface. Any hills found on the subsoil should be levelled down, also the valleys filled up, and the whole be left as hard and smooth as its quality will allow. Where the quality is very bad, such as sand or sheer clay, barriers may need to be placed between it and the surface soil. Simple concrete is most frequently used for this purpose, and it answers well. But other methods are sometimes employed, such as mounding and ridge-planting. By adopting this form the evil day when the roots will plunge into injurious subsoils is deferred, and in not a few cases prevented altogether.

Uniformity of quality of soil should be aimed at as well as regularity of depth. This comes of thorough mixing and blending in the process of trenching. Some, however, recommend placing the richer portion of the soil a foot or eighteen inches below the surface. The roots as they penetrate will thus find fresh supplies, as those on the top get more or less exhausted. But on the whole it is better to have the soil, as nearly as may be, of one uniform quality throughout.

Time to Plant.—Nature and experience, theory and practice agree that the time to plant Apple, and most fruit and other trees, is the month of November. The leaves are just about to fall, or have fallen, the former being the best state for insuring success. Vital force, never at rest, is in November comparatively active, especially rootwards (see the LIFE-HISTORY OF PLANTS, which renders it needless to dwell at any length on the physiology of the subject here). Neither is the solar heat of the summer and autumn yet exhausted. Even November fogs, by reducing evaporation to a minimum, assist the plant to suddenly re-establish itself, and recommence growth in its root-quarters. The drizzling rains, as well as the fogs, are useful to the semi-detached roots, as they are conservative of the vital forces of the tops of the Apple-trees.

Even the unfallen leaves, under such genial conditions, exert a certain semi-resuscitating force, and tend to quicken the production of fresh roots. The latter are in an unusually active state in November. Various reasons have been assigned for this, but the planter is most concerned with the fact rather than the causes of it. And of the fact there is no doubt

whatever. Those moved in November re-establish themselves sooner than at any other season. So generally is this known and acted upon by practical men, that not a few of those who cannot plant their Apple or other trees in November, nevertheless lift them during that month, and lay them in temporarily by the heels to lie there till placed in their permanent quarters. The roots are merely covered with earth, and roots and tops crowded more or less closely together while in this transition state. Occasionally leaf-mould, or other compost, is scattered over the roots in order to intensify and develop to the full the root-forming tendency of the November season.

The chief drawback to this intermediary planting arises from its success in developing roots. These are produced in such numbers, and grow with such freedom, as to induce a most dangerous degree of succulency and crispness of growth. Hence, when the laid-in trees are removed to their permanent quarters, not a few of their best and newest roots are broken off or bruised out of useful condition, the net result being a loss of time as well as of force through the laying in by the heels of Apple or other fruit-trees in November. But by planting them in their permanent quarters at once the full advantages of their abnormal root-activity are reaped without any such drawback. To derive the fullest possible advantages, however, from November planting, it is of importance to preserve the growing roots from being severely frozen. This may be accomplished by covering them with from six to nine inches of soil, or, better still, planting them as near the surface as may be desired, and placing a mulch of any long litter over them to a depth of from six inches to a foot. Such a mulch, or surface covering, is as conservative of moisture as of caloric, and is one of the surest and simplest means of commanding success in planting.

Distance to Plant.—Fifty years ago or less there were but two distances: twenty feet for wall-trees or espalier, and thirty for orchards and standards. At times, however, and on strong soils and sheltered localities, these distances were extended to twenty-five or thirty feet for espalier and wall-trees, and forty for those in orchards. The first distances can hardly be improved for the same sorts of trees at the present day.

The tendency, however, is to place the trees closer together. The question of distance has now become mixed up with that of stocks, as well as the character of the tree. Thus, for example, Apple-trees for walls or espalier on the Paradise stock may be planted as closely as from ten to twelve feet, while the same Apples on the Crab might be the better for a clear

space between them of twenty or twenty-five feet. The same rule will hold good with pyramidal or columnar trees. Worked on the Crab, from eight to ten feet will prove suitable distances; worked on the Paradise, from four to five feet will suffice. Another disturbing modern element also comes in to upset the older distances. This is root-pruning, the purport of which is to concentrate the fruiting force of Apple and other fruit-trees into the most limited area possible. Trees root-pruned may be planted almost as close again as those not subjected to this latest device for the husbanding of space as well as of force, and for the development of fertility.

Assuming that root-pruning will be more or less resorted to, as well as dwarfing stocks, such as the English or French Paradise, pyramidal Apples on these may be planted at distances of from four to six feet apart, six feet between the rows and four from tree to tree being a useful distance for trees on the French Paradise. Those on the English Paradise may have eight feet between the lines and six from tree to tree. Vase-shaped trees or bushes may be planted at almost equal distances, or six feet apart each way, or six feet by four. On poor soils good results have been reaped by planting small bush Apples in rows four feet apart, the plants being only three feet from each other in the rows. Vertical and oblique cordons may range from eighteen inches to thirty or even thirty-six apart, twenty-four inches being a useful mean. Diamond cordon Apples do well two feet or thirty inches apart. These form largish squares that allow of a free exposure of the leaves and fruits to sun and air, and result in fruit of the finest quality. Spiral or waving cordons must have space proportioned to their size. Those with an open centre a yard in area should be seven or eight feet from centre to centre. Horizontal cordons on the French Paradise need not be more than four feet apart. Even on these stocks, however, six feet is better for the trees that are expected to last for several years, and the double cordons should never be planted closer than six feet, which only gives each half of the cordon a yard run.

Planted thus closely with fertile trees, it is quite astonishing what enormous quantities of fruit can be gathered from limited areas.

The centre walks may either be planted with espaliers, on the usual method or trained over the walks to form arbours; or the arch or pyramidal trees may be planted in lines up to within six feet or so of the walks, and then a line of horizontal cordons run along as a super-edging to tiles or Box. Such arrangements have a charming effect, and no method of planting produces so much fruit in such a short time and from such limited areas of ground.

Method of Planting.—This resolves itself into a matter of depth, diameter, disposition, despatch, and the solidarity of the roots. The proper depth to plant is a vexed question, on which more trees have been wrecked than perhaps any other. Plant too deeply, growth is checked; plant too fleetly, the tree is crippled, if not killed. The tree-stem affords the only safe guide as to depth. The original ground-line is clearly marked upon it, and that line ought to be followed to a hair's breadth. It is nature's sure and certain index as to depth. All above it is stem fitted for the air; all below it is under-ground stem or root; and there is nothing that trees and woody shrubs cling to with more tenacity than this natural dividing-line between earth and air.

But as the roots seldom proceed from this line, the average depth of root-covering may be accepted as six inches from the surface. But the roots often proceed from the root-stock at lower planes, and hence the holes for planting Apples may generally be dug out to a depth of a foot or eighteen inches. For older and larger trees they may have to be a yard in depth. But for young trees, say a year or at most two from the graft, a foot or eighteen inches will suffice.

The diameter of the hole may vary from a yard to six feet, according to the size of the trees and the number of their roots. Neither is it needful to make the hole circular; a square hole will do just as well or better. The form is of little matter; that it should be wider than the largest root is of vital importance, so as to allow of each being spread out to its utmost length, while still leaving a clear space of several inches between it and the unmoved earth at the sides of the hole.

The base of the hole should be made firm and slightly elevated in the centre, and over this base an inch or so of compost should be sprinkled, unless indeed the whole of the soil has been worked or ameliorated into a root-tempting medium by the process already recommended.

The next step in planting is the disposition of the roots. If the tree is young, and the roots almost wholly in one horizontal plane, this is very simple. A stout stake should be placed in the centre of the hole, to which loosely tie the tree, to keep it upright. This simple process saves the necessity for another hand in planting. Place the tree in the hole, spread out the roots regularly, and with a sharp knife cut off any that are wounded or bruised, or any excess of roots. Then sprinkle over them a little fine compost, or the choicest soil that has been removed, scattering the earth on to the roots from the bole outwards all round until the whole of the roots are covered.

All clods or lumps should be broken with the spade before placing the earth over the roots, as the attempt to break them afterwards would probably break or bruise the roots as well. If all the earth is returned the root-space will be a little higher than the surrounding surface. But this will approximate to the general level as time, the great consolidator, does its work. The surface of the soil is best left rather loose, as this acts as a barrier to the escape of heat and insures the conservation of vapour, loose soil in fact acting in a similar manner, though not to the same extent, as a surface mulch of cocoa-fibre refuse, moss, or straw litter.

Should any of the trees have roots at different levels on the root-stock, the operation of planting becomes more complicated, and should proceed tentatively. The hole must be dug sufficiently deep for the lower roots, and as soon as these are displayed carefully and covered, another layer will be displayed, and so on, till the process is completed. In practice, however, the process is at times more difficult; the roots proceed from the root-stock most irregularly, one here and another there, and it is important that each should proceed from the root-stock at right angles or nearly so. The result of this careful disposition of the roots is that each is separated from the other, with its own special covering of soil, and all crushing or overcrowding is avoided.

To escape the trouble of planting Apple or other trees rooted at different levels, the lower layer of such roots may be cut off where there are a sufficiency at a higher level, and then the trees may be planted in the usual way.

Despatch.—This is half the secret of success in planting. The old-fashioned plan of making all the holes for Apple or other fruit-trees several months in advance has never been bettered. It proved a great saving of time at the planting season, as well as thoroughly prepared the soil; sun and shower mellowing the earth into the best possible condition for nourishing the newly-made roots.

Not a moment should be lost from the time the Apple or other tree is out of the ground until it is planted again; and it is here that the great advantage of raising one's own trees where practicable is obtained. Having everything in readiness, the trees may be lifted under such favourable circumstances and re-planted so promptly as—to use the common phrase of practical men—never to look behind them. In receiving trees from a distance the case is of necessity somewhat different. So carefully, however, do most nurserymen, florists, and tree-growers lift and pack them, that they take comparatively little harm in the bundles. But it is when undone and dangled in the

air, perhaps during bright sunshine, or in the teeth of a sharp cutting wind, that the most serious injury is done to the roots. Exposure of the roots to the air at all is most unnatural, and consequently injurious, and every means should be used to curtail the period of exposure to the uttermost. The roots of even the hardest trees, such as the Apple, are most sensitive to injury from cold and drought. A minute's exposure to an east wind may check the growth of the roots for weeks, or injure them for life. Hence the great importance of expert planting.

Solidarity.—This term is used to denote stability of top and solidity of bottom. There are several means of securing the latter. The oldest-fashioned and worst plan is that of treading the trees in. So soon as the roots were covered, boot-heels were down upon them, and the process was repeated several times in the process of filling up the holes, while the finish consisted of a firmer and more persistent surface-treading. This doubtless consolidated the roots, and also ruptured, bruised, and broke off many of them as well.

Water is a much safer and more subtle, though a slower consolidator than boot-heels or the tread of the foot. Where trees are of considerable size, and the weather or soil is dry, there is no better mode of consolidation and of running the earth home and down solid than that of flooding the roots home.

First of all, cover the roots all over with three or four inches of fine soil. Then water so freely and fully as to flood the soil over with water. The result will be the filling in of every crevice and encasing of every root and fibre with soil. Leave the holes to settle for half an hour or so, and then place the remainder of the earth over the flooded portion, and planting is complete. This is far better than the filling in of all the earth before flooding the roots home.

The best consolidators are time and natural showers. These do their work more slowly, but surely and well. Trusting to these, the earth is simply filled in over the roots, and neither treading nor watering given. The roots probably lose a little time by this mode of planting, but it is the most favourable for leaving the soil in the best mechanical condition for their well-doing in the end. Roots, however, seem to be unable to bite loose soil, and on very friable soils slight mechanical compression or aqueous consolidation quickens their fresh grip of the soil and fosters top growth.

Stability of top is, however, as essential to successful planting as solidity of root-run. Hence the advice to stake before planting or immediately afterwards. The tops of trees left unsupported become the free sport of every passing breeze, which converts

their tops into levers for the displacement or snapping asunder of every new-made root almost as fast as the latter is formed. Hence, while freshly-planted trees should be so fixed as to have the power of sinking as the earth subsides or consolidates into less bulk, they should have no power of motion from side to side, till the new roots have rendered the tree immovable in its new root-run. Perfect fixity of tenure and immobility as far as practicable are essential to the rapid re-establishment of the newly-planted tree, and its permanent health and fruitfulness. Root-disturbance or curtailment may indeed be needed as surgical operations in the future career of the tree, but these come within the range of special and exceptional treatment for particular purposes, and in no way affect our present argument in favour of solidarity on the heels of planting.

COMMON GARDEN FLOWERS.

Everlasting Pea and Sweet Pea (*Lathyrus*).

—There are certain common forms of *Lathyrus* that are weeds in our fields and hedgerows, and they are known as Vetchlings. This comes from *vetch* (Latin, *vicia*), "bind," from its twining habit. Of these we may mention *L. pratensis*, the Yellow Meadow Vetchling; *L. sylvestris*, the Narrow-leaved Everlasting Pea; *L. palustris*, the Blue Marsh Vetchling; *L. maritimus*, the Sea-side Everlasting Pea, and a few others. While they are not considered choice enough for ordinary garden purposes, they are yet very pretty in the highways, fields, and woods. But we may remark of the Yellow Meadow Vetchling (*L. pratensis*), which is known also as the Tare Everlasting, that it was called in Parkinson's time "the Ramping Wild Vetch by the country people, because it is the most pernicious herbe that can grow on the earth, killing and strangling corne or any other good herbe it shall grow by." Yet in recent times it has been recommended for cultivation as a fodder. It is said that cattle eat it with great avidity, hence it is spoken of as valuable to be grown on very dry soil; but, owing to the creeping nature of its roots, it should be grown only as a permanent crop. This is why it is called the Meadow Pea.

L. latifolius is the Everlasting Pea of our gardens, and it is so named because of its perennial character. It is also known as the Broad-leaved Everlasting Pea. It is a plant that grows naturally in woods, but rarely in Britain in a wild state. There is no doubt that what is now grown as the Everlasting Pea represents varieties that have been greatly im-

proved by means of seeds. The ordinary form of *L. latifolius* is one of the most ornamental of hardy plants, flowering nearly all the summer and most valuable to cut from. The flowers are of a bright deep rose or rosy-crimson. We have seen two or three very fine varieties, larger in the flower and richer in the colour, but we think locality and soils have a good deal to do with producing these differences. There is a white variety also, known as *L. latifolius albus*; it is not so common as the purple-flowered form, and though it produces seed it is not to be relied upon as coming true when sown, as many will revert to the old type. There is a beautiful new variety, produced during 1884, named *delicata*; in this case the flowers are of a beautiful soft pink, pencilled with rose—really a lovely form. The foregoing are all climbing plants, and should be planted against something that they can attach themselves to by means of their tendrils; and they do well for covering stumps of old trees, rooteries, &c. *L. grandiflorus* (the Large-flowered Lathyrus) is a fine form; it is very handsome, the flowers much larger than those of the common Everlasting Pea. It is sometimes known as *L. biflorus*. We may say of this that it is the finest of all the Everlasting Peas. The flowers are very bright crimson-scarlet, produced with great freedom, and earlier in point of time than the preceding. It does well on banks and hedges, in which it will run freely through low bushes; also in borders on low trellises, or root-work, rock-work, &c. While the common Everlasting Pea will flourish in almost any garden soil, *L. grandiflorus* does best in a deep sandy loam or on a gravel subsoil. *L. californicus* is the Californian Everlasting Pea, dwarfier-growing than the others, having lilac, purple, and white flowers, and does well in ordinary flower borders. *L. rotundifolius* is the Round-leaved Vetchling, from the Caucasus and Southern Russia. It is a small but handsome Everlasting Pea; it is a little delicate, however, and should be planted against the foot of walls or houses, where it can trail over low shrubs. *L. Drummondii* is a very distinct and showy species, most probably from California; it is a very strong

grower, and probably the earliest of all the Everlasting Peas to bloom. The flowers are of a rich cerise, deepening to carmine, and produced with wonderful freedom. Unfortunately, it is not so well known as it deserves to be, and consequently not nearly so much grown. A strong plant makes a very free growth indeed, and covers a great space. No garden may be said to be complete without *L. latifolius*, *L. grandiflorus*, and *L. Drummondii*.

Of the annual Sweet Peas there is now a large group. These are varieties of *Lathyrus odoratus*, which came to us from Sicily about the year 1700. There are now a large number of very beautiful varieties; and during the last two or three years such pretty new forms as Princess Beatrice, the Queen, Blue Beard, Bronze Prince, Fairy Queen, Violet Queen, have been produced. All the varieties are so pretty during the summer months, and so useful for cutting from, that no garden may be said to be complete without them. One very pleasing way to grow them is to sow a line of seeds of mixed colours, just as one would of ordinary garden Peas, and stake them with sticks or supports in the same way. The seeds should be sown in March, in deeply-dug, rich ground, and then the plants will flower profusely all through the summer. Some persons sow the



LATHYRUS LATIFOLIUS.

seed in August, under a warm wall or hedge, where they will come up in autumn and stand through the winter, having a little protection if necessary; and these plants will flower in May, some days before those plants raised from seeds sown in March; the flowers will be finer and more freely produced, because the plants have a longer time to thoroughly establish themselves.

Some gardeners sow in pots at the end of August or early in September, placing a half-dozen seeds in each; these are put into a cold frame and kept there until the beginning of February, when they should have stakes placed against them, and be taken into a warm green-house, where they flower abundantly in early spring, and are very useful. But gardeners of all grades generally sow their Sweet Peas too thickly, and make no allowance for their natural free-branching habit. There is one beautiful

annual Pea, namely, *L. sativus*, but generally sold as *L. azureus*; it is not fragrant like *L. odoratus*. It is of dwarf growth, and bears profusely charming pale blue blossoms. It does well in good garden soil.

The Scabious (*Scabiosa*).—The generic name (*Scabiosa*) means Scurfy, from *scabies*, "scurf," in allusion to the scaly pappus of its seeds, which, on the doctrine of signatures, led to its use in leprous diseases. *Scabies* is also rendered "the itch": this plant being considered by our forefathers a certain cure for that eruptive disease. The Scabious is included in the order *Dipsacaceæ*, which also comprehends the Teasel—both the cultivated and the wild varieties. The former (*Dipsacus fullonum*) is very useful in that the heads are employed by fullers to raise the nap on woollen cloths. For this purpose they are fixed round the circumference of a cylinder, which is made to revolve against the surface of the cloth, and raise the nap, by their hooked, stiff, spiny bracts; and this they do better and more effectively than any mechanical contrivance hitherto invented. In the clothing districts of Somersetshire and Yorkshire, the cultivation of the Teasel is a matter of consideration. This plant is a native of the South of Europe, and may also be found wild in England, but it cannot be regarded as indigenous, having, in all probability, escaped from cultivation. The wild Teasel is *Dipsacus sylvestris*, a stout herbaceous plant, with an erect prickly stem, and large bright green leaves, which are prickly underneath, and united at the base, and often contain water. It is common by roadsides and in hedgerows. The bracts of this species are not hooked at the points, and therefore the heads are not adapted to the use of clothiers. The leaves, uniting at the base, and forming a basin round the stem, collect water, and the country people regard the water as a cure for warts, a remedy for bleared eyes, and a beauty-wash for the face—hence it is called Venus' Bath. There is another curious custom practised by the country people of England. If the heads are opened longitudinally in September or October, there is generally found a small worm in each: only one is found in each head. People collect three, five, or seven of these—always observing to make an odd number—and sealing them up in a quill, wear them as an amulet against the ague (Hogg's "Vegetable Kingdom"). Of the British species the best known is *S. succisa*, the Devil's Bit Scabious. "It is commonly called," says Gerarde, "*Morsus diaboli*, or Devil's Bit, of the root (as it seemeth) that is bitten off—for the superstitious people hold opinion that the Devil, for envy that he beareth to mankind, bit it off, because it would be otherwise good for many uses." This is a perennial; is in

flower from August to October, and it grows in grassy, rather moist pastures. The Field Scabious is *Knautia arvensis*. It was named so in honour of Dr. Knaut, a physician and naturalist of Halle, in Saxony. *Arvensis*, "field," frequently refers to the usual plan of growth. In addition to being commonly known as the Field Scabious, in some parts of the North it is known as the Great Blue Capes, or Caps, from its tuft of blue flowers. It is a well-known plant in corn-fields, where it is injurious; but in pastures, as it produces a large amount of herbage which is readily eaten by all the farming stock, it is not so objectionable. The whole plant is slightly bitter and astringent, and has been recommended as remedial in various disorders, both internal and external; "but," says Dr. Martyn, "woe be to him who trusts on such broken reeds." The flowers, if fumigated with tobacco-smoke, have their delicate blue colour changed to a bright green. This is caused by the ammonia contained in the smoke.

The cultivated Scabious are all hardy herbaceous perennials; the best known in our gardens are the varieties of *S. major*, of which there are tall-growing and dwarf-growing sections, both double and single. There is a very fine dark purple form, known as *S. atropurpurea*, which came from the East Indies; and there is a rich scarlet variety from Germany, named *atrococcinea*. What are known as the German Scabious are greatly improved garden varieties of different colours; all being very fine and showy. *S. caucasia*, the Caucasian Scabious, is one of the handsomest hardy perennials we possess, and one which should be grown by everybody, if only for the sake of its flowers for cutting, a use to which they are particularly well adapted. They last for a long time in water, and their peculiar soft lilac-blue shade is charming. It grows two feet or so in height, forming a spreading dense tuft, and thriving well in any open place in ordinary garden soil. It is a vigorous grower, thoroughly hardy, and very free-blooming. This is a native of the Caucasus and Armenia, in arid places. It can be propagated by a division of the root, or from seeds, as in the case of the German and other garden varieties. All that we have named succeed well in ordinary garden soil. There are a few other species, such as *S. graminifolia*, the Grass-leaved Scabious, from the mountains of Italy and Switzerland, which should be grown in sandy loam on the margins of warm borders; *S. ochroleuca*, the Yellow Scabious, from Germany, requiring a similar position and soil; and *S. Webbiana*, Webb's Scabious, from Phrygia, also needing a warm border and sandy loam. But the cultivation of these is mainly in botanic gardens, where collections of species are preserved.

Megasea (*Saxifrage*).—The Megaseas were formerly included among the Saxifrages, but they now form a group by themselves. There are not many of them, but they are a valuable group of very interesting hardy plants, closely allied to the Saxifrages, it is true, but very distinct in general appearance. The foliage consists of large, bold leaves, from six to twelve inches in length, very thick, and usually evergreen. They flower in spring, some earlier than others; the blossoms are in numerous panicles, about a foot in height, and from six to eight inches in circumference. They are all more or less distinct in foliage and flower, and well worth growing in summer borders and in pots; and most of them do well in smoky atmospheres. They are all hardy perennials. One of the best known is *M. (Saxifraga) cordifolia*. This is a very large-leaved evergreen perennial, and it blooms profusely in early spring; the flowers are rose-coloured. There are some good varieties of this. One is named *purpurea*, because of the rich purple colour of the flowers, and it is perhaps the very best of the group. *M. crassifolia* is the Thick-leaved Saxifrage, and is very closely allied to the foregoing, but it is considered, on the whole, superior. Both are natives of Siberia, and they are admirably adapted for planting in the spring garden, where they flower very freely indeed. *M. ciliata*, or *ligulata*, is a very early variety also, and may be used in pots in early spring for a cold-house with great effect. There are several pleasing varieties of this. *M. orbicularis* has thick leathery foliage, and heads of rose-coloured flowers; it is later in flowering than the preceding. *M. Stracheyi* is a fine plant, producing large spreading panicles of white flowers of great beauty. Being plants of strong growth and also free-flowering, they should be planted in a good deep loam, trenched and well manured, and have some top-dressings of manure in early spring. All the Megaseas can be propagated by division of the roots.

We have alluded to *M. cordifolia* doing well in smoky atmospheres. It is an admirable plant for forecourt gardens in towns; it stands all weathers, and as soon as the reviving influences of spring are felt it unfolds its leaves and develops its flowers: a charming spring plant of unusual attractiveness.

American Cowslip (*Dodecatheon*).—The Dodecatheons make up a small genus of Primrose-worts. According to Chaucer, "wort" was a term applied to all cultivated plants. These American Cowslips grow freely in woods in North America, where they are known by the name of Shooting Stars. "They are all perennial, and perfectly hardy in this country, requiring a cool situation, and light loamy soil, though they grow as freely in peat or leaf-mould, but a proper situation is the principal point in their cultivation. All grow freely, and soon form large tufts, which require division every third or fourth year. The best time to perform this operation is the latter end of January or beginning

of February, when the roots are becoming active, taking care not to divide them into too small pieces, as in that case they are in danger of losing the plants while in a weakly condition" (*Garden*). The species and varieties in cultivation are as follows:—*D. Meadia*, the common American Cowslip, the flowers of which are of a pale purple, and fragrant, and produced in umbels on erect, slender stems, twelve to fifteen inches high. Of this there are several distinct varieties, differing more or less in size of flower, colour, and height of plant. Among the best of these may be mentioned *D. giganteum*,



MEGASEA CRASSIFOLIA.

elegans, albiflorum, and violaceum. *D. Jeffreyanum* is the Giant American Cowslip, the largest of the group; the foliage is long and erect; the stems are twenty inches in height, supporting large umbels of drooping, rose-coloured flowers, with yellow centres. In rich, moist, loamy soil the plant grows vigorously in an ordinary border, but it succeeds best when partially shaded from the mid-day sun. It is thoroughly hardy, and one of the best of our border perennials. *D. integrifolium* is the Entire-leaved American Cowslip; being, perhaps, the most lovely of the genus, and an excellent rock-plant. Its foliage begins to make its appearance in March, and when well grown attains a height of from four to five inches, supporting four to ten Cyclamen-like blooms, of a deep crimson colour. It is a perfect little gem for a cool, shady spot.

Jacob's Ladder (*Polemonium*).—This plant is usually supposed to have derived its name (Jacob's Ladder) from its successive pairs of leaflets. It is

also known as the Greek Valerian, which appears to be a name of uncertain origin. The generic name is from *polemos*, "war;" and according to Pliny a dispute about its discovery led to a war. *P. cœruleum*, which is usually regarded as the Jacob's Ladder, is an old garden favourite, with its tender

that it has become a favourite bedding plant, also for the rockwork, and for edgings, but when used in this manner the flower-spikes should be kept cut away. In good garden soil, the variegated form, known as *P. cœruleum variegatum*, is easily cultivated, but it is apt to go off on a very wet clayey ground,



DODECATHEON JEFFREYI.

green leaves, and rather showy blue flowers, and is widely diffused over the northern regions of the world. It is a British plant, but abounds also in Siberia and Northern Europe. It is a fine border plant, producing panicles of blue flowers in early summer, and doing well in ordinary garden soil. There are several varieties of this species, and one has white flowers (*P. cœruleum album*) and forms a handsome and attractive plant. The striking beauty of the variegated variety is so generally recognised

while it will flourish in a deep, rich, well-drained loam. As regards its propagation, it is effected by simply digging up well-established old plants, pulling them in pieces, and then planting them immediately in a nursery bed of good soil. This is best done in early autumn, so that the young plants may be nicely established before mid-winter. *P. reptans*, the creeping Polemonium, is a low spreading kind, and a valuable spring-flowering species, with panicles of blue flowers. This is a native of North America,

and it can be propagated by division and by seeds. *P. Richardsoni* is a little-known but very beautiful hardy perennial, allied to the old Jacob's Ladder, but far superior in every respect. It is a native of Arctic North America, consequently is thoroughly hardy; and as it will thrive in almost any soil or situation, and is also a fine decorative plant, it should be universally cultivated. The flowers are of a lovely sky-blue colour, with golden-yellow anthers, forming a striking contrast, and are produced in large lax heads. It grows about two feet in height, and flowers in May or June. There is quite a large group of species and their varieties, but those we have named are best deserving of a place in gardens. They are also very free of bloom, lasting for some time in flower.

The Evening Primrose (*Enothera*). — The common Evening Primrose is *Enothera biennis*, a tall and stout herbaceous plant, with long, light green, smooth leaves, and large, pale yellow, fragrant flowers; and it is called the Evening Primrose because its flowers open about six or seven o'clock in the evening, and, as Parkinson observed in 1629, "consisting of four pale yellow leaves, smelling somewhat like unto a Primrose, as the colour is also, which hath caused the name."

It is a native of North America, but has become quite naturalised in many spots in the British Islands, and also in many countries on the Continent of Europe.

There is this peculiarity about the Evening Primrose, that it appears to open its flowers very suddenly, because the points of the calyx are hooked together, and the lower part is burst open some time before the growth of the corolla is sufficient to force apart the hooks, but when once this is effected, the yellow corolla seems to spread itself out suddenly.

In reference to its generic name, it is found in Theophrastus, Dioscorides, and Pliny, and is derived from the Greek words, *onios*, "wine," and *thera*, "imbibing," because the plant to which they applied the name provoked thirst, and a desire for bacchanal indulgence. It was a pink-flowered plant, and does not seem to have been at all related to our genus *Enothera*. The specific

name refers to its being a biennial — sown in one year, it blooms and perfects its seeds in the next or second year. *Æ. biennis* will grow well in ordinary garden soil, and is increased by means of seed.

There are several very fine hardy perennial forms of the Evening Primrose; foremost is *Æ. acaulis*, a neat Alpine species, forming dwarf little tufts of greyish foliage, which produce an abundance of large white flowers; it is very distinct, and a most useful plant. It is a native of Chili. *Æ. eximia* (syn. *Æ. marginata*) is the Large Evening Primrose, introduced from North America some years ago. It is a very fine kind, growing from nine to twelve inches in height, blooming as nobly as any luxuriant native of the tropics, the individual flower being four to five inches across, of the purest white, changing as the flowers become older to a very delicate rose, the blooms coming full above the toothed or jagged leaves as the evening approaches, and remaining in all their glory during the night, emitting a delicious Magnolia-like odour. It is a true perennial, quite hardy, and increased by suckers from the root, which are freely

produced. It can also be increased by cuttings. It begins to flower in May, continuing till the weather gets hot about July, when it seems to like a rest, and again blooms in September and October. Young vigorous specimens in rich ground would probably flower continuously throughout this period. The following accounts for its introduction to this country:—"Mr. Robert Stark, of Edinburgh, a well-known lover and cultivator of rare hardy plants, obtained roots of this when in Canada from a botanist in the Western States of America, and it is to him we are indebted for its introduction to our gardens." *Æ. macrocarpa* is in reality a broad-leaved form of *Æ. missouriensis*, the Missouri Evening Primrose. It is a native of the dry hills on the Missouri, and the banks of the river. It is a noble and most useful herbaceous plant, with prostrate, rather downy stems, entire leaves, their margins and nerves covered with silky down, and bears rich, clear golden-yellow flowers from four to five inches in diameter. It is a very showy plant, growing in almost any soil or situation. As the seed is but



ENOThERA TARAXACIFOLIA.

rarely perfected, it is better increased by careful division, or by cuttings made in April. The flowers open best in the evening. *Æ. speciosa* is the Tall White or Showy Evening Primrose, and is a native of the southern parts of North America. It is a free-growing hardy perennial, two feet in height, forming neat tufts composed of many erect stems, which are covered from June to October with numerous large, white, fragrant flowers. It is increased by division, cuttings, or seeds, but does not seed freely in this country; and it flourishes vigorously in well-drained rich loam. In Paris this species is extensively used for bedding purposes, for which it is well adapted, and as a border plant few can be found to equal it. *Æ. taraxacifolia* (in reality a form of *Æ. acaulis*) is one of the prettiest of the dwarf Evening Primroses, forming prostrate tufts of deeply-divided foliage, and therefore called the Dandelion *Ænothera*. The plant is quite hardy and perennial, but on some very cold soils it perishes in winter. Where it does well the plant is much admired, and it should be raised annually from seed. It will thrive in almost any garden soil, but best in one rich and deep, and it is very effective in the rock-garden. It is a native of Chili, flowering all the summer and autumn, and seldom rising more than six inches above the ground. *Æ. Youngi* is one of the most ornamental of the perennial Evening Primroses. Growing about two feet in height, and producing a profusion of deep yellow flowers, it makes a first-class border plant. It is a Canadian species. *Æ. Drummondii* is a sulphur-yellow-flowered variety, growing a foot in height, but smaller in the blossoms than the preceding species. It is a native of Texas. There is a dwarf variety of this named *nana*, and a white-flowered form named *alba*, both what are termed garden varieties. They make excellent hardy plants.

Æ. Lamareckiana (correct name *Æ. biennis grandiflora*) is a hardy biennial, also from Texas. It is a noble plant, growing three to four feet in height, producing many long spikes of very large yellow flowers. Seeds should be sown every year to secure successional plants. It flowers all the summer, and onwards until quite late in the season.

There are a few annual varieties that are quite hardy. The best are *Æ. bistorta Veitchiana*, very dwarf, bright yellow, very free; *Æ. rosea*, rose, very pretty; *Æ. Sellowii*, yellow, free, and pleasing; and *Æ. tetraptera*, white, very free and attractive. These annual varieties can be raised from seeds, it being necessary simply to sow them in the open ground.

The most notable localities for the Evening Primrose in a semi-wild state in Britain are on the coasts of Lancashire, and sand-banks a few miles north of Liverpool; and also near the east coast, at Woodbridge, in Suffolk.

Sunflower (*Helianthus*).—The common Sunflower of our gardens is *H. annuus*; the specific name is from *helios*, "the sun," and *anthos*, "a flower," in reference to the opinion that this flower turns round after the sun. It is also named Sunflower from its "resembling the radiant beams of the sun," as Gerard states, and not as some of our popular poets have supposed, from its flowers turning to face the sun, which they never do.

There are annual and perennial varieties, and of the former the most generally grown are the Californian, *H. californicus*, a fine tall-growing variety; the Dwarf, also yellow, and about three feet high; the Leviathan and the new Double Orange, both very fine garden varieties, the former single and very large; and the common Tall Sunflower, which came to us years ago from South America. The common Sunflower, apart from its ornamental character as a conspicuous object in gardens and shrubberies, is also a much more important plant than it is generally supposed to be. In France, the leaves are used for forage for cattle, which are said to eat them with great relish and avidity. The stalks make an excellent fuel, and yield a large quantity of potash after they are burned; or, if not wanted for that purpose, the ashes may be used as manure by sowing them over the land, or mixing in the manure heap. In Portugal the seeds are used to make a wholesome and nutritious bread, and, when roasted, they form an excellent substitute for coffee; in some parts of the Continent a kind of *bouilli* (boiled or stewed meat) is made of them, which serves as food for infants. They also yield by expression a fixed oil, little if at all inferior to olive oil, which is used in some parts of Europe both for burning in lamps and other domestic purposes to which olive oil is applied, and for making soups. As food for poultry they have been found to be very nutritious. One acre will produce fifty bushels of seed, yielding fifty gallons of oil, and about 1,500 lbs. of oil-cake; and the stems will yield about 10 per cent. of potash (Hogg's "Vegetable Kingdom"). It need scarcely be stated that the Sunflower is a very accommodating plant, but the richer and better the soil, the finer the flowers. Of late years the Sunflower has become very popular, the prevalence of what are termed æsthetic ideas having given a great impetus to its culture. The tall-growing varieties, both the double and single, are very suitable for the backs of flower borders, and the verges of shrubby borders.

There are several very fine perennial species and varieties of Sunflowers well worthy a place in the garden, some double and some single-flowered—all growing freely and flowering abundantly. *H. angustifolius*, the Narrow-leaved North American Sunflower,



HELIANTHUS MULTIFLORUS FLORE-PLENO.

is a rare and interesting species, remarkable for being the dwarfest of the perennial group, producing a tuft of spreading, dark green, glossy leaves, and slender stems two and a half feet high, bearing numerous

flowers one and a half inches across, arranged in a long leafy raceme. This species flowers abundantly in September and October. *H. multiflorus*, the Perennial Single Sunflower, or the Many-

flowered Sunflower, is a vigorous-growing perennial, four feet in height, producing large deep yellow flowers from June to October, very useful for cutting, and one of the best of our autumn-flowering perennials, either for massing or for single specimens in the border, and it is one of the few plants that will thrive in a smoky atmosphere. *H. multiflorus flore-pleno* is a double variety oftener met with than the single form, and produces large double yellow flowers of a handsome character. A variety named *maximus*, the Great Perennial Single Sunflower, is an enormous-growing variety, attaining the height of six to nine feet, and producing immense golden-yellow flowers, almost as large as those of the annual species. Other useful species are *H. decapetalus*, *H. occidentale*, and *H. orgyalis*, but they are not nearly so much grown as the forms of *H. multiflorus*, which are decidedly the best. *H. rigidus*, better known as *Harpalum rigidum*, is one of the best of our autumn-flowering perennials; the flowers are very large and of a bright golden-yellow colour, with a striking black disc. It grows about three feet in height, flowers very fully, and forms a very attractive object. It is a native of North America, and has roots which spread about very much. Like all the perennial Sunflowers, this does well in ordinary borders, in which, from its rapidly-spreading habit, it will require annual division.

The forms of *H. multiflorus* are being much grown by gardeners, as they are found so useful for cutting from for decorative purposes, and yellow flowers being in much demand at the present time, their growth is deserving of encouragement on this ground also.

The Jerusalem Artichoke (*Helianthus tuberosus*) is a Sunflower. Artichoke is a name which Diez derives from the Arabic *Ardischauki*, "Earth-thorn," and which was introduced with the plant by the Moors of Spain. This particular plant is called Artichoke from the flavour of its tubers, and Jerusalem, which has puzzled many, from the Italian *Girasole*, "Turn-sun," that is, a sun that turns about. Unlike the other Sunflowers, it very seldom blossoms; it will sometimes flower in this country, after a short dry summer like that of 1884, when several instances of its doing so are recorded. There is not sufficient heat in our climate to mature the seeds: but M. Vilmorin, of Paris, states in the *Bon Jardinier* that he has obtained seeds and raised several varieties. This species produces tubers in the soil, and they are baked, roasted, boiled, and served up with milk and butter, and in various other ways.

It is found wild in Upper Canada and the United States.

THE PINE-APPLE.

BY WILLIAM COLEMAN.

CULTIVATION (continued).

Resting.—By the beginning of August, the majority of the plants will be firm, stocky and well matured, with plenty of white, healthy roots, working round the insides of the pots, and through the drainage. The growing season, if they are to start into fruit at the time we have named, will be nearly over, and the next two months will be devoted to a gradual reduction in the supply of heat and water. By gradual it must be understood that the transition from active growth to comparative rest must be so steady as to prevent the possibility of a premature check, which may lead to the most promising plants throwing up their fruit in mid-winter, when, in the case of Queens, the labour of the past season would be thrown away. Therefore the supply of water to the roots, and in the air of the house, must be regulated by the state of the weather, and the condition of the bed. If the chilly, foggy nights which characterise the month of September prevail, the reduced supply of water to the roots and in the atmosphere must be given early in the day; plenty of air during the hours of sunshine will then carry off superfluous moisture, and an external covering of some kind, while economising fire-heat, will, to a great extent, prevent the condensation of moisture under the glass at a time when drip will be most hurtful to the plants. Unless the weather is very bright and fine in October, no more water must be given to the roots; but if, on examination, the lower part of the plunging-bed is found to be at all dry, it will then be prudent to water between the pots until the whole of the tan is moderately moist, and capable of feeding instead of robbing the roots during the season of rest.

By the end of October the bottom heat should be brought down to about 75°, and the day and night temperatures proportionally low—say, 65° as the minimum, and 75° as the maximum—with air whenever the sun raises the house to 70°. Through November and December a further all-round reduction of 5° may be made; but lower than this it will not be safe to go, unless the weather is very severe, when a fall of a few degrees through the night, and on dark days, will be preferable to sharp fring, which will render a corresponding supply of moisture absolutely necessary to counteract its parching influence. If all has gone well, the plants will not require a drop of water through December; neither must the fire-heat, which is often necessary at this period, be so severe as to rob the plants and pots of the stored-up moisture, which will soon be again set in motion. To counteract its influence on the roots, the watering of the old tan may be repeated, and when it has thrown

off a little of the vapour, a quantity cast up with a hand-fork round the sides and over the tops of the pots will keep them quite safe until early in the new year, when they will be transferred to other quarters as "Fruiting Plants."

Fruiting Plants.—Assuming that the set of plants under treatment occupy the hip-roofed house (Fig. 2), and that the lean-to (Fig. 1) is the structure into which they are to be taken for the completion of their course, in order to have the bed ready for them by the first week in January, it will be necessary to go back to the beginning of December to commence operations with the plunging material for giving a retaining bottom heat. If leaves can be obtained, well harvested and well worked, there is something about them which places them before tan in the estimation of many for swelling and finishing off the fruit of the Pine. But this part of the subject having been touched upon in a previous chapter, it is only necessary to say the material, be it leaves or tan, should be placed in the pit in time for the heat, which invariably revives after disturbance, to settle down to a temperature averaging from 85° to 90°, when plunging may be commenced without further delay. As the plants, which have been some ten or twelve weeks at rest, will now be divided into two sections, the first to start into fruit without making a growth, and the second to make a growth before they start, and so form a succession, some discrimination and judgment will have to be brought to bear upon the selection of the first set of plants.

First Section.—As a rule, plants having the thickest stems, which have shown the greatest disposition to throw out suckers, and with a number of narrow, sharply-pointed leaves in their centres, will be found the most certain starters. All of them, even when selected by an experienced person, may not throw up their fruit at once; but the majority will do so, and any that miss can be taken out, and replaced with others from the second set, which, contrary to expectations, may afterwards start without making a growth. For very early work, and to give a supply of ripe fruit in May and June, the time when Pines are in the greatest demand, and as a natural consequence of most value, imported fruit being out of the market, Queens will be the least likely to disappoint, as they are most sensitive, and swell and ripen off their fruit quickly. A few plants of other good summer kinds, as Rothschilds, Fairy Queens, and the always excellent Smooth-leaved Cayenne, may also be taken in for growing fruit, which will form a link between the first and second batches, but Queens should form the majority.

Formerly it was the custom to tie up the leaves as

often as the plants were moved; but this barbarous treatment has been given up by all good Pine-growers, and very wisely too, as plants of any age, when allowed to take their natural form of growth, cannot be so treated without receiving considerable injury, and when they arrive at the age of fruiters, with short, stiff, inflexible leaves radiating from the centre, the trouble of tying up is a considerable addition to the labour of removal. When a sufficient number of plants have been marked for removal, a few of the lower leaves must be stripped from the stems, and all loose inert soil removed as they are taken out of the bed, preparatory to top-dressing with pieces of rough fibrous loam, which must be firmly rammed round the collars to keep the plants steady, and to prevent water from hanging in suspension about the surface roots.

Plunging.—Having determined on the distance the plants are to be placed apart—two feet to two feet four inches will not be too much—let each plant be plunged with the side which formerly grew to the light again facing the sun. The depth in the bed must be regulated by circumstances, created by the quantity and condition of the plunging material: for instance, if the heat is obtained from a heated chamber entirely under control and there is no danger of its rising much above 85°, the rims of the pots at the back may be on a level with the tan, as there will be no fear of burning; but if all the heat is derived from tan or leaves, then loose or shallow plunging will be the safest plan, until such time as the heat is a little below 90°, when the plunging material may be pressed closely about the pots. When it is borne in mind that all the valuable roots are coiling round the insides of the pots, and through the drainage, and that the most important, in fact the most vital point will be their preservation in a fresh, healthy, and very shortly a most active state, too much care and watchful attention cannot be devoted to the regulation of bottom heat.

When all the plants have been plunged, they must be supplied with water of a stimulating nature at a temperature of 80°, and in sufficient quantity to moisten every particle of the soil. Atmospheric moisture in moderation at first (as too much will start some of the plants into growth) must be provided by damping the paths and walls, but not the surface of the bed. Later on this may be done; but for the present the excitement must be due to bottom heat, and a moderate quantity of water about the house.

Monthly Treatment.—The temperature during this first month may range from 60° at the beginning to 65° at the end by night, and 65° to 70° by day, when fire-heat is the only moving power.

On bright sunny days, which sometimes prevail in January, the maximum may touch 80°, air being given when the glass registers 76°.

February.—If the past month has been bright and fine, the plants may now have another watering with weak guano-water, or diluted liquid manure, at a temperature of 80°. Atmospheric moisture, still in moderation, should be provided by damping the paths and walls and filling the evaporating pans with diluted liquid. When feeding Pine plants, it is a good plan to vary the liquid as much as possible, where animal as well as artificial manures can be obtained. Manure-waters of all kinds should be quite clear when used. The night temperature may be steadily raised from 65° at the beginning to 70° at the end of the month, and that by day from 70° to 76°. When the latter point is reached, give sufficient air to allow a rise to 80° under the influence of sunshine. Close early to economise fire-heat, and run down the blinds at night. If the plants are satisfactory, some of them will begin to show fruit by the end of the month, when a little more water may be given with advantage, and the surface of the bed syringed on bright afternoons. If the bottom heat varies, take steps to reduce or raise it to about 85°; but be careful as to the disturbance of fermenting beds, as sun-heat in March sometimes causes a sudden rise of several degrees, which might be hurtful to the plants at a time when all their energy is needed to force the fruit well out of the foliage, and aid in the rapid development which will take place during the next two months.

March.—Early in this month, all the plants which have responded to the autumn rest will be throwing up fruit, and suckers will be starting from the stems of the Queens and other free kinds. As stock of these is always plentiful, not more than two of the best need be kept to grow on. All the others, as well as the gills, which form just below the fruit, should be removed as soon as they can be seen, otherwise they will take away the strength which should be thrown into the fruit.

As this is a very trying month, a portion of the day often being very bright, with sharp piercing winds, followed by cold, arid nights, the minimum and maximum temperatures from fire-heat should not be much increased; but sun-heat must be husbanded to the fullest extent, by closing in time to run up to 90° for a short time, with atmospheric moisture, which is best produced by syringing the walls and floors and occasionally the surface of the bed. Overhead syringing must not be indulged in until after the flowers on all the pips have set.

Cross-fertilisation.—If cross-fertilisation is contemplated, the time is now at hand, and early,

spring-started plants will be found the best, as the seeds will be ripened under the most favourable conditions which this climate affords. Should the month be unusually bright and dry, watering with stimulating liquid must be more frequent; but of two evils it is best to err on the side of dryness, provided the soil is kept in a fairly moist growing condition and atmospheric moisture is liberally supplied. To counteract the rapid escape of heat and moisture, the blinds should be let down during the hours of darkness, when the front brick ventilators may be opened to let in a chink of fresh air.

April.—Under the favourable influence of mild, gleamy days, the night temperature should range from 75° at banking time to 70° in the morning, and the maximum from 80° to 85° by day. Air must be given at the apex when the thermometer touches 78°, and steadily increased to an extent that will allow the mercury to rise to 85°. When it begins to decline, reducing must also have timely attention, as rapid forcing with plenty of solar heat and moisture on fine afternoons is in every way preferable to early firing to catch the night heats. Immediately after the house is closed, the plants should be regularly dewed overhead with water at a temperature of 80°, and a little thrown into the axils of the lower leaves will feed the stem-roots; but the latter practice, while keeping them moist, should not be carried to an extent that will load them with water and so increase the size of the crowns to the detriment of the fruit. As the latter are now swelling fast, neat sticks firmly placed in each pot and rising a little above the tops of the crowns will be needed as supports to keep them upright. In lean-to houses, the fruit is apt to lean with the plant to the south, when the crown gets drawn out of the perpendicular.

May.—Any fruits that were not tied up last month will now require attention, as nothing looks worse than a crooked crown. When all have been tied up, examine the beds; if dry, water between the pots, using soot or lime-water where worms have found an entrance. If free from these pests, clear diluted liquid is preferable to pure water, as it throws off ammonia at a time when stimulants in moderation are constantly needed. If the fermenting material has left the sides of the pots, replace it, set the pots level and add a thin surfacing of tan or leaves. Gentle stimulants at every watering will do good service, until the most forward fruits have attained their size, when root-feeding must be discontinued. Some Pine-growers lay great stress on certain animal manures, such as deer or sheep dung; but for all round, general purposes there is nothing better than weak solutions of guano, and the contents of the

ordinary liquid-manure tank, into which the drainage from stables, cow-sheds, or the frame-ground is conveyed. These should be used alternately, as plants, like animals, benefit by change of diet.

If the weather is genial and bright, the Pines will now make very rapid progress, as the houses can be ventilated early, and have a moderate supply of air through the early part of the day, while the declining sun will not be so hot as to delay closing in the afternoon. As sun-heat with an abundance of atmospheric moisture can then be bottled up and kept for some hours before fires are needed, the temperature may range about 90° with perfect safety; indeed, where time is an object, it is no uncommon thing to run Pine-stoves up to 100° on bright sunny afternoons in May.

June.—If any of the fruit commenced colouring at the end of last month, the proper course would have been to remove them to a drier house to ripen up; but as the majority would not be so far advanced, June may be taken as the great ripening month. Therefore, when the lower tips of the fruit assume a lighter colour, the flavour must have full consideration, as fine Pines deficient in flavour are of little value. This important feature can be obtained in two ways, either of which must be decided upon by the purpose for which the fruit has been grown. If for an early market, then simultaneous maturity, or what is termed a glut, being no impediment, the whole house may be treated to more air with plenty of heat, and less moisture both in the atmosphere and the soil. If, on the other hand, the Pines are wanted for private use, then the treatment, though practically the same in its application, must be different in its result, as a constant supply of ripe fruit extending over the longest possible period will be the object held in view. To secure this, and to give late starters, and the few later kinds, which were recommended for forming the connecting link, the best possible treatment, all the early Queens should be lifted out boldly as they begin to change, and placed in a dry, light, airy house, where they can have the benefit of a partially-spent bed for plunging them in; thus doing away with the necessity of watering, and securing sufficient heat to avoid a check from cold. Another advantage which attends the early removal of ripening fruit from a hot, moist stove, is the increased length of time which can be devoted to the ripening process, and the superior condition of fruit so ripened for keeping after it is fit for use.

Retarding and Keeping the Fruit.—In the absence of a suitable compartment for this purpose, a Vinery from which ripe Grapes are being cut answers very well, as partial shade from the Vines protects the bright golden fruit from the direct rays

of the sun, and the free circulation of dry warm air, so essential to the Grapes, is just what is needed for ripening and retarding as well as giving high flavour to the Pines.

When the season is further advanced, and settled summer weather has set in, it will be no longer necessary to use a house for retarding purposes, as Pines can be ripened up and kept in an airy Grape-room, where they will remain in good condition for several weeks. In this way Pines can frequently be kept a month or six weeks longer than under the best management in the fruiting-house.

Second Section of Plants.—After the first set of plants were drawn for starting in January, those left behind, as being the least likely to start without first making a growth, should be re-arranged in the old bed, where they can be kept quiet during the succeeding two months. In the meantime, a span-roofed house being at command, preparations should at once be taken in hand for getting the fermenting material well worked and settled down into a steady bottom heat of 85° to 90° ready for their reception by the end of February. As was anticipated, a portion of these plants will make a growth before they start, and so prolong the supply, by producing the finest Queens of the season, while the Cayennes and Rothschilds will carry it on from the end of May until the beginning of December. The preparation of the plants and their treatment will, in almost every particular, be precisely the same as that recommended for the first section. They will, however, as may be readily understood, require less fire-heat, more air and atmospheric moisture through the early stages, and a fair proportion of them being Cayennes and Rothschilds, two varieties which always take more water than Queens, a more liberal supply of this element in a stimulating form will also be necessary.

Should any of these plants miss fruiting and continue growing, in defiance of all the checks that may be brought to bear upon them, the best plan is not to throw them away, in conformity with an old custom, but to keep them on the high-and-dry principle until a newly-prepared plunging-pit, with a bottom heat of 90°, has been made ready for the reception of a set of suckers or successions, and to cut them off at the base close to the soil. With one stroke of the knife they will again be reduced to the condition of very large suckers, ready for potting and treating in the usual way, except that the pots should be from nine to ten inches in diameter, as they will not receive or require another shift into a larger size. Having stripped off a few of the lower leaves, they should be firmly potted in rough fibrous loam, and plunged up to the rims in the hottest part of the bed, where they can be pretty closely shaded from bright sunshine,

and have a slight syringing daily until they are fairly rooted. When treated in this way, every particle of the soil being fresh and sweet, they very soon throw out an abundance of active roots, and become stout, vigorous plants, capable of finishing excellent fruit within a few months, as the check causes every one of them to "show" in a few weeks after the cutting down.

Summer Suckers.—In order to completely dispose of the first set of plants, which have been carried on through the different stages of their growth, from the sucker to the ripe fruit, it may not be out of place to return to the fruiting-house, where they were left standing as stools, with one or two suckers on each, ready for detachment. The manipulation and potting of suckers having been discussed, it is only necessary to say that the general move forward to fill up the house they have occupied will make room in the sucker-pit for their reception; and, as the majority of them will be large and well ripened at the base, they will form the first batch for growing on through the winter, and shifting into fruiting-pots early in the spring. When all the best of the suckers have been taken off and potted, the shy kinds, with which the reader is now well acquainted, will require special treatment to set the latent or dormant buds in motion, as well as to bring forward any small suckers on the Cayennes, which may be considered too small for placing in single pots. With some it is the practice to water the old stools thoroughly, and plunge them in a strong bottom heat to force the growths forward; but space at command, as a rule, being limited, it is in several ways advantageous to shake them out, and re-pot in smaller pots, as the fruiting-sized pots are then set at liberty. The old roots are stimulated by being placed in new compost; feeding liquid can be more frequently supplied, and a great number of stools can be plunged with more fermenting material between them than will be the case when the large, unwieldy fruiting-pots are retained.

Having shown that the first set of plants, which ripen their fruit in May and June, furnish suckers that will supply the earliest fruiters twenty months later, it follows that the second batch, which ripen their fruit through August and September, will give the suckers that will succeed them. But as Queens cannot be had in first-rate condition through the winter months, other kinds, of which little has yet been said, must be brought forward, for giving the late winter and early spring supply.

Winter and Spring Pines.—Reference to the descriptive list of varieties will show that the Smooth Cayenne, Black Jamaica, Lord Carington, Beatrice Lambton, and Rothschild are considered suitable

kinds for giving a supply of winter and spring fruit; but the last-named being better adapted for autumn and early winter use, and Beatrice Lambton being a very large variety, more suitable for special requirements than general private use, the first three stand unrivalled for giving high-class Pines, which are always good, and can be kept for a considerable time after they are ripe. Two sets of these should be grown where space admits, and, to treat them properly, separate compartments should be used; the warmest and driest being devoted to the Jamaicas and Caringtons, the coolest and most airy to the Cayennes.

It is now an acknowledged fact that houses of moderate dimensions are preferable to large ones for the growth of Pines in general, and for winter fruit in particular. The facilities afforded by small houses or compartments for covering up the glass at night must not be reckoned amongst the smallest advantages gained by keeping the different kinds of winter Pines under distinct and, as a matter of course, proper treatment. Therefore, assuming that the lean-to house, which is better than the full-span roof for winter culture, is divided into two equal parts, with an abundance of piping for giving top and bottom heat, the pits should be prepared for the successions—that is, the full-sized autumn-rooted suckers, by the time the general stock is ready for shifting into fruiting-pots in February. No difficulty is experienced in getting a sufficient number of Jamaica suckers for potting up in August; but with the always shy Cayenne matters stand in a more unfavourable light, consequently propagation from dormant eyes, crowns, and gills may have been going on for a year or two before plants raised from such small pieces can be considered large enough to be treated as good suckers in the autumn. Should this be the case, strong fruiting plants, carrying perhaps one or two really good suckers, may be divested in October before the fruit is ripe. But instead of the stock so obtained being kept cool and dry through the winter months, a compact span-roof pit (Fig. 5), some five degrees warmer than the general sucker-pit, will be found suitable for growing them steadily on in six-inch pots until they are well rooted and fit for shifting with the others in February, or it may be early in March. Late suckers never root so quickly and freely as those usually taken in September, and shifting before they are ready is quite as bad as allowing the balls to become matted.

With the bottom heat standing at 85°, a sufficient number must be selected, and potted precisely as the Queens—the Jamaicas into ten-inch and the Cayennes into twelve-inch pots, the two sizes in which they will remain until the fruit is ripe. Their treatment through the spring will not differ

from that recommended for Queens; but they will require a little more room after the beds have been renovated in the autumn, and the Cayennes all through their treatment will take more water and atmospheric moisture than would be good for Queens and Jamaicas. Having elevated all the plants well up to the light, they must have as much water and moisture as will keep them steadily progressing through the winter. To secure this, the bottom heat should range from 75° in November to 80° by the end of January, and that of the house from 60° at night to 70° by day. To economise fire and husband moisture, so very important in the maintenance of a humid, growing atmosphere, the covering must not be neglected.

In twelve months from the time the suckers were potted, they will be large enough for fruiting; but as this cannot be secured without a spring growth, give more top and bottom heat through the early months, followed by a decided check to the Jamaicas in June, and a little drier treatment to the Cayennes; nearly all the plants will be ready to throw up from July to the end of September.

It invariably happens that the selection of a given number of suckers for a special purpose leaves a weaker set behind, and as they will require more time than the first lot to grow into a fruiting state, the one-shift system is not so well adapted to their culture. Many of these plants having been raised from dormant buds and gills of the preceding spring, the pots in which they are wintered will not exceed five inches in diameter; and, although the top and bottom heats have been favourable to constant progress, the pots used for the February shift cannot well exceed eight inches in diameter. In these, constantly plunged in a brisk bottom heat of 80°, with their heads close to the glass in the span-roof pit, they soon fill the small stratum of soil with roots, and are fit for the final shift into ten to eleven-inch pots, which are quite large enough for winter-fruiting Cayennes and Jamaicas, by the end of April. The object being to grow this set of plants from the sucker to the fruit without a check, a close, compact pit, with full command of top and bottom heat, must be available, otherwise the attempt to swell the fruit through the winter months will end in disappointment, and the entire loss of a number of plants, to which a great deal of time and patience has been devoted. Unless the young practitioner has a fair stock of plants to fall back upon, his attempt at starting Pines after September should be confined to a few Jamaicas and Caringtons at first, as there is no difficulty in obtaining suckers of these varieties, and they can be induced to swell off excellent fruit in nine-inch pots, provided they are well fed when water in winter is required.

From the foregoing remarks on winter Pines, it will be seen that the only way in which their management differs from that of summer fruiters consists in the maintenance of conditions, as regards heat and moisture, favourable to steady growth through the winter months, when Queens are in a comparative state of rest.

The Open-bed System.—We are indebted to Mr. Mills, at one time gardener at Gunnersbury, for bringing into prominence the planting-out system (as it is generally called), and there are a few places in this country where it is now practised, the most successful being the Royal Gardens, Frogmore, where, as in other large establishments, the Queens and tender varieties are still grown in pots. The Smooth-leaved Cayenne, which seems to do the best, can be grown to great perfection on this principle, but not better than a number of advocates of the pot system can produce them; and as plants in pots are easily moved from place to place, either to be pushed forward or retarded, cultivators having limited space at command will find that the planting-out system is not the best for giving a continuous and steady supply of ripe fruit. The usual method of growing the Smooth-leaved Cayenne out of pots is over hot-water pipes placed in chambers or dry rubble. The tank system is not so well adapted, as the moisture constantly rising from the open gutters in course of time affects the soil, and the roots do not seem to take hold of the lower stratum, which, under ordinary conditions, is considered the best. At Frogmore bottom heat is obtained from a bed of fermenting Oak-leaves, the best of all mediums for forcing vigorous growth; and it is, doubtless, to the use of this material in an immense decaying body that the wonderful luxuriance and colour of the plants must be attributed. The suckers, as may be supposed, are large and good when they are taken off and planted over the beds of rich fermenting leaves in the sucker-pit. In due course they are removed to the succession or fruiting-pit with large forks, where they are placed in rows from two to three feet apart, and earthed up with large, rough, turfy pieces of loam and peat, leaving them standing in ridges a foot or so in height.

When passing through the gardens at Gunnersbury many years ago, the process of shifting the succession plants forward from one pit to another was going on. Large flakes of half-decayed leaves were hanging from the roots, which, despite the greatest care, naturally received a check, and were thus predisposed to form their embryo fruit, apparently simultaneously, judging from the equal size of the Pines then swelling off in another house. Since that time the planting-out system has made some progress;

but there can be little doubt that this drawback to the otherwise simple mode of growing Pines has kept it in check even in large places, where a constant supply of good fruit is of the first importance. Some cultivators have modified the system by growing young stock in pots, and turning them out into the beds when they would otherwise receive their final shift into fruiting-pots; but it is questionable if the space gained by growing the plants closer together through the first season will compensate for the uncertainty which attends their fruiting, and the possibility of the majority of the Pines becoming ripe at one time.

In order to place the plants in the best condition for producing large fruit, pots should be dispensed with altogether, as it very often happens that the bed is not ready for their reception before they become pot-bound, when one of two things takes place after they are turned out—either many of the roots perish, and the plants are reduced to the condition of suckers, or some of them start prematurely into fruit, and become useless. Therefore, to avoid these mishaps, the Pine-grower whose space is limited should have a good pit, large enough to hold as many young plants as will keep the fruiting-house furnished with successions. If bottom-heat pipes do not exist, then fermenting leaves firmly trodden will produce a genial bottom heat, over which suckers will soon form roots and grow on firm and stocky, till the fruiting-house can be properly prepared for their reception. To insure a constant bottom heat of 80°, hot-water pipes should be laid in a chamber, or in dry rubble, with space for a foot of leaves and the soil, to raise the level to within eighteen inches of the glass in front, and from three to four feet at the back of the pit.

The planting-out system may be commenced at any season, provided the plants can be thoroughly established before the dead months set in. Early spring is, however, the best, as newly harvested leaves are then at hand, and autumn-rooted suckers are in good condition for moving, with every chance of their taking to the new compost, and starting away at once. When the fruiting-pit has been prepared, and the compost, similar to that recommended for pot culture, is ready, it should be placed loosely in ridges running across the pit to get properly warmed, turned, and aerated, when planting may be proceeded with in the following manner. The best variety, as has been stated, being the Cayenne, the largest plants should be placed in a row, two feet six inches apart, along the back, with a few pieces of rough turf under the balls to raise them to the proper level, and firmly packed with compost, so as to leave a deep furrow between the plants from back to front. Then will follow the second row, two feet

from the first, and so on until the pit is full. After planting, the house should be kept close and the atmosphere well supplied with moisture for a few days, when ordinary treatment as to air, heat, and slight shading for an hour or two on bright days will follow. If the soil is in nice friable condition, no water must be given to the roots until they have started fairly into growth; neither must the plants have more than an occasional slight dewing over with the syringe, as the new leaves and soil will give off an abundance of moisture for a considerable time. If larger plants from pots are used, the balls should be slightly crushed, and the roots carefully unwound, so as to bring them into immediate contact with the new soil, and to prevent the old compost forming a hard, dry substance, impervious to water during the summer.

When Pines are turned out into warm ridges of fresh fibrous turf, it is astonishing how quickly the white roots begin to force their way to the sides, and the broad short leaves spread out to catch every ray of sunshine and light, giving them quite a distinct character as compared with the same varieties when confined to pots. When once established, the treatment as to heat, air, and moisture will be the same as for plants in pots, with perhaps a little more solar heat to penetrate the ridges after the pit is closed for the day. When watering is found necessary, it should be liberally supplied, and great care should be observed in the use of the syringe, otherwise the large quantity of soil will hold more water in suspension than is good for Pines. If the plants are intended to start into fruit early in the spring, no water must be given after September, and the atmosphere must be kept drier than would be considered safe for plants resting in pots; but the Cayenne being more valuable as a succession to early Queens, by modifying the winter treatment, and fully developing the root system, much finer fruit will be obtained from plants which are allowed to grow themselves into a fruiting condition.

Renovation of the Bed.—When hot-water pipes are found sufficient to keep up the proper degree of bottom heat, it is not considered necessary to turn out the pit and replenish the bed every year, as plants can be taken out after the fruit is cut and replaced with others from the reserve, which will, of course, have a little fresh soil given to them at the time of planting. In course of time the soil and leaves get too far away from the glass, the plants become irregular, and the general appearance of the house suggests the propriety of making a new start with everything fresh and clean. The best period for this is immediately after a large proportion of the plants have finished their fruit, and there are but few

that have not started on the way. If these are carefully lifted, and replaced in the back row when the bed has been renovated, they will start as freely as cut-over pot plants that miss fruiting. At places like Frogmore, where leaves are the principal, if not the entire, source of bottom heat, annual renovation is a necessity, which comes round as regularly as the crops of fine Pines are cut from the plants; and if those who have not embarked in the planting-out system are to judge from results, the question will undoubtedly be decided in favour of the extensive use of Oak-leaves, both for giving bottom heat and swelling off the fruit.

From the preceding pages it must not be supposed that the Smooth-leaved Cayenne is the only Pine which does well when planted out. Its free, hardy constitution undoubtedly places it at the head of the list; but other varieties, including the Queen, can be equally well grown, as was proved by the late Mr. Fleming, of Trentham, who produced Queens quite as remarkable for size and quality as the finest Cayennes that have yet been grown. And others have frequently grown them in quantities averaging over six pounds each, in pure loam, of a calcareous nature, which many would consider too heavy for Pines. This particular soil was obtained from a paddock in which ewes and lambs are kept in the spring, and was placed over leaves and hot-water pipes in a succession pit, where the top heat is barely sufficient to keep Cucumbers alive throughout the winter months.

There are other systems, including the Meudon, which at one time brought the French growers into prominence, and stimulated our own countrymen into action. But it is not too much to say that the supreme excellence of the produce of our Pine-stoves of the present day will enable British growers to challenge any country in the world to which the king of fruits is not indigenous.

ROCK, ALPINE, FERN, AND WILD GARDENING.

ALPINE PLANTS.

By EDWARD W. BADGER, F.R.H.S.

List of Plants.—In the following list the plants which require least skill to grow them successfully are distinguished by an asterisk (*); the others will be found to require some special treatment as to soil, situation, &c., and are consequently a little more difficult to grow successfully. There are, however, very few of the plants named which will not thrive admirably if the directions given are carefully followed.

**Acæna microphylla* (Rosy-spined Acæna).—A minute-leaved, very dwarf, trailing plant. It produces a number of insignificant flowers in round heads. As the flowers fade the sepals elongate into bright rosy spines, which are persistent and pretty, and render the plant very conspicuous for several months. Should be planted in an exposed position away from larger plants. It blooms from June to August and sometimes later; is easily propagated by division; thrives in any good soil, but should be well supplied with moisture during the summer months. This plant is sometimes known as *A. Nova Zealandie*. A native of New Zealand.

**Alyssum saxatile* (Yellow Alyssum).—A most valuable early-flowering plant, producing an abundance of bright yellow flowers. Will grow in almost any soil and position, but a dry exposed part of the rockery suits it best. Readily propagated by cuttings or from seed. A very dwarf variety is known as *A. s. compactum*. Native of Southern Russia.

Andromeda tetragona (Square-stemmed Andromeda).—A very distinct and choice little plant, the correct name of which is *Cassiope tetragona*, growing from six to eight inches high, bearing pure white bell-shaped flowers in April and May. Should be grown in sandy peat kept very moist during the summer. Propagated by careful division of the roots in spring. Native of Northern Europe.

Androsace carnea (Rosy Androsace).—A lovely alpine with rosy flowers, which may be grown with only moderate care provided it be supplied with plenty of water during the summer, and is planted in a peaty soil mixed with sandy loam. Propagated from offsets and seeds. European Alps.

Androsace Chamæjasme (Rock Jasmine).—A most desirable plant for the choice rockery. Should be grown in a fully-exposed position where there is plenty of root-room and the soil is a good sandy loam. The surface of the soil should be covered with nodules of sandstone to prevent too rapid evaporation of moisture. Plenty of water must be given during the growing months. Propagated by division. A native of the European Alps.

Androsace lanuginosa (Himalayan Androsace).—This plant is so good that a sheltered position on the rockery should be provided for it, and duplicate plants in pots preserved in the cold frame during the winter months. It should be planted at the edge of a rock over the face of which it may trail. Soil, light and well drained. During growth plenty of water should be supplied. A little extra care and trouble bestowed upon it will secure an ample reward. Propagated by cuttings of the current growth. A native of the Himalayas.

Androsace sarmentosa (Bushy Androsace).—A beautiful plant, forming dense silvery-grey rosettes, with

rapidly-spreading stoloniferous runners. Flowers shaded rosy-pink; soil peaty loam, though we have it thriving in ordinary garden soil with which plenty of leaf-mould is intermingled. Propagated by cuttings. From the Himalayas.

**Anemone apennina* (Apennine Wind-flower).—An easily-grown, lovely plant, quite hardy, producing beautiful bright blue flowers. Suitable for rockwork or the mixed border. Flowers in spring. Is easily increased by division. A native of the Apennines.

**Anemone blanda* (Winter Wind-flower).—Much like *A. apennina*, but a deeper blue; flowers earlier, and is, if possible, hardier. Deserves to be planted extensively. Will grow in any well-drained, good soil on rockwork or in borders. Propagated by division when at rest. A native of Greece.

**Anemone fulgens* (Scarlet Wind-flower).—A plant which blooms very early. The flowers are a most brilliant scarlet, and last a long time when cut. Suitable for beds, borders, and rockwork, and will grow in any good, rich soil. Should be kept moist when growing. Propagated by division and seeds. A native of Southern Europe. It is plentiful in some parts of France.

**Anemone nemorosa* (Wood Anemone).—One of our loveliest native plants. Besides the more plentiful single variety, there is a handsome double one, the flowers of which are more durable than the single variety, and the same colour; also a rose-coloured double (*rubra fl. pl.*) and a single blue one (*cœrulea*). All are spring bloomers, and are fitting tenants of the choicest rockery. Soil, a strongish loam, in a somewhat shady position. The double forms may be easily propagated by division of the tubers when the plant is at rest after the foliage has died down.

Anemone palmata (Palmated Wind-flower).—A plant with leaves somewhat like a Cyclamen, producing yellow flowers. Must be grown on a level part of the rockery, where it will have room to spread, which it will do in good peaty loam, if not overrun by more rapidly-growing plants. It is so good as to be deserving of a little extra care and attention. A white form of this Anemone is offered in some catalogues. Can be propagated by division of the roots and by seeds. A native of the shores of the Mediterranean.

**Anemone Pulsatilla* (Pasque Flower).—A fine, long-cultivated native plant, which blooms about Easter. The ordinary kind has purplish flowers, but there are several other kinds in cultivation. Does well in a dry, chalky soil, but may be grown successfully in almost any situation where it has a full exposure. Propagated chiefly by division.

Anemone ranunculoides (Yellow Wood Anemone).—Should be grown in warm, well-drained situations.

Flowers yellow, in spring. Propagated by division and seeds. Native of Southern Europe.

**Antennaria dioica* (Mountain Cudweed).—A charming plant, which, from the silvery colour of the leaves, invariably forms a pretty contrast with green-leaved Alpines. Grows in neat tufts and makes a good edging. Ordinary soil; flowers in early summer. Easily propagated by division. A native plant.

**Antennaria tomentosa* (Snow Plant).—A silvery-leaved, dwarf, spreading plant of first-rate quality; grown for its foliage effects, the flowers not being attractive. Should be grown in well-drained sandy loam. Propagated by division. A native of the Rocky Mountains.

Aquilegia cœrulea (Rocky Mountain Columbine).—One of the loveliest flowers grown in our gardens. They are large, blue and white, and very long-spurred. Grows nine to twelve inches high; is not particular about soil, but thrives best in fairly rich well-drained loam. Blooms in May and June, sometimes later. Easily raised from seeds. A native of the Rocky Mountains.

**Arenaria balearica* (Balearic Sandwort).—One of the dwarfiest-growing plants we possess. The leaves are very minute, and the habit of the plant is to densely spread like a tiny Moss. Planted close to stone, it rapidly attaches itself to it, and will soon cover a considerable space. The flowers are pure white stars lifted a little above the leaves. A gem of the loveliest kind, which deserves a place on every rockery. Should be fully exposed and protected from the visitation of larger-leaved plants. Easily propagated by divisions pressed firmly in the soil. It comes to us from Corsica.

**Asperula odorata* (Sweet Woodruff).—One of our native plants, which may properly find a place on the rougher and larger rockeries. Its leaves smell like sweet hay, and the flowers, which are plentiful, are of the purest white, and appear throughout May. Propagated by division.

**Aster alpinus* (Alpine Starwort).—Most Asters grow too tall for the rockery, but this kind rarely exceeds six to nine inches in height. The flowers are lavender-blue in colour, of large size, and are produced early in the summer. Ordinary garden soil. Propagated by division. Native of the Alps.

**Aubrietia deltoidea* (Three-angled Aubrietia).—A round, spreading, tufted plant, producing abundance of flowers of a pleasing shade of purple, early in spring. Particularly adapted for positions where it can hang over a face of rockwork. *A. Campbelliæ* is very bright in colour. Other good kinds are *A. grandiflora* and *A. græca*. *A. purpurea variegata* has nicely variegated leaves. Thrives in any kind of soil. Propagated by seeds and division. Native of the Levant, Greece, &c.

* *Bulbocodium vernum* (Spring-blooming Saffron).—A very early—January to March—blooming, bulbous plant, when planted in dryish, sheltered, sunny positions. Good sandy loam suits it admirably. Division of the bulbs every two or three years in July. A native of South and East Europe.

Calandrinia umbellata (Umbel-flowered Calandrinia).—Bears most brilliantly coloured flowers—magenta-crimson. The plant is of dwarf growth, easily raised from seeds, which should be sown in pots or where they are to remain. Thrives best in fully-exposed situations facing south. Soil, sandy peat. A native of Chili.

* *Campanulas* (Bell-flowers).—Many members of this family will be favourites with almost every one. The kinds named below are the gems of the Bell-flowers of dwarf growth. The cultivation of all of them is extremely easy, and they can nearly all be easily propagated by division, cuttings, and seeds. Good ordinary garden soil will be found to suit most of them when the drainage is good and the texture of the soil open.

* 1. *Campanula carpatia* (Carpathian Bell-flower).—Moderately dwarf, averaging eight inches high, and bearing comparatively large, bluish flowers. Commences blooming early in summer. The white variety (*C. C. alba*) is worth growing for contrast of colour. Native of the Carpathian Mountains.

2. *Campanula fragilis* (Fragile Bell-flower).—This is a true Hairbell of dainty growth, with a name which most propagators know to have been most judiciously bestowed, and which suggests careful handling. The flowers are a pale blue, somewhat open in form. It is a very dwarf grower and should never be placed near rapidly growing plants. The best situation for it is in a warm, sheltered crevice, well drained, the soil being decidedly light in texture. The best way to propagate it is by cuttings in spring. It is a native of Southern Italy, which will suggest that it is somewhat tender, and requires a little more care for its protection than is usually bestowed. This is a plant of which duplicates should always find a place in the winter protected frame.

3. *Campanula Garganica* (gargano Hairbell).—A sweet little plant, producing an abundance of pale blue flowers. Its habit of growth is prostrate, and it should be planted in such positions as will make the most of this characteristic. Its proper position is alongside plants of dwarf growth fully exposed on a rocky surface, in a crevice of which it will thrive and delight every one. Easily propagated by seeds, cuttings, and division. Soil, rich and good. Native of Italy.

4. *Campanula hederacea* (Ivy-leaved Bell-flower).—This is one of the most charming of our na-

tive plants. We have seen it thriving on a damp lawn in Warwickshire, in front of the "Cheverel Manor" of one of George Eliot's prettiest tales; in the Fairy Glen near Llanrwst; and in a damp lane near Bettws-y-coed. Its correct botanical name is *Wahlenbergia hederacea*. It is a charming little plant, but to ensure its successful growth there must be an abundance of moisture, and the only place where it may be expected to thrive is the artificial bog. It may be readily divided, and will grow freely if provided with the natural conditions of its native habitat. Its merits will well repay the trouble necessary for its successful cultivation.

* 5. *Campanula Hendersoni* (Henderson's Bell-flower).—This is a plant growing to a height of twelve inches or more, but it is so floriferous and beautiful that in the rougher parts of the rockery it may well find a place. Its salver-shaped blooms are produced profusely; their colour is a bluish-purple; and it is a plant of decided merit, easily grown.

* 6. *Campanula pulla* (Violet Bell-flower).—A somewhat rare species, which should be preserved in the reserved frame we have already referred to. It is somewhat delicate in constitution in our climate, and should be placed in a most favoured situation, but its merits will repay all these attentions. Soil, sandy peat. Increased by division. A native of the Tyrol and elsewhere.

* 7. *Campanula pumila* (Dwarf Bell-flower).—This is also known as the Tufted Bell-flower, or *Campanula caespitosa*. Nothing can be grown more easily or be propagated with less trouble, as every scrap of it may be easily grown into a plant; at the same time, nothing in our gardens is more likely to afford pleasure. It has two varieties, the white and the blue, and both are equally hardy. It grows only some four inches high, spreads rapidly, blooms profusely; thrives best in a somewhat moist position, though it would be difficult to name a spot where it would fail to thrive. A native of the European Alps and elsewhere. This should find a place in every garden.

8. *Campanula Raineri* (Rainer's Bell-flower).—A rare plant, but as we find it named in most of the best lists of Alpines now offered for sale at a moderate price, we unhesitatingly recommend it. It is a dwarf plant of great excellence. It relishes good soil and a sunny position. It comes from the Swiss and Italian Alps.

* 9. *Campanula rotundifolia* (Round-leaved Hairbell).—This is our native Harebell, or Hairbell, whichever is the proper name. Every one knows it, and no one disputes its charms. It is named here for the purpose of recommending the white variety, which is fit for any position on the choicest

rockery. It is as hardy as a weed; can be propagated by division most easily.

* 10. *Campanula turbinata* (Vase Bell-flower).—Its name suggests its shape, which is that of a shallow, open, cup-shaped vase. It is very hardy, dwarf in habit, obtainable in two or three colours, and not at all particular in its requirements. The flowers are large and freely produced. A native of Transylvania.

11. *Campanula Waldsteiniana* (Waldstein's Bell-flower).—This is another of the very dwarf Campanulas deserving a place on every select rockery. It produces an immense number of bluish-lilac flowers. Soil, sandy loam, intermixed with a little leaf-mould. Situation exposed, sunny, and well-drained; propagated by division with care, but most easily by cuttings in spring in a gentle hot-bed. A native of Hungary.

* 12. *Campanula Zoysii* (Zoysse's Bell-flower).—A charming tufted plant, the flowering-stems of which rarely exceed two to three inches high. The flowers are azure-blue, of comparatively large size. Thrives best on fully-exposed spots in sandy loam. A native of Carinthia.

* *Cerastium alpinum* (Alpine Cerast).—A native plant, pretty abundant in some parts of Scotland, dwarf-growing, rather striking in appearance, and producing large white flowers in summer. Propagated from seeds, or by cuttings and division.

* *Cheiranthus alpinus* (Alpine Wall-flower).—Too well known to require any description. A very useful early-blooming plant, producing an abundance of bright yellow flowers. Ordinary soil. Propagated by cuttings. A native of the European Alps.

* *Cheiranthus Marshalli* (Marshall's Wall-flower).—This hybrid is worth growing in every garden. Its flowers are of a deep orange-yellow colour, and are produced plentifully in May and June. The plant is from eight to twelve inches in height. Will grow in dry situations, though it is not at all particular as to situation. Ordinary garden soil. Its supposed parents were the perennial *C. alpinus* or *C. ochroleucus*, and the brilliant orange-flowered annual *Erysimum Peroffskianum*.

* *Chionodoxa Lucilæ* (Glory of the Snow).—This charming bulbous plant was introduced in 1877 by Mr. George Maw. It is perfectly hardy, producing flowers much like the blue *Nemophila* in April and May. It should find a place in every garden. It is admirably adapted for growing in pots in a cold frame, where the flowers are even more beautiful than those grown out of doors. It thrives in any good soil, though the addition of a little peat or leaf-mould to ordinary loam seems to yield the best results. It was introduced from mountainous elevations, 3,000 to 4,000 feet high, near Smyrna.

* *Colchicum autumnale* (Autumnal Crocus).—The popular name is misleading, as it is not a *Crocus*, though its flower is much like one. A hardy native plant, blooming in September and October. Will grow anywhere, but does best in a moderately shady spot. It is usually found growing wild in moist meadows. Should not be disturbed oftener than every three years. There are single and double varieties, purple and white in both cases.

* *Colchicum variegatum* (Chequered Meadow Saffron).—The segments of the corolla are beautifully chequered with white and rosy-purple. Sandy loam of good quality, and in a warm situation, having a southern aspect. It flowers in the autumn. A native of Greece.

* *Convallaria majalis* (Lily of the Valley).—Although this deservedly popular plant is usually grown in beds, it will be found an admirable plant for moist and shady positions on the rockery. By planting in various aspects the flowering period may be considerably extended. Soil, sandy loam and leaf-mould, well enriched with cow-dung. It grows wild in much abundance in some parts of England, and almost always in woods. Propagated by separation of the crowns. A very much finer variety than our native one (the "Berlin") is grown in Germany, whence it is imported in large quantities for forcing by our florists.

Cornus canadensis (Canadian Cornel).—A miniature shrub, growing from six to eight inches high, yielding an abundance of pleasing flowers. It is most suitable for the damper portions of the rockery. In a light peaty soil, with plenty of sand intermingled, it will be sure to thrive, provided plenty of moisture be present. It flowers from June to October. A native of North America. We have a native Cornel (*C. suecica*), often confounded with *canadensis*, not uncommon in Scotland, which is not undeserving of a place among dwarf-growing bog plants.

Crassula alpestris (Alpine Crassula).—A creeping, somewhat branched plant, bearing white wax-like flowers in terminal clusters. It is a plant of recent introduction, which has proved hardy at Kew, though coming from the Cape of Good Hope. Blooms throughout the summer. Should be planted in a dry open position on the sunniest part of the rockery.

* *Crocuses*.—Of this genus there is scarcely one unsuitable for the rockery. Many species are at present botanical rarities. Of these it will scarcely be necessary to take any notice in this select list of Alpines, except to say that the cultivation suitable to one is, generally speaking, suitable to all. We shall mention only such as are likely to prove useful on the open-air rockery, and shall make no mention of

such as bloom during the depth of winter. These are for the most part quite hardy, but the flowers appear at a time when they would almost certainly be injured if grown unprotected out of doors in nearly all parts of England. The kinds named below are such as bloom either in spring or autumn, and are all moderate or not very extravagant in price. They all thrive in rich alluvial soil. They should be planted about three inches below the surface, and taken up and re-planted every third year, as the corms get nearer the surface each year, the new one forming above the old one. The earlier they are planted after the corms are procurable the better, as when they are ready to commence growth they rapidly deteriorate. The foliage should in no case be removed prematurely, as is too often done, but should be allowed to die off naturally, or the corms will not be so large as they otherwise would be. Crocuses may be grown pretty successfully beneath the dwarfier Saxifrages and other similar plants, but this plan is at best somewhat of a makeshift method, and is only mentioned here for the purpose of suggesting how to avoid bare places on the rockery.

Spring-blooming Crocuses.

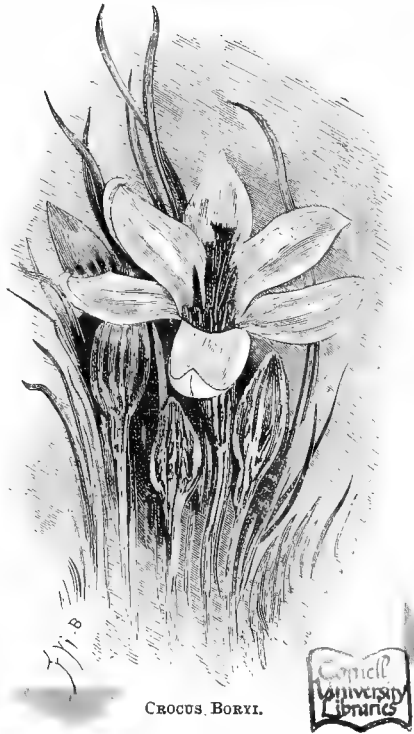
—First to be named are the best Dutch kinds, which are usually offered in seedsmen's catalogues.

Many of these are of great beauty, and they include the following colours:—Blue, purple, striped, white and yellow, and intermediate shades and combinations of these colours. Some of the choice named Dutch Crocuses are very large and handsome, and are particularly adapted to produce striking effects on the rockery when out-door flowers are very scarce, and consequently correspondingly precious. Besides these, which for the most part are the progeny of *C. vernus* and *C. aureus* and their varieties, there are some species of greater rarity which, where variety is desired, may well be grown by enthusiasts. Of these we will mention *C. alata-vicus* (white, with black lines), *C. atlanticus* (white, striped with brown), *C. aureus* (rich golden-yellow),

C. bannaticus (purple), *C. biflorus pusillus* (a miniature form of the Scotch or Cloth of Silver Crocus), *C. Boryi* (white, bright orange at the throat), *C. Imperati* (variable in colour and markings), *C. lacteus* (creamy-white), *C. Sieberi* (bright lilac, orange at the base), *C. stellaris* (yellow, striped with black), *C. sulphureus concolor* (sulphur), *C. s. striatus* (yellow, striped with black), *C. s. pallidus* (primrose). These specially named kinds vary in price from 3d. to 1s. per corm, and are easily obtainable from leading houses in the bulb and Dutch flower-root trade.

Autumn-blooming Crocuses.

—*Crocus cancellatus* (variously coloured from white to pale bluish-purple), *C. arpetanus* (pale purple), *C. etruscus* (blue, grey, and white), *C. iridiflorus* — of which *byzantinus* is a synonym (rich lilac, shaded with purple), *C. longiflorus milltensis* (light purple, yellow at the throat), *C. medius* (bright purple, veined at the base; the stigmata bright scarlet and much branched), *C. nudiflorus* (violet-purple), *C. ochroleucus* (creamy-white, orange base), *C. odorus longiflorus* (soft lilac), *C. pulchellus* (lavender-blue), *C. sativus* (purple), *C. serotinus* (blue), *C. speciosus* (blue), *C. suaveolens* (violet, fawn, and black), and *C. zonatus* (pale lavender, with scarlet zone — most beautiful). These autumnal kinds vary from



CROCUS BORYI.

3d. to 1s. 6d. each corm, except *sativus*, which is procurable at 6d. per dozen.

As Crocuses are good seed-bearers and are readily hybridised, it is to be hoped that amateurs will possess themselves of many of the species named above, and devote some attention to raising new varieties. They will find the work very interesting. Crocuses are easily raised from seed, which should be sown as soon as ripe. In from two to three years the seedlings will bloom. The additions made to this genus in recent years are of sufficient interest and variety to warrant the expectation that still further valuable additions will be speedily made, if a sufficient number of amateurs can be induced to engage in the work of hybridisation.

Cyananthus lobatus (Lobed Cyananthus).—A rare rock gem, delighting in peaty soil and full exposure. It does not usually exceed nine inches high. It flowers in August and September. Is increased freely by cuttings, and by seeds when obtainable, but a dry season is needful to ripen them. A native of the Himalayas. Should be grown in positions where the stones of the rockery allow it to nestle between them. Situation fully exposed, but damp. It flowers during September and October. Quite worth trying in the bog-garden.

Cyclamen Atkinsi (Atkins' Cyclamen).—The worthy man who raised this variety was of opinion that the hardy Cyclamens ought always to be planted *below* the surface of the soil, in this country at least. He paid much attention to the subject, and was one of the most successful growers of hardy Cyclamens. His chief reason for the opinion expressed above was that, in many cases, the roots of hardy Cyclamens proceed from the upper surface of the tuber only. Our own experience bears out this idea. Mr. Atkins was also of opinion that hardy Cyclamens should be grown in rich, friable, open soil, of which vegetable *débris* formed a constituent, and that plenty of moisture should be supplied to them. They are best placed in warm, sheltered, and well-drained positions in the rock-garden, where they will usually thrive to the grower's content. They should not be exposed to the east or the north if success is desired. These interesting plants are readily raised from seed sown as soon as ripe in pots, the surface being covered with moss, which is to be removed gradually when the tiny plants begin to make their appearance. *C. Atkinsi* produces rosy-red flowers in February and March. There is also a white form of this hybrid variety.

Cyclamen Cóm (Round-leaved Cyclamen).—This species blooms at the same time as the foregoing, the flowers being deep red. These plants, when grown in the open air, should, from the period when they bloom, be afforded some protection, and at least should be covered with bell-glasses (*cloches*). It will be still better to grow some of them in frames, for in severe winters the flowers will be much injured in the open. Soil should be rich and well drained. A native of the Greek Archipelago.

Cyclamen europæum (European Cyclamen).—This flowers from June to November, more or less, according to the season. The normal colour is bright red, and the blooms are very fragrant. Usually does well in a light, rich, loamy soil, well drained. A native of Switzerland.

Cyclamen hederaefolium (Ivy-leaved Cyclamen).—A synonym of this plant is *C. neapolitanum*. This is in bloom from the end of August to October. It is a very hardy kind; grows almost in every kind of

soil and situation, though kindly attentions are never thrown away upon it. It is a native of Switzerland and elsewhere.

* *Daphne Blagayana* (White Daphne).—This is at present rather rare, but when its great merits are recognised it will be in much request, and will no doubt be forthcoming from all the leading trade growers of Alpines. It grows about six inches high, and has sweetly-scented white flowers, which appear early in the year. It should be grown in light sandy loam and peat. Propagated by layers. A native of Carniola.

* *Daphne Cneorum* (Garland Flower).—This dwarf evergreen produces under favourable circumstances a profusion of rosy-pink flowers, deliciously perfumed. It rarely exceeds nine inches in height. It blooms early in the summer, and sometimes also in the autumn. Sandy peat should be mixed with the soil, and a plentiful supply of water applied during the summer months. Should be planted in an open, sunny position. Propagated by layers. A native of the European Alps.

Daphne rupestris (Rock Daphne).—Another lovely rock plant of dwarf growth, and when grown well is covered with a mass of rosy-pink flowers. Grows naturally in the fissures of limestone rocks. Should be grown in light sandy loam and peat, and care taken to prevent it being overrun by more rapidly-growing plants.

* *Dianthus alpinus* (Alpine Pink).—Bears solitary rosy-pink flowers from July to August. Is very dwarf in growth. Will grow in almost any soil, but thrives best when peat is one of the principal ingredients. It enjoys an exposed position, but should be kept rather moist. Can be propagated from seeds or by division. A native of Austria, &c.

Dianthus cæsius (Cheddar Pink).—So named popularly because it grows wild on the Cheddar rocks in Somersetshire. It is also found in various parts of the European continent, on limestone or volcanic rocks. The flowers, which appear in early summer, are large and rosy in colour. It should be grown on the highest and driest part of the rockery. It also grows well on walls, and the best way to establish it there would be to sow the seeds on the wall in a little cushion of moss, if such existed, or if not, to place a little earth with the seed in a chink of the wall.

* *Dianthus deltoides* (Maiden Pink; Gerarde called it the Virgin-like Pink).—Another native Dianthus, which will grow anywhere, and is admirably fitted for the rougher and drier parts of the rockery. The flowers are pink or spotted with white. The flower-stems are from six to twelve inches long. It flowers more or less throughout the summer. Propagated by division or from seeds.

* *Dianthus dentosus* (Toothed Pink).—A dwarf kind producing large flowers much toothed at the edge. In bloom during May and June and often later. Thrives in light, dryish soil; can be readily raised from seed. Is a native of Southern Russia.

* *Dianthus glacialis* (Glacier Pink).—One of the choicest gems of the rock-garden. It is very dwarf. The flowers are rosy-pink, and it is quite hardy. Grow it in poorish, sandy soil, fully exposed. Propagated from seed and by division. Native of the Alps and Pyrenees.

Dodecatheon integrifolium, now named *D. Meadia lancifolium* (Entire-leaved Cowslip).—A gem from the Rocky Mountains. Flowers in May. Soil, sandy peat. Situation not too exposed. Best grown in pots preserved in a frame during winter, and plunged in a shady part of the rockery during summer. Propagated by careful division and from seeds.

* *Dryas octopetala* (White Dryas).—A neat native evergreen trailing plant, having white flowers. Moist peat suits it best. Propagated from seeds and by division. There is also a yellow-flowered species named *D. Drummondii*, to which the foregoing remarks apply equally.

Edraianthus dalmaticus (Dalmatian Edraianthus).—A herbaceous perennial of which slugs are abnormally fond. It rarely exceeds four inches in height. The flowers are pale purple in colour, and an inch in length. The soil should be gritty and well drained, and the position in fissures among the most exposed rocks. The offsets may be used for propagation if separated after the plant goes out of flower. It blooms in July and August. Native of Dalmatia and Switzerland. The modern name is *Wahlenbergia tenuifolia*.

* *Ericas* (Hardy Heaths).—Among hardy Heaths there are a number of very dwarf-growing kinds of great beauty, which are admirably adapted for first-class positions on the most select rockery. Many of these form dense dwarf cushions of velvety-green when not in flower, but when in flower are gems not to be matched. They should all be planted in fully-exposed positions, and in soil in which sandy peat predominates. The following is a list of the best and most characteristic kinds:—*Erica carnea* (flesh-coloured), *E. c. alba* (pure white—very choice), *E. Tetralix Mackayana* (crimson), *E. vagans* (Cornish Heath), *E. vulgaris alba aurea* (golden foliage), *E. v. a. Hammondii* (white), *E. v. Allporti* (crimson), *E. v. Fozii* (a compact variety), and *E. v. Pygmaea* (very dwarf), are all forms of the common Ling (*Calluna vulgaris*). There are many other kinds worth growing, the names of which may be found in the catalogues of the leading growers.

* *Erodium Reichardii* (Reichard's Heronsbill).—A pretty dwarf plant, with numerous small white

flowers, from June to August. Soil, moist sandy peat or loam. Native of Majorca.

Erpetion reniforme (New Holland Violet).—An Australian plant, not quite hardy in this country except in warm sunny spots. It therefore is needful to give it in-door protection during winter. It is, however, such a perfect little gem that no one will grudge as much attention to it as they bestow on common-place half-hardy summer bedding plants. It is a suitable plant to form a close-fitting carpet in the best positions. Soil, light and well drained. Propagated by divisions, protected in pots in the winter, and planted out the latter end of May. Requires plenty of water during the summer.

Erysimum pumilum (Fairy Wall-flower).—A very dwarf plant, suitable for the highest and driest positions of the rockery, or on the tops of old walls. It has a branching habit, and the prostrate shoots often emit roots where they come in contact with the soil, so that it is easily propagated. Soil, very sandy loam. Native of Switzerland.

* *Erythronium dens-canis* (Dog's-tooth Violet).—One of the choicest of early spring-blooming plants; foliage and flowers alike beautiful. A mixture of peat with ordinary soil seems to suit it best, but it will grow under almost any conditions provided it is fully exposed. It propagates itself by the formation of new bulbs annually, and these should be taken up, divided, and re-planted every third year early in the autumn. Native of Central Europe.

* *Galanthus nivalis* (Snowdrop).—Not only the common kind, than which none is more beautiful, but *G. Imperati* and *G. Elwesi* should be grown by every one. The common Snowdrop is thoroughly naturalised in many parts of England, but it is doubtful whether it is indigenous. Needs no special culture, and propagates itself by rapid increase of its bulbs.

* *Gentiana acaulis* (Gentianella).—To grow this well it must be planted in deep rich loam, and be well supplied with water during the summer. Although in some respects a common plant like our Daisies, it is like them too in being extremely lovely. There is really nothing like it in this respect, its beautiful dark blue flowers, when the plant thrives, having no equals. Wherever the circumstances suit its requirements it grows like a weed, and no one can have too much of it. The base of the rockery seems to suit it best, and it should be grown in positions rather flat than sloping, and fully exposed to the sun. May be readily propagated by seeds and division. It flowers from May to July. It is a native of the Alps and Pyrenees. Where a bog-bed exists it should be planted as a marginal plant, as it is fond of plenty of moisture.

Gentiana bavarica (Bavarian Gentian).—Much like the preceding species, but its leaves are smaller and Box-like. Its flowers are brilliantly blue. The bog is the proper place to see this lovely gem in perfection, but it must have full exposure to the sun, and be protected from the incursions of rapidly-growing plants. A native of the European Alps.

**Gentiana Pneumonanthe* (Marsh Gentian).—One of our loveliest native plants, bearing long tubular flowers. This is another plant for which the bog is the proper home. Propagated by division.

Gentiana verna (Spring Gentian).—Another native of exquisite beauty, and very dwarf in size. On fully-exposed positions where plenty of water is supplied during the summer, as well as in the artificial bog, it will be sure to thrive if not overrun by more rapidly-growing plants. It deserves any amount of trouble, being so beautiful, and though it rejoices in moisture this should not be stagnant. It seems to prosper best when a plentiful supply of nodules of sandstone are sprinkled on the surface of the soil, and so preserve it from droughts. Plenty of sand should be mixed with the soil in which it is planted to secure sufficient drainage.

DECORATIVE USE OF FLOWERS.

BY JAMES HUDSON.

DRAWING-ROOM AND BOUDOIR.

THERE are many flowers that can be appropriately used in the decoration of these, which would not be so well suited to the purposes dwelt upon in the previous chapter—such as Carnations, Picotees, Pinks, and Stocks from among hardy flowers; and Gardenias, Jasmines, Stephanotis, and *Bouvardia Humboldtii corymbiflora* from under glass. Our reasons for not using too many strongly-scented flowers on the dinner-table were given in the last chapter. In any room one or two sprays of this *Bouvardia* would be sufficient to perfume the atmosphere, the fragrance from it in the evening being very powerful. A few flowers also of the Tuberose are quite enough in any apartment. When some two or three spikes of it have to be arranged, they will be best placed in either an entrance-hall or corridor, where the perfume would be the more likely to be disseminated throughout other apartments. The Polyanthus Narcissus and Hyacinths are best placed in the same position as the Tuberose spikes. Mignonette and Violets are universal favourites in the drawing-room; their unpretentious flowers are not calculated to make a showy display, but are nevertheless most welcome. So are the blossoms of the *Chimonanthus fragrans* and its

variety *grandiflorus* with their distinct perfume. The Heliotrope, the Honeysuckles, and many other flowers that are not adapted for making a great show, are yet well suited to, and general favourites in, the drawing-room and boudoir.

Vases and Baskets.—In the selection of vases for these rooms, those of medium size should never be exceeded, unless the room be of unusual proportions. We much prefer vases of small dimensions for every-day use; any vase that is large enough to hold an ordinary-sized bouquet being ample in our opinion. On special occasions those of larger size could be used, perhaps, with advantage when it is desirable to congregate a larger quantity of flowers together. Greater variety in form and material of the vases that are utilised would be admissible, no two in fact need be alike in any way. Many vases that would be too massive and heavy for the dinner-table could be turned to a good account for special occasions. For general purposes glass vases will be found the best in every way. Large-sized specimen glasses are very useful for sprays of Orchids, or any special flowers that it is thought desirable to keep by themselves. Vases of china or other heavy material require greater discrimination in the selection of flowers. Those in which dark shades predominate should be chosen for light-coloured flowers, and *vice versa*. Take, for instance, one of the gorgeous blossoms of *Magnolia grandiflora*, for this a vase either black or of dark colour should be chosen, whilst for the *Pæonias* with flowers of light shades of pink and rose, we would prefer a dark blue vase. With a bunch of dark-coloured Roses we should seek for a receptacle of pale tint. For the Tea-scented Roses of light shades a vase of a bronzy or pale brown colour would give a good contrast.

Rustic baskets look exceedingly pretty when not over-crowded, and are suited for Roses, Primroses, Daffodils, and Anemones, with other similar flowers. These baskets, too, have a most pleasing effect with a few bulbs placed in them during the spring time, and some *Selaginella* to carpet the same, or a small pot of a dwarf-growing Fern placed in the centre. A few roots of the Primrose, or other spring-flowering plants, could be chosen as a change, with nice fresh Moss or shoots of a small-leaved Ivy to entwine about the same. Those flowers which are in most cases only to be had with very short stems, such as the Stephanotis and Gardenias, can be advantageously arranged in a flat dish, placing some Moss in the latter with the necessary quantity of water. In such dishes a few flowers of the Gardenias, and the Tea-scented Rose Madame Falcot, look very well, each with a little of their own foliage.

None of the designs in this department of floral decoration, except the rustic baskets and flat dishes just referred to, need be dressed with flowers at the base. In fact it is better that no such styles of arrangement be chosen which of necessity require this kind of filling: we would rather prefer, in a general way, those vases which are elevated somewhat above the immediate surroundings. In all cases also avoid the error so often committed of over-crowding the flowers; better to choose another vase, and the effect will be greatly enhanced thereby. Do not let one vase be a counterpart of the other, avoid repetition as much as excessive crowding. If one

arranged and placed near a window that is open a considerable part of the day, the flowers and foliage must of necessity fade the sooner. This caution is the more requisite when we have to do with forced flowers early in the spring; these, by reason of being pressed into flower out of their proper season, have not, as a rule, that persistency or power of resisting this exposure which flowers have in their natural season. The same caution is required in dealing with tender exotics, during chilly weather especially. The better way will be to place the flowers in a position where this evil can be partially avoided, yet not in proximity to a fire-place. Cut flowers are



Fig. 5.—A RUSTIC BASKET FOR THE BOUDOIR OR DRAWING-ROOM. (Filled with cut flowers.)

variety, or species of flower, predominate in one stand, see that the opposite is the case in the other.

Flowers are coming to be much sought after for bed and dressing rooms, especially as a welcome to invited guests. Such flowers should be chosen with forethought, avoiding those which have more than usually strong perfumes, and in the case of one colour predominating among the surrounding furniture of the room, avoid that colour in particular. Small specimen glasses with a solid base are the best in which to arrange what few are required. There will not, thus, be much room for artistic arrangement, simplicity being what should be aimed at. The foliage used therewith should be of good lasting properties; in an emergency it can then be taken for personal decoration with other flowers, if necessary.

Preservation of Cut Flowers.—The mistake is very often made of exposing cut flowers in rooms to sharp currents of air; thus, if a stand is

oftentimes placed in small vases on the chimney-piece; this when the fire is alight is a great mistake, worse even than the exposure to the draft. In lieu of using fresh flowers in such a position, we would urge all decorators to furnish their vases with everlasting flowers and grasses, as recommended in a previous chapter. With very choice flowers on which special value may be placed, it is an excellent plan to arrange them in a vase which when filled can be covered with a glass shade. In this manner their retention of colour and freshness will be greatly enhanced. When each vase in its turn has to be re-filled, some of the flowers, if necessary, can generally be used over again, excepting in the summer months, when the quantity is more abundant. Those flowers that are still fresh should have a little piece taken off the end of the stem, so that the fresh water given them is the more readily absorbed. The water in which Stocks in particular, and some other flowers also, are placed, is soon rendered

obnoxious; in such cases fresh supplies should be given at least every other day, the vases at the same time having a thorough cleansing.

and striking flowers. *Richardia ethiopic* (the Lily of the Nile), with the spathes of *Anthurium Scherzerianum*, would give an effective display during



Fig. 6.—A STAND OF POT PLANTS ARRANGED IN AN IMPROMPTU STYLE, FLOWERING AND FOLIAGE INTERMIXED.

ENTRANCE-HALLS AND CORRIDORS.

In dealing with floral arrangements for these, there is an excellent opportunity for exercising one's abilities in the grouping together of bold

the spring months, bearing in mind the addition of appropriate foliage as previously advised. Later on the larger forms of Daffodils could be turned to a good account; these in turn being followed by

numbers of herbaceous plants, such as the showy panicles of the Delphiniums, with the distinct spikes of the Funkias, and their own handsome foliage. Following these there are the hardy Lilliums (Lilies), as *L. candidum*, *L. chalcedonicum*, *L. longiflorum*, *L. Humboldtii*, and the forms of *L. lancifolium* or *speciosum* for the autumn. Before the last of these are fit to use there will be plenty of Gladiolus spikes to be had; these form excellent subjects for side-board decoration. At the same season, too, there are the single Dahlias, whilst the smaller forms of Sun-flowers (Helianthus), chiefly of the herbaceous section, will have been useful for some time. Then we have the Guernsey and Belladonna Lilies, that will take us on till the late autumn flowering varieties of Salvias are fit for use (chiefly the forms of *Salvia splendens*). After these are past there will be an abundant choice of Chrysanthemums, which will afford for several weeks an excellent variety in both colour and form. When these are over and gone there will be the spikes of Epacris in various shades, and *Schizostylis coccinea*, with *Eucharis amazonica*, which should be used when the last two or three flowers are about developed, so that there is no waste by taking off the spike. The Eucharis can of course be worked into use at other seasons of the year, in unison with the richly-coloured forms of English and German Iris in particular, also with *Valloia purpurea*, and the Amaryllis which flower early in the season.

In this manner the year can be bridged round with suitable subjects for bold and striking arrangements, which in such positions are more appropriate than any other form of decorations. In the place of fresh flowers when these may be scarce, or to use in addition to them, we have choice of the graceful plumes of the Pampas Grass (*Gynerium argenteum*), and the silvery Arundo (*Arundo conspiciua*). The ears of Indian Corn, too, can be turned to good account, so also can the species of Typha or Cats'-tails. These latter would be a good contrast to the plumes of the Pampas. Very effective, too, are well-grown examples of *Celosia pyramidalis*. We manage to secure these after the plants have done their turn in the conservatory, and show signs of decay in the roots and stem, the tops being still fresh and bright. Flowers that are comparatively small, and only to be had with short stems, are not so well suited for these methods of grouping. The majority of the examples that we have given will only be seen on one side in either entrance-halls or corridors; the best and most effective way of arranging them therefore will be "to one face," in which manner some most striking arrangements can be made, that with a little practice can soon be improved upon by those who have not attempted much in this direction before. It is

necessary, however, to have vases with a firm footing, to avoid any danger of toppling over after being filled.

SINGLE PLANTS FOR ROOMS.

There are many plants which can be advantageously used in the various apartments of the house, imparting in many instances a characteristic appearance with the surrounding objects in each room, and in unison too with the decorations of the same. Of such plants, those that are grown for the beauty of their foliage will, as a general rule, be found the more suitable. These may be divided, we think, with advantage into two divisions: first, those which can be grown with tolerable success for a portion of the year at least in the said rooms; and, secondly, those which are handsome objects for decorations of a temporary character, but by reason of their susceptibility to be injured if allowed to remain for any length of time, should not be employed as permanent ornaments. It is morally impossible to grow with success those plants which require the maximum of heat and moisture for their proper development. In rooms, the plants have no congenial atmospheric conditions, no genial dew at night to invigorate their foliage for the retention of health in the same, and as an aid to the perfecting of future growths. This, combined with the scarcity of light that is obtainable in some positions (for plants often get placed in out-of-the-way nooks and corners) is the frequent cause of failure. If we for a moment glance at these plants, which in their native climes revel in heavy dews and considerable rainfall, we shall see the struggle they have to maintain life under such disadvantageous conditions. Everything that can be done to counteract these drawbacks to successful culture, should be acted upon by preparing the plants beforehand for these uses, gradually inuring them to the changes they have to go through.

No plants should be used in room decorations that have been recently re-potted into larger pots, or by reducing the size of the ball and putting them back again into the same pot. All plants should be thoroughly well established in the pots they occupy before being used. Our reason for this is, that they will then more readily absorb the moisture from the soil than when taken into use soon after a shift has been given. The roots that are freshly made in new soil are tender, and quickly suffer when the plant is not in a growing atmosphere. The soil then becomes cold and sodden, ending in the roots dying at the extremities through these not being able to assimilate the necessary food from the soil, and the latter then becomes what is termed sour and inert, by reason of the excess of moisture. We advocate in all possible cases the charge of the plants being in the

hands of the cultivator, whatever position they may occupy. It is extraordinary what superficial knowledge some have who are not practically acquainted with the requirements of plants. They will, perhaps, say, "Oh! we watered our plants a little every morning, and they cannot have suffered in that way." It is this dribbling system that is the evil, the soil nearly always being saturated with water. Or, on the other hand, we may see the opposite extreme of neglecting to water for days together, and then giving a quantity to make up for deficiencies. During the late autumn, the winter, and the early spring months, the plants in rooms should be carefully shielded from draughts and the cold exterior atmosphere. We often see plants placed in windows, or near them, and no better place either, taken as a whole; in the early morning, however, the windows are thrown up when cleansing operations are being carried on, quite irrespective of the plants and the state of the weather outside, with, perhaps, a few degrees of frost or a biting wind. No wonder that plants should suffer when thus exposed. To remedy this, remove them to a table or other convenient spot till the window can again be partially closed. Windows with plants in or near them should be opened at the top, not at the bottom, so that the cold air will not strike right on to the plant.

Ornamental vases or pots can be obtained of many varied designs to suit the taste; those with a hole in the bottom to let off the water that drains from the pot will be found the best; such generally have an ornamental saucer to accompany them. Rustic stands or baskets to hold a small group are very pretty when carefully filled, with a carpeting of fresh green Moss placed between them. With such as these, a few plants of drooping habit will be of use around the edges, or some nice fresh tufts of *Selaginella denticulata* or *S. cæsia*.

The following list of plants may be taken under the first division hinted at as being good durable room plants: those marked with (*) being capable of effective use as dinner-plants as well. Of foliage subjects: *Aspidistra lurida variegata*, from China, one of the best, thriving in unfavourable positions as well or better than the *Ficus elastica* (India-rubber Plant); this, too, must be included, being an excellent subject for a high window when the plant reaches three or more feet in height. *Stenocarpus sinuatus*, a little-known plant with pinatifid foliage, and very pretty in a small state. *Aralia Sieboldii* and its variegated forms are handsome objects for large-sized vases, both distinct and durable. *A. reticulata* is also a good plant, with narrow leaves, unlike most of the Aralias. Of the green-house *Dracenas*, two or three of the green-leaved forms are very useful, being also of good consti-

tution. *D. congesta*,* with narrow leaves of medium length, is one of the hardiest; *D. rubra*,* with broader foliage, is equally useful. *Eurya latifolia variegata*, best described as resembling a Camellia with variegated foliage, is very ornamental. *Farfugium grande*, or the Variegated Coltsfoot, is a good dwarf plant. *Grevillea robusta** is coming to be better known since it has been raised from seed; its Fern-like foliage is very ornamental and distinct. *Ophiopogon Jaburan variegata*, with grass-like leafage and pretty spikes of porcelain-blue flowers, is a good lasting plant. *Rhopala curcovadensis*, with its rich brown tomentose stems and younger leaves, is very ornamental as well as of good lasting properties; *R. elegantissima** is another handsome kind; *R. De Jonghii*, with more massive foliage, is also good.

Several of the hardier kinds of Palms are among the most ornamental plants for room decoration. The following list comprises the best adapted for remaining any time in rooms and other positions in the house:—*Areca sapida* (*Rhopalostylis sapida*), *A. Baueri* (*Rhopalostylis Baueri*), *Chamærops humilis*, *C. excelsa* (*Trachycarpus excelsus*), *K. Forsteriana** (*Howea Forsteriana*), *Latania borbonica* (*Livistona chinensis*), *Phoenix reclinata*, *P. rupicola*,* *P. tenuis*, *P. dactylifera*, *Rhapis flabelliformis*, and *Seaforthia elegans** (*Ptychosperma Cunninghamiana*); these being all cool-house species, with good lasting foliage that does not so easily suffer from exposure. There are not many stove plants adapted for remaining many days out of their quarters; the green-leaved *Pandanus*, as *P. graminifolius*,* *P. utilis*, and *P. Vandermeerschii*,* are about the best. We have, however, several Ferns that succeed for months together, provided they have a favourable position with an average amount of light. *Adiantum pubescens*, *Asplenium bulbiferum*, *A. flaccidum*, *A. lucidum*, *Cyrtomium falcatum*, *Davallia canariensis*, *D. Mariesii* (comparatively new), *Dictyogramma japonicum*, *Lastrea Sieboldii*, *L. Standishii*, *Nephrolepis exaltata*, *N. pectinata*, *N. tuberosa*, *Nipholobus lingua*, *Phlebodium aureum*, *Platyceerium alciorne*, *Platyloma falcatum*, *Pteris cretica*, *P. longifolia*, *P. serrulata* (or Ribbon Fern), *P. tremula*, and *P. umbrosa*. These Ferns would give greater satisfaction than the more delicate forms. The Maiden-hair (*Adiantum cuneatum*)* is often attempted, but generally creates disappointment, growing less day by day.

Some few plants are well adapted when in a large state for situations of considerable extent; such, for instance, as *Phormium tenax*, and its variegated varieties; and the tall-growing *Dracenas*, *D. australis*, *D. indivisa*, and *D. lineata** (these three are really *Cordylines*), with the greenhouse species of the genus *Yucca*; these plants in a small state are not generally so useful, *Dracena australis* being the best of them when young. Many

of the other subjects that we have named are also very effective in a large state; the Palms more particularly, most of which are of stately growth and bold contour. There are some few flowering plants that succeed well in rooms, especially in windows. One of the very best is *Campanula fragilis*, which we have seen cultivated the year round by a lady in her drawing-room; *C. garganica* is another pretty species. Several of the *Cacti* are also easily grown, though not desirable when of extra size. Space forbids us to enumerate other genera of suitable flowering plants, though many may be attempted with tolerable success.

Of foliage plants belonging to the second division, we have a wealth of choice wherewith to beautify and adorn the apartments for special occasions, either individually or collectively. Several stove plants can here be brought into use with advantage. Some of the best are in the following list, viz.:—*Acalypha tricolor*,* a plant that lights up well; *Alocasia metallica*, in a small state; *Ananassa sativa variegata** (Variegated Pine-apple); *Avallia elegantissima*,* *A. Veitchii gracillima*,* and *A. leptophylla*, three distinct plants both light and pretty; *Asparagus plumosus nanus*,* described in a previous chapter, also *A. tenuissimus*; Begonias with ornamental foliage; *Caladiums*, in variety, *C. argyrites* in particular. Crotons in a small state are very ornamental when well coloured. The following are some of the best, viz.: *C. angustifolius*,* *C. Bragæanus* (new), *C. Johannis*,* *C. majesticus*,* *C. nobilis*,* *C. caudatus tortilis*, *C. Warrenii*,* and *C. Sinitzinianus*, all having narrow pendulous foliage. The following kinds

have long yet fairly broad leaves, and are all well-tried sorts with good colour, but, although so well known under the name of Croton, belong to a quite distinct genus, viz., *Codiaeum*:—*C. Queen Victoria*,* *C. undulatus*,* *C. Weismanni*,* *C. Nevilleæ*,* and *C. Ancitumensis*.* The broad-leaved section are highly ornamental in a small state; the best are *C. Bavoness*



Fig. 7.—A STAND OF POT PLANTS, FOLIAGE SUBJECTS ONLY.

J. de Rothschild, *C. Comte de Germiny*, *C. Dayspring*, *C. Evansianus*,* *C. Mortii*, *C. pictus*,* *C. variegatus*, *C. Andreanus*.* The best of the trilobe types are *C. Disraeli** and *C. Earl of Derby*. Next to these we will enumerate a few of the best coloured *Dracænas*; these make splendid decorative plants, some with narrow and linear foliage, others with broad and noble leaves. Of the former, *D. terminalis*,* *D. Cooperii*,* *D. Bausei*,* *D. jucunda*,* *D. elegantissima*,* *D. nigrorubra*,* and *D. Mooreana*,* are distinct and good. Of the broad-leaved section, *D. Youngii* is one of the most noble and effective, so also is *D. Baptistii*, *D. amabilis*, *D. stricta*, and *D. Thompsonii* are likewise fine varieties. *D. gracilis*, with green foliage and a margin of purplish-bronze, is quite distinct (all the preceding, however, are not now known as *Dracænas* at all, but are forms of one or two species of *Cordylina*). There is also *D. Goldieana*, with its curiously-barred leaves. *Cyperus alternifolius** and its variegated variety are very handy plants, especially for grouping. *Ficus parvelli* is distinct, so also is *Erythrina marmorata*, a plant that bears a good amount of rough usage. Of the variegated *Pandanus*, *P. Veitchii** is far away the best, and always in request. For carpeting work or

edging of groups *Panicum variegatum* (*Oplismenus Burmanni variegatus*), *Fittonia argyroncwa*, the *Tradescantias*, and the *Sonerilas* are all good in association with the Club Mosses or *Selaginellas*. Considerable aid is also obtained from Palms of more tender constitution. The following varieties will all be of the greatest service either as individual specimens, or for using collectively in groups. Of the so-called *Areacas*, *A. aurea** (*Dictyosperma album*), *A. lutescens** (*Chrysalioocarpus lutescens*), and *A. Verschaffeltii* (*Hypophorbe Verschaffeltii*) are all distinct and handsome species. *Calamus ciliaris** is also a beautiful Palm. Among the *Geonomas* there are *G. pumila**, *G. gracilis**, *G. Schottiana**, and *G. intermedia** all of elegant growth. *Dammonorops fissus**, *Euterpe edulis**, and *Thrinax elegans** are each of them excellent decorative plants. *Cocos Weddelliana**, is a well-known Palm that scarcely needs any recommendation, being a general favourite. The following kinds are all of tall, slender, and plume-like habit, which causes them to be of great service in groups or in

any position where their beautiful heads of feathery foliage can be effectively displayed, viz., *Cocos plumosa*, *C. Romanoffiana*, *Chamedorea elegantissima**, *C. graminifolia**, *C. glaucifolia*, and *Oreodoxa regia*. All of these thrive in the most limited size of pot, provided they are well supplied with water. Of hardy plants, or nearly so, there are the fine lacinate or cut-leaved varieties of Japanese Maples (mostly forms of *Acer palmatum*), some with deep green, others with bronzy-red foliage. These have a beautiful effect under artificial light, with a few flowering plants interspersed amongst them. The variegated *Acer Negundo* (more correctly *Negundo aceroides variegatum*)

is also a useful plant when grown in pots for in-door decoration. The hardy Bamboos are likewise excellent subjects for these uses, *Bambusa Metake* (*Arundinaria japonica*) and *Arundinaria falcata* being the best. *Eulalia japonica** and *Gymnothrix latifolia* are two valuable Grasses; the variegated variety of the former, when grown under glass, being a choice plant for groups.

The choice of flowering plants is so large that but a cursory glance can be given. Avoid the use of trained plants of formal and stiff outline in every case where beauty of arrangement is the primary consideration. Rather choose such as are of slender growth, as *Richardia ethiopia*, *Lilium*, and *Gladiolus* of various sorts, *Eucharis amazonica*, with *Pancreaticum fragrans* (*Hymenocallis orata*), and *Amaryllis* of many kinds, for the central portions of groups, whilst around the margins small pots of *Gloxinias* and other plants, each in their season, will be very effective, with the addition of some Maiden-hair Fern. In all groups let every flowering plant be placed so

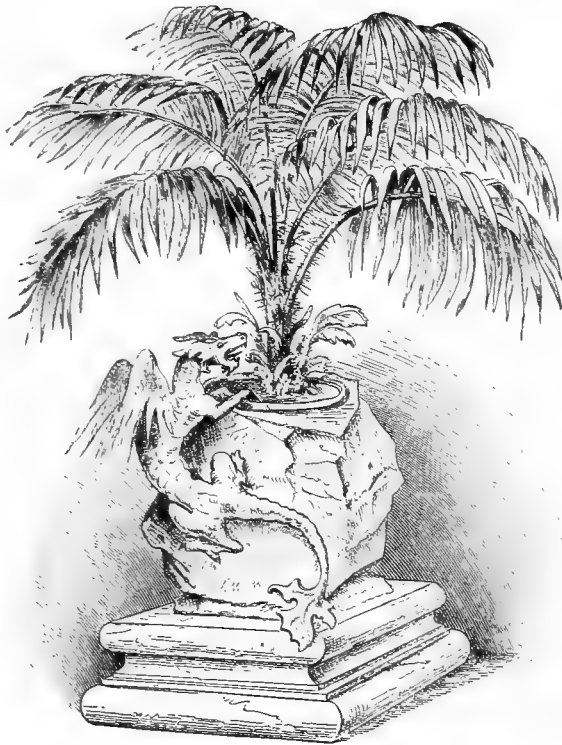


FIG. 8.—A WELL-PROPORTIONED PALM FOR A VASE.

that its beauty is seen distinctively. The mistaken notion of overcrowding pot plants is as much to be condemned as is a crowded arrangement of cut flowers. Massing of several plants of any given variety must be done with caution. Pots of *Spiraea japonica* (*Astilbe japonica*) and *Lilies of the Valley* make pretty groundworks amongst the taller-growing plants. *Rhodanthes*, in variety with the *Aquilegias*, can be used in a similar way. Of plants with sweet perfume, besides those named, among the cut flowers, there are the scented-leaved *Pelargoniums*, and *Aloysia citriodora* (*Lippia citriodora*), called also Sweet-scented Verbena, or Lemon Plant. Mention must also be

made of *Boronia megastigma*; the aromatic fragrance of its singular flowers should cause it to be grown by lovers of odoriferous plants. If a window which admits a goodly quantity of sunlight is available, that would be a very suitable place for a pot of Musk (*Mimulus moschatus*) through the summer months. Fern or Wardian cases should also be accorded a similar position, but slightly screened from the direct rays of the sun during its greatest height each day. A bow-window would be an excellent position to choose for one of these cases, guarding, as previously hinted at, against injury from excessive or cold currents of air. This branch of the subject will, however, be treated more in detail in a series of articles upon WINDOW AND HOUSE GARDENING.

THE ROSE AND ITS CULTURE.

By D. T. FISK.

ROSES ON WALLS, AND WALLS OF ROSES.

THE title may savour of tautology, but it is really not so, as the two things are totally distinct. Roses have doubtless found a place on walls from their first introduction, but a wall of Roses is a novel modern invention, the number of examples of which may yet be counted on our fingers. To plant a tender Rose on a dwelling-house or wall is a very different matter to clothing a whole wall, fifty, one hundred, or five hundred yards long, with Roses. And this is what we are coming to in the not distant future; for, commercially, Roses pay better than fruit, and they also yield a richer and more durable revenue of pleasure.

Some Roses, such as the Daisy or Banksian—which, by the way, are also Roses without thorns—and some of the more tender Noisettes, such as the Cloth of Gold (*alias* Chrometella) or La Morgue, have always needed the genial shelter of warm walls to enable them to thrive and bloom in our climate. It would almost seem, too, as if our climate or some of our Roses had changed for the worse. Five-and-twenty years ago the Cloth of Gold, contrasted with the general rarity of Roses, was common. I have seen a plant of it in Suffolk covering the front of a large mansion, which it goldened o'er with a profusion of Roses that could hardly be exceeded by its great successor and superseder, Maréchal Niel. But now—well, it is nowhere. Not that it is extinct, for it lives, mayhap flowers here and there, but it is hardly ever seen or, indeed, heard of; and yet this Cloth of Gold in perfection is quite equal to Maréchal Niel, which has not only superseded it, but apparently so undermined its constitution that the Cloth of Gold will hardly live where it used to grow like a weed.

Since the introduction of Maréchal Niel it has become the favourite golden Rose for warm walls. It has, however, faults of its own from which the Cloth of Gold was free. It blooms almost too early for our climate, and is subject to gout in its stems, that ends its career suddenly and prematurely. The merits of this Rose are, however, so great, and it flowers so profusely, that it has already become the most popular of all Roses for walls.

But writing of Roses on walls rather than walls of Roses, it will be our duty and pleasure to note some of the old favourites. First and foremost among these ranks the Banksian or Daisy Rose, introduced from China by Sir Joseph Banks in 1807. These Daisy Roses have also the merit of being without thorns. They flower in clusters like white and golden Daisies already gathered into posies. The white is fragrant—a sort of half-and-half of Primrose and Violet; the yellow has little or no odour. Both are great favourites, and bloom freely on a south or west wall. The variety introduced by Mr. Fortune and bearing his name has much larger and pure white flowers, which so far spoils a Banksian Rose. There is also an improved yellow Banksian, with finer foliage than the common, and a deeper-coloured, richer yellow bloom. These are, however, seldom seen in gardens, whereas trees of the common white and yellow of enormous size and floriferousness are not uncommon. To flower these Roses freely, a free growth should be encouraged, and they should be pruned sparingly, and that only once a year, about midsummer, so soon as the flowers fade. The whole of the long sprays made afterwards should be left, and these result in wreaths of bloom in tiny clusters from a foot to two yards long, drooping and draping and even hiding the front of a wall.

The Macartney Rose (Rosea bracteata) was also a great favourite on walls when the old China, the Boursault, and Ayrshire, with a few others, were almost the only competitors. These are still among the most interesting of all Roses, though, considering that they were introduced from China as early as 1795, they are far from common. The foliage, wood, and stem are peculiar as well as the flowers, the leaves large and shining; the stems of at least one being rough, with a sort of suppressed spines as those of a hedgehog, and the flowers pure white, of a peculiarly pleasing odour. There is a double variety now, but the single was the most common in the olden times.

The Musk Rose.—This was one of the first to be introduced into this country, supposed to have been received from Persia or India as early as the year 1596. It was well known to the early poets, as

Shakespeare refers to it several times in the *Midsummer Night's Dream*, thus:—

“Some to kill cankers in the Musk Rose buds,

And stick Musk Roses in thy sleek, smooth hair.”

This species of Rose with its varieties is still largely grown in Spain, Persia, and Africa, and is supposed to be the Rose from which the famous Otto of Roses is manufactured. It is somewhat tender, and flowers in clusters in the autumn. Musk scent is less popular than it used to be, and it would almost seem that the Musk Rose had dropped part of its perfume to be in harmony with the times. Certain it is that it now needs a moist atmosphere, a still air, and acute olfactory nerves to perceive the odour of Musk in these Roses. There are several varieties now, among the best of which are White Fringed, the Double White, the flowers having a dash of yellow in them; the Princesse de Nassau, the sweetest of all modern sorts, of a yellowish-pink colour; and Rivers' Musk, a creamy-white with a dash of pink in the cream. The original species (*Rosa moschata*) was single, and was the one generally grown on walls or in warm borders long, long ago. In favourable situations and on warm walls the Musk Rose grows freely, and a few are well worth growing for their associations as well as their intrinsic merits. Additional interest attaches to the Musk Rose, inasmuch as it is thought to have been one of the parents—the other being the Chinese—of the Noisette Rose, so called after Philippe Noisette of North America, who introduced that family into Europe in 1817. The small and curious-leaved Rose microphylla was also occasionally met with, and other species, the Boursault, Ayrshire, and Evergreen Roses, being fast climbers, were likewise largely employed as wall-climbers.

Those who could appreciate the persistent flowering properties of the common and other varieties of the China Rose, that earned for it the well-deserved character of “monthly” in the olden time, also frequently backed it up against walls with the happiest results. Roses being scarce, and empty walls plentiful, all Roses were often placed against them, and one of the most pleasing visions of the past is that of a trio of the oldest Moss, Provence, and Alba Roses, planted thus—a Maiden Blush in the centre, supported by the old Cabbage and the old Moss to the right and left of it. These had enwreathed the entire front of a cottage, which they clothed with beauty and steeped in fragrance every summer-tide, and furnished a good illustration of the fact that all Roses will climb if you give them time. This is worth remembering in these days of feverish hurry and haste, and when so many vigorous-growing Roses are marshalled ready to our

hand, warranted to reach the summit of the highest post, arch, or wall in the shortest time.

Varieties.—Any favourite Rose, either of the past or the present, may be planted against walls; and those who wish to retain something of the character of the old-fashioned wall Roses, while using more or less of new material, can hardly do better than add to the old Roses, already indicated, such selections from the Moss, Hybrid Chinas, Chinas, Bourbons, Noisettes, and Hybrid Perpetuals, as follows:—

MOSS.

Perpetual Moss.—Pure white, flowering in clusters.

Madame Moreau.—Bright red, striped with white.

James Veitch.—Deep violet, with crimson shading, large and double.

Mrs. Wm. Paul.—One of the best and brightest of the Perpetual Moss Roses.

HYBRID CHINAS.

Blairii No. 2.

Coupe d'Hébé.—This is far the best of its class, grows vigorously, flowers in clusters, exquisite in bud, of the deepest pink, continues in flower for two or more months.

Chenodole.—Brilliant crimson, very large.

Fulgens.—Bright crimson-scarlet.

Madame Plantier.—Pure white.

Miss Ingram.—Pure white, with pinky centre.

Paul Ricaut.—Rich crimson, one of the most vivid.

Paul Verdier.—Bright rose, large and full.

Vivid.—Rich crimson, free and showy.

CHINAS.

Common Red and Pink.

American Banner.—Yellowish-white, grand colour, with rose magenta stripes.

Cramoisie Supérieure.—Velvety-crimson.

James Sprunt.—A climbing sport from the above.

BOURBONS.

Gloire de Rosamene.—Brilliant in bud, though not much more than semi-double when full.

Souvenir de la Malmaison.—One of the best of the pale flesh or blush Roses.

NOISETTES.

Aimée Libert.—Pure white, very fine.

America.—Pale salmon-pink, shaded, in large clusters.

Celine Forestier.—Pale or primrose-yellow, in clusters.

Coquette des Blanches.—Extra pure white, large and free.

Jaune Desprez.—Bronzy-yellow and buff, changeable, very vigorous.

Lamarque.—Pale lemon, pure white in buds, flowers in large clusters, one of the best.

Rêve d'Or.—Deep yellow, large and full.

Triomphe de Rennes.—Pale yellow, very free and good, especially so in the autumn.

William Allen Richardson.—Small orange-yellow flowers, striking.

HYBRID PERPETUALS.

These are so beautiful, and most of them such good growers, that the whole family might be backed up against walls, which they would speedily clothe with verdure and beauty. Hence the difficulty of selection is as great as it seems almost needless. But the following may be warranted as among the best wall-clothers.

First of all there are the climbing varieties of such well-known Roses as—

Captain Christy, *Charles Lefebvre*, *Edouard Morren*, *Jules Margottin*, *Bessie Johnson*, *Mdlle. Eugénie Verdier*, and *Victor Verdier*.

Anna Alexeff.—Bright rose, large and free.

Baron Nathaniel de Rothschild.—A bright rosy-crimson.

Brightness of Cheshunt.—Bright scarlet, fine form.

Boule de Neige.—The very best white Perpetual for a wall, small but exquisite in form and fragrance, flowering in bunches throughout the season.

Baroness Rothschild.—Pale rose, shaded white, robust, but not a fast grower.

Baron Bonstetten.—Rich dark velvety-crimson.

Camille Berardin.—Light crimson, often shaded with white, striking and most effective.

Charles Lefebvre.—As good, though not quite such a rapid grower, as the climbing variety of the best of all the darkest red or velvety-purple Roses.

Comtesse de Serenzi.—Light rosy-pink, fine form, large.

Countess of Rosebery.—Rich soft carmine-rose.

Duchesse de Vallombrosa.—Soft rosy-peach, melting with age into French white; good.

Duke of Connaught.—Rich velvety-crimson, very brilliant, rather small.

Duke of Edinburgh.—This well-known, popular, rich vermilion Rose is an excellent grower, with clean and beautiful foliage.

Emily Laxton.—Bright rose-coloured.

Edouard Morren.—Large, deep cherry-coloured.

Fisher Holmes.—Brilliant scarlet, rich, open.

Glory of Cheshunt.—Rich and vivid shaded crimson.

General Jacqueminot.—One of the oldest and still the best among the brilliant crimson-scarlets.

Helen Paul.—Good white, occasionally suffused with pink.

John Bright.—Pure glowing crimson.

Jules Margottin.—Bright carmine, one of the finest and best autumnal Roses on walls.

John Hopper.—Delicate rosy-crimson; a general favourite.

La France.—The best of all the silvery-pink Roses, and in bloom on a wall from May to December; an ever-growing, long-blooming, almost ever-green Rose, combining in itself the fragrance of all the others; no wall must be without this Rose, and if there is only room for one Rose, let *La France* be that one.

La Duchesse de Morny.—A soft mixture of rose and silver.

Madame Victor Verdier.—Large and full, deep carmine.

Madame Clémence Joigneaux.—Very sweet rose, shaded lilac, large and full.

Madame Lacharme.—Pure white, large and full; needs a wall in many localities to do it justice.

Madame Nachury.—Light silvery-rose, deeply cupped.

Mdlle. Annie Wood.—Large and full, rich clear red.

Maréchal Vaillant.—Bright crimson, very profuse bloomer.

Marchioness of Exeter.—Clear bright cherry-rose.

Maurice Berardin.—Rich vermilion, very fine, and similar to *Ferdinand de Lesseps*, *Sir Garnet Wolseley*, and *Exposition de Brie*; the number of aliases in this instance being proofs of excellency.

Monsieur Noman.—Perfect form, large, rose-coloured.

Merveille de Lyon.—The best and most vigorous of all the white sports from the *Baroness Rothschild*. Better than the *White Baroness* or *Mabel Morrison*.

Mr. Harry Turner.—Bright crimson-scarlet, with rich maroon shading.

Paul Neron.—The largest of all Roses, coarse in summer, but worth a wall for the more moderate-sized and good-shaped bloom it yields in autumn; deep rose-coloured.

Prince Arthur.—Deep rich crimson, rather small, but brilliant and beautiful.

Prince Camille de Rohan.—This is too well known as the deepest, darkest, and most fragrant of all the black-crimson velvet Roses to need further description.

Red-Gauntlet.—Scarlet-crimson, shaded rose.

Souvenir de Mons. Boll.—Bright cerise, large, full.

Star of Waltham.—Deep crimson, with very firm foliage.

Robert Marnock.—Brownish-crimson, rich and good.

Sultan of Zanzibar.—Dark maroon, a sort of intermediate colour and character between *Duke of Edinburgh* and *Reynold's Hole*, and equal to either, excepting in size. *Reynold's Hole* should also be grown.

Thomas Mills.—One of the brightest and freest of the bright crimson Roses, not very large.

Violette Bouyer.—Almost pure white.

W. Wilson Saunders.—Intense crimson, good and showy.

OTHER KINDS.

Among hybrid Teas, *Cheshunt Hybrid*, a rich, free-flowering, rampant-growing, cherry-carmine Rose, is a host in itself.

Reine Marie Henriette has been called a red Gloire de Dijon, and is a Rose of similar character, and of a deeper cherry-red. The buds are also longer and more pointed.

Cannes la Coquette.—Light salmon-pink, something in the way of La France.

Some of Mr. Bennett's pedigree Roses promise to be useful for walls, though several of them have wholly failed in the open air. The following are the most promising and latest additions to these, though they have far more of the Tea than the Hybrid Perpetual in their character and constitution:—

Countess of Pembroke.—A cross between President and Charles Lefebvre; of a soft rose-colour and fully scented.

Lady Mary Fitzwilliam.—A cross between Devonians and Victor Verdier; a delicate flesh-coloured, good Rose.

Distinction.—A cross between Mme. de St. Joseph and Mdle. Eugénie Verdier; soft shaded peach; a good grower.

Princess of Wales.—A cross between Adam and Eliza Sauvage; colour a unique rosy-yellow; long, pointed buds; opens well, good form.

The Tea Roses shall have a wall to themselves; suffice it to name among Roses on walls the Climbing Devonians, Gloire de Dijon, and Gloire de Bordeaux, or Pink Glory, as it is often called. These possess a vigour and power of blooming that enable them to mount and cover the loftiest walls in the briefest space of time. The bulk of the family of Teas are, however, reserved for furnishing whole walls of Roses.

Walls of Roses.—The building of new walls for, and the devoting of old ones wholly to Roses, is one of the latest developments of taste, civilisation, and commercial enterprise in horticulture. Like many fashions, however, it is less of a new invention than a revival. The furnishing material is more or less novel, but floral walls are, or were, one of the oldest features of English horticulture. Jasmines, Honeysuckles, Clematis, or other plants too fragile or tender to stand alone, were aided by the strength and nurtured by the warmth of stone and brick walls. To help the plant the better to battle successfully against climatic difficulties, these walls were not seldom heated. By such means magnificent displays of all the more tender as well as the best species of

Magnolias, and other tender shrubs or trees, have been grown and bloomed successfully.

Varieties.—No plant, or flower, can better deserve a wall than the Tea Roses, while none can match them in fragrance or beauty. And there are many of them, such as Marie Van Houtte, Catherine Mermet, &c., that eclipse the golden riches of Maréchal Niel by their delicacy of colour and perfection of form.

Anna Ollivier.—Rosy flesh-colour, large and full.

Adrienne Christophe.—Rich mixture of copper, apricot, and peach.

Alba rosea.—White, with rose centre; one of the hot Amazons; elegant, deep lemon-coloured; bud valuable for cutting.

Aline Sisley.—Purple and bright red colour—almost new.

Belle Lyonnaise.—Deeper than Gloire de Dijon.

Beauté de l'Europe.—Deep yellow, reverse of petal coppery. [de Dijon.]

Bouquet d'Or.—Deep fawn and yellow, like Gloire

Bride.—A pure white Catherine Mermet.

Catherine Mermet.—A lovely variety, large and perfect in form, light flesh-coloured.

Comtesse de Nadailac.—Rich apricot-yellow.

Comtesse Riza du Parc.—Pink with coppery base, best as a rule on a wall.

Coquette de Lyon.—Soft canary-yellow, fine form.

Devoniansis.—Grows more freely on a wall; nothing can exceed its soft mixture of rose and cream, nor its exquisite fragrance. Also the climbing variety.

Duchess of Edinburgh.—The deepest-coloured of all Teas, crimson, very floriferous, in the way of the old China.

Eliza Sauvage.—Large and fine, yellow-rose, with orange centre.

Etoile de Lyon.—Bright sulphur, excellent form.

Homere.—Blush, mottled with pink, very vigorous, covers the highest wall in a very short time.

Honourable Edith Gifford.—Something like Devoniansis; white, tinted rose, extra fine.

Innocente Pivola.—Pure white, tinted rose, chaste and charming.

Isabella Sprunt.—One of the most profuse bloomers, thin when open, but exquisite in bud, most useful for button-holes, deep yellow colour.

Jean Ducher.—Large, full, of good form, yellow and salmon, splashed with peach.

Jules Finger.—This fine Rose has been called a red Catherine Mermet.

La Boule d'Or requires a south wall fully to develop its beauty; pale yellow, with deep orange centre.

Le Mont Blanc.—White, slightly suffused with yellow.

Letty Coles.—A pink sport of one of the most beautiful of all Tea Roses, of the Madame Willermoz type.

Madame Angèle Jacquier.—Copper-coloured yellow, with bright pink centre.

Madame Bravy.—A very rich and beautiful variety, cream-coloured.

Madame Berard.—Large reflexed flower of a shaded salmon-colour.

Madame Falcot.—Rich orange-yellow, better than Safrano, best in bud.

Madame Welch.—Light yellow, with orange centre.

Madame Denis.—White, with sulphur centre, one of the most vigorous.

Madame Etienne Levet.—Deep red, with coppery-yellow centre, one of the richest and best.

Madame Cusin.—Light purple, the base of each petal being yellow, pretty pointed bud, very distinct.

Madame Willermoz.—One of the finest of all the Teas, white, with salmon centre, very double, and of perfect form.

Madame Eugène Verdier.—One of the richest and deepest-coloured of all the Gloire de Dijon sports or seedlings.

Madame Hippolyte Jamain.—White, with yellowish centre.

Madame Margottin.—Deep crimson, with rich rosy-peach centre.

Madame Maurin.—White, shaded with salmon, full and large.

Madame de Watteville.—A fine new rose, tulip-shaped, salmon, bordered with rose.

May Paul.—A red Tea; a refined and more floriferous Gloire de Bordeaux.

Monsieur Furtado.—A decided improvement on Narcisse; soft pale yellow.

Marie Sisley.—Yellowish-white, fringed with rose.

Marie Van Houtte.—The richest and most delicate combination of yellow and peach to be found among Roses.

Maréchal Niel.—So deep and full of gold and of fragrance as to deserve the whole of any wall to itself.

Niphotos.—Worthy to run abreast with the Maréchal Niel as the finest pure white Rose in-doors or out. Grown on a south or west wall, it blooms most profusely, and the outside of its Magnolia-like shaped and substantial petals is often surface-painted with pink that even adds to their beauty. Niphotos is generally described as pale yellow, but in the garden or under glass the yellow is blanched out of it, and it is the whitest of all white Roses, as well as the best.

Perfection de Monplaisir.—Very free-flowering; deep yellow.

Perle de Lyon.—Rich yellow, large and full.

Perle des Jardins.—This rather new, bright straw-coloured Rose is so beautiful as to warrant its ambivalent name.

Rubens.—Something in the way of Adam and President, which are so nearly alike as to have become one in show-stands, but having more white and less rose in it than either; Rubens also grows and blooms freely.

Safrano is still one of the most popular and floriferous of the orange-yellow Roses.

The coppery-red Rose, *Safrano à Fleur Rouge*, is almost equally worthy of a place on the wall, both being perfect in bud.

Sombreuil.—Still one of the best pure white Roses, flowering in large bunches.

Souvenir d'Elise.—The very best of all the cream and rose Teas, though these may be said to be the prevailing colours among Roses.

Souvenir de Madame Pernet.—Large, globular, rose-coloured.

Souvenir de Paul Neron.—Fine, double, yellowish, bordered with rose.

Souvenir d'un Ami.—One of the best selfs among the Teas; almost a pure rose-colour, with a dash of salmon.

Souvenir de Thérèse Levet.—A crimson Niphotos.

Triomphe de Guillot fils.—Large and fragrant; fawn, tinted with salmon.

Vicomtesse de Cazes.—A rich mixture of yellow and orange, fringed with copper.

New fragrant pedigree Roses for walls:—*Countess of Pembroke*, pinkish; *Earl of Pembroke*, crimson; *Heinrich Schultheis*, pink-rose; *Mrs. John Laing*, soft pink; *The Puritan*, yellowish-white; *Viscountess Folkestone*, creamy-pink; *William F. Bennett*, crimson, lemon-scented. Other Roses worth trying on walls, not fragrant:—*Her Majesty*, *Princess Beatrice*, and *Ye Primrose Dame*. Two other new and fragrant Roses:—*Lady Helen Stuart*, h.p., crimson-scarlet, and *Triomphe des Noisettes*, bright Roses, flowering in clusters.

FERN S.

BY JAMES BRITTON, F.L.S.

The Hymenophyllums.—Probably but few plant-lovers would be found to dispute the assertion that in the whole kingdom of ferns there are no more beautiful and interesting plants than the Hymenophyllums and their near allies, the Trichomanes. The two genera just named, and Todea—which has already been treated in this work—constitute what are popularly known as “filmy ferns.” Now that the general requirements of these wonderfully delicate-fronded subjects are better understood, there seems no reason to doubt that before

long their cultivation will extend considerably. A large collection can be grown in a comparatively small structure, and will thrive with very little attention, provided that the essential conditions obtain, viz., continuous shade and moisture.

Hymenophyllums are found in all temperate and tropical climates, and, according to the "Synopsis Filicum," there are about eighty species. Various authors, however, with very different views as to the limitation of genera and species, consider that Hymenophyllum and Trichomanes—as understood here—comprise no less than some two dozen genera; the eighty species of Hymenophyllum, too, are by the same writers multiplied into more than five times that number. Many of the species are almost ubiquitous—the two representatives of the genus in the British flora may be cited as examples—and, as is almost sure to be the case, they exhibit a very considerable range of variation in size, habit, &c., according to the widely-different conditions as to temperature, &c., under which they exist. These purely geographical forms are regarded as distinct species by many botanists.

The principal character by which Hymenophyllum may be distinguished from Trichomanes, resides in the involucre; that of the first-named genus being two-valved, whilst in the latter it is united into a cup. Both affect moist, shady places, near waterfalls, trunks of trees, and dripping rocks.

The following selection comprises some of the best and most distinct species in cultivation.

H. aeruginosum is a rare species, a native of the island of Tristan d'Acunha; the tripannatioid, copiously hairy fronds measure some two or three inches in length, by an inch or less in breadth; in outline they are lanceolate or ovate-pointed.

H. asplenoides, from tropical America, is easily recognisable by its peculiar habit of growth; it has rather large pendulous fronds, oblong in general outline, and pinnatifid to within a short distance of the rachis; the stipe is from one to two inches long, and the frond from two to four inches long, by half an inch to an inch broad.

H. ciliatum is very widely distributed throughout the tropical regions of both hemispheres, and has lately been found in New Zealand; it is a free-growing, handsome species, with fringed and winged stipes, one or two inches long, and oblong-acuminate, tripinnatifid fronds, two to six inches long, and one to two inches broad at the centre; a magnificent variety of this, *splendidum*, which occurs in Guatemala, Ecuador, and west tropical Africa, has fronds a foot in length.

H. demissum is one of the most beautiful species of the genus, as well as one of the easiest to manage; the firm, erect, wingless stipes are from four to six

inches long, and the finely cut ovate-triangular fronds, which are light green when young and a very dark glossy green when mature, measure from four to twelve inches or more in length, by three or four inches in breadth. It is a native of New Zealand, Fiji, Java, the Philippines, and adjacent Polynesian Islands.

H. flabellatum, from Australia, New Zealand, and Lord Auckland Isles, is a near ally of the last-named. It has glistening, glossy green, ovate-pointed, thrice-cut fronds, from four to twelve inches long, by two to four inches broad.

H. faciforme is a strikingly distinct species, from South Chili and Juan Fernandez. It has strong, erect stipes, four to eight inches long, narrowly winged above; and beautiful, bluish-green, wavy, triangular lance-shaped, thrice-cut fronds, one to two feet in length, by four to six inches in breadth.

H. hirsutum, a native of tropical America and Madagascar, &c., has once-cut, hairy, linear-oblong fronds, two to six inches long, by half an inch broad. It forms a dense, compact carpet of delicate fronds, of a peculiar brownish-green hue.

H. lineare has flaccid, pendulous, long, narrow fronds, and forms densely interlaced masses on rocks and trees. It is a native of tropical America, from Jamaica and Mexico, southward to Brazil and Peru, ascending on the Andes of Ecuador to 12,000 feet, and also occurs in the Mauritius.

H. polyanthemus has slender, wingless stipes, two or three inches long, and thrice-cut, ovate-oblong, smooth, dark green fronds two to eight inches long, by one to three inches broad. It is found everywhere throughout the tropics.

H. pulcherrimum is a very handsome New Zealand species, with ample, finely-cut, firm, bright green, glossy fronds, ovate-triangular in outline, and measuring from six to twelve inches or more in length, by four to six inches in breadth.

H. tunbridgensis, once abundant at Tunbridge Wells, is widely distributed throughout the British Islands; the extra-British distribution is Belgium, France, Germany, Italy, Canaries, and south temperate regions. It has an ovate frond, pinnate below and pinnatifid above, with spreading spinulose-serrate pinnæ, and toothed involucre.

The other British species, *H. unilaterale*, has more rigid, darker green fronds, which are oblong in outline, pinnate below or throughout, with decurved spinulose-serrate pinnules, and entire involucre. It occupies about the same geographical area as the last-named.

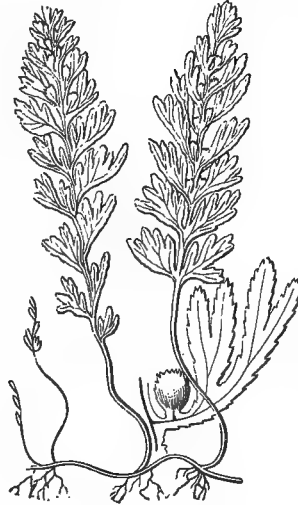
Cultivation.—Undoubtedly the essential requirements of filmy ferns are a fair amount of light with continuous and absolute protection from every ray of direct sunshine, and an atmosphere constantly at

saturation point. Soil, &c., is quite a secondary consideration, and all the species above-mentioned—although some of them hail from tropical climes—are accommodating enough with regard to temperature, with the exception, perhaps, of *H. asplenoides* and *H. hirsutum*, which do better under warm-house treatment. None should be watered overhead, as the fronds discolour when such a course is followed, but luxuriate and retain their beautiful colour for three or four years when each is almost always laden with the condensed moisture of the atmosphere in which they grow. Draughts of dry air should be rigorously guarded against, as a few minutes' exposure to such conditions would probably prove fatal to the wonderfully delicate pellucid fronds. Not a few species require no artificial heat whatever, and the number of these would probably be increased were experiments conducted to prove their hardiness.

Some of the finest specimens of filmy ferns in existence (in cultivation) are in the possession of a leading London surgeon, and are grown under—at first sight—unpromising conditions. Nothing, however, can exceed the beauty of these plants, which for some years have had no artificial heat whatever. The fronds are never wetted overhead—although always covered with condensed moisture—and no air is ever given except when watering is being performed, and when other necessary work is being attended to. During the hot summer days a spray of water is kept playing on the outside of the shaded roof, and this, by keeping the iron-work and glass cool, prevents the temperature from rising to any great extent.

Most of the Hymenophyllums succeed admirably on fibrous tree-fern stems (such as those of *Dicksonia*)—into which it is advisable to rub a little fine peat before wiring on the slender rhizomes. Some do thoroughly well on blocks of wood or on pieces of sandstone. The British species do very well grown, together with the small Mosses amongst which they are found in a state of nature, against a wall of peat, &c., to which they must be securely and firmly fastened by wire-netting or some such contrivance. Not a few of the species have been, and are now, cultivated by a letter-carrier in one of our large cities, without any properly-constructed case at all. Barrels, &c., plunged in a piece of ground behind his

dwelling, covered with sheets of glass, and of course shaded from direct sunlight, furnish quarters in which splendid plants have been grown, specimens which it would often be difficult to match in establishments where unlimited means are available. Unlikely as it may appear, the finest fronds of *H. tunbridgensis* probably ever produced in England are to be seen in the window-case of a dwelling-house on the shady side of a crowded London thoroughfare. The residence in question is that of the surgeon above-mentioned, who has made filmy ferns and their requirements a special study. The



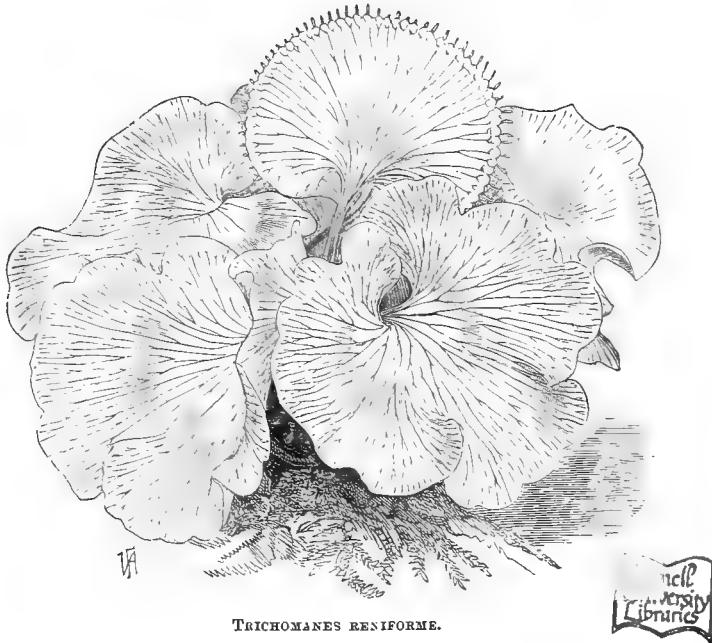
H. TUNBRIDGENSIS.

same gentleman has *H. demissum* in magnificent condition under precisely similar circumstances. The window-cases used are to all intents and purposes ordinary ones, the only point in which they differ from those in every-day use being that they are double-glazed. This double-glazing of course does a great deal to maintain an equable temperature, a most important matter in connection with filmy fern cultivation. A good many of the species bear frost apparently without any injury; a number of them withstood 14° of frost at Messrs. J. Veitch and Sons', Chelsea, where for a whole fortnight they were frozen into a solid block of ice. When the thaw came they were found in perfect health, much better than plants of the same species which had been kept in the artificially-heated temperature of another house. When watering, use a long-spouted can, and take care not to wet the plants overhead; the condensed moisture in which they revel will be free from the mineral constituents which often prove so injurious to the membranous fronds. Now and then the mycelium of various fungi appears amongst the fibrous roots of the tree-fern stems; this can as a rule be got rid of by a careful dusting of flowers of sulphur. Thrips are probably the insect pests which prove the most troublesome; but careful fumigating, repeated several times if necessary, will be found to extirpate them. If the cases, &c., in which the plants are growing are placed inside a green-house, fill the latter with smoke and then remove the lids, &c., of the filmy fern cases. Sometimes, in spite of the densely moisture-laden atmosphere, the red spider makes its appearance; submerging the entire plants for twelve or twenty-four hours in soft rain-water will kill this insect, without injuring the plants. Such treatment, however, proved ineffectual

with thrips, as a recent experiment showed that submersion for twenty-four hours apparently had no effect; the little creatures were particularly lively and active after the trial to which they had been subjected.

Practically speaking, Hymenophyllums are not raised from spores. It is true that one very successful grower has succeeded in raising plants of two or three species from spores, but the method is an exceedingly slow one. Vigorous growers are readily

From Hymenophyllum it principally differs in the involucre being urn-shaped and not split lengthwise into two valves. In both the spore-cases are clustered around hair-like receptacles, which are, in fact, the ends of the veins of the fronds projecting into the urns. In Trichomanes it is usual for these slender columnar receptacles to protrude more or less, so that the fronds become somewhat bristly when very full of fructification, and hence has arisen the common name of Bristle Fern. On the other



TRICHOMANES RENIFORME.

propagated by means of the numerous thread-like rhizomes; and some of the species, if the old fronds are fastened down on a moist surface, become prolific, and develop plantlets which can be removed when large enough, and grown on. As a rule, the plants offered for sale by nurserymen are imported ones, and these require somewhat different treatment from their arrival until they become established. Much less light is desirable until the rhizomes begin to push out new fronds, when the plants may be gradually inured to the conditions which are found suitable for their established congeners.

The Trichomanes.—In common with Hymenophyllum, Trichomanes holds a high position in the estimation of fern-lovers. The beautifully-cut and pellucid fronds are different in texture and general appearance from those of almost all other genera.

hand, these hairs are shorter than the involucre in Hymenophyllum. There are many filmy ferns which cannot be referred to either genera with any degree of certainty without fructification.

In the "Synopsis Filicum" above ninety species of Trichomanes are described; they are principally natives of tropical and damp warm climates, the only European representative being the Killarney Fern, *T. radicans*. The species mentioned below are the most distinct now in cultivation.

STOVE SPECIES.

A number of these, formerly supposed to be exclusively stove kinds, have been found to do better in a cooler temperature; they will be mentioned among the cool-house sorts. Those kept under the above heading have not hitherto, I believe, been successfully cultivated except in structures

with a minimum temperature of 60°. Perhaps further trials might still further lessen the number of the warm-house species, and prove that with a little care most of the stove *Trichomanes* might be gradually inured to, and succeed better with, green-house treatment.

T. apiifolium is a very beautiful and rare species, with finely-cut fronds somewhat resembling those of *T. maximum* in general outline, but the habit is more graceful and the texture more delicate; the in-

lanceolate pinnate or pinnatifid fronds four to twelve inches long by one and a half to two inches broad. In texture these are membranaceous, the pinnæ are generally incurved and crisped, and the rachis is more or less clothed with reddish-brown hairs. This species is widely distributed throughout tropical America, and has also been found in western tropical Africa. *T. macilentum* is a near ally of *T. Bancroftii*, from which it is distinguished by its more creeping rhizome and more divided fronds; it



TRICHOMANES RADICANS.

volucres, too, are smaller and shorter, verging upon those of the *Hymenophyllum*. In fully-developed fronds, the strong erect fibrillose stipes measure four or six inches in length, and the frond itself nine to eighteen inches long by four to eight inches broad. This species is now and then met with under the name of *T. meifolium*, and is a native of the Philippine Islands, Java, Polynesia, and Norfolk Island.

T. Bancroftii is a distinct and pretty species from the West Indian Islands and tropical America southward to Brazil and Peru. It has firm-textured, dark green, ovate-oblong fronds, from three to six inches long by about an inch broad; the rachis is broadly winged and so is the stipe to the very base. *T. crispum* has a strong, tomentose rhizome; strong, wiry, tomentose stipes two to six inches long, and

is a native of Trinidad, Demerara, and the northern provinces of Brazil, and succeeds almost equally well under stove or cool-house treatment. *T. Prieurii* is a noble species with stout tufted stipes four to eight inches long, and broadly-ovate, finely-cut fronds twelve to eighteen inches in length by from six to twelve inches in breadth; it is a native of the West Indian Islands southward to Peru and Brazil. *T. spicatum* is the only representative mentioned in these pages of a small section, *Flea*—regarded as a distinct genus by some authorities—in which the sterile and the fertile fronds are different, the latter consisting of a narrow distichous spike. The dark green sterile fronds measure from four to six inches in length by one to one and a half in breadth, and are pinnatifid nearly to the rachis.

THE BLUE BOLLEA (*BOLLEA CCELESTIS*).

A STOVE epiphyte from tropical South America, belonging to the order of orchids. Pot culture will most likely be best adapted to meet the needs of these plants, for although, in common with most other epiphytal species, they will no doubt grow on a block with sphagnum, still pots, well drained and filled with good porous material, composed of fibrous peat, sphagnum, and broken crocks or charcoal, will doubtless be the best medium for the roots to lay hold of.





THE BLUE BOLLEA
(BOLLEA CELESTIS)

COOL-HOUSE SPECIES.

T. alatum, from the West Indies, Columbia, and Brazil, is a handsome species with lanceolate or ovate-lanceolate, twice or thrice-cut fronds of a delicately membranaceous texture; it has tufted stipes two to four inches long, the fronds measuring from three to twelve inches long by one to four inches broad. In size and amount of hairiness this varies a great deal; the larger-growing forms make very beautiful specimen plants. *T. auriculatum* has a strong, wide-creeping, hairy rhizome, and nearly sessile, twice-cut, olive-green, firm-textured fronds, six to twelve inches in length by one and a half to two inches in breadth; it is a native of Japan, Formosa, North Hindostan, the Philippines, Java, and Guiana. *T. exsectum*, an elegant species from South Chili, Chiloe, and Juan Fernandez, has a widely-creeping, slender, tomentose rhizome, and slender naked stipes one to three inches long, with finely-cut, lanceolate, pendent, flaccid fronds of a membranaceous texture; in size these vary from six to twelve inches in length by one or two inches in breadth. *T. maximum* is a noble plant with very finely-divided sub-rigid fronds, which are ovate in outline, and measure from a foot to a foot and a half in length by six to nine inches in breadth; the creeping rhizome is stout and the stipes are strong and erect, varying from three to six inches in length. This species is a native of Java, Borneo, and the Polynesian Islands. Extremely unlike any of the species hitherto mentioned is *T. parvulum*, a charming little plant which was first exhibited a few years ago by Messrs. J. Veitch and Sons at one of the London shows; it has small, dark green fronds—orbicular in general outline—measuring from a quarter to half an inch across. These are cut into narrow irregular segments, and are produced in profusion from the wide-creeping interlacing rhizome; the plant thrives on pieces of porous stone. *T. Petersii*, a tiny species which is at present somewhat rare in cultivation, has crenate or slightly-lobed fronds—varying in shape from linear to obovate—which make a dense carpet of dark green on the moist porous stones on which the plant luxuriates. The only locality given for this species in the "Synopsis Filicum" is "near a waterfall in Winston co., Alabama, U.S.A." *T. pyxidiferum*, a variable species found everywhere throughout the tropics of both hemispheres, is perhaps one of the most widely-cultivated members of the genus; it has widely-creeping, rather slender, tomentose rhizomes, and ovate-oblong, thrice-cut fronds, one to six inches long by an inch to one and a half broad. Perhaps of all filmy ferns the Killarney Fern, *T. radicans*, is cultivated by the greatest number of gardeners, amateur and professional. It has a remarkably wide

geographical distribution, being found in West Europe, tropical Africa and America, Himalaya, Japan, and Polynesia. In the last edition of the "Student's Flora," the distribution of the series in the British Isles is given as follows: "Wet shaded rocks, Killarney, York, S. Wales, Argyll, Arran." In all probability the Bristle Fern no longer exists in some of the localities just mentioned, owing to the destructive zeal of collectors. *T. radicans* varies somewhat in a wild state even in this country, and to a great extent in the tropics, one of the more distinct of the numerous named forms which must be referred as varieties to *T. radicans* being *T. Luschnatianum*, a handsome plant with lanceolate pointed, quite sessile fronds.

T. reniforme, with its peculiar kidney-shaped entire fronds, is quite different in habit and general aspect from all the other species of the genus. It is a native of New Zealand, and is the only *Trichomanes* in which the frond has four layers of cellules. One of the most graceful and delicate of all is *T. trichoidesum*, with thrice-cut, bright green, membranaceous fronds, the pinnules being cut into distant hair-like segments. When each segment bears at its tip a drop of condensed moisture the aspect of the plant is very beautiful. It is a native of the West Indian Islands and Mexico southward to Ecuador and Brazil.

Cultivation.—In a wild state *Trichomanes* grow under very varying conditions in some respects, though humidity and shade are in all cases present. Some affect wet rocks, others stems of various ferns and trees, whilst a few grow luxuriantly in strong loam. Under the widely different conditions which obtain artificially, these latter do best in a pot or pan thoroughly drained and filled with a mixture of loam, peat, pieces of charcoal, porous stone, &c. Those, like *T. trichoidesum*, &c., which seem to thrive best on tree-fern stems, should have their delicate rhizomes carefully attached to a portion of *Dicksonia* stem, amongst the roots of which peat has been rubbed. Others, of which *T. macilentum*, *T. alatum*, and *T. Luschnatianum* may be regarded as representatives, thrive in pots or pans on a raised mound of Sphagnum, or on tree-fern trunks on which living Sphagnum has been bound. None of the species should be watered overhead; the case or structure in which the plants are grown should be so liberally supplied with water that the fronds are constantly laden with the condensed moisture. Direct sunlight should always be excluded; it has, however, been abundantly proved that established healthy plants do better in a good light than with dense shading. Most of the remarks on *Hymenophyllum* cultivation are equally applicable to *Trichomanes*.

FLORISTS' FLOWERS.

BY RICHARD DEAN.

The Pelargonium. — The common name of Geranium has been erroneously applied to this genus, but usage has gained such a hold upon the flower-loving public that the Pelargonium will be known as Geraniums for years to come. The generic name Pelargonium is derived from *pelargos*, a stork, referring to the beak-like formation of the ripe seed-pod. The common name is Stork's Bill, but it is seldom used because that of Geranium has been so extensively employed. There are an immense number of species and varieties in cultivation, all green-house plants, some biennials and annuals, some herbaceous, some tuberous-rooted, and some evergreen shrubs, nearly all of which came from the Cape of Good Hope. A large number of the Cape species and varieties are still grown; but their cultivation is confined mainly to those who make a speciality of them. They form a very interesting group of plants, the flowers of most of them being comparatively small in size, but often very brilliant in colour. The leaves of many are beautifully sub-divided, almost fern-like in character; those of others are deliciously fragrant. *Pelargonium zonale*, the common Scarlet Geranium of our gardens, the Horse-shoe or Zonal Stork's Bill, appears to have been introduced into this country about the year 1710; and *Pelargonium inquinans*, the Staining or Scarlet Stork's Bill, about 1714. It is believed that the modern Zonal Pelargonium has resulted from the blending of these two species.

The very fine and showy forms of what are known as the Large-flowered or Show Pelargoniums, and the Fancy or Ladies' Pelargoniums, have, no doubt, by means of careful fertilisation and cross-breeding, sprung from the comparatively insignificant-flowered species indigenous to the Cape of Good Hope. How and when they originated it is very difficult to state. Careful selection and successful culture have done much; raisers in different parts of the country have vied with each other in the production of higher forms of excellence; the names of Catleugh, Dobson, Beck, Hoyle, Foster, Gaines, and Turner deserve a record in this relation. We remember the Large-flowered Pelargonium of thirty-five years ago: the flowers small, ill-formed, and wanting in brilliancy of colour; to-day we have flowers of amazing size, perfect form, and brilliant hues. So successfully indeed have they been improved, that it seems difficult to imagine anything of a more advanced character.

The Fancy or Ladies' Pelargoniums are a more delicate race, not so robust in constitution, and needing a little different treatment during winter

from the more vigorous large-flowered varieties. But they are wonderfully free of bloom; the blossoms are finely formed, and generally of much more delicate colours. Their culture is more restricted than that of the show types.

Large-flowered or Show Pelargoniums. — Beautiful as these are, and so well adapted for green-house cultivation, it is yet a fact that they are rarely so successfully grown as they might be. We seldom see healthy, clean, good-habited plants in gardens. We too frequently see weak spindling specimens that appear as if they were greatly neglected. Let us endeavour to show how good specimen plants can be grown if only they be carefully attended to at the proper time; and by following the development of the plant from the cutting stage until it has reached a size qualifying it for decorative or exhibition purposes, we shall thus see the advance and necessary treatment at all stages.

Any nurseryman who makes a speciality of the Pelargonium does the greatest part of the work of propagation by means of cuttings in the autumn. When the plants have gone out of flower, they are stood in a cold frame, or out in the open air, until the wood becomes hardened or ripened, then the plants are cut back somewhat hard, according to their age; if one or two years old, the main stems are left two or three inches long; if they are older, five or six inches long or even more, according to the probabilities as to whether the shortened branches will break again back to the trunk of the plant or not. Out of the wood so cut away, cuttings can be made; every single joint that is matured will make a cutting, and this cutting will be pretty certain to throw two shoots from the eye, one on either side of the stem. The rule with cultivators is to break away the weakest shoot, leaving the strongest, so as to make a good sturdy plant. But we are, perhaps, anticipating. Some persons put their cuttings round the sides of a five-inch pot; others make up a bed in a cold frame and press them firmly into the soil in lines. Where only a few cuttings are raised it is perhaps best to place them singly in three-inch pots, in all cases using a light compost in which sand and fine leaf-soil play an important part. The readiest way to root is by placing the pots of cuttings in a gentle heat, and as soon as they show signs of having rooted they should be removed to a cooler house, and gradually hardened off. Then a shift should be given into four-inch pots. This done, and a few days allowed for the plants to become established, the shoot, when it is about four inches in length, should be stopped by pinching out the tip; the result being that it will make three or four breaks, which will be quite enough of leading shoots the first season, if the grower would like the plants

to carry good flowers. Every time the plant is repotted the stem should be placed a little deeper in the soil, as it not only imparts strength to it, but prevents to some extent growths coming up from the roots. The last shift should be into a five-inch pot, and in this it may be allowed to flower. It is surprising what a fine plant can be produced in a five-inch pot. We have seen specimens in Covent Garden Market in this size pot, having six and eight leading shoots, and carrying splendid heads of bloom; but these are grown by market growers, and they give such plants special treatment which cannot be given by ordinary cultivators.

Now should an amateur cultivator require a specimen plant, say for exhibition next season, the cultural process must vary a little. It should again be shifted from a five-inch into a seven-inch pot, which will cause it to break freely but flower late. But the flowers will be smaller in consequence. Nevertheless, there is obtained a sufficient number of eyes to form a fine large plant for the following season. When the bottoms become two or three years old they will require a little different treatment. They must be shifted into their blooming-pots a little earlier: those intended for flowering in May must not be stopped at all; those for flowering in June and July should be stopped once in February.

Successful culture depends so much on little attentions constantly rendered—such points as compost, shifting, stopping, tying-out, syringing, fumigating, &c.; and experience is a most valuable teacher. Young beginners can scarcely hope to succeed all at once; but patience and perseverance can accomplish much, and let the cultivator always bear in mind that thorough cleanliness in every stage is most important, enhancing the beauty and quality of the flowers.

Soil is a very important matter in the culture of this useful class of plants. That used by the leading exhibitors of Pelargoniums is a compost made up of rich fibrous loam, stable dung, and a little cow-dung, laid by a year previous to become thoroughly rotten: these are well mixed together, and frequently turned before using, and when employed for potting purposes, some good leaf-mould and sufficient silver sand to make the whole gritty are added. A little experience is of use in the proper mixing of this compost, this being a detail that is soon picked up in the course of practice in cultivation.

Fancy Pelargoniums.—These are of much more compact growth than the Show or Large-flowering varieties; they are much freer in blooming, and a little more delicate in constitution. The general treatment of Show varieties suits Fancy varieties pretty well, but they do not strike so freely as the others, and they root best when the cuttings are

made in early spring from half-ripened shoots. The plants grow more slowly also, and they require to be kept warmer during the winter, but care is necessary that the shoots do not become drawn and lanky. Care must also be taken that they do not have too much water at the roots; of this they are very impatient.

A successful cultivator and exhibitor of Fancy Pelargoniums states, in regard to this charming class of plants, that "they may be grown to almost any size by keeping the house moist and warm; the plants like a little warmth, but plenty of air should be given all day when it can be done, and the plants should have plenty of room, else the foliage becomes drawn. The peculiar nature of the growth of the plant is to crowd it with shoots; therefore, in the case of specimens, the outside branches should be tied out to give the centre shoots all the room possible. In potting, the plants need to be kept higher in the pots than the large-flowering varieties, so that what is termed the 'collar' of the plant be kept level with the surface of the mould. Great attention should be paid to watering. It is better to find six plants too dry than one too wet. There is a remedy for the first evil, but none for the latter. The roots, being of a much finer character than those of the more robust large-flowering sorts, cannot endure an excess of moisture." We may add that Fancy Pelargoniums, being so free of bloom, are well adapted for making the stage of the flowering house very gay. The last time for repotting should be regulated by the month in which the cultivator wishes to have the plants at their best. If early flowers are required, the plants should have their last shift not later than October, and they should not be allowed too much root-room in the pots. A seven-inch pot is, as a general rule, large enough, but something depends upon the plants. If bloom is desired at a later period, the specimens can be had at their best during the month of July by giving them a good shift in March. To retard the bloom of the plants, the points of the shoots may be pinched out, and this is a desirable plan when the specimens are thin of branches, as it causes them to break into growth freely, making large plants that flower later.

The soil for Fancy Pelargoniums differs from that above recommended in that it is of advantage to mix a little peat with it, and some broken oyster-shells.

Decorative Pelargoniums.—These represent a large group of sturdy-growing Pelargoniums of good habit and profuse flowering, that are well adapted for decorative purposes in green-houses, conservatories, and sitting-rooms. The flowers are not so well formed generally as those of the large-flowering type, but not a few of them make fine exhibition

plants. Many of the varieties are of Continental origin. The colours of the flowers are in not a few instances bright and striking, and some of them have the petals handsomely fringed. These are very attractive, and great favourites. Their robustness of habit is greatly in their favour, and we may truly say of them that they are all good growers. There are a few double or semi-double varieties, and these possess this advantage, that they are much more durable while in flower than those having single blossoms.

Those of our readers who have attended one of the large summer exhibitions of the Royal Botanic Society in the Regent's Park, or the exhibitions of the Royal Horticultural Society at South Kensington, or at the Crystal Palace, will have noticed the fine specimens of Large-flowered, Fancy, and Decorative Pelargoniums, sometimes measuring four and five feet in diameter. These are from two to five years old. They are grown by experienced cultivators who give them daily attention; the shoots are carefully tied out as they lengthen, and the utmost care is taken to keep them in the very best condition. Light and airy houses are required in which to grow them. When one of these fine plants is cut down, at the end of the summer, the frame of the specimen is some two feet or so across. It then breaks into growth, is taken out from the pot, the soil is quite removed from the roots, they are carefully trimmed, and re-potted in smaller pots, and a dash of silver sand is placed about the roots. These cleansed roots put forth fine fibres, and the plants are made new again.

It is not an uncommon practice, in order to insure large and vigorous-growing specimens of Fancy Pelargoniums for exhibition, to graft them on free-growing stocks of large-flowering varieties. Grafting is done early in September, the stock being in advance of the scion in respect of growth, and the grafted plants are stood on a shaded border until union is complete. Grafting when done by an experienced operator is invariably successful.

During autumn and winter the plants will need special attention by occasionally stirring the surface of the soil, and keeping them free from green-fly, and in all respects healthy. But little fire-heat will be necessary except the weather is very severe; as much air as possible must be given on all favourable occasions, and everything should be done that will tend to keep the plants sturdy, short-jointed, and the wood stout and robust. We have already stated that the Fancy varieties require more warmth during the winter. The cultivator need not be alarmed at losing a few of the bottom leaves, as this is a sign of the wood ripening, and the more thoroughly the stems are ripened so will the quality of the flower

be improved the following season. We cannot attach too much importance to the thorough ripening of the wood when the plant goes out of flower and loses its leaves.

Now let us revert to the plants in four-inch pots. We will assume that they have been grown carefully, kept clean from vermin, and that they have flowered well. Then they should be stood out of doors to thoroughly ripen their wood. When this is accomplished they should be cut back, leaving a symmetrical "bottom," as the growers term it, and then kept rather short of water for a time. Then they will break into growth, and as soon as they show their first two leaves, the plants should be turned out of the pots, the roots trimmed, and the plants potted in pots only just large enough to take the roots. The plants should be placed in a greenhouse, and as soon as they are established the shoots will grow. They should be stopped, and soon after shifted into a twenty-four or sixteen size pot, according to the dimensions of the plants, doing this about the end of October or early in November. The plants should now be placed on a light, airy shelf in a greenhouse, where they can be preserved from frost. They must not be allowed to be stopped any more. By-and-by, in spring, the shoots should be tied out to stakes so as to keep a good shape to the plants; and as the days lengthen and become warmer, they should be lightly syringed over, and some weak liquid manure given occasionally. Those who require to have their plants in bloom at the end of June and in July would do well to re-pot again in December, and stop them once more in January. These plants must be kept as cool as possible, and after April be frequently syringed. During the time they are in bloom the plants must be shaded from the sun, plenty of air given, and any injury from damp must be guarded against. All dead leaves and flowers must be kept removed from the plants.

Zonal or Bedding Pelargoniums.—The various forms of Zonal or Bedding Pelargoniums are from *P. zonale*, the Horse-shoe or Zonal Stork's Bill, introduced to this country about 1710; and no doubt the blood of *P. inquinans*, introduced four years later, has been found of great assistance in imparting fresh and decided characters to seedlings. They have been found of great value for bedding purposes and pot culture, and hundreds of varieties have been raised, named, and distributed. At the present time there must be several hundred varieties in cultivation; and new forms are announced every year, though not so numerous as a few years ago. Then this very useful plant took a surprising hold upon the public mind, and for several seasons it was all the rage. It was largely used for masses and ribbon lines in flower gardens; but since the system of bedding out,

in which the Zonal Pelargoniums played so important a part, has been, to a large extent, abandoned, it is now much more grown in pots for green-house decoration, and especially for flowering during the autumn and winter. All through the autumn and winter months, fine young plants of Zonal Pelargoniums raised from cuttings taken the previous spring will bloom freely, but to do so should be grown by themselves in small, warm, airy houses where the plants can have plenty of light and a dry warm atmosphere. Messrs. Henry Cannell and Son, the well-known florists at Swanley in Kent, have been foremost in showing how well adapted the Zonal Pelargonium is for flowering in winter, and it is their practice to exhibit during the dark months bunches of flowers of marvellous size, great beauty, and wonderful colouring. They have adopted the practice of running a hot-water pipe round their houses, above the plant stage, and level with the flowers. This gives just the dry warm atmosphere required to produce the flowers in such splendid form. As a matter of course they are well attended to in all other respects.

Some years ago the late Mr. Donald Beaton raised a race of Zonal Pelargoniums that were designated "Nosegays," because they produced very large trusses of bloom, but the individual flowers were much smaller and less perfect in form than in the case of the newer Zonal types. What crosses were used by Mr. Beaton has never been stated; but this section soon became very popular, especially for bedding purposes, as they were generally very profuse of bloom. Several raisers turned their attention to the improvement of this section, and by crossing the varieties with some of the better-formed Zonals an advance in point of form was secured; but the trusses retained the nosegay character. Eventually a section was formed, termed Hybrid Nosegays; but now so closely interwoven are the Zonal and Nosegay types that they cannot be separated. The greatest credit is due to the late Mr. J. R. Pearson, of the Chilwell Nurseries, Nottingham, for the admirable work he did (which his successors are continuing) in the way of improving the Hybrid Nosegay section. He gave us good habits of growth, robust constitution, large trusses of flowers of the most approved form, novel and distinct colours, and the utmost freedom of blooming.

All the varieties of the Zonal section can be propagated with the greatest ease. Gardeners, who have to provide a large quantity of plants, take their cuttings in July and August, and put them into a sandy soil forming a bed made up in the open ground, or in boxes of light sandy soil which are stood in the open air. They quickly root, when they are potted off, one or several in a pot, to winter, or

they are kept in the cutting-boxes all the winter. Or cuttings can be stuck in pots; and those can be taken at any season of the year; but late summer and spring are the best. In regard to wintering Zonal Pelargoniums, damp is one of the greatest enemies to their well-being; if only the plants can be kept warm, fairly dry, and free from damp, they will winter in safety. They will not require a great deal of water, but they must not be allowed to become dust-dry, unless some frosty weather prevails. When planted out in beds and borders, Zonal Pelargoniums should not have too rich a soil, or they grow too much to foliage. On the other hand, too poor a soil results in starvation, and this should be avoided. A richer soil is needed when the plants are grown in pots; it is when the plants get somewhat pot-bound that they flower best, and then they need a little stimulus in the way of weak manure-water.

There is now quite a large group of double-flowered Zonals of various colours. The flowers of the single varieties are not very lasting, and it is customary, when cultivators exhibit plants, to drop a little liquid gum into the centre of the flowers, which makes them much more durable. This is also done in the case of cut flowers sent to the market for sale. None of the single Pelargoniums are lasting in a cut state, and thus a little gum, carefully applied, considerably prolongs the freshness of the flowers. The double varieties are much more persistent, and this is why they are taking the place of the single Zonal for all cut purposes. They are also largely used for house decoration, and exhibition purposes, and it must be admitted they are most valuable. They are of great variety of colour: crimson and scarlet, purple, mauve and lilac, cerise, pink and salmon, rose-pink, flesh-coloured and white. We cannot too highly commend them to the attention of our readers.

Ivy-leaved Pelargoniums.—These represent a well-known and most useful section, the varieties being the offspring of *P. peltatum*, or *P. lateripes*; the true Ivy-leaved varieties are of trailing habit, and are chiefly used for vases and borderings out of doors. Of late years a valuable race of hybrids has been obtained by crossing the finely-formed Zonal varieties with a view of obtaining higher quality in the flowers. The results have been most satisfactory, and that without affecting to any great extent the trailing character common to the species. There are now in cultivation Hybrid Ivy-leaved Pelargoniums with flowers so striking in point of size and colour as to be surprising. Double forms are also produced, catalogues are rich in these, and they make excellent decorative plants. The Pelargonium Society (now unhappily defunct) made a

practice of offering prizes for specimen Ivy-leaved Pelargoniums, and plants were produced, mainly grown as pyramids, large in size, finely cultivated, and covered with flowers. For warm green-house and conservatory decoration they are invaluable. Ivy-leaved Pelargoniums require warmer treatment than the ordinary Zonals; they should have a free open soil, and the pots should be well drained. Cuttings will strike readily in a little heat in spring or in early autumn.

Variiegated-leaved Pelargoniums.—There is a large group of these divided into several sections. There are, first, the Variiegated Zonals, or Tricolours, of which there are Golden-edged and Silver-edged-leaved types. Then there are the ordinary Silver-leaved varieties, the green leaves being broadly edged with silver, cream, and white. Then there are the Gold and Bronze, or Bicolours, in which the leaves are golden, with rich, bronzy zones. All the varieties of these sections are of the Zonal race, but the Bicolours are all of more vigorous growth. Then there are a few Variiegated-leaved varieties of the Ivy-leaved section that are very useful for bedding purposes.

It would appear that Variiegated Pelargoniums were known in this country nearly two centuries ago. One of the oldest known was Mangles' Variiegated; then came, after a considerable interval, Lee's Variiegated, and it is from this latter that Mr. Kinghorn succeeded, in 1848, in raising the well-known variety called Flower of the Day, which is still to be found in gardens. Soon after the introduction of this very useful bedding variety—viz., in 1850—the same raiser originated what may be considered as the first Silver Tricolour-leaved Pelargonium, which received the name of Attraction, and was followed by Countess of Warwick, another of Mr. Kinghorn's seedlings. Then Mr. Grieve and others became interested in the work. Several new varieties were obtained, until Italia Unita was produced, in which a marked advance was shown. So far the variegation had been cream or white. In 1844 appeared a variety named Golden Chain, and this had golden-margined leaves; but it is generally supposed to have originated twenty years previously. Then followed a series of varieties culminating in that beautiful and useful variety known as Mrs. Pollock, and from this came Sunset, Lucy Grieve, Mr. Benyon, Lady Cullum, and others, raised by Mr. Peter Grieve, Culford Hall, Bury St. Edmunds, which are to be found in cultivation to this day. In the seedling state all these were green-leaved forms, with a large dark horse-shoe zone. When they reached a certain stage of development variegation began to appear, and presently the whole plant changed to this character. This peculiarity is always noted in the case of seedling Tricolours.

Soon after the introduction of the Golden Variiegated Zonals, there appeared an entirely new tribe of Zonal Pelargoniums, designated Gold and Bronze or Bicolour Zonals. The disc and margin presented a uniform yellow, bright in some, dull in others, or rather of a pale green colour, showing off to great advantage the brown or cinnamon-coloured zone. These were greatly improved, the golden-green leaf character becoming more golden, and the zones brighter in colour; and being generally of robust habit, they made excellent bedding plants, and became very popular.

Respecting the culture of the Tricolours, most of which make good bedding plants, it may be stated that they require a rich, light soil. They are not quite so hardy as the ordinary Zonals, and when used in the open air they should be planted a little later. Cuttings of these root less rapidly than do those of the common Zonals. They should be made from well-ripened wood, and put singly into small pots in July and August, keeping them in a gentle warmth. The Silver Tricolours should have a poorer soil than the Golden ones, and they succeed best in the open air when planted in raised beds. In pots they need careful culture—never over-potting them; using clean pots, well drained; a light, rich soil; and keeping the plants warm and free from damp. The Gold and Bronze Zonals, being vigorous growers, can have the same treatment as the ordinary bedding Zonals.

Hybrid Pelargoniums.—There is a section of these that, in all probability, have resulted from the crossing of certain species that are well adapted for pot culture and for bedding. We may mention Rollison's Unique, crimson, very fine; Lilac Unique; Shrubland Pet, rose-coloured; Picturatum grandiflorum, white; and Lady Mary Fox, scarlet. These are all charming in pots. Then there are certain Cape species, with their hybrids—the flower small, but often produced in good trusses, and in many cases brilliant in colour. Among them we may mention Ardens, brilliant crimson; Blandfordianum, with its pale green Oak-like foliage; Echinatum, white, spotted red; and its fine hybrid varieties—Spotted Gem, Rosy Morn, Beauty, Album multiflorum, and Ariel; Fragens, Schotti, &c. Any one fond of species of Pelargoniums with scented leaves will be charmed with Capitatum, Rose-scented; Citriodorum majus, Lemon-scented; Apple-scented; Nutmeg-scented; Prince of Orange, scented like an Orange; Crispum, Citron-scented; and Odoratissimum, richly fragrant, one of the best.

Seedling Pelargoniums.—The peculiar fascination and interest which attaches to the raising of seedling flowers, induces some persons to raise seedling Pelargoniums. It is necessary to raise the seeds in

heat, and they can be sown in summer as soon as ripe, which is the best plan, or in the early spring. In order that they may germinate successfully, the seeds when sown should be placed in a temperature of 50° to 60°, and they will soon germinate, and when they are large enough to handle should be potted off singly into small pots, or be placed four or six in a five-inch pot, and when large enough potted off—using a fine, light, sandy soil—in forty-eight-sized pots. In this size of pot the plants should be allowed to flower. When seed is sown in August the plants will not flower until early summer following; when sown in spring the plants will bloom the same season if grown on into size with attention.

SELECTIONS OF PELARGONIUMS.

Large-flowered or Show Varieties.

Ambassador.	Maid of Honour.
Anethyst.	Margaret.
Brilliant.	Martial.
Claribel.	Outlaw.
Confessor.	Pericles.
Cornet.	Retreat.
Despot.	Royal Review.
Duke of Norfolk.	Sunbeam.
Fortitude.	The Baron.
Illuminator.	Veteran.
Magnate.	Virgin Queen.

Decorative and Spotted Varieties.

Captain Raikes (double).	Lady Isabel.
Carl Klein (double).	Lucie Lemoine.
Decorator.	Maid of Kent.
Digby Grand.	Marie Lemoine.
Dresden China.	Mrs. John Hayes.
Dr. Masters.	Prince of Novelities
Duchess of Edinburgh.	(double).
Edward Perkins.	Queen Victoria (double).
Formosa.	Triomphe de St. Mandé.
Gold Mine.	Vénus de Milo (double).
Kingston Beauty.	Volant Nationale.

Fancy Varieties.

Ambadressess.	Miss Goddard.
Bridesmaid.	Mrs. Alfred Wigan.
Cloth of Silver.	Mrs. Hart.
Countess of Dudley.	Mrs. Langtry.
East Lynne.	Nelly Fordham
Ellen Beck.	Pilgrimage.
Fanny Gair.	Princess Teck.
Indian Chief.	The Shah.
Lady Carrington.	Vivandière.

Zonal and Nosegay Varieties (Single).

Alarm.	Lucy Bosworth
Bayard.	Mr. Chandler.
Charles Schwind.	Mrs. George.
David Thomson.	Mrs. Holden.
Dr. Denny.	Mrs. Leavers.
Dr. Orton.	Mrs. Moore.
Dreadnought.	Nemesis.
Ferdinand de Lesseps.	Queen of the Belgians.
Future Fame.	Rosa Little.
Guinea.	Snowdon.
John Gibbons.	Sophie Birkin.
Lady Byron.	Titania.
Lady Sheffield.	Vesuvius.
Lizzie Brooks.	White Clipper.
Lord Nelson.	

Zonal Varieties (Double).

Auguste Villanne.	F. V. Raspail.
Charles Darwin.	Guillon Mangilli.
Depute Lafize.	Henri Cannell (Le-
Edward Lequin.	moine).
Emilie de Girardin.	Heroine.

La Candeur.	Madame Michael Buch-
Lord Mayor.	ner.
Louis Buchner.	Madame Thiers.
Lucie Lemoine.	Prince Noir.
Madame A. Baltet.	Roi des Violettes.
Madame Lemoine.	Wonderful.

Golden Tricolour Varieties.

E. R. Benyon.	Mrs. Henry Cox.
Florence.	Mrs. Pollock.
John Downie.	Peter Grieve.
Lady Cullum.	Prince of Wales.
Macbeth.	Sophia Dumaresque.
Marie Stuart.	William Sandy.

Silver Tricolour Varieties.

Dolly Varden.	Mrs. Laing.
Minnie Warren.	Mrs. Miller.
Miss Farren.	Porteous.
Mrs. Clutton.	Prince Silverwings.
Mrs. Col. Wilkinson.	Princess Beatrice.

Gold and Bronze or Bicolours.

Black Douglas.	Prince Henry.
Distinction.	Prince of Prussia.
Effective.	Regularity.
Joseph Kirkham.	Swanley Bronze.
King of the Bronzes.	White Distinction.
Maréchal McMahon.	Zulu.

Golden or Yellow-band Sections.

Creed's Seeding.	International.
Crystal Palace Gem.	Robert Fish.
Golden Chain.	

Ivy-leaved Varieties (Double).

Abel Carriere.	Madame Crousse.
Alice Crousse.	Madame E. Galle.
Comte H. de Choiseuil.	Mdlle. Wouters.
Docteur Ox.	Prince of Wales.
Gloire d'Orléans.	Souvenir de Charles
Isidore Feral.	Turner.
Jeanne d'Arc.	Vesta.
Konig Albert.	

Ivy-leaved Varieties (Single).

Argus.	Mon. de Boringe.
Diadem.	Mon. Dubus.
La France.	Mrs. H. Cannell.
Masterpiece.	Progress.

Pentstemon.—This is one of the most useful and showy of hardy perennials, and it is a plant that has been marvellously improved of late years. It is a plant of foreign introduction, and the name is derived from *pente*, "five," and *stemon*, "a stamen"—four fertile and one abortive stamen. It has no common name other than that which heads this article.

The Pentstemon represents a large genus of herbaceous perennials, very ornamental and among the prettiest of summer-flowering plants. Some of the species are of a sub-shrubby habit, but they are rarely grown now, having given place to a large lot of fine plants in the shape of seedlings raised from *P. Cobea*, *P. Hartwegii*, *P. gentianoides*, and others, all of which can be increased by means of cuttings and seeds. The original *P. Hartwegii* produced flowers of a kind of dullish crimson-purple, but seedlings from it have developed many shades of colour, from white to the deepest crimson and purple.

Some very fine species can still be found in old gardens, such as *P. ovatus*, blue; *P. barbatus* and *P. Murrayanus*, scarlet; *P. digitalis*, white; *P. Jeffreyanus*, blue, and others, which are grown by lovers of select hardy perennials.

English as well as Continental raisers have done good work in improving the Pentstemon. Year after year new varieties have been raised until they have come to possess vigorous habits of growth, and to produce large bold trusses of flower of a singularly imposing character. The Pentstemon can be increased by means of seeds and cuttings. Any one with but slight conveniences can raise seedlings. One requires only good seed and good soil, and if a pot, shallow box, or pan be filled with the latter, and the seeds sowed thinly, they will soon grow, provided they are kept watered as required and shaded from the sun. Those who make a practice of raising new varieties of Pentstemons generally sow their seed in heat about the month of February, and when the little plants are large enough to handle they are potted off, either singly in small pots, or two or three plants placed round the sides of a pot, grown on into size, and then planted out in a well-prepared bed about the end of May, or earlier if the weather be favourable. If the season is favourable to their doing well, the main portion of the plants will flower in September. But as every lover of hardy flowers may not have heat at his command, he must proceed more slowly, and the best thing he can do is to sow his seed in March in a cold frame, bring on his plants as soon and as strong as possible; and in July or August avail himself of showery weather to plant out in a bed, where the plants will stand the winter and flower the following summer. The

Pentstemon does well in a good sandy loam, enriched with a little dung and leaf-soil, and in it they root freely and strongly, and throw up strong spikes of flower. While the Pentstemon is a hardy plant, it suffers from too much wet during winter, and if hard frost succeeds rain, many plants will suffer or die. Therefore it is well to plant out on a dry soil, but taking care the plants do not suffer for

want of water during the summer. It is also prudent to keep a stock of all the finest strains in store-pits throughout the winter.

Some seed should be saved only from the best varieties, and by doing this a good strain can be preserved.

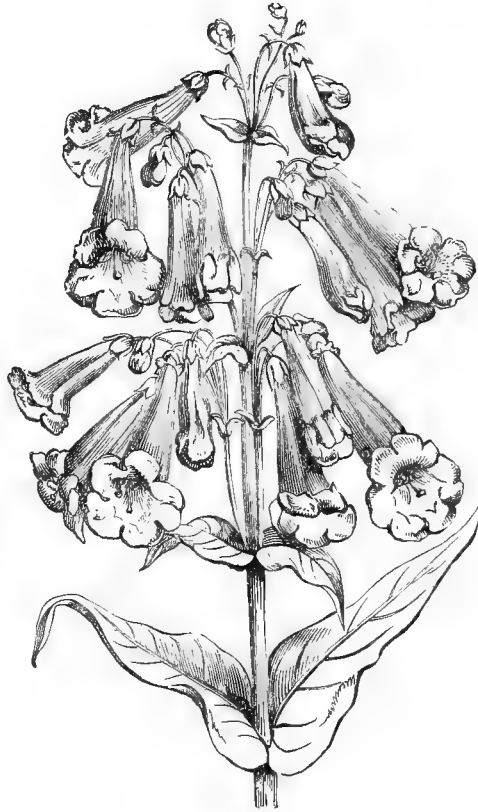
The Pentstemon can be increased by division of the root and by means of cuttings. The former method is seldom resorted to; the latter is that generally followed. Cuttings can be had in plenty at the end of the summer from the young growths put forth from the main stems, and if they are placed in pots of sandy soil well drained, and kept in a cold frame, they will soon make roots and form good plants the following spring; also by potting the plants of any good varieties in autumn, keeping them in a cold frame

in winter, placing them in heat in spring, which induces them to make young growths; and from these cuttings can be made that will soon root in a gentle bottom heat.

The following is a list of good named varieties of Pentstemon:—

Agnes Laing.
Atlantide.
Bridesmaid.
Candidate.
Diane.
Edward Tate.
General Nansouty.
H. Cannell.

Henry Irving.
Joseph Buchner.
Little Frank.
Miss Salteau.
Mrs. J. Allen.
P. Klein.
The Favourite



PENTSTEMON GENTIANOIDES.

ORCHIDS.

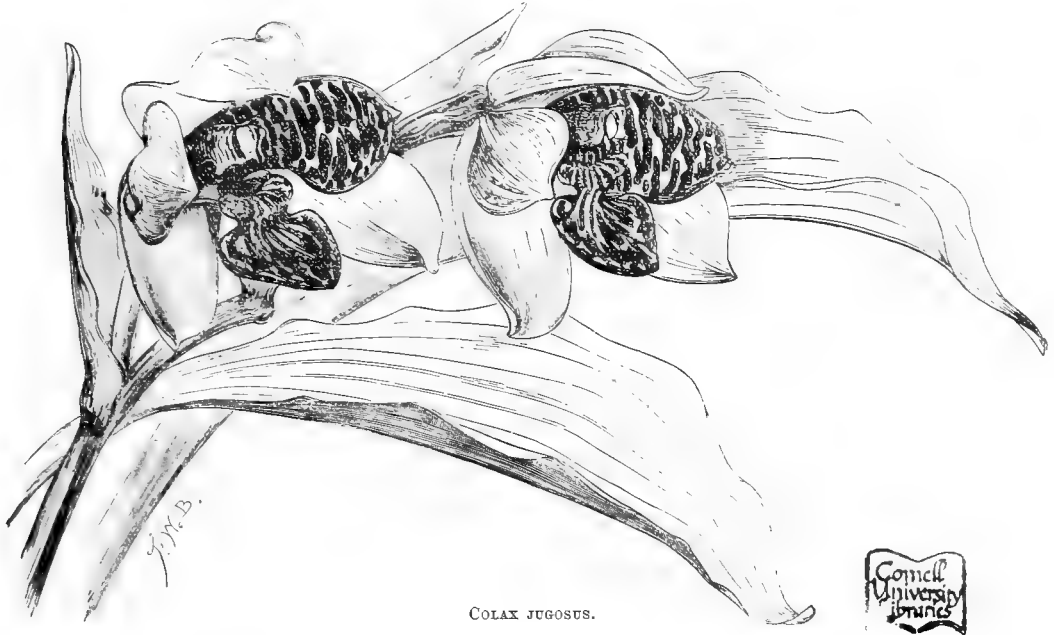
BY WILLIAM HUGH GOWER.

Colax.—A small genus of Epiphytes, nearly allied to *Maxillaria*; indeed the difference is so small that few cultivators would find it. The caudicle in this genus is destitute of a gland, whilst in the true *Maxillaria* it is short, stout, and semi-circular. The only species we shall include here is—

C. jugosus.—This plant should be treated as a pot

The genus is remarkable for its very long, double spurs, which are sheathing, one within the other. These plants require to be grown upon a block with a little *Sphagnum* moss: they do not like full exposure to the sun, but rather affect shade; water must never be entirely withheld, as they cannot live if they get any drying. Shady corner in the Brazilian House.

C. coccinea.—This elegant little plant is extremely rare in cultivation, and blooming as it does during



COLAX JUGOSUS.

plant and placed in the Brazilian House. Pseudo-bulbs somewhat ovate, compressed, smooth, some three inches high, bearing a pair of deep green leaves at the apex, and several smaller sheathing ones at the base; these are lanceolate, and taper to a point, six to eight inches long, nearly two inches broad; scape erect, radical, two to three-flowered; sepals broadly-oblong, creamy-white, and waxy in texture; petals somewhat similar in shape, creamy-white, but inside profusely banded with transverse bands of rich velvety purple; lip small, white, striped and spotted with bluish-purple. Spring and early summer. Brazil.

Comparettia.—A few small-growing but beautiful plants make up this genus, which is named in honour of M. Comparetti, a distinguished Italian botanist.

the dreary months, it seems to brighten up the plant-houses. Pseudo-bulbs, long and slender, bearing one to three leaves on the apex, scape issuing from the side of the pseudo-bulb, near the base; three to seven-flowered; sepals and petals small, yellow, edged with scarlet; lip three-lobed, side lobes small, middle lobe large and spreading, brilliant scarlet-orange at the base; spur very long. Autumn and winter months. Brazil.

C. falcata.—The leaves of this species are larger than the preceding, and falcate. Scape three to six-flowered; sepals and petals small; lip obcordate, spreading, rich deep crimson. Spring and early summer. Peru and Columbia.

Coryanthes (the Helmet Flower).—This name is derived from *korys*, "a helmet," and *anthos*, "a flower," in allusion to the extraordinary form of the

labellum. Botanically, the genus is thus characterised:—Sepals dilated, flexuose, conduplicate; petals erect, much smaller than the sepals. Labellum large, unguiculate, galeate, continuous with the base of the column, tridentate; column terete, two-horned at the base, elongated, recurved at the apex, two-winged. Anther two-celled. Pollen masses, two, compressed, sulcate behind, with a linear-arched caudicula, and a lunate gland. These plants are all epiphytes, natives of tropical America, and are found growing upon the tops of the highest trees, fully exposed to the influence of the sun's rays. It is recorded that these plants are always found in the company of ants, and that they grow in, and derive benefit from, their nests. It occurs to us, however, that the ants, finding the *Coryanthes* produce such quantities of a liquid so congenial to their taste, establish themselves on the branches and round the pseudo-bulbs of these plants, it is therefore the *Coryanthes* that are necessary to the ants, and not the ants to the *Coryanthes*.

A writer thus describes the first species introduced:—“From the branches of trees on Victoria Hill, above Bahia, hang down little vegetable buckets, into which a pair of stumps or fingers constantly distil a sweetish, colourless fluid, which, drop by drop, gradually fills the bucket. The fingers are processes springing from the base of the column of this Orchid; the bucket is a great helmet-shaped lip, sustained by a stiff arm which keeps it perfectly steady, so that the honey may not be spilt. The column itself turns back as if to keep its head out of the way of the drops, while the broad, membranous, lateral sepals, resembling bats' wings, turn quite back, as if to unveil the singular phenomena which the blossom presents.”

Coryanthes should be grown in hanging baskets, as they are seen to much better advantage in such a position; they are evergreen plants, producing from their pseudo-bulbs, which are more or less furrowed, a pair of plaited leaves some ten or twelve inches in length. During the growing season they require an abundant supply of water, but afterwards sufficient only to keep them from shrivelling; they must be exposed to all the sun and light it is possible to give them; peat and Sphagnum, in about equal parts. Brazilian House.

C. Fieldingii.—The species belonging to this extraordinary genus have, to a great extent, fallen out of cultivation. This has arisen from their habit of dying off

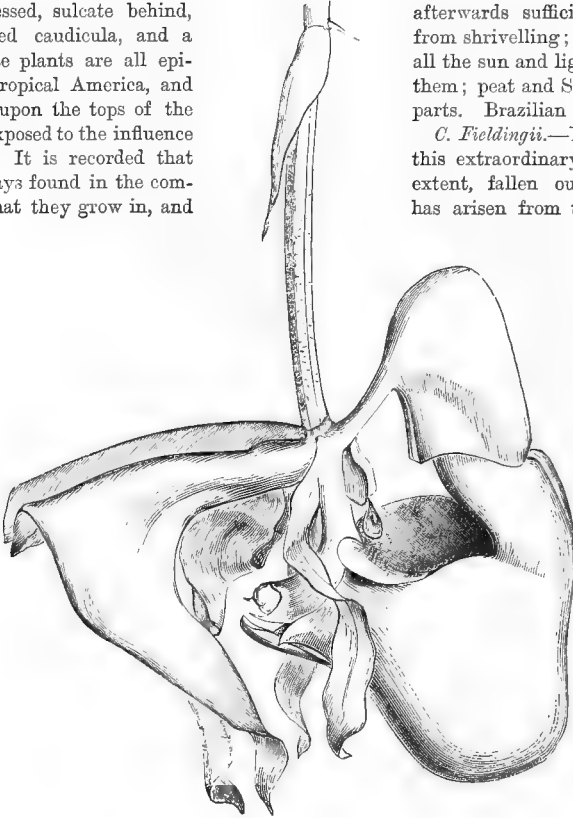
rapidly, which, we believe, is caused by a system of heavily shading, which these plants cannot endure. The present plant produces flowers of a dull yellow, mottled with rich brown, and some five inches in diameter; it is very distinct and the largest of the family. May and June. Brazil.

C. macrantha.—This fine species produces very large flowers. Ground-colour, a bright rich yellow, spotted with red, the conical helmet being, in

addition, suffused with rich orange-brown. June and July. Caracas.

C. maculata.—In this we have a very distinct and handsomely-marked flower. Sepals of a uniform pale yellow; the hood is curved prominently forward; pale yellow, the helmet suffused with light purplish-violet, and spotted with a deeper shade of the same colour. June and July. Demerara.

C. maculata, var. *Albertine*.—Flowers large, sepals and petals bright yellow, spotted with rich, deep red; hood white, dotted all over with rose; helmet deep crimson, sparingly spotted on the inside. June and July. Venezuela.



CORYANTHES SPECIOSA.

C. maculata, var. *Parkerii*.—An extremely beautiful variety; sepals and petals light yellow; hood deep reddish-purple, the helmet being spotted with the same colour. May and June. Demerara.

C. maculata, var. *punctata*.—In this variety the flowers are large, beautiful, and distinct; sepals and petals bright yellow, dotted and spotted, with red; helmet conical, rich orange-brown. June and July. Caraccas.

C. speciosa.—This species, of which we give an illustration, will show the strange form taken by these flowers. The whole flower is of a uniform pale yellow throughout, and spotless, and the hood is not curved forward as in the other species. Spring and early summer. Bahia.

C. speciosa, var. *alba*.—The flowers of this form are of a uniform white, which is quite destitute of spots. May and June. Bahia.

C. speciosa, var. *vitellina*.—A variety with rich, deep, yolk of egg coloured flowers; spotless. May and June. Brazil.

Cycnoches.—The name signifies swan-neck, and is derived from the long curved column; the genus is a near ally of *Catasetum*, and like the plants of that genus, is subject to great variations, which indeed render it very difficult to define the limits of a species. Cultivation same as for *Catasetum*.

Cycnoches are remarkable for the fact that the same plants often produce quite different flowers. In some cases the same are not produced two seasons in succession; and not unfrequently two kinds of flowers are produced on the same plant at the same time. The variety illustrated—the parent of many others—is an instance of this. The following are brief descriptions of some other varieties:—

C. aureum.—Flowers large and closely set, of a uniform clear yellow. Spring and summer. Central America.

C. barbatum (*Polycynis barbata*).—Flowers bright pink, spotted with red. Spring. Costa Rica.

C. Loddigesii.—This produces two kinds of flowers rather frequently; in the most showy form the flowers are large and fragrant; sepals and petals green and purple; lip white, spotted with purple. Summer months. Surinam.

C. pentadactylon.—The flowers of this kind are large, and of a uniform yellowish-green, more or less streaked with brown. Summer and autumn. Brazil.

Cymbidium.—These are terrestrial vandaceous Orchids, producing sword-shaped distichous leaves, and forming in some instances short, stout, oval pseudo-bulbs, which are enveloped by the imbricated bases of the leaves. The scape is radical, in some species erect, in others quite pendulous, the chief



CYCNOCHES WARSZEWCZII.

character in the flowers being the presence of two conspicuous curved ridges on the labellum.

The word Cymbidium is derived from *kymbē*, "a boat," and refers to a hollow recess in the lip, and formerly included numerous Orchids which had no claim to be associated with this group.

Cymbidiums should be grown in rough peat and Sphagnum moss. They are plants which make a great quantity of stout fleshy roots, and consequently require plenty of pot-room. During the growing season give a liberal supply of water, and never by any chance allow the thin-leaved kinds (such as *eburneum*) to suffer from drought at any time. Formerly the beautiful species *eburneum* was very rare, and unfortunately it lost favour on account of its being a shy flowerer; but then it was treated to



the hottest corner of the East Indian House. A friend, when sending some plants home a short time back, writes: "In the cold season they sometimes have snow on them for a short time, but afterwards they break up like Willows, and, when in flower, they look like great beds of white Tulips." Taking this as a guide, I have been able to redeem this species from the bad character it had got as a poor flowerer, and recommend *Cymbidiums* to be kept in the Brazilian House; when at rest, even in a still lower temperature.

C. Dayanum.—Leaves long and narrow, somewhat

margins, ivory-white, the base ornamented with a broad band of yellow. It blooms during the winter and spring months. There is another form of this plant with rose-coloured dots on the lip. Upper Assam.

C. giganteum.—This is a bold strong-growing plant. Leaves ligulate-acute; scape erect, many-flowered; flowers large; sepals and petals brown; lip same colour, stained and blotched with purple and yellow. Winter and early spring. Northern India.

C. Hookerianum.—In habit resembling the preceding species, but the dark green leaves are striated



CYMBIDIUM EBURNEUM.

resembling *C. eburneum*; raceme pendulous, many-flowered; the ground-colour of the flowers is yellowish-white; sepals and petals streaked with purplish-crimson; the lip is margined with the same rich colour, and ornamented on the disc with numerous reddish-crimson lines and streaks. Spring and early summer. Assam.

C. eburneum.—The leaves of this fine species are narrow, arranged in a two-ranked manner, and bright shining green, acutely two-lobed at the apex; scape usually one-flowered, but frequently two are produced; sepals and petals spreading, oblong-lanceolate, nearly equal, thick and fleshy in texture, and ivory-white; lip three-lobed, side lobes rolled over the column; middle lobe triangular, with wavy

with yellow. Flowers upwards of four inches in diameter; sepals and petals apple-green, about equal, oblong-acute; lip three-lobed, white, and lemon-colour, profusely blotched, spotted, and dotted with purple. Spring and early summer. Sikkim, Himalaya.

C. Huttonii.—This is a very distinct and most beautiful species. Pseudo-bulbs three to five inches long, bearing a pair of leaves longer than the pseudo-bulbs, and upwards of two inches in breadth; these are somewhat oblong, coriaceous, and deep green; raceme pendulous, five to ten-flowered; sepals larger than the petals, recurved, and ovate; the former pale brown, streaked and blotched transversely with deep brown; the latter rich chocolate inside; lip three-

lobed, green, with chocolate stripes. Summer months. Java. The correct name is *Grammangis Huttoni*.

C. Lowianum.—A majestic plant, producing long pendulous spikes, which bear from twenty to thirty large flowers; sepals and petals apple-green, streaked with light brown; lip creamy-yellow, lateral lobes yellow, frond lobe blotched and bordered with rich maroon. Spring and early summer. Burmah.

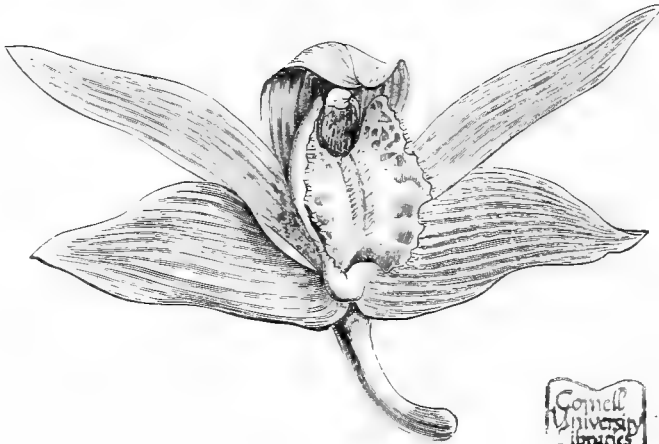
C. Mastersii.—The leaves are longer and broader in this plant than those of *C. eburneum*, which it much resembles. The flowers are borne on arching racemes, as many as ten to twelve together; the whole flower is ivory-white saving the lip, where it is stained with pink; the flowers have a delicate almond-like perfume, and last in full beauty a long time; they are admirably adapted for decorating a lady's hair. Winter months. Upper Assam.

C. pendulum, var. *purpureum*.—The leaves of this plant are very thick and coriaceous, nerveless, and deep green; spike one to three feet long, pendulous, many-flowered; sepals and petals about equal, yellowish-green on the outside, deep reddish-purple on the inner surface; lip white, spotted and blotched with crimson; disc stained with yellow. This is a very superior plant to the type. It blooms in spring and early summer. Northern India.

C. tigrinum.—A rare and elegant species, which has hitherto been found rather difficult to manage, we imagine through having been kept too hot, as it inhabits the Tenasserim Mountains, at an elevation of 6,000 feet. The pseudo-bulbs are small and ovate; leaves about six inches long; scape erect, bearing several large flowers; sepals and petals green, dotted with red towards the base; lip three-lobed, large; side lobes erect, reddish-purple internally; middle lobe broad and flat, white, marked with numerous transverse bars of reddish-purple. Summer months. Moulmein.

Cypripedium.—This genus contains one species indigenous to these islands; its extreme beauty has,

however, nearly led to its extinction. Like all other native plants, this found its English name amongst the people, and we now apply it to all the beautiful tropical species which have been introduced to cultivation; indeed, as Orchidaceous plants become more popular there appears to be an increasing desire to apply English names to them, and their singular flowers have generally suggested a resemblance to some insect or animal: thus we have the Butterfly (*Oncidium papilio*), the White Moth (*Phalenopsis amabilis*), the Dove (*Peristeria elata*), the Cockatoo (*Angracum Ellisii*); whilst amongst our native species we are reminded of their peculiar shapes by such names as the Lizard (*Orchis hircina*), the Bee



CYMBIDIUM GIGANTEUM.



(*Ophrys apifera*), the Spider (*Ophrys arachnites*), the Man (*Aceras anthropophora*), the Fly (*Ophrys muscifera*), and the Slipper (*Cypripedium Calceolus*); the large inflated pouch-like form of the labellum evidently suggested the name *Calceolus Marianus*, first applied to this plant by the learned, and

hence came the popular name Slipper of our Lady, or Lady's Slipper, whilst the generic name comes from *Kypris*, "Venus," and *podion*, "a shoe"—the Shoe or Slipper of Venus.

Cypripediums are very distinct, both in shape and structure, from all other genera; and the genus contains a great many extremely handsome species and varieties, the numbers of which are continually being increased by fresh importations and the skill of the hybridisers, upwards of three hundred varieties being known as in cultivation. Many of these plants are natives of quite cool places, Siberia and Canada being rich in species; and one very peculiar form is found in Japan, but by far the greater number are found in India and the Indian Islands, and throughout South America; the kinds indigenous to the cold regions, however, are all caulescent and deciduous. The species of Cypripediums here enumerated are terrestrial and acaulescent, and are quite destitute of pseudo-bulbs; their leaves are arranged in a distichous manner, and are mostly thick and leathery in

texture; in some instances they are beautifully tessellated, whilst the scape rises from the centre of the leaves, and is either one or many-flowered.

pediums are great favourites in the horticultural world, for their singular forms and beautiful colours charm all beholders; then again, they have the



CYPRIPEDIUM CAUDATUM.

Some of the species included here, and which are peculiar to tropical America, have been removed from this genus, and called *Scelopendium*, on account of their having a three-celled ovary, whilst the *Cypripediums* of the Old World have a one-celled ovary only. It is not at all surprising that Cypr-

additional recommendation of being by no means difficult to cultivate, for with ordinary attention they very soon grow into handsome specimens, and most of them will continue in full beauty for many months.

In potting these plants they should not be elevated

above the rim of the pot; the soil best adapted for them is a mixture of two parts rough peat, one part good leaf-mould, and one part chopped Sphagnum moss; to this add a little sharp sand, whilst some species like the addition of a portion of yellow loam.

The pots for *Cypripediums* must be exceptionally well drained, for they like an abundance of water during the growing season, and as they are entirely destitute of pseudo-bulbs to support them, at no time must the supply be cut off, although as a matter of course less will be necessary when the plants are at rest.

Cypripediums are not much subject to the attack of insect pests, but scale will sometimes fix upon them; whenever these are seen, remove at once with sponge and soft-soap and water. But the red thrip is their worst enemy, and must be exterminated immediately it puts in an appearance; this can be effected with tobacco powder as previously recommended for *Aerides*.

As a general rule, these plants are grown in the East Indian House, but the majority of the species thrive best in a cooler temperature; it will therefore be necessary to specify these in the descriptive enumeration, but all those not specially mentioned may be kept in the East Indian House.

C. Argus.—This is undoubtedly one of the very handsomest of the *barbatum* section. Leaves upwards of six inches long; oblong-lanceolate, tapering to a point, pale green on both sides, the upper surface beautifully tessellated with deep green; flowers some five inches across, and solitary; dorsal sepal cordate-acuminate, the ground-colour white, with

numerous purple and green stripes running from point to base; the lateral sepals, like all in this genus, are combined and are somewhat inconspicuous; petals upwards of three inches long, rose-colour, tinged with green towards the base, profusely spotted and blotched with purple, and fringed on

the edges with dark hairs; lip large, dull purple in front, yellowish-green underneath. Spring and early summer. Island of Luzon.

C. barbatum, var. *grandiflorum*.—There are many forms of this species, this being one of the best; the leaves are oblong and bright green, tessellated with dark green; flowers large and solitary. The ordinary form has a small dorsal sepal, and a smaller and more pointed pouch-like lip. This variety is distinguished by its very broad dorsal sepal, which measures some two and a half inches in diameter, white, striped from base to apex with lines of greenish-purple or port-wine colour; petals warm rose-colour, tinged with green towards the base, fringed on the edges with purplish hairs, and warty on the upper margin; lip large, the pouch broad



CYPRIPEDIUM INSIGNE.

and obtuse, deep port-wine colour. It lasts long in full beauty. Spring and summer. Malacca, &c.

C. caudatum.—As with most other plants, there are several varieties of this species; the best form is *C. caudatum roseum*, distinguished by the large and deeper rose-coloured lip. Leaves twelve to eighteen inches long, carinate beneath, and plain, shining green; scape many-flowered, flowers large and showy, with remarkably long tail-like petals; dorsal sepal large, and directed forward like a hood,

tawny-yellow, variously streaked and barred with reddish-purple; the lateral ones combined, greenish-yellow; the petals are the most remarkable feature; these are tawny-yellow, and are lengthened into linear pendent wavy tails nearly two feet or more in length; lip much inflated, tawny-yellow, more or less suffused with rich deep rose, or reddish-purple. April to June. Cool part of Brazilian House. Andes of South America.

C. chloroneurom.—This is a hybrid raised by that enthusiastic lover of Orchids, Mr. R. Warner, so long known as possessing one of the finest collections of these plants in England. Professor Reichenbach in describing this plant writes thus:—"Leaves of *C. venustum*; very dark; flowers large, very shining as if varnished; odd sepal light green, with darker longitudinal and transverse veins; pair sepals ligulate acute, white with green nerves, very small and narrow; petals divided by a longitudinal, purple-maroon, broad streak, white with green nerves on side towards the lip, green on the other sides, light brown to the apex, with green nerves and Indian purple wart-like spots on the basilar limb, and some spots near the base; lip's sac very broad, with short blunt lateral horns, light copper-coloured, with green reticulations on a yellow border." January and February. Garden hybrid.

C. Druryi.—A fine addition to this family; there are, however, several inferior forms. The finest may be thus described:—Leaves oblong-ligulate, tapering to a point, and deep green; scape erect, longer than the leaves, and densely clothed with ferruginous hairs, bearing a single flower; sepals and petals deep yellow with a chocolate band down the centre of each, the latter dotted at the base with green; lip large, obtuse, pale yellow. East Indies.

C. Dominianum.—A hybrid between *C. caudatum* and *C. Pearcei*, one of the splendid results obtained by Mr. Dominy in the establishment of Messrs. Veitch of Chelsea, and is exactly intermediate between the two parents. Leaves narrow-ligulate, plain green, scape three or more flowered, all expanded at one time; the petals are much twisted, but broader and not so long as in *C. caudatum*; lip almost same shape as in *C. Pearcei*, colour tawny-yellow, suffused more or less with reddish-purple. Cool end of Brazilian House. May and June. Garden hybrid.

C. euryandrum.—This is the result of a cross between *C. barbatum* and *C. Stonei*; it is a magnificent flower, raised by Mr. Seden in the Veitchian nurseries at Chelsea. We believe Mr. Seden was a pupil of our friend Mr. Dominy, and when this flower first opened it must have made the hearts of both rejoice. Leaves large, broadly-oblong obtuse, and plain deep green; scape three-flowered; flowers very large; dorsal sepal broadly-ovate obtuse, and

fringed round the edge with blackish-purple hairs, ground-colour white, suffused with rose, stained with pale yellow up the centre, and striped with purple; the combined lateral sepal is smaller and duller in colour; petals slightly shorter than *C. Stonei*, but broader, dull port-wine colour, suffused with tawny-yellow, variously spotted with reddish-purple, and slightly warty on the upper edge; lip large and bold, obtuse, deep port-wine colour. Spring and summer. Garden hybrid.

C. Fairrieanum.—This exquisite small-growing species is very rare in cultivation. Leaves oblong-ligulate, some three inches long, and light green; scape double the length of the leaves; flowers large, solitary; dorsal large and somewhat cordate, fringed and waved at the edges, ground-colour white, shaded with green, and strongly veined from base to apex with deep purple; petals at first deflexed, then curiously curved upwards, oblong-lanceolate, white, with greenish-purple veins, and ciliate on both edges; lip large, extending forward, dull purple, suffused with green. It succeeds best in the cool end of the Brazilian House. September and October. Assam.

C. Harrisianum.—This is a hybrid between *C. barbatum* and *C. villosum*, and both leaves and flowers appear to be exactly intermediate. The leaves have the bright shining surface of *C. villosum*, and the tessellations of *C. barbatum*, but these are not so plainly marked; the flowers are somewhat in the style of *C. villosum*, yet abundantly distinct; dorsal sepal broad, dull purple, tipped with white; the lower sepal smaller, and greenish-white; petals broadly-ligulate, port-wine colour, the middle vein being very dark; lip large, dull purple, tinged with green. Spring and early summer. Garden hybrid.

C. hirsutissimum.—Leaves some nine or ten inches long, strap-shaped, and deep green; scape longer than the leaves; flowers nearly six inches in diameter, solitary; dorsal sepal very broad and cordate, green, suffused with purple in front, and clothed with long shaggy hairs behind; petals spatulate, the basal half undulate, greenish, the edges fringed with short hairs, upper part rich purple; lip large, green, freckled with purple. April to June. Brazilian House. Assam (?) Java (?).

C. Hookeri.—Leaves broad and obtuse, coriaceous, about five inches long, dark bright green, tessellated with white; the flowers are somewhat similar in colour to those of the last-named kind; dorsal sepal cordate, yellowish-green; petals slightly undulate towards the base, where they are green, dotted with purple; upper half rose-purple, fringed all round with short dark hairs; lip somewhat small and blunt, yellowish-brown. Reichenbach, in describing this species, says: "Flowers of *Cypripedium hirsutis-*

num and leaves of *Phalenopsis Schillerianum*, or nearly so." Summer months. Borneo.

C. insigne.—This fine old species still maintains its place in our plant-houses, notwithstanding the numerous species and hybrids introduced during the past few years. Leaves ligulate, thick and fleshy, pale green; scape longer than the leaves; flowers large, solitary; dorsal sepal greenish-yellow; the apex white and spotted with brownish-purple; petals green, suffused with brown, dotted towards the base with purplish-brown; lip large, tawny-orange or yellow. The variety *Maulei* has a very broad dorsal sepal, the largest half of which is pure white to the apex; the basal half is spotted with purple. Cool end of the Mexican division. Its flowers are produced during winter, and last several weeks in full beauty. Nepal and Sylhet.

C. levigatum.—A fine but very slow-growing kind; the leaves are ligulate, thick and fleshy, nerveless, and bright shining green; scape double the length of the leaves, three to five-flowered; sepals large, broadly-ovate, white, the dorsal one being striped with broad lines of purplish-brown from base to apex; the coalescing lateral ones are striped with green; petals lengthened out into twisted tail-like appendages, some six inches in length and a quarter of an inch in breadth, blotched with brownish-purple towards the base on the upper edge; white or greenish-yellow, changing to chocolate, for two-thirds of their length; lip small, narrow-oblong, uniform pale yellow. Mr. Bateman, in recording the discovery of this fine species, writes thus: "Mr. John Gould Veitch found *C. levigatum* established upon the roots of the well-known *Vanda Batemanii*, to obtain which was one main object of his voyage, though he sought for it long in vain, and had almost begun to despair of ever meeting with it, when running his boat one day ashore in the bay of a small island, he was delighted and astonished to find the rocks by the coast covered with huge masses of the plant of which he was in quest." Spring and early summer. Philippine Islands.

C. Laurencianum.—This fine plant belongs to the *barbatum* group. The leaves are oblong-acuminate, dark green, splendidly tessellated with yellowish-green; the scape is sometimes two-flowered; the flowers resemble the *grandiflorum* variety of *barbatum* in some respects; the dorsal sepal is larger, white, striped from base to apex with broad purple lines; the petals are fringed round the edges with long dark hairs, with numerous wart-like spots on both margins; lip large, dull purple. Spring and early summer. Borneo.

C. Lowii.—Leaves oblong-ligulate, a foot or more long, some two inches broad, and plain dull green; scape erect, much larger than the leaves, two to five-

flowered; flowers large and showy; dorsal sepal pale green; petals long, spatulate towards the ends, where they are of a uniform purple; greenish towards the base, and marked with large blotches of purple, and fringed round the edges with short hairs; lip oblong, large and smooth, brownish-purple. Summer months. Jungles of Borneo.

C. niveum.—This is a dwarf and compact plant, and one of the most chaste and beautiful of the whole family. Leaves oblong-obtuse, and coriaceous in texture, about six inches long, dark green, streaked and tessellated with silvery-white and light green; the under side dull reddish-purple; scape usually one-flowered, but sometimes it bears two pure snowy-white flowers, upwards of three inches and a half in diameter; in some varieties the sepals and petals are freckled with purple and cinnamon dots. Spring and early summer. Tambelau Islands, Straits of Malacca.

C. Parishii.—A very distinct species, nearly allied to the very fine *C. levigatum*, although not so showy. Leaves eight to ten inches long, and upwards of two inches broad; strap-shaped, bifid at the apex, dark shiny green above, paler below; scape more than twice as long as the leaves, bearing three to eight of its long-tailed flowers: dorsal sepal somewhat ovate, acute, apple-green; petals upwards of five inches long, twisted, upper part greenish-white, blotched with purple, and ornamented on the edges with a few hairy purple warts; lower part of petals dull vinous purple, edged with green; lip long and narrow, in some instances purplish, in others greenish-purple and white. Summer months. Mountains of Moulmein.

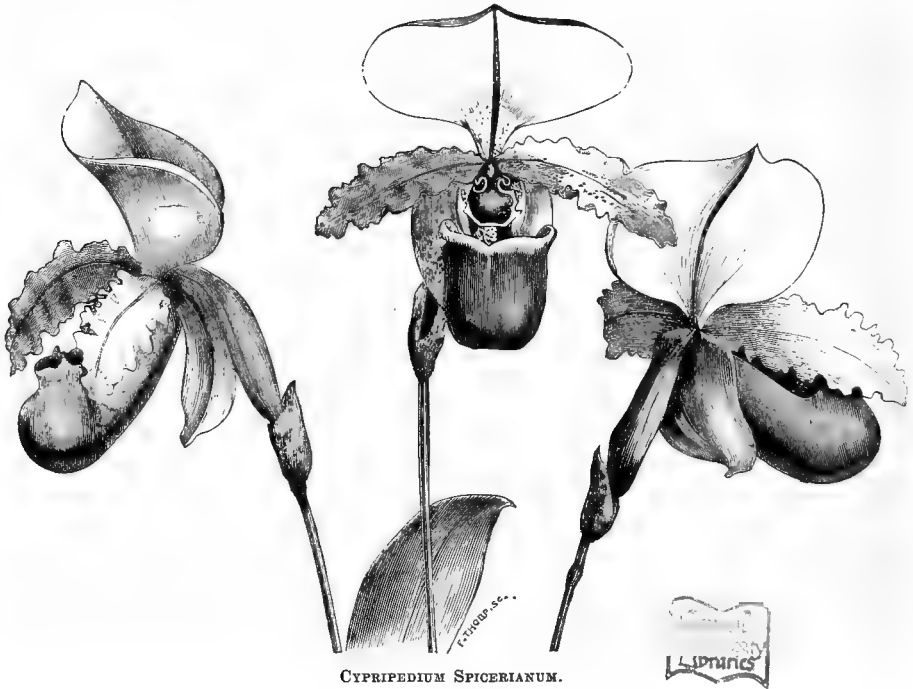
C. Roezlii.—A very strong-growing plant, belonging like *caudatum* to the *Selenipediums* of Reichenbach. The leaves are upwards of two feet long and two inches broad, ligulate-acuminate, deep green on the upper side, paler below; scape one to three feet high; it continues to grow and produce flowers for a long time, but there are seldom more than one or two flowers open at once on the same scape; sepals yellowish, suffused with rosy-purple and green; petals long and narrow, spreading; in some varieties rosy-purple, in others yellowish-green, with reddish-purple margins; lip very long, yellowish, freckled at the base with dots of red. It blooms nearly all the year round. Summer in Peruvian House; winter in Brazilian House. Andes of Choco, New Grenada.

C. Schlimii.—This pretty little species is found growing in cool wet places. Leaves eight to twelve inches long, ligulate-acute, leathery, deep green; scape many-flowered; flowers two inches in diameter; sepals ovate-obtuse, white, tinged with green; petals a little larger, pure white, stained and

spotted with crimson at the base; lip round and full, contracted at the mouth, white behind, rich rosy-crimson in front. Peruvian House. Autumn months. It grows at an elevation of 4,000 feet in Ocaña, New Grenada.

C. Schlimii, var. *albiflorum*.—This very elegant variety is an exact counterpart of the species, saving its flowers, which are pure snow-white, except the mouth of the labellum, which is ornamented with

C. pardinum.—When not in flower, this plant has much the appearance of *C. venustum*. The leaves are some six inches long, and about two inches broad, dark green, tessellated with yellowish-green above, stained with purple towards the base beneath; scape erect, longer than the leaves, two to three-flowered, seldom one-flowered; dorsal sepal large, ovate-acuminate, pure white, streaked with bright green from base to apex, every second stripe reach-



CYPRIPEDIUM SPICERIANUM.

crimson rays. Peruvian House. Autumn. New Grenada.

C. politum.—This is another hybrid raised through the skill of Mr. Warner, of Bloomfield, Chelmsford. Leaves rather large, with numerous dark green transverse marks; flowers equal to that of a good *C. argus*; sepals triangular, white, with a reddish wash; nerves green, Indian purple spot at the base; pair sepals well connate, surpassing in length the lip for a little space; lip's face blunt, copper-coloured, with green nerves in front, greenish on sides; petals broad, ciliate, totally reddish at top, the remaining part half white and half light brown; the first part towards the odd sepal, with numerous Indian purple blotches; the other one with similar blotches and green nerves. January and February. Garden hybrid.

ing only half the length; lower connate sepals smaller, but same colour; petals long and broad, standing at right angles, tapering to a point at the base; yellowish-green, dotted with purplish-black, and bearing several small, ciliated, dark brown warts on the edges; the ends bronzy-red, shaded with purple, and fringed all round with short dark hairs; lip saccate, yellowish, tinged with rose, and netted with green veins. April and May. Moulmein.

C. Sedenii.—This is a beautiful hybrid, obtained between *C. Schlimii* and *C. longifolium*. The latter species, if not identical, is a very near relative of *C. Roezlii*. It is a very handsome form, and almost a perpetual bloomer. Leaves a foot or more long, ligulate-acuminate, and bright dark green; sepals and petals greenish-white, shaded with crimson, with a few darker streaks; lip large, and much in-

flated, rich crimson, suffused with a purplish tinge. Summer months, &c. Garden hybrid.

C. selligerum.—A hybrid between *C. barbatum* and *C. lavigatum*, and is a very handsome and distinct variety. It is of robust habit, with broad ligulate leaves; these have nearly lost all the tessellations of the *barbatum* group. Scape erect, two to three-flowered; dorsal sepal white, boldly veined from base to apex with dark crimson; the coalescing lower one is white; petals much deflexed, and slightly twisted, about three inches long, white, veined with crimson, with numerous dark warty blotches, and fringed all round with long dark hairs; lip large and obtuse, vinous red. Spring and summer. Garden hybrid.

C. Stonei.—This is a superb species. The leaves are ligulate-obtuse, about a foot long, and dark shining green above, paler beneath; scape erect, as long or longer than the leaves, three-flowered; sepals ovate-acuminate, the dorsal one largest, white, stained with yellow, and streaked with purple on the outside; petals slightly deflexed, some five inches long, orange-yellow, blotched with dark purple; lip large, with a curiously-shaped pouch, ground-colour white, reddish-purple in front, with deeper-coloured veins. June and July. Sarawak in Borneo.

C. Spicerianum.—A small-growing species, not possessed of brilliant colours, but a charming addition to the family. Scape erect, flowers solitary, two to three inches in diameter; dorsal sepals pure white; petals white, tinged with green, and streaked with purple; lip deep reddish-brown. It should be placed in the cool end of the Brazilian House. Spring months. Northern India.

C. superbiens.—This species belongs to the *barbatum* group, and is the finest of that section yet introduced. In English gardens it has obtained the name of *Veitchianum*. Leaves strap-shaped, oblong-obtuse, ground-colour yellowish-green, tessellated with dark green; flowers very large, solitary; dorsal sepal ovate, tapering to a point, the lower one very small, white, with numerous bright green lines running from base to apex; petals oblong-obtuse, three inches long, white, dotted and streaked with dark purple, and fringed all round with dark hairs; lip very large, deep purple in front, passing into brown beneath. Summer months. Java.

C. vexillarium.—The result of a cross between *C. barbatum* and *C. Fairrieannum*. Leaves oblong-obtuse, ground-colour yellowish-green, chequered with dark green; scape one-flowered, the flowers being about the size of the last-named parent; dorsal sepal white, greenish at base, shaded with light purple, and streaked with darker lines; petals curved downwards, purple, slightly tinged with

green; lip large, pale brown, veined and shaded with pale green. Summer months. Garden hybrid.

C. venustum, var. *spectabile*.—This is a beautiful form of this very old acquaintance, which appears to be the first species of the genus introduced from India. The original form was rather dull-coloured, and suffered from comparison with later discoveries until it became almost obsolete. This variety has again brought the name of *venustum* to the fore. Leaves oblong-ligulate and acute, deep bluish-green, tessellated with two shades of lighter green, reddish-purple beneath; scape longer than the leaves, erect, one-flowered; dorsal sepal ovate, tapering to a point, white, suffused with pale green and striped with darker lines of the same colour; petals somewhat spatulate, white, streaked with green, and broadly tipped with carmine, sparingly spotted with deep purplish-black; lip greenish-yellow, tinged with rosy-red. This species thrives well under the same treatment as *C. insigne*. Winter months. Sylhet. Northern India.

C. villosum.—A superb species, the last we shall enumerate here, although the family contains many other beautiful forms. Leaves strap-shaped, tapering to a point, coriaceous in texture, and deep green, slightly spotted at the base with brown; scape one-flowered; flowers large and spreading, measuring about five inches in diameter; the dorsal sepal is obovate, curved forward, green, heavily stained at the base with deep purple, and veined in the upper part with netted purple lines; petals unequally spatulate, the upper half rich chestnut-brown, lower portion greenish-yellow; lip large, yellow, suffused with light brown, the whole flower having the appearance of being newly varnished. Spring and early summer. Moulmein.

THE KITCHEN GARDEN.

BY WILLIAM EARLEY.

MONTHLY CALENDAR (concluded).

June.

MAKE another and a last sowing of Broad Beans. Early in the month stick Scarlet Runner Beans, where this method of growing them is practised. On the contrary, where the market garden system is followed, keep every young shoot pinched back immediately it appears, by which means very dwarf free-fruiting rows will be assured. Make a final sowing of summer cropping or main crop Peas. The ground for them should be deep, rich, and if possible cool. Should this sowing, in the exigencies of successional sowings in order, happen to come early in the month, then it will be well to make a

final sowing of the following also about the third week in the month, viz. :—*Ne Plus Ultra*, *Day's Early Sunrise*, and *John Bull*. It is excellent practice during a dry summer to mulch late Peas. By its aid moisture is kept in the ground, and the action of the sun's rays upon the surface of the soil is neutralised, to say nothing of the assistance it affords in connection with all artificial waterings.

At no other season of the year is it so important to give free use to the hoe as during this month of June. By keeping the surface soil loose and free, the beneficial action of the dews at night is accelerated. Equally important are hoeings following all heavy rains, which level or beat down the surface of the soil and so neutralise such results. Beyond which, seedling weeds form very rapidly at such a season, following all rains, and hence hoeing has a dual or triple merit.

Where the most tender vegetables are in constant demand, it will be desirable during a showery period in the month to make again small sowings of the following:—*Early Horn Carrots*, *Turnips*, *Spinach*, *Radishes*, *Lettuces*, *Endive*, and such small salading as *Mustard*, *Cress*, *Onions*, &c., for drawing. A damp cool soil is the most desirable at this season for all kinds of salad plants.

Any temporary covering such as hand-lights placed over *Ridge Cucumbers*, *Vegetable Marrows*, &c., gradually remove; cut, dry, and harvest all kinds of herbs immediately any show signs of blooming, at which time they are ripe for the process.

Artificial waterings are very important during the month. Unfortunately, it so happens that every part of the garden calls loudly for extra attention at this particular season, hence the great assistance such artificial waterings are capable of cannot in some cases be properly rendered. I would remark, nevertheless, that should dry weather intervene, no other extra labour that could be applied would give better results than such as may be applied to this one of the artificial root-watering in season; and to hire a man, or two, for a day about twice in the month for this purpose would greatly repay the small outlay. It may be added in connection with this subject that weak manurial waterings, being so exceptionally helpful to the roots, should be applied in all instances where practicable. If but a bag of horse-droppings be placed in a tub whence the water is drawn it will afford good assistance in this respect.

Give more and more air by day to *Cucumbers*, even towards the end of the month to tilting the sashes of frames on their sides, by inserting wedges under the opposite side. Always so raise each, however, that any winds blow over and not directly into the frames. Add manurial watering to the usual root-waterings. These should be given every other day

during very hot drying weather; but only every third or fourth day when the weather is heavy and dull, though superficial sprinklings will be required daily at this date at 3.30 p.m. Take care to give root-waterings at the same hour, upon sunny days only; so that the heat of the sun's rays, subsequently boxed up by closing the lights down tightly, aid in renovating the heat lost in process of watering. To insure that a moderate warmth pervades the water used, make a point of filling all water-pots with water as soon as the general morning waterings are finished, and place them in full sun previous to the periodical waterings. Continue to look through the plants. Pinch back lateral shoots upon which embryo *Cucumbers* form, at one leaf beyond such tender fruits. Remove all tendrils wherever they form. Stop the points of strong shoots (which it is well to let grow occasionally, to insure better root-action) when they approach the outer sides of frame or proper limits, removing all aged leaves and freshening up the surface of the soil, to neutralise the formation of noxious fungoid growths, &c.

Mushroom-beds, which have been spawned five or six weeks, should have the surface covering carefully removed, giving waterings as may be necessary. Well shake up the material used as a covering, and replace it over the bed lightly, and as circumstances suggest less densely also. Collect more materials and make up successional beds out of doors, for cropping during September onwards. Such materials will dry well spread out in the sun during dry weather, and prove better than such as are prepared by process of fermentation. It is important that the droppings be such as are formed by horses fed upon dry food, and not from such as are pasturing, as many horses are at this season. Take care to remove all vegetable crops immediately they have ceased to be young and useful, especially of the *Brassica* tribe, *Spinach*, &c. To permit these to stand upon the ground but a few days subsequently, is to greatly and needlessly rob the ground of its best constituents.

July.

Even during the month known as arid July, cropping must be continued by all who would have vegetables subsequently "in season." As spring-sown crops come into bearing and exhaust themselves, they must in rapid succession be uprooted, the ground "repaired," and other crops made to take their place, as by a wizard's hand. Too much attention cannot therefore be given to the immediate digging up of all ground, when crops thereon become exhausted. It is highly desirable likewise to add manure to all such ground as is dug up at this season. Following former crops it is generally very dry, and unless heavy rains fall it will continue so.

By giving it a dressing of manure, the manure will, by the very moisture it contains, give latent moisture to the ground below which it could not otherwise possess at such a period and under such conditions. It is a practice (greatly wronged in the omission) very desirable to trundle a wooden roller over quarters so dug up, immediately after dug. Crops of all kinds, transposed to soil so treated, succeed far better at such a season. Judgment and discrimination must be used in connection both with sowing seeds and transplanting winter vegetables. It is always desirable to do both as near to a rainy period as possible, and towards the latter part of each day. Take care not to put plants of the Brassica tribes too deeply into the ground. Just the root-fibres alone should be placed in the ground, and the soil pressed very firmly over them. A watering given to the roots of each will greatly aid in making the soil firm around them, which, aided by the moisture, will cause quick root-action.

Take up, harvest, or store away Shallots, Garlic, and early bulbed Onions. Cut down old stalks of Globe Artichokes immediately the last head is removed from each; also flower-stalks upon Rhubarb and Sea-kale, as frequently as they are seen to push up. Take care to keep crops of Scarlet Runner Beans, Vegetable Marrows, Cucumbers, Peas, &c., picked immediately any are ready for use. If left upon the plants they become old, and keep even better in several instances when picked than when exposed to the sun's rays upon the plants, doing the parent plants at the same time an incalculable amount of injury in regard to their capacity for giving an intermittent succession of crops. The hoe must be used throughout all crops once or twice during the month. See that the necessary quantities of Brussels Sprouts, Kale, Broccolis, Collards or Coleworts, Cauliflowers, &c., are completely planted out before the end of the month. A successional transplanting of Broccoli and Cauliflower plants gives also successional supplies in due season, which is an important fact to bear in mind.

Make sowings of Cabbage for autumn planting, and small sowings of Lettuces, Endive, Turnips, and Spinach. Asparagus-beds are during the month in active growth; and at no time can greater aid be given to the plants in view of forming fine produce the following spring than by giving good manurial waterings at this particular season. Dig up and store away early Myatt Potatoes, planting a few rows of the tubers after having first exposed them to the sun for a few days upon a warm sunny border, in view of securing a few early tubers towards the month of November.

Dig out Celery trenches, manure them liberally, and transplant Celery therein in successional batches,

according to the quantities necessary for supply; give thorough soakings of water, and should the weather be very hot and dry, it will be well to lay a few green-leaved tree-branches across the trenches. Attend to ridge Cucumbers and Vegetable Marrows. Stop the points of all strong-growing shoots, to induce laterals bearing fruits to form; watering, &c., as needful. Nail up Tomatoes, Capsicums, &c., growing against walls, keeping them also well supplied with root-waterings.

Winter or very early-planted Cucumbers will show signs of exhaustion. If the plants are healthy, cut them well back; add a layer of fresh soil over the roots, and induce a quick young growth. By these means the whole will be resuscitated, and other good fruit crops will follow. Sow seeds of desirable kinds of Cucumbers, to grow into plants for the renewal of such as are house-grown, and which it is well to get planted out and established before dull November weather too nearly approaches. Cut down all superfluous growth on herbs, such as the seedy stalks upon Tarragon, Fennel, Marjoram, Sage, Angelica, Mint, &c., where any still remains from the herb-collecting and drying process of the latter part of the month of June. By this means young shoots of merit will be formed in time to stand for winter.

August.

It is important that all who desire to secure good beds of winter Spinach should prepare the ground during the first week in the month. Seeds of the prickly or hardier kind should be sown between the 10th and 12th of the month. As early in the month as convenient, prepare also a nice bed whereon to sow French or Short Horn Carrots, from which a nice supply of young produce can be secured for early winter uses. An open, sunny aspect, and free sandy soil should be chosen for the purpose.

Mould up all kinds of winter greens, &c. During the second week sow the main crop of Cabbages, including Red, for pickling, to plant out in the autumn for the early spring supplies. Make also two distinct sowings of Cauliflower for a similar purpose on the 8th and 13th of the month. The result will be a batch of young plants, for transplanting into frames, or under hand-lights, in the usual way. Finish planting out Leeks, earthing the earlier ones up as they proceed in growth. Make main sowings of winter Lettuces, especially black-seeded Brown Cos and hardy Cabbage. Where Lisbon Onions were not sown as advised last month, make a sowing early in the present. Batavian and Curled Endive, Turnip Radishes, &c., sow also as required. Finish planting out Celery as soon as possible, ground being at liberty for the purpose. Go over the earlier row of Celery, remove all small useless leaves from each plant, and

carefully take off all minor side-shoots or suckers from each, hoe the soil on each side of the row, and chop down a little soil from the sides of the trenches as a preliminary to earthing up. If the earliest row is sufficiently advanced to permit of this being done about the first week, a second earthing up may be made during the third or fourth week.

Transplant towards the middle and end of the month seedling Lettuces and Endive on to any open space and rich soil. The result will be fine large plants for late autumn use, and for transplanting in frames, &c.

Where the main Onion crop does not ripen off evenly, sundry large strong-necked ones existing amongst them, go over the bed, and bend the necks of such down, a practice which hastens the bulbing process. So soon as such green stalks contract, and show a ripened aspect, pull the crop up, laying the bulbs bottom upwards in rows to hasten the further ripening process. Give the needful attention to Tomatoes, Cucumbers, &c., well deluging all with water as necessary. Pot off seedling Cucumber plants grown on for winter work. Well hoe all ground requiring such attention.

September.

Prepare ground whereon to plant the main bed of spring Cabbages. Upon light ground the old Onion-bed, especially if well manured and prepared for such, will prove an excellent place whereon to plant them. On the contrary, wherever the ground is of a heavy, tenacious nature, it will be desirable to manure and dig up a proper space for them, whereon to plant to the necessary extent so soon as the young seedling plants are large enough for the purpose. The Spinach sown as advised will require thinning out; the better this is done, so will the young plants gain strength for withstanding the frosts, &c., of winter. Thin all out to six inches apart, well hoeing the ground during the operation.

Take up Potato crops immediately the haulm shows signs of ripening, and should disease show upon any, either cut the haulm down and remove it to a distance, or forthwith dig up the crop. In digging the crop up thus early, however, it is needful to at once remove the tubers to a cool, close, dark shed, or to clamp them at once in the open ground. The latter is preferable. Care must be taken, however, not to place too large a bulk together, otherwise they are likely to ferment and receive great injury. In any case, it is desirable to dig up this crop as soon as possible. The practice of leaving it in the ground after the haulm has died down, too certainly causes undue loss or waste.

Proceed with earthing up Celery. The process requires to be done by degrees, at intervals of about a

fortnight. Chop a quantity of soil down from the sides of the trenches each time, break it up finely, place it against the plants, and whilst each plant is held bodily in one hand, with the leaves naturally closed together, and their stalks straight, draw the soil with a trowel up around and between each. During dry weather a final watering should be given before the second earthing up.

Towards the end of the month take up and store Beet-root and Carrots. Dig up each root carefully, so as not to break them; twist the leaves off the former, and cut them off the latter, storing them away conveniently for winter use. A cool, somewhat damp place suits both. Carrots will keep fresh and well clamped in the open ground, in the same way as Potatoes are clamped.

Mildew often attacks late Peas early in the month. A fine dusting with flowers of sulphur is a good antidote. The Onion crop should be ripening quickly during dry weather. Turn the bulbs over occasionally with a wooden rake, until the green stalks have become brown and dry, and then harvest; in doing which remove as much of the decayed stalk as can be detached from each in process of picking them up and transferring them to baskets, for transmission to dry shelves in sheds, &c. All stiff, seedy-stalked ones should be removed from the general crop, to be stored away. A dry, cool place is most suitable to them.

Continue to transplant Lettuces and Endive, as the successional seedling plants upon seed-beds become large enough for this purpose, tying up a few for early uses as required. Prick out Cauliflower plants when large enough on to an open sunny aspect, where they can advance in sturdy growth, preparatory to placing them in their more permanent winter quarters.

Sow small beds of Lettuce, Endive, Radishes, Cauliflower, and any similar subject, to produce a few late plants or crops, which, as "catch crops," often come in very handy when hard winter weather, &c., tax or injure the more permanent ones. Well thin out the late Turnip crop, hoeing deeply and well between it. Mould up the young Cabbage plantation so soon as active growth is seen to commence, first making up any vacancies that occur, and deeply hoeing between the rows. Continue to gather all produce immediately it is fit for table, whether really wanted for use or not. Any neglect in regard to this must be avoided.

Remove all growing shoots from Tomatoes as they continue to form, placing a large slate immediately over the roots of each to keep off rains, a simple practice which is conducive to the more immediate ripening of the fruits.

Clear old Cucumber plants in an exhausted state

out of Cucumber-houses. Remove the soil, and thoroughly cleanse the structure, washing and whitewashing as necessary. Then re-lay the drainage base; cart in new soil, consisting of decomposed turfy loam and thoroughly decomposed and sweetened manure. Re-plant with the young Cucumber plants, as prepared on former suggestions. Cucumbers so planted now should be grown on robustly with a liberal supply of air and moisture, to insure a good basis for the ultimate winter cropping. Late Cucumbers in frames will require periodical manipulation, or picking and cutting over, watering, &c., on the principle previously explained. During the month it will be needful also to renovate the linings. Remove the old, add fresh stable litter, well moistening with clear water such parts as are dry, shaking both old and new materials well up together in the process of renewing such linings. By doing half the linings at one time, and the other half subsequently, heat will be gradually increased.

October.

The work of harvesting crops delayed from last month should be pushed rapidly along. Sharp frosts occasionally occur early in the month, even though immunity from such occurs for some weeks subsequently. In like manner transplantings of all kinds from seed-beds must be hurried forward, and completed. Successional plantations from successional sown Lettuce, Endive, Cabbage, and other beds, made in due manner, will prove an admirable safeguard against the exigencies of winter. Invariably a percentage of all such young seedling plants are lost, and it is often only by making successional sowings that the progeny in some shape or other is conserved in ample numbers for the demand. Thus, early-sown seedlings give early and good results following mild winters; whilst, on the other hand, a severe winter often destroys such forward crops; when happily foresight and provision, in the shape of late sowings, steps in to fill up the gap.

Clear away the surface old growths from Asparagus, Sea-kale, Rhubarb, Artichokes, &c. Manure each, after having well hoed between the stools if necessary, and fork up the soil between them later on. A little soil may be taken out of the alleys between Asparagus and laid over the dressing of manure placed upon them. This will tend to make the trenches somewhat lower, and to give better drainage to the beds during seasons of heavy rain. New plantations of Rhubarb and Horse-radish may be made during the month.

Early in the month collect the necessary materials for indoor or winter-bearing Mushroom-beds. As it is always desirable to procure such materials as are dry, it will be well to shake them out of existing

fresh stable manure repositories, that have lain dry, and during a dry period. Mushroom-houses should be thoroughly cleansed, whitewashed, &c., and the flues or heating medium in connection placed in good order, in preparation.

Finish earthing up all Celery. The earliest, or such as is to come into use next in succession, should, besides being earthed up to the necessary extent, have the soil at the apices of the mounds drawn tightly together around the tops of the leaves in such manner as to exclude the air. By this means alone is good blanched Celery secured. Later crops are best left open at this time, as it is better not to unduly blanch the whole growth too long a time before required for use.

Remove all old crops from the ground. Burn all accumulation of such and other rubbish. Turn over manure-heaps, carting on to vacant spaces such materials as are ready for transferring to the ground, and as early as possible dig up all vacant ground, placing the soil in ridges for the freer ingress of frosts, &c., which proves so beneficial to all cultivated soils, those of old gardens more especially.

At this season sundry dead or decaying leaves exist upon plantations of Brussels Sprouts, Broccoli, &c., which it will be desirable to remove. By so doing the plantations receive more fresh air, and are kept drier during the winter season, facts which conduce to improved prolificacy. Remove unripe Tomatoes from the open ground on to a dry shelf, where they will ripen in due season.

Plant Cauliflower plants into frames, or under hand-glasses. Do this moderately thickly, in such manner that they can be wintered therein, and be eventually thinned out or transplanted wholly on to rich ground next spring.

Strong-grown Broccoli, especially such as exists upon cold, stiff, and low-lying grounds, you must "lay" with their heads towards the north. This "heeling over" is readily performed by a handy man, with very little injury to the roots.

Give another hoeing amongst all young crops, drawing the soil up around such as need it; thinning out late Spinach, Turnips, &c.; and give the necessary attention to walks in the matter of sweeping, rolling, &c. If at this season the fallen tree-leaves, and, so to speak, the *débris* from Nature's autumn, be not kept constantly swept up and cleared away, the walks will quickly become so foul as to require double the amount of work thus originally required, to bring them back into comfortable or presentable appearance and usefulness.

November.

Speculative sowings of Peas may be made during the month, and as near to the tenth as may be con-

venient. Choose a warm sunny border for the purpose, and where the soil is naturally dry and light. It should not be unduly manured. William I. and improved forms of Dilliston's Early, &c., may be sown. A border at the foot of a south-aspect wall will be the most suitable place for this purpose. Whilst in cold northern parts of the country these early sowings require much care to bring them forward successfully, nevertheless, more south, &c., there need be little difficulty with them. Broad Beans may in like manner be sown across any exposed open quarter of the garden. Care will be necessary to protect both from a variety of enemies, which prey upon the seeds and the tender plants of each subsequently when above ground, to which extended reference need not here be made.

Watch the weather, and transpose successional batches of Lettuces and Endive from the open ground to frames, as former crops are being used, and room is thus made for them. Give air to such frames, as a deterrent of decay alone, should such exist; the produce will grow as well, and be crisper, when kept in airless frames, when no such symptoms of decay occur. It is desirable always to tread the ground firmly between such plants when lifted from the open ground, with balls of earth attached as they should be, and transplanted therein.

Look occasionally into the hearts of Walcheren and Snow's Broccolis and Veitch's Cauliflower, to ascertain whether any are showing symptoms of flowering; taking care to well bend the leaves over the centres where signs of such occur, and pull any plants bodily where the flowers are moderately advanced, putting them into a cool place beyond reach of frost until required for use.

Take advantage of the first hard ground-frost to wheel manure on to all vacant spaces, and subsequently proceed with the work of digging and trenching with expedition. The chief object should be to have all vacant spaces, whereon crops do not exist, turned up as early as possible, so that it may receive the full benefits of long and free exposure. In turning it up, do not chop it to pieces, but let each spittle lie as roughly as possible. Subsequent frost, air, &c., will thoroughly desiccate the lumps, and level all in superior mellowness. Additions of fresh soil, &c., may well be made to any parts of the kitchen garden at this season: fences, ditches, drainage, and so on, attended to, walks turned, Box edgings re-planted, and all similar work performed, at this less busy period of the year.

Look over stores of Potatoes, Onions, and all other root-crops, removing all signs of decay, and sorting to suit future intentions in regard to each. Make up the Mushroom-beds, and collect materials for successional beds as necessary.

Where forced vegetables are required early, or as near to Christmas and the new year as possible, it will be necessary to commence forcing such during the month of November. Sea-kale and Rhubarb forced under fermenting materials out of doors, should have such fermenting materials collected and placed over the stools or crowns about the middle of the month. First, however, look over the stools, remove all litter from around the crowns, especially any form of decay, and place a small heap of cinder-ashes over each. Upon it place the forcing-pots and their covers. The fermenting materials will be best if placed in a heap and permitted to ferment before they are neatly packed over a given space, or number of such stools. By this means heat will be quicker and more uniform. See that the pots fit down tightly on the ground, and that the lids are tight, &c., else the excessive steam in association with great heat may injure and rot the crowns before they commence to move. Do not omit to place test-sticks in this material, and to examine them frequently to ascertain whether the heat is ample, or fluctuations of too great extent occur. Roots of Sea-kale, and of Rhubarb, may also be carefully dug up and placed in heat, for a like purpose. Both air and light must be scrupulously excluded from the former, to insure perfect whiteness.

Chicory and Dandelion roots should be placed in warm Mushroom-houses, to force a growth for salading. Such houses should be kept dark, and air should be excluded from them, or they will not be properly blanched for use.

December.

In connection with the ground work, such as digging, trenching, &c., it is often convenient to renew or enlarge plantations of Rhubarb, Sea-kale, &c. For instance, the old bed-space of these and of Horse-radish can often at this period of the year be better trenched and prepared for such than during other more busy seasons. As concerns the Sea-kale and Horse-radish, the old growth may be severally and variously utilised. The roots of Sea-kale so taken up should have the crown portions cut into lengths fit for present forcing, or to be re-dibbled into the ground, on the principles advised under the head of its general culture. All lesser roots may be cut into three-inch lengths, and buried up to the upper apices in rows, in a convenient place for forming young plants for the future. The larger base of each stool of Horse-radish, store for use, cutting off crowns also with short lengths of root-base for planting in the proper way. Divide Rhubarb if the stools have more than three crowns each. Take care to elevate all such dormant subjects somewhat, when re-planting them at such a

season, on newly-worked ground. Otherwise next spring, when growth should be in progress, they will be found to have become unduly buried in the soil, and deep planting is always adverse to nature's teachings and proper progress in the matter of excellence of growth and produce. In favourable localities, sowings of Peas and Broad Beans may be made during a mild period, both in instances where November sowings were honoured in the observance and otherwise.

Should late rows of Celery require more earth added to the mounds, take care to do so during dry weather. As one row of Celery is used up, give attention to the closing of the soil around the apices of the leaves of succeeding ones, in such manner as to deter the air from entering, to insure perfect blanching of the produce. This simple operation should be done generally about three weeks before each row is actually required for use. During very severe weather, it is well to place a layer of light litter, such as Bracken Fern or light straw, along the sides and over the foliage of each row. Without such a slight protection severe frosts often penetrate down to the crop, and injure if not destroy it.

Even during this month, should a fine dry period exist, it will be excellent practice to lightly hoe amongst beds of Spinach, Lettuce, Endive, Parsley, &c. The very process of stirring the soil proves an incentive to enduring plant-vigour. Take up, pot, and place roots of Mint and Tarragon in heat. Make sowings of dwarf French Beans, sow small saladings; place light coverings of straw litter, or straw hurdles, &c., over young Radishes. Take up Parsnips, Horse-radish, &c., when severe frosts are anticipated. Extend and renew the fermenting materials upon Rhubarb and Sea-kale, or take up more stools and place in position for forcing, so as to insure constant supplies.

Give attention weekly to Snow's, Walcheren, and similar tender crops hearting in. Spawn Mushroom beds, making up others to follow, and collect materials for further successions. Look through frames of Lettuces and Endives. Renew the bed, as it becomes exhausted from the largest plants, taken up carefully from the contingent still without-doors.

Following any decided change in the weather, especially if it be a severe frost, the general out-door crops will need looking through, for the removal of dead plants or decaying leaves. Make up vacancies in the autumn-planted Cabbage-beds. Place protection over Cauliflowers in frames, &c., should very severe weather exist. Keep Spinach picked, an operation which benefits the plants when properly performed, the larger and more succulent leaves only being carefully removed. Again look over all vegetable stores; sort Potatoes, placing those intended

for seeds, or "sets," in a cool airy place, and as thinly together as possible.

Carefully give air to house-grown Cucumbers, on all favourable occasions. Keep up a good heat of about 75° by day with 10° less by night, and a nice atmospheric moisture to counteract its drying influences. Should mildew appear upon the leaves, slightly dust with flowers of sulphur; give careful attention to deep root-watering, in accordance with the system of artificial bottom heat employed.

Finally, push forward all ground work; but do not wheel and tread upon ground during very wet weather; choose moderately dry weather for all such work. There is a *proper time and condition* for even trivial operations, and soil once puddled into semi-mud is ruined, or injured, for at least a whole season.

GREEN-HOUSE PLANTS.

BY WILLIAM HUGH GOWER.

Myrsiphyllum (*M. asparagoides*) is an elegant scandent plant belonging to the Lilyworts, and nearly allied to the genus *Asparagus*, of which there are several very beautiful species now introduced; but as they require more heat than is afforded by an ordinary green-house, they must be left for the stove-plant section. The present plant even likes a little extra comfort in winter, so that it will be advisable to place it in a snug corner. It is a slender-growing plant, with much-branched zigzag branches; the so-called leaves, which are in reality modified branches, and assume the appearance of leaves, are ovate-lanceolate, and taper to a point, bright green above, paler below; the flowers are small, but produced very freely, purest white, and very fragrant. The branches of *Myrsiphyllum* are admirably adapted for dinner-table decoration, or, when in bloom, for the embellishment of a lady's hair, whilst as a rafter plant it has few equals. There is a variety called *M. angustifolium*, but it is scarcely any different; another plant, named *M. falcatum*, does appear somewhat distinct, especially in its blooms.

It flowers all through the winter months, and seems to be widely scattered about Africa round the Cape of Good Hope.

Myrtus.—The Myrtle has always been popular with gardeners and amateur plant-growers; indeed, the "old lady" population of these realms have always had a peculiar *penchant* for a Myrtle-bush in the window. Ropart says they were first cultivated in the gardens of Sir Francis Carew, at Beddington, in Surrey.

The order *Myrtaceæ* is a large one, and contains

many plants of great beauty, and not a few highly beautiful, the whole of the plant is poisonous to man; valuable from an economic and commercial point of view.

The species and varieties of Myrtle in cultivation are not numerous. *M. communis*, which is generally considered a native of the South of Europe, is not really so; and though now so abundant throughout Spain, Italy, and the South of France, it has been at some remote period brought into these countries from Persia. It is a plant with shining bright green leaves, which, as well as its pure white flowers, are very fragrant. Then we have the Double-flowered Myrtle, *M. communis* *f. pl.*, the Box-leaved, the Orange-leaved, and the Rosemary-leaved Myrtle, and a very small-leaved kind called Jenny Reichenbach, which is grown chiefly for forming ground-work to bouquets and mixing with cut flowers.

The cultivation of Myrtles is very simple; they thrive well in a mixture of two parts light sandy loam to one of leaf-mould, and will grow in almost any place. Their pretty white flowers are produced naturally during the spring and summer months, but if required in winter the plants should be placed in heat some time in autumn.

Nerium.—These plants are better known by the name of Oleander; the species is a native of the Levant, and is recorded, with the Orange and Myrtle, to be among the oldest greenhouse plants cultivated in this country, and long naturalised in the South of Europe. Although so very



MYRSIPHYLLUM.



NERIUM OLEANDER.

notwithstanding this, however, the splendid larva of the Oleander Sphinx Moth (*Charocampa nerii*) thrives well upon its poisonous leaves.

These plants should be propagated from cuttings in spring, and, when rooted, potted singly in small pots; keep them growing freely, and well supplied with water, and re-pot when necessary; these cuttings will flower the same season. After flowering cut them back a short distance, and place them in a little heat to induce a short growth before winter; in spring re-pot if necessary, and encourage free growth by keeping them well supplied with water. This process must be repeated each season. For soil use loam, peat, leaf-mould, and well-decomposed manure, in equal parts.

Nerium Oleander, and its variety *splendens*, have large double rose-coloured flowers borne upon many-branched panicles, which last a long time in full beauty, and are deliciously fragrant. There is also a variety called *album*, with pure white flowers. It sometimes happens that young shoots start out from the base of the flower-stem, which, if allowed to grow, will entirely spoil the bloom—they must, therefore, be pinched or cut out as soon as seen.

Passiflora.—This genus consists of grand climbing plants, that are the glory of the tropical and sub-tropical forests of the New World, a few species only being found in Asia and Africa. They are popularly known as "Passion-flowers," from a

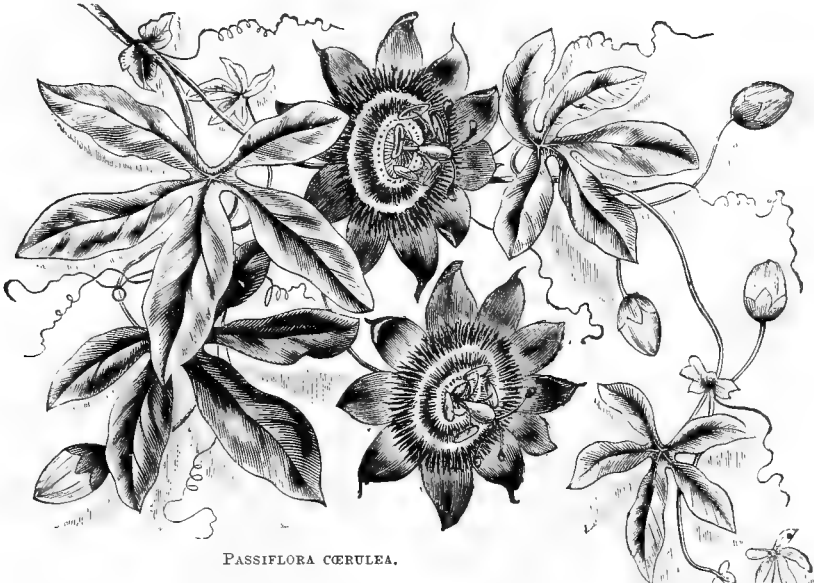
fancied resemblance which the early Christian travellers imagined, in their joy at the discovery of these gorgeous plants, to the instruments used at the Crucifixion of our Lord. Thus the stigma is said to represent the nails, two for the hands and one for the feet; the five anthers represent the five wounds, the rays of the corona represent the crown of thorns, the ten rays of the perianth represent the ten Apostles, this number only being present, as Judas had betrayed his Master, and Peter had denied Him, so that both were absent; whilst the

It blooms during the whole of the summer season. Brazil.

P. cœrulea racemosa.—A free-growing but not rampant variety, obtained many years ago by cross-breeding; the flowers are reddish-purple, and bloom in profusion all through the summer and autumn months.

P. Bellotti.—Of moderately free growth, this garden hybrid produces its pink and white flowers all through the summer months.

P. Hartwegiana.—This is well adapted for small



PASSIFLORA CÆRULEA.

eager hands of His cruel persecutors are represented by the five-lobed leaves, which bear the tendrils, representing the scourges.

Passifloras, from a horticultural point of view, take rank amongst the most desirable of climbers; the great majority require stove-heat, but those given here are admirably adapted for green-house or conservatory.

There is very little trouble in the cultivation of Passifloras. If potted or planted out, which is better, in equal parts of peat, leaf-mould, loam, and sand, they will make vigorous growth, and bloom profusely. The various species of Passifloras have more or less digitate leaves, and it will not be necessary to describe anything but the colours of the flowers.

P. cœrulea.—In many parts of the country this is perfectly hardy, but in places where it will not live in the open air it makes a fine green-house plant, a profuse bloomer; flowers white and blue.

houses; flowers white and blue.

P. Impératrice Eugénie.—One of the very best for green-houses of moderate dimensions; flowers large, rosy-pink and white.

P. onychina.—A free grower and also a profuse bloomer; the flowers are of a light purple colour. Buenos Ayres.

Pentapterygium.—According to some authors, the plants comprised in this genus have been needlessly separated from *Vaccinium*; they are extremely beautiful, and require the same treatment as *Cerastema*.

P. flavum.—A shrubby plant with alternate deep green leaves, which are broadly-lanceolate, tapering

to a point, and sparingly toothed at the edges; flowers in short racemes near the tops of the shoots, drooping, flowers numerous, tubular, with prominent ribs, rich yellow, a colour rarely found in this order of plants. North-eastern India; 400 to 500 feet elevation.

P. rugosum.—A somewhat lax-growing shrub, forming a thick, gouty stem, and growing naturally upon the branches of the large forest trees; leaves broadly-lanceolate, tapering to a point, and toothed at the edges; these, when young, are tinged with reddish-purple, becoming deep green with age; flowers drooping, on long foot-stalks; tubes sharply five-angled, shining white, transversely banded with lines of cinnamon, and tipped with green; calyx large, blood-red; spring and early summer. Northern India.

Phænocoma.—A showy member of the *Assteraceæ*, known also as *Helichrysum*, from which genus, however, it differs in the arrangement of the florets. For culture, see *Aphelaxis*, to which it is nearly allied.

P. prolifera.—The only species; has curious small granular leaves, which are densely set on the woolly stems; the flower-heads are terminal and very showy; the texture is dry and chaffy; colour reddish-crimson. Spring and summer months. Cape of Good Hope.

P. prolifera Barnesii is similar in habit of growth to the species; but the flowers are of a uniform rich deep crimson. Summer and autumn months. Of garden origin.

Phormium.—The one species in this genus of *Liliaceæ* is popularly known as the New Zealand Flax; it contains a great quantity of very strong fibre, which the natives prepare and make articles of clothing from, &c.; but there is some peculiarity about it which prevents it coming into the European market.

Phormium is an extremely ornamental plant, and quickly attains a large size; pot in rich loam, and increase by division.

It is found only in New Zealand and Norfolk Island.

P. tenax.—Leaves erect, five to six feet or more long; ensiform; arranged in a two-ranked (distichous) manner; sheathing at the base, and deep shining green in colour.

This plant is quite hardy in many parts of the kingdom; forms a noble ornament in the conservatory, and is very effective in the open air during summer.

P. tenax Colensoi variegatum.—This is a highly ornamental plant; less robust than the type, and consequently better adapted for green-houses of smaller dimensions; the habit is more erect; leaves bright green, with a broad white marginal band.

P. tenax variegatum.—Similar in size and habit to the type; leaves dark green, with longitudinal bands of rich yellowish-white.

P. tenax atropurpureum.—A small-growing form, the leaves being of a beautiful deep reddish-purple colour throughout.

P. tenax Veitchii variegatum.—In habit somewhat resembling *P. Colensoi*; but the leaves, instead of being bordered with white, are striped with bright golden-yellow.

There are numerous other varieties. All are beautiful, and all have some distinctive character.



PHORMIUM TENAX.

Pimelea.—A large family of slender-growing, handsome shrubs, belonging to the order *Thymelaceæ*. When well grown they are unequalled for public exhibition, and are equally valuable as home decorators.

In potting, use a mixture of two parts peat, one part light loam, and a fair proportion of sharp sand; they require great care in watering, just keeping them in the happy medium between wet and dry during the growing season; shade from the strong sunshine, and during the latter part of summer place them in a cool frame, where they may obtain a free circulation of air and shelter from heavy rains. A watchful eye must be kept upon them during winter, to keep mildew or damp from injuring their foliage.

Pimeleas are natives of Australia and New Zealand.

P. decussata.—Leaves opposite and set crossways (decussate); dark green on the upper side, paler

below; flowers arranged in dense terminal heads; bright pink. Early summer months.

P. diosmaefolia.—A larger-growing plant than the preceding, which it otherwise resembles; terminal heads of flowers large; clear rose-colour. Summer.

P. elegans.—A fine showy plant, with broad, somewhat ovate leaves; heads of bloom large and dense; flowers pale straw-colour. Spring months.

P. Hendersonii.—An erect species, with slender branches and bright green leaves, and an abundant bloomer; flowers rich pink. Early summer months.

P. hispida.—A small-growing plant, with linear oblong-lanceolate leaves, and bluish-white heads of flowers. Spring months.

P. limifolia.—Leaves linear, dark green; heads of flowers white. Summer months.

P. Neippergiana.—A compact-habited plant, with densely-set dark green leaves, and large heads of snow-white flowers. Spring and early summer.

P. rosea.—A small plant of close habit; leaves linear-lanceolate, heads of flowers deep rosy-pink. Spring and early summer.

P. spectabilis.—One of the strongest-growing species; leaves linear-lanceolate, pale green; heads very large, downy, snow-white. May and June.

P. spectabilis rosea.—Resembling type, bearing large heads of downy rosy-purple flowers. May and June.

Plumbago.—Fast-growing plants, some of which are very handsome; and amongst them are some peculiar species, or rather, the properties found in them are put to peculiar purposes. *P. scandens*, the *Herbe du Diable* of the island of San Domingo, is very active as a blistering agent, and is said to be used for affections of the liver, whilst *P. europea* is used by medicants of the South of Europe to produce artificial sores. *P. capensis*, if allowed to grow without any pinching back, will make very long shoots, and in this state is admirably adapted for covering pillars or training upon rafters, but if regularly attended to in the way of stopping, may be kept in bush form. The leaves are oblong, entire, thin in texture, and pale green; it produces immense quantities of large heads of flowers, which are steel-blue in colour. It flowers more or less during the whole season. Cape of Good Hope.

Polygala.—A genus of Milk-worts, which give their name to the order *Polygalaceæ*; they are pretty widely distributed, and many of them have valuable medicinal properties. The green-house kinds are all natives of the Cape of Good Hope, and form handsome specimens.

Polygalas are all plants of free growth and easy culture, and thrive best in a compost of two parts peat, one of loam, and one of sand. After the flowering season is over the knife should be applied

freely, or the plants will become straggling, and lose their bottom leaves.

P. Dalmaisiana is a vigorous grower, with purple flowers; the lower petal in all the species is keel-shaped and beautifully fringed, which gives the members of this genus a very distinctive character. May and June.

P. myrtifolia grandiflora.—Leaves smooth, oblong-acute; racemes of purple flowers, which are much larger than in the original species. Summer months.

P. oppositifolia major.—Leaves opposite, oblong-acute; flowers bright purple; an improved form of the species. May and June.

Primula sinensis.—These are among the most popular and useful of all our autumn, winter, and spring blooming greenhouse plants. There are now many improved varieties, chiefly the result of careful selection and crossing, though obviously all obtained from the original pale pink species introduced in 1820. We have now a rich variety of flower and foliage of every shade of colour, from purest white to deep crimson; and of all shapes, forms, and degrees of doubleness—fimbriated, serrated, single, semi-double, double, almost to perfect spheres. The old double white is, however, still one of the best, the readiest propagated, and easiest grown. The real double varieties can only be increased through layers or cuttings; while the single and semi-double varieties are readily raised from seed. To ensure a long succession of bloom through the early autumn and winter, successional sowings may be made from March to May. Sow in well-drained shallow pans, pots, or boxes, in a mixture of equal parts of leaf-mould, peat, and sand, and cover lightly with fine soil or sand. Cover with a square of glass to preserve moisture and protect the seeds. A temperature of about 55° is most favourable to their germination. So soon as up remove the glass, and gradually inure to light and air in frames, or on greenhouse shelf. When the plants have formed three leaves, prick off or pot singly in small pots. So soon as these are filled with roots, shift again into larger, or at once into five-inch pots, a size sufficiently large for blooming the stock of Chinese primroses. For the last shift a mixture of equal parts of peat, loam, and rotten manure, or leaf-mould, with a liberal addition of sand, is the best. Let the base of the plants rest on the soil; they must not be buried; and it is good practice to place three small stakes in a triangle round the crown to keep the plants steady, as they get top-heavy with foliage and bloom. A temperature of 50° to 55° is not only the most suitable for growth, but also for blooming, though most of the doubles—notably the old white—will bear five degrees more heat.

The so-called fern-leaved varieties (*filioifolia*) and fimbriated strains—white and red—are the most valued. Among other of the finer strains are—

Alba magnifica.
Braid's Seedling.
Chiswick Red.
Coccinea.
Improvement.

Marginata.
Meteor.
Scarlet Gem.
Swanley Giant.
White Perfection.

DOUBLES.

Candidissima.
Duke of Edinburgh.
King of Purples.
Magnifica.
Marchioness of Exeter.

Miss Eva Fish.
Peach Blossom.
Princess of Wales.
&c. &c.

The doubles are specially valuable for bouquets, wreaths, and all decorative purposes, from their lasting properties.

Psammisia.—Handsome Vaccineaceous shrubs. Treatment same as for *Ceratostema*, which see.

P. Hookeriana.—A handsome species, which has been distributed under the name of *Thibaudia pichinchensis*, var. *glabra*; the branches are angular and smooth, ovate-lanceolate, and dark green; racemes many-flowered, drooping, deep rosy-red. Summer months. From Columbia.

P. longicolla.—Leaves large, ovate-lanceolate, and tapering to a long point, thick and leathery in texture, deep green; racemes axillary, many-flowered, pendulous; flowers tubular, swollen at the base, which is deep crimson; upper part of tube much contracted and yellowish-green. South America.

P. penduliflora.—An erect evergreen plant, with long, broadly-ovate, entire leaves, which suddenly taper to a point, deep green above, paler below; racemes axillary, many-flowered, and pendulous; flowers tubular, stoutest at the base, rich vermilion, tipped with yellowish-green. Caraccas.

P. sclerophylla.—A somewhat stout-growing plant, with ovate entire leaves, which in the young state are tinged with red, changing with age to deep green; racemes axillary; flowers large, drooping; tubes swollen at the base, rich crimson, tipped with yellow and creamy-white. New Grenada.

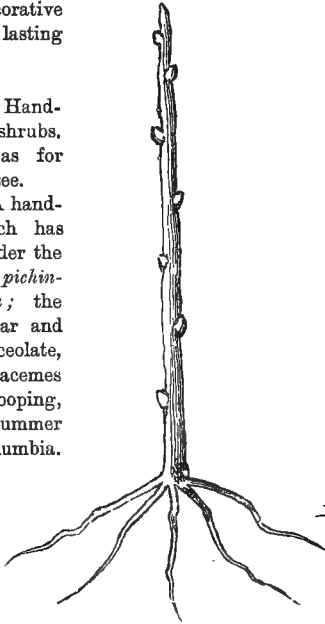


Fig. 2.—Crab Stock.

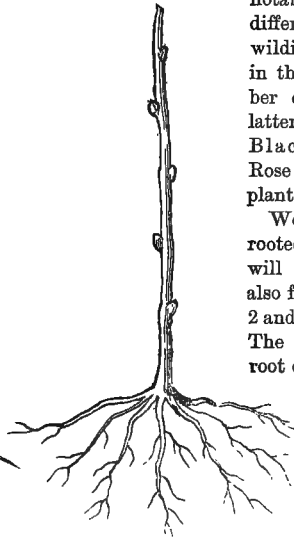


Fig. 3.—Paradise Stock.

while even the roots of Crabs may be led into fibrous forms by pruning and culture.

Root-pruning.—So important and close is the connection between a fibrous condition of root in the Apple and other fruit-trees, and dwarfing character and fertile habits of top, that root-pruning should precede top-pruning. From the time the stocks are moved from the nursery beds or rows until the Apples, after one or several removes, are planted in their final quarters in the orchard or fruit garden, the trees have perforce been subjected to a series of root-prunings.

In addition, however, to those forcible ruptures and removals, it was left for modern pomologists to discover the enormous advantages of direct and special

THE HARDY FRUIT GARDEN.

By D. T. FISH, ASSISTED BY WILLIAM CARMICHAEL.

APPLES—PRUNING AND FORMING.

THOUGH the practice of forcing Apple and other fruit-trees into form at the edge or point of the knife is giving place to the more rational one of moulding growth into shape in the making, yet all pruning and training is so closely correlated in the early life of fruit-trees, that it will be best to treat the two abreast.

Root and Top.—All the modern stocks, such as those of the Creeping Apples, Nonsuch, English and French Paradise—notably the two last—differ materially from the wilding Crab of the woods in the character and number of their roots. The latter roots more like a Blackthorn or wilding Rose than almost any other plant.

Work them upon fibrous-rooted stocks, and the roots will dwarf the tops, and also favour fertility. Figs. 2 and 3 will make this clear. The first represents the root of a crab; the second, that of the Paradise Apple stock. The Paradise and other stocks run naturally into fibrous growths; but this tendency may be further developed by treatment,

root-pruning, not only of young trees, but of others when necessary. Two tall-tales on the trees themselves indicate, with unerring certainty, alike the time and extent to which it should be carried. These are the vigour of the wood, and partial or complete sterility. A skilful use of the knife on the roots is an infallible cure for both.

To prevent the necessity of multiplying illustrations, it may be stated that by root-pruning the Crab (Fig. 2) it may be forced into a fibrous condition of root closely resembling Fig. 3. Not that the

for the healing of wounds on old roots and the development of whole hosts of new fibrous ones as sweet fine leaf-mould. However, as this is seldom within reach of amateurs and mechanics, any sweet fine soil or nourishing compost will do as a helpful stimulus to pruned roots. The roots will recover and assume a fibrous character without such aids; but these hasten the processes, and hence should be used when procurable.

Figs. 4 and 5 will illustrate and render more clear the theory and practice and effects of root-pruning.

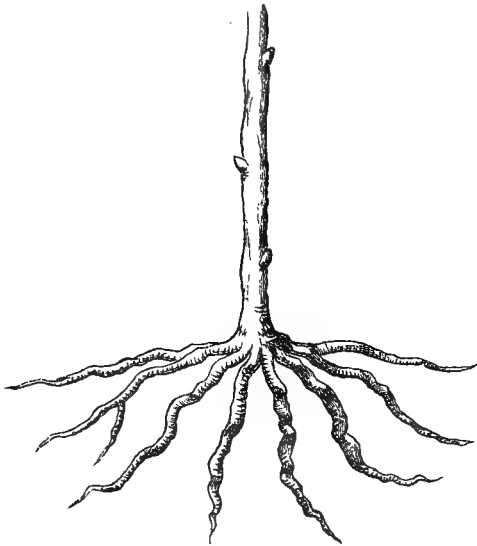


Fig. 4.—Apple Stock not pruned.

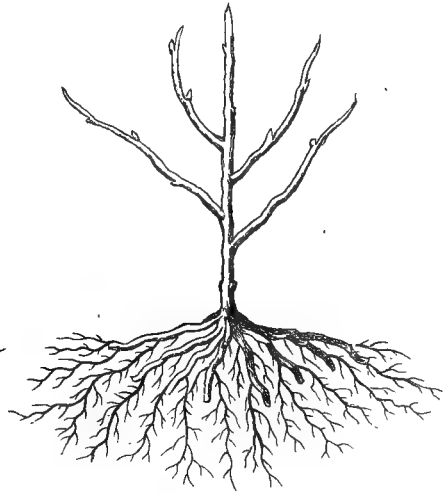


Fig. 5.—Same Stock root-pruned.

roots will be transformed from the gross fangy condition into a network of fibres all at once; but through a series of careful surgical operations on the larger fangs, or by detailed manipulations on the sub-fangs, a fibrous condition may be forced, and to a very considerable extent perpetuated. All this, too, may be aided by culture as well as by pruning: just as patients who have to submit to amputations are carefully dieted with nourishing yet suitable food, so roots may be nourished through their pruning crises, and modified in form by special culture or food. One of the most potent applications after root-forming is a slight dressing of sweet and well-rotted leaf-mould. Unfortunately the general and careless use of this root-resuscitating, root-developing compost led to its being used too fresh, rank, or sour, the consequence in many cases being the formation of most destructive root-fungus among fruit-trees; but, if of good quality and sufficiently decomposed, there is no compost so favourable

In Fig. 4 the young Apple-tree has not been pruned at all, and both roots and tops are distinguished by vigour and verticality, to coin an expressive word. Were timber and stability our aim, this is the form of tree to be desired. In Fig. 5 the roots and the branches are nearly alike numerous, and both incline to horizontal rather than vertical growth. This form, as already remarked, tends to promote fertility, and to develop that tendency to the uttermost. It is needful, however, to bear in mind that the root-pruning of Apple and other trees weakens or destroys the holdfast character of the roots. This function of the roots is of far more moment in orchards or other exposed places, than within the shelter of the fruit garden. Small trees also need it less than larger ones, while horizontal Cordon, Espalier, or wall trees, neither need nor call into action the holdfast character of roots. Taller trees, however, such as Pyramids, and large bushes on fibrous-rooted stocks, or severely root-pruned ones, must be kept firm with

stakes or other supports, to compensate them for the withdrawal of their natural supports—vertical roots—and their conversion into fibrous and horizontal ones.

It will be observed that much importance is attached to the position and direction, as well as the form and character of the roots, and this not without the best of reasons. The best food and most favourable influences for the roots of Apple and other fruit-trees are found within an average of between twelve and twenty-four inches of the surface of the ground. By so modifying the roots of fruit-trees as to force them to continue in this surface tilth, we shall give good security for their health, strength, and fertility, and hence, largely, the permanent and lasting benefit of root-pruning.

Should, however, the roots regain a vertical position, and the tops respond to them by vigorous growth and less fruit, nothing can be simpler than to uncover, examine, and if needful prune the roots afresh. This may be done all at once, or at twice, or even at three times. The root-pruning of established Apple or other fruit-trees at two operations is safest for amateurs. But the roots should be approached from east and west, and not from north and south. Approaching to the centre of the bole as here directed, about half the roots would probably be found on either side of the bole. Approach it from north and south, probably three-fourths, perhaps nine-tenths, of the roots would be found on the south side of the bole.

As to the best season to root-prune, from the end of October to the end of the year is the best time, the whole of November being the most favourable of all. Experienced pomologists, however, have root-pruned even at midsummer with positive advantage. Root-prunings, however, during the full growth of top, ought to be done tentatively, and are better left to those endowed with special skill and ripe experience. Guided by these, root-pruning might be performed at almost any season, excepting that when the sap is in full motion in the spring, and before the buds have burst into leafage. Roots pruned at that special season are prone to bleed profusely, and so impoverish the trees of vital force. The roots are also slow to heal, or to emit fresh roots, under such conditions. Practically, and excepting for experts, root-pruning had better be limited to the periods included between the last week of October and the first of January.

As to the method of root-pruning, it should be performed with as much or more painstaking care than that of the tops of trees.

The matter is simple enough in the case of transplanted trees. Transplantation itself, as already indicated, necessitates a certain amount of root-

pruning. This is mostly supplemented by the removal of all injured or misplaced roots by the knife. If the roots still need reduction, or transforming into smaller and more fibrous ones, the stronger ones should be cut through. But in the case of trees already planted, uncovering should precede pruning, though the mere fact of uncovering and detaching fixed roots from the soil, even were all the roots left intact, which is impossible, is tantamount to root-pruning.

In addition to this, however, the direct cutting back of strong roots, or reduction of superfluous ones, may be required. A keen-edged knife should be used, and the cuts should be made at a short acute angle from the bottom of the roots upwards. If one or more small fibres appear on the main root, it is wise, where practicable, to cut back to this. Clean cuts, and the roots returned to earth as quickly as possible, are among the surest aids to success in the root-pruning of the Apple or other trees. If the trees are pruned tentatively—one-half or a third at a time—the pruning may be renewed every year till finished—unless, however, the character of the top growth has been so checked and modified as to prove that the main roots have been sufficiently pruned. In that case the wise saw of letting well alone is most

appropriate, for root-pruning is not desirable in itself, only as a means to an end: and the end—moderate growth and fertility—being already reached, there is no rational motive for pushing the root-pruning further. Notes should, however, be made of these partially root-pruned trees, and should they again fall into sterile ways, the process may be renewed at the point where it was left on the former occasion.

The permanent effects of root-pruning are not only seen in less top growth and more fruit, but it also reduces top-pruning to the lowest limits. This will be readily understood.

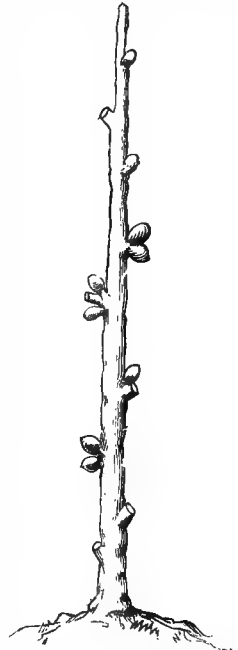


Fig. 6.—Cordon planted and left full length, showing fruit-buds plumped up in the autumn.

So much is this the case at times, that not a few fruit-trees on dwarfing stocks are hardly pruned at all. The best lot of garden Apples ever grown by the writer were from maiden plants about fifteen inches long on the French Paradise stocks. They were so finely rooted that a good many roots were also pruned off at planting. The tops were, however, left at full length, tied down, and fastened to wires fifteen inches from the ground. During the summer the tiny trees for a time seemed to have a severe struggle for life. Each bud, however, broke at last, from base to summit. During the season no extension of the leading shoots nor side shoots was formed.



Fig. 7.—Apple-shoot unstopped.

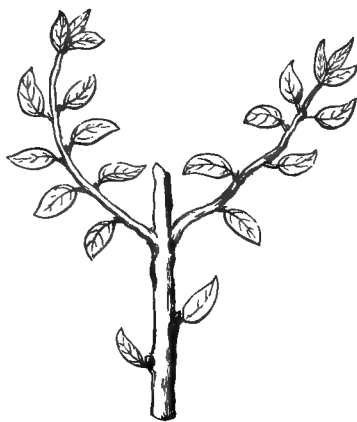


Fig. 8.—Apple-shoot stopped once.

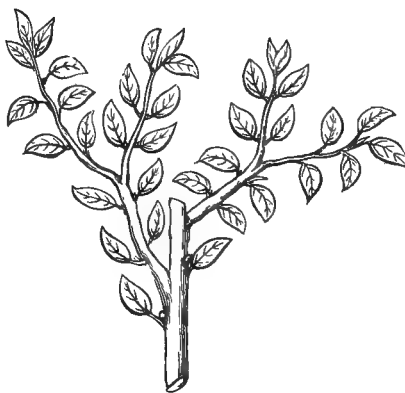


Fig. 9.—Apple-shoot stopped twice.

The few leaves produced, however, nurtured one or more fruit-buds under their axils, which were well plumped up before the leaves fell in the autumn (see Fig. 6). The following spring, those cordons thus formed were pinked over from base to extremity with blossom, in due time developing into fruit. A full crop was left, the fruit crowding one upon the other; and from that day to this, those trees have had little, several of them scarcely any pruning, and they have never missed a crop unless when the frost has blighted them. Three things combined to develop their fertility to the uttermost—the Doucin stocks, root-pruning, and the strain of the full-lengthed tops on the roots.

This extreme case is cited less as an example to be generally followed, than as an illustration of the important fact that root-pruning lessens and may even, in certain cases, abolish the necessity for top-pruning.

Summer Pinching.—It may seem almost absurd, in an article on pruning and forming, to point out the possibility of abolishing the former altogether. This, indeed, is seldom possible. Whatever system, however, can be devised to lessen its amount is likely to prove a clear gain of time and profit to the Apple-grower or general pomologist. The old system of cutting back all maiden trees very hard—that is, heading them back, as it was called—is dead or dying fast. Not only are dwarfing stocks, root-pruning, the leaving of the top full or partial length, in league to abolish it, but so is summer pinching or stopping. By these simple and prompt processes of

arresting growth and distributing force, the growth of fishing-rods for the knife, as in Fig. 7, is prevented, and two or more seasons' growths of a more fruitful, and therefore satisfactory, character are concentrated into one, as in Figs. 8 and 9.

Like most other systems, summer pinching, when first introduced, was carried to excess, and induced in many cases weakness, disease, or immaturity. But the system is good, as a whole, nevertheless. Throughout the greater part of Great Britain, the current year's shoots of Apples and Pears and other hardy fruits may be pinched back about mid-summer, and the second crop of wood from the stopped shoots be sufficiently matured before winter. In warmer and more southern positions, the shoots may be stopped twice—early in June and again in August—and the third shoot of the season yet be ripened. But it needs warm soils, sites, and localities for this. Neither is it needful. Once stopping, and the more even redistribution of force and multi-

plication of shoots which follow, are sufficient for our purpose, and lay the basis of the young tree a year sooner, and as sound and well or better than could have been done in double the time on the older system of growing wood for the knife.

Nor is the saving of time the only benefit, though that is very great. As the roots modify top growth, and to a very great extent subordinate its character to their own likeness, so do the tops of trees their roots. Hence, a branching tree of moderate extent favours, if it does not actually force, a similar style and character of roots; and thus root-pruning forms, as it were, two correlative and consecutive links in the chain

in fruit-culture, none can object to have their fruit-trees moulded into models of symmetry to please the eye, as well as examples of fertility to satisfy the palate. Apple-trees feathered down to the base of the root-stock are also far more likely to remain healthy than others that are mounted on Crab or other stilts of considerable height. Not a few of the latter, however, have lived and fruited for a century or more; and, of course, at present, experience is lacking as to the durability of dwarf or Pyramidal Apples on the Paradise or other dwarfing stocks. So important, however, has growth near to the root-stocks of Apples been considered, that

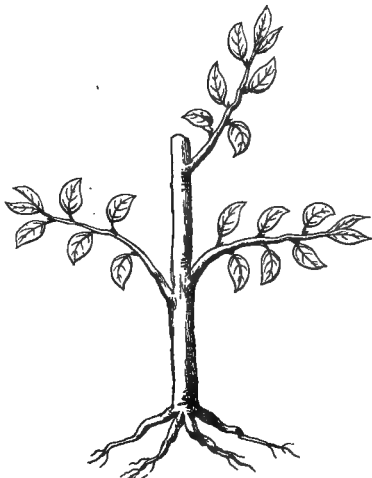


Fig. 10.—Maiden Apple-tree, first year's growth, stopped once.

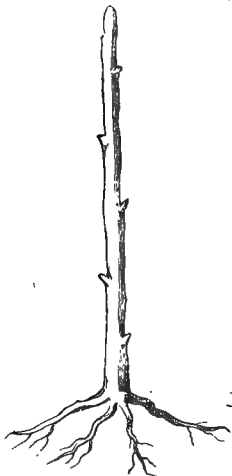


Fig. 11.—Maiden Tree un-stopped.

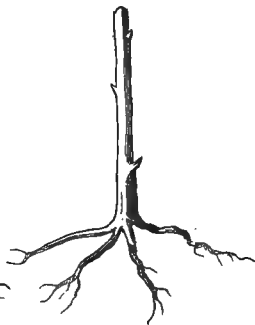


Fig. 12.—Cut back at end of first season's growth.

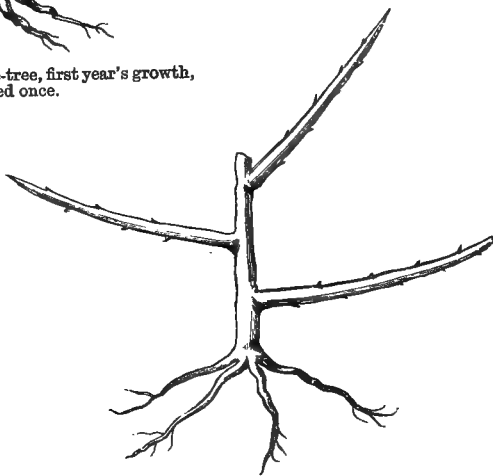


Fig. 13.—Second year's growth of Fig. 11: three shoots, with no fruit-buds.

that moulds the trees into form and forces them into fertility.

Summer pinching or stopping also promotes good form in Apple or other fruit-trees by laying the foundation of the tree near to the root-stock. This is most important in these days of the concentration of force and the husbanding of space, as it will enable the grower to reap the most produce from limited areas. This system of keeping the trees at home in the making, also results in developing great beauty of form in Apple and other fruit-trees. And though, doubtless, utility should be the main object

not seldom have wilding shoots been left on the stems of stocks to sustain vigorous growth, and insure a full flow of sap between the roots and the tops of the trees. This simple expedient of a few wilding shoots left for a time on tall standard Apple-trees, has proved the best antidote and cure for the hide-bound condition into which they frequently fall. This method of increasing the volume of sap must not, however, be carried to excess, or sterility, or starvation of the most valuable portion of the tree, is likely to ensue. But this is rather anticipating, and refers more to cultural

expedients than the pruning and training of trees into form.

Maiden Trees.—The majority of trees, as they come from nurseries, are called "maidens," and consist of one stem, varying in length from six inches to six feet. As a rule, the maidens are a yard in length. This form of tree is the starting-point for all the rich variety of form, such as Cordon, Pyramid, Bush, Espalier, Wall, Standard, and Dwarf, now so common among Apple and other fruit-trees. The maiden may be said to be the primitive foundation of all others. Until quite recently it was looked upon as a necessity. Now, however, not a few raisers and sellers of fruit-trees dispense with their one-stemmed maidens. By pinching their shoots once or twice during the summer, three or five stems may be produced of a more serviceable character. For example, instead of the maiden tree resembling Fig. 7 towards the end of the season, it may, by a single stopping, say in June, be converted into Fig. 8; or by two stoppings—one at the end of May, and another early in July—be developed in a single season into the rudimentary Bush Apple-tree (Fig. 9). Nor is this all that is gained by single or double stopping. Observe the difference of the buds on the lower and upper portion of the stems of Figs. 8 and 9. The difference of size in both cases indicates a difference of character and of function. The plump round buds on the base of these trees show them to be fruit-buds, while the whole of the buds on the unstopped maiden (Fig. 7) are wood-buds, thus showing that judicious stopping, as well as a wise selection and treatment of stock, hastens fertility as well as accelerates the formation of the tree. Fig. 10, a form mostly resulting from a single stoppage of a maiden during its first year's growth, is already on the high road to becoming a Pyramid, Espalier, or any other desired form of Apple-tree.

Contrast this with the one-stemmed maiden (Fig. 11) as received from the nursery, the same cut back in the spring (Fig. 12), and grown into three shoots in the subsequent summer (Fig. 13), and it will at once be seen that a whole year has been saved in time, and more than a year in condition. It is impossible

to exaggerate the importance of this latter difference. The trees having made one vigorous shoot, and a root or roots of similar character, will have established a tendency to produce similar growths in the future; hence its three buds will break into shoots as strong, or possibly stronger, than the first shoots formed. Consequently no fruit-buds are likely to be formed on the second nor probably on the third-year shoots. Growth and its forcible suppression by pruning may thus continue for several years. As a matter of fact and of history, it continued so long at one time that it merged into a common saying that "Men planted Pears and other fruits for their children; seldom living long enough to eat of them themselves." All this is now altered by the use of

dwarfing stocks; the reduction of pruning to the lowest possible limits, or its total abolition; and by summer pinching, or, as we prefer to call it, the moulding of growth into form and fertility in the making.

Fruit-buds.—It may be well before proceeding further to point out the broad distinction between fruit and wood-buds. No one can prune with profit



Fig. 14.—Wood-buds.



Fig. 15.—Fruit-buds.



Fig. 16.—Spur of Fruit-buds.

who has not learned to distinguish the difference. In general terms, and this applies to fruit-bearing trees of all sorts, the fruit-buds are larger and also rounder than the wood-buds. As a rule, too, they will be found towards the base of the stems of the wood of the current or the past year. Figs. 14 and 15 are pieces of two Apple-shoots, Fig. 14 clothed with wood-buds only from base to summit, and the other (Fig. 15) with fruit-buds. They are comparatively seldom found like this, pure and unmixed, in a state of nature. But they are shown so here to make the distinction more obviously apparent. The fruit-buds of Apples, Pears, Cherries, and other trees are also often found in clusters at the bases of spurs, and in such cases they are called fruit-spurs (Fig. 16). These may be solitary, or in twos, threes, or much larger aggregates. Lower, or near to these fruit-spurs, wood-buds are generally found, and these are useful as fetching up food-supplies to the fruit, and maintaining a vigorous development of vitality in the near vicinity of the Apples or other fruit.

It is important, however, to force, shorten, or pinch back the shoots of growing wood during the summer,

to allow of more light and air reaching the swelling fruit; and in the autumn the growing shoots should be cut back, as shown in Fig. 17.

The thinning or reduction of size of fruit-spurs, as shown in Fig. 19, belongs more to general culture of fruit-trees than the moulding of young trees into

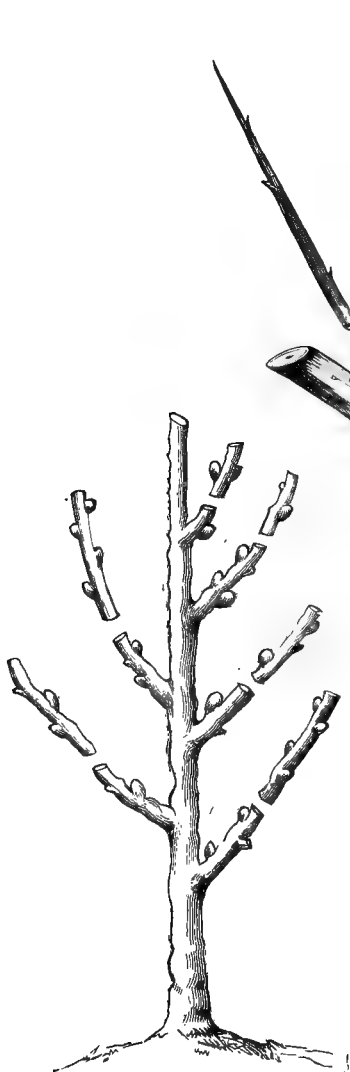


Fig. 18.—Keeping Fruit-branches at Home.



Fig. 17.—Fruit-spur with Wood-shoots, the latter cut back.

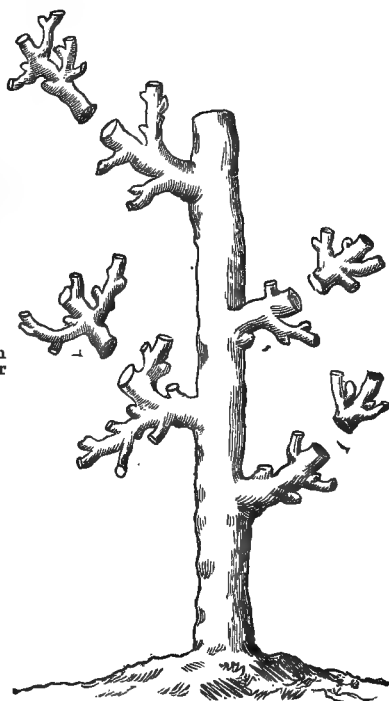


Fig. 19.—Thinning of Fruit-bearing Spurs.

For the purpose of keeping Apple or other fruit-trees in good form—or at home, as it is called—the shortening back of the branches is often practised, as shown in Fig 18, whether these branches are clothed with fruit-buds, as there shown, or with wood-buds.

form. But an illustration of it is given here to complete what is needful to a full comprehension of the subject. It is obvious that trees may be injured by an excess of fruit-bearing spurs even more readily and seriously than by an excess of woody shoots; and hence the importance of reducing the numbers,

or shortening the length, of fruit-bearing Apple-spurs, as shown in Fig. 19. In some senses this is the highest form of pruning, and it becomes the more important now that fertile stocks—small trees—and systems of culture that force fertility to the uttermost, have become the rage in fruit-growing. This thinning of fruit-spurs has become an absolute necessity to preserve the health and prolong the life of the trees, and obtain produce of the highest quality, under the modern high-pressure system of fruit-growing.

It now only remains for us to note and illustrate the various steps by which Apple and other fruit-trees may be pruned and trained into fertile Cordon, Bush, Pyramid, Espalier, wall, or orchard trees.

This diversity and variety of form not only gives great additional interest to the culture of hardy fruits, but enables far more to be grown in less space, and much of the highest quality to be produced in gardens of too limited area to have held one old-fashioned Apple or Pear-tree. Several Cordon Apples may even be backed up against an area wall.

ROCK, ALPINE, FERN, AND WILD GARDENING.

ALPINE PLANTS.

BY EDWARD W. BADGER, F.R.H.S.

List of Alpines (concluded).—The plants marked with an asterisk (*) are those most easily grown.

* *Geranium argenteum* (Silvery Cranesbill).—A dwarf plant with silvery-grey foliage and large rosy flowers, produced in May and June. Soil, good loam; most readily propagated from seeds. Native of the South of Europe.

Geranium cinereum (Grey Cranesbill).—A plant worth a position on the choicest portion of the rockery. Growth dwarf; flowers flesh-coloured, veined with purple. Readily raised from seeds. Soil, sandy loam. Native of the Pyrenees, &c.

* *Geranium sanguineum* (Blood Geranium).—A pretty native species, suitable for planting among the larger rock plants. Flowers large and handsome. Will grow in any ordinary garden soil. Propagated by division and from seeds. There is a pink-flowered variety, *G. s. lancastricense*, well worth growing. It is not quite so vigorous as *sanguineum*.

* *Globularia nana* (Dwarf Globularia).—A very dwarf trailing evergreen plant, bearing tiny spherical blue flowers. Should be grown in an open sunny position, in sandy soil, with which some broken sandstone has been intermingled. Increased by division. Native of the Pyrenees.

* *Helianthemum vulgare* (Rock Rose).—A native plant which, under cultivation, has yielded a great number of beautiful varieties. All grow vigorously, and should be planted where they will have plenty of room. If allowed to hang over the front of a bold piece of rock, they will soon grow into handsome plants. The flowers are variously coloured, but all are beautiful. Easily propagated by cuttings and division, and from seeds. Will grow in any soil. Should be planted in sunny positions to be seen to the greatest advantage.

* *Helleborus niger* (Christmas Rose).—For shaded positions of the rougher parts of the rockery this is a most desirable plant, both in its ordinary form, and in the varieties which are to be found in many nurserymen's lists under conflicting names. The most noticeable are *H. n. maximus*, the flowers of which are rose-tinted; *H. n. major*, bearing somewhat larger flowers than the type; *H. n. minor*, which in all respects is smaller than the type, and very distinct; *H. n. scoticus*, a kind for which the world is indebted to Miss Hope, of Wardie, who found it at Aberdeen; it bears large pure white flowers, and is deserving of general cultivation; *H. n. Juvernis* (St. Brigid's Christmas Rose), an Irish variety of the very highest character; and *H. n. angustifolius* (Mr. Brockbank's Christmas Rose): this is a very desirable kind, and has very pure white flowers. The Christmas Rose is thoroughly hardy and of great value, because its lovely flowers come at a time when flowers are most precious; they are at the same time very beautiful and enduring. The Christmas Rose will grow in any good ordinary soil; but in a well-enriched one, with which some fibrous peat has been intermingled, it will thrive best. The most suitable situation is a somewhat shady one, rather moist than dry. As the flowers are produced from Christmas onwards they should be protected with a bell-glass (*cloche*), and will by their enhanced beauty repay the attention. As cut flowers, they are as useful as Eucharis, and very lasting. Easily propagated by division and from seeds. Native of Austria.

* *Hepatica angulosa* (Large Hepatica).—The flowers are much larger than those of the more common kinds, and of a lovely sky-blue colour. It should be grown in good soil and somewhat sheltered to be seen at its best. Propagated by division once in three years. A native of Transylvania.

* *Hepatica triloba* (Common Hepatica).—There are a number of varieties of this favourite spring flower, all of which are worth growing: the single and double blue, single white, single and double pink or red, and some others not so common. Will thrive in almost any soil, but best in a shady situation. This is one of the choicest of our old-fashioned

flowers, having been a favourite in English gardens for at least three hundred years. The less often they are disturbed, the finer and larger will they grow. Propagated by division. Native of Southern Europe.

Houstonia cœrulea (Bluets).—A very dwarf plant bearing an abundance of pale blue flowers. It should never be grown except in connection with the dwarfiest Alpines, so that no risk may be incurred of its being overruled by more vigorous-growing plants. A moist peaty soil suits it best, in a position fully exposed in chinks among stones. Propagated by careful division. A native of North America.

Hutchinsia alpina (Alpine Hutchinsia).—Another very dwarf Alpine. In suitable positions it grows into dense compact plants, and produces masses of pure white flowers. Soil well drained, with sand preponderating. Propagated by division. A native of Southern Europe.

* *Iberis corifolia* (Coris-leaved Candytuft).—An evergreen Candytuft, dwarf in growth, bearing a profusion of white flowers during May. Will grow in any position and soil. Propagated by division and cuttings. Native of Sicily.

* *Iberis correæfolia* (Correa-leaved Candytuft).—This is now generally regarded as a garden hybrid of the common perennial Candytuft. It is a very distinct and most valuable plant, and bears fine large white flowers in May and June. Deserves a place on every rockery. The foliage is evergreen, and is cheerful-looking all the year round. Any ordinary garden soil suits it, and it seems to thrive in every position.

* *Linaria alpina* (Alpine Toadflax).—A little gem of spreading habit and dwarf growth. Situation, moist chinks of the rockwork, in sandy, gritty soil. Seeds freely, and self-sown seeds will yield an abundance of plants. Native of the Alps and Pyrenees.

* *Linaria cymbalaria* (Ivy Toadflax).—A pretty native plant often found on rocks, old walls, and stony places. Easily raised from seeds. The positions where it grows naturally indicate those on the artificial rockery where it will thrive best. Soil, sandy peat. There is a pretty white variety *L. C. alba*.

Linnaea borealis (Twin-flower).—A small trailing evergreen, a member of the Honeysuckle family, found growing wild in some parts of Scotland and, though very rarely, in the North of England. The flowers are pale pink in colour, and are produced in pairs. Soil, sandy peat, in positions where moisture will be always available, consequently on the rocky portions of the bog-bed. Situation, somewhat shady. Increased by division.

* *Linum alpinum* (Alpine Flax).—The flowers are dark blue in colour, and appear in July and August.

Soil, good peaty loam. Situation, warm and well drained. Propagated by seeds, divisions, and cuttings in spring. A native of many parts of Europe.

* *Lithospermum prostratum* (Prostrate Gromwell). A delightfully beautiful plant, bearing a profusion of Gentian-blue flowers during many months. Its habit, as its name indicates, is prostrate, and the leaves are evergreen. It should be allowed room to spread flatly, or to depend down the face of a rock, if it is wished to see it at its best. A moderately dry situation in good loam suits it admirably, though it will grow almost everywhere if the drainage is good. It resents frequent removal. Situation, exposed and sunny. Propagated by cuttings of last year's growth, under a hand-light, in sand and peat or leaf-mould, preferably in the summer. It is sometimes, though erroneously, called *L. fruticosum*. Native of Spain and Southern France.

Lychnis Lagasœ (Rosy Lychnis).—One of those dwarf Alpine gems that every lover of these charming plants will desire to possess. Its comparatively large flowers are rose-coloured, and appear from June to August. Its habit is very dwarf, so that it must not be planted where its charms will be obscured by plants of taller growth. The situation best adapted for it is an exposed one where, between two projecting stones, it will obtain a little protection, and the beauty of the flowers will justify its being placed in a most prominent position. Soil, if well intermingled with grit or sand, may be of any kind. Readily increased from seeds. A native of the Pyrenees.

* *Lysimachia Nummularia* (Creeping Jenny).—Although this is a common native plant, there are few rockeries from which it will be excluded. Its growth is prostrate, and no situation suits it better than a chink between two rocks, from whence it can depend in graceful elegance. The flowers are of a pleasing yellow, and are produced profusely. There is a golden-leaved variety which is almost better than the type. This is one of the accommodating plants which will grow as well on the window-sill of a back court in the densest part of London as on a rockery in the most salubrious garden. It is in no wise particular as to soil, but if it has the chance will prefer a shady, moist situation. Most easily increased by division, which may be made at any time of the year.

* *Menziesia empetriformis* (Empetrum-like Menziesia), or more correctly, *Bryanthus empetriformis*.—A Heath-like plant of great beauty, and very dwarf. Should be grown by every one. Soil, rather moist sandy peat. Situation, fully exposed. The bell-like flowers, produced in clusters, appear usually in early summer. It came to us from North America.

**Modiola geranioides* (correctly, *Mabastrum Gilliesii*).—A tuberous-rooted plant, bearing leaves and flowers somewhat resembling a Geranium, whence its specific name. It grows about six inches high, and the flowers are magenta-coloured. Ordinary garden soil is sufficient for it; but the situation should be sunny and exposed. A native of Chili, &c.

**Muscari botryoides* (Grape Hyacinth).—A cheap, pretty, bulbous plant, deserving general cultivation. The flowers, which are deep sky-blue in colour, appear in March and April, and are very durable. Not at all particular as to soil or situation; best grown in little clumps. Propagated by division every third year. Native of Southern Europe.

Myosotis azorica (Azorean Forget-me-not).—The colour of the flowers of this species of Forget-me-not is so strikingly distinct (rich indigo-blue) that, though it is a little tender, it will repay the trouble of protection in a cold frame during the winter. Readily raised from seed in the early autumn. Somewhat peaty soil, kept moist, supplies its requirements perfectly. Situation, shady. Native of the Azores.

**Myosotis dissitiflora* (Spring Forget-me-not).—A very distinct early-blooming kind, producing lovely flowers resembling those of *M. sylvatica* (so much used in spring-bedding), but dwarfer in habit, and in most respects superior to it. A plant placed here and there in moist chinks of the rockery will be found very ornamental. Soil, somewhat peaty. Readily raised from seed, and by cuttings, and division of the roots. Native of the European Alps.

**Myosotis palustris* (The Forget-me-not).—This lovely native plant should find a place wherever there is a bog-bed in the garden, as no plant can be more lovely. It can also be successfully grown on the rockery in any position where it will get a plentiful supply of moisture. An admixture of peat in the soil causes it to thrive better than in ordinary garden soil. Increased by division of the roots.

**Nierembergia rivularis* (White Cup).—A trailing plant keeping very close to the ground, very hardy, which produces an abundance of large white flowers in July and onwards. It will thrive in any good soil provided it gets a full supply of moisture in dry weather. It should be afforded space for spreading to be most effective. This when well grown is truly a gem. Propagated by division. A native of La Plata.

**Enothera marginata* (Large-flowered Evening Primrose).—The flowers are very handsome, and appear from May to July, and oftentimes again in the autumn. Ordinary garden soil. Propagated by division, suckers, and cuttings. Native of North America.

**Enothera taraxacifolia* (Dandelion-leaved Evening Primrose).—A showy trailing plant, bearing fine

large flowers from June to August, which are first white, then later on tinged more or less with pink. It rarely exceeds six inches high, but will spread for some distance. Its position should consequently be away from the small slow-growing plants. The soil should be rich and deep. Increased by division and by seeds. This, and the preceding, like most of the *Oenotheras*, open their flowers at night, when they emit a rich perfume. Native of Peru.

Omphalodes Luciliae (Lucilia's Forget-me-not).—A sweet little plant with oval glaucous leaves, and flowers like the Forget-me-not. Should be grown in crevices of the rockery having a sunny exposure. Soil, sandy loam. Increased by division. Native of Mount Taurus.

**Omphalodes verna* (Creeping Forget-me-not).—Blooms early in spring, the flowers being strikingly blue. Should be planted where there is plenty of space, as it spreads somewhat rapidly. Will thrive in very shady situations, and even under trees. Any good soil will suit it. Propagated by division early in spring. There is a white variety, *O. v. alba*. Native of Southern Europe.

**Orobus vernus* (Spring Bitter Vetch).—A thoroughly hardy plant, suitable for the rougher parts of the rockery; when in full bloom a mass of it is very beautiful. The soil around it should be richly manured. Increased by division, and from seeds. A native of Southern Europe.

Ourisia coccinea (Scarlet Ourisia).—A rare plant at present, but not a dear one; while its merits are many. It is dwarf in habit, with creeping stems, and produces Pentstemon-like flowers. Although it requires an abundance of water during dry weather, the situation must be thoroughly well drained, and at the same time entirely shaded from the midday sun, so that the aspect should face either east or north. It must, however, be protected from cold winds. This plant has the reputation of being somewhat difficult to grow, but this idea has no doubt arisen from endeavours having been made to grow it in sunny positions, or under some other equally unsuitable condition. Soil, good sandy loam, with which a little leaf-mould or peat might perhaps be advantageously mixed. Easily propagated by division of the creeping stems in spring. A native of Chili.

Petrocallis pyrenaica (Rock Beauty).—A tiny, tufted Alpine, blooming in May. The place for this little beauty is a sunny spot in the most select part of the rockery. Soil, sandy loam, with plenty of nodules of sandstone intermingled. Increased by division and from seeds. A native of the Alps, Pyrenees, &c.

**Phlox frondosa* (FronDED Phlox).—A most useful plant, suitable for sunny positions, where it can hang down over the face of the rock, or nestle on a ledge. Not at all particular as to soil. Propagated

by cuttings. The flowers of the type are rosy-pink. Some of the hybrids best known in gardens are well worth growing on the choicest rockery, foremost of which we name *P. Nelsoni*, flowers white. *P. frondosa* comes to us from North America.

* *Phlox reptans* (Creeping Phlox).—This is a trailing plant, rooting at many of its joints, so that its increase is readily effected. There are many positions on the rockery where its employment will not be ineffective. The flowers are violet-mauve in colour. Not at all particular as to soil. *P. stolonifera* and *P. verna* are other names by which this Phlox is known. A native of North America.

Polygala Chamæbuxus (Box-leaved Milkwort).—A pretty little plant, producing Pea-shaped flowers, yellow in colour. Grows readily in peat and loam. *P. purpurea*, a similar plant with magenta-purple flowers, is also deserving of a place on the choice rockery. Native of the European Alps.

* *Polygonum Brunonis* (Indian Knotweed).—For rough parts of the rockery this may properly find a place. It comes to us from elevated positions in India, and is quite hardy. It should be grown in flat, fully-exposed positions, when its leaves will exhibit their autumnal brick-red colour to the best advantage. The flower-spikes are useful for cut flowers, if used with suitable neighbours. Any ordinary garden soil suits it. Easily propagated by division.

* *Polygonum vacciniifolium* (Bilberry-leaved Knotweed).—A lovely little plant from the Himalayas, which is quite hardy in England. It is very dwarf in height, but when properly placed and space is afforded, extends over a considerable amount of surface. The flower-spikes are rosy in colour and pleasing to look at whether in bud or fully expanded. It is particularly effective in the autumn. Does well in partial shade in a light loam. Propagated by divisions and cuttings.

Primulas (Primroses).—There is scarcely a member of this family unsuited for the rockery, and some of them constitute its brightest gems. They vary very much in size and in other respects: some thrive only in the sun, others in the shade; but under whatever conditions they can be successfully grown, they are one and all worth the trouble and attention which they demand, in order that they may be seen at their best. There is probably no genus which has afforded to English gardeners so much pleasure at a like expenditure of time, trouble, and money. They are not more varied in appearance and beauty than are the localities whence they have been derived. A garden well furnished with the genus may contain natives of Britain, France, Austria, Switzerland, Southern Italy, the Pyrenees, the Levant, the Tyrol, Siberia, the Alps of Tauria, the Caucasus, the Hima-

layas and other elevated ranges in India, Japan, China, and North America. Most of the *Primulas* are spring bloomers, and are most deservedly valued for that among other reasons. They are without exception beautiful, and most of them are as easily grown as the commonest of them all—our native Primrose, one of the loveliest of British plants, with which we commence our list.

* *Primula vulgaris*, syn. *Primula acaulis* (Common Primrose).—Although so beautiful, we should omit it from this list but for the desire to mention some of the lovely garden varieties now in cultivation, which are fit to grow on any rockery. Our selection is—the Double Crimson, Crousse's Lilac, the ordinary Double Lilac, *platypetala* (Double Violet), Double Purple, Double Sulphur, Double Yellow, and Double White. Singles: *auriculiflora*, *altaica* (lilac), Rosy Morn, Gem of Roses, Crimson Banner (maroon-crimson), Fairy Queen (pure white), Lustrous (deep crimson with lemon eye), Scott Wilson (the Blue Primrose), and *Violetta* (violet-purple). There are numberless others. If it be borne in mind that common Primroses when well thrive best in partially sheltered and shady situations, where an abundance of leaf-mould is usually to be found, a clue to the soil and situation suitable for the bulk of them is at once suggested. The double kinds are more difficult to grow than the bulk of the single kinds, and if success is desired, extra trouble must be bestowed upon them; and it will be advisable for most of them to have duplicates in pots preserved in frames facing north during winter. Many of them will produce plenty of offsets, and it is by the offsets that the named kinds are mainly to be propagated. The double kinds produce fewer offsets than the singles. Seed-sowing is also to be resorted to for increasing stock, but seedlings will often, indeed generally, vary more or less from the parent that produced them. Seed should be sown as soon as ripe on moist soil of which leaf-mould is a principal constituent, and should be just covered with a thin film of the finest compost or sand. They should be sown in a position facing north, or where they will not be exposed to the mid-day sun. We now proceed to mention some of the choicest species from other countries, and a few natives worth growing on the choice rockery, with this one observation, that, where not otherwise mentioned, the hints above given as to cultivation for the Common Primrose and its varieties will apply to all named below.

* *Primula amena* (Pleasing Primrose).—A purple-hued Primrose, blooming very early. It has large leaves, and should have a sheltered situation on account of its precocity. Native of the Caucasus.

* *Primula Auricula* (Auricula).—The kind here referred to is what by florists are called Alpine Auriculas. Allowed to remain in the same spot for two or

three years, each plant will send up numerous umbels, each bearing many flowers of much beauty. Alpine Auriculas are very hardy. Native of Switzerland and elsewhere.

* *Primula capitata* (Round-headed Primrose).—This plant sends up a meal-covered flower-stem, on which a round dense head of bloom is produced. The colour of the pips when opened is violet-blue. The flowering period is from April to June. Native of Sikkim.

* *Primula cashmeriana* (Cashmere Primrose).—The foliage when well grown is very large and handsome, consequently plenty of room must be afforded it. As one describer of it says, it often has the appearance of a young Cos Lettuce. The under side of the leaves is covered densely with yellow meal. The flowers are borne in a globular truss, on a stout stem often a foot high, and are of a pleasing light purple colour. This is one of the truly herbaceous kinds, and therefore care must be taken that they are not destroyed by digging about them after they have gone to rest.

* *Primula cortusoides* (Cortusa-like Primrose).—This is a charming old-fashioned kind easily raised from seed. It should be grown in a sunny position, sheltered from rough winds, the flower-stems being slight and brittle. Native of Siberia.

* *Primula denticulata* (Small-toothed Primrose).—Although this comes from India, it is quite hardy in England. Its native home is at a considerable elevation on the Himalayas. The flower-stem often reaches a foot high. The flowers are a dark lilac in colour, and are produced from March to May. A position where plenty of moisture will reach, but will not be able to stagnate, will usually secure the robust growth of this species.

* *Primula farinosa* (Mealy Primrose).—Although this miniature Primrose is a native plant, it is well worth cultivation in our gardens, especially in those parts of the country where it does not grow wild. The flowers are of a pale lilac colour, with a yellow eye, from which peculiarity one of its common names has been derived—Bird's-eye Primrose. A damp situation suits it to perfection, and a preference should be given to a strong rather than a light soil. Shade from the mid-day sun also suits it. The flowers appear from April to June.

* *Primula japonica* (Japanese Primula).—A few years ago this was such a rarity that it commanded very high prices; now it is so universally distributed as to be almost as cheap as our Common Primrose. It is, nevertheless, so beautiful that it is a welcome denizen of every garden, and its tendency to variety in colour indicates that the amateur who bestows attention upon it may be rewarded with results which will repay him. In our own garden we have hybrids

between it and *P. rosea*, which have much interest, and have encouraged us to hope for advances in the combination of the beauties of both, which may yet prove "things of beauty" as well as "joys for ever." There seems some difficulty in raising seedlings unless the seed is sown directly it is ripe, then no difficulty is experienced. The moral is to sow the seed the moment it can be obtained, and to do so in a cool frame, and never in the green-house. Its name sufficiently indicates its habitat.

Primula luteola (Yellow Primrose).—This fine yellow Primrose, where it is well grown, produces vigorous flower-stems, rising sometimes to more than a foot in height. A moist shady situation suits it, and where it thrives it is generally regarded as one of the finest members of its family. It is a native of the Caucasus.

Primula marginata (Margined Primrose).—The specific name has been bestowed because the leaves are so distinctly margined with silvery silken markings as to separate it by this peculiarity from all other kinds. The flowers are of a soft violet-rose colour, rising but little above the leaves. The proper position for such a dainty plant is in some crevice of the rockery where shelter can be derived from the neighbouring stones. A mixture of ordinary soil, sharp sand, and leaf-mould will enable this plant to thrive, especially provided the surface be covered with nodules of sandstone. Propagated by division of the little offsets which appear during the summer; they should be separated from the parent plant when they are seen to emit roots. A native of the Alps of Tauria.

* *Primula Munroi* (Munro's Primrose).—This is a white-flowered Primrose of easy culture in a damp peaty soil. We have ourselves grown it to perfection in a border of ordinary garden soil facing north, where it was well supplied with moisture during the summer months. Moisture it must have if it is to thrive, and on the edge of the bog-bed it will doubtless be seen at its best. Easily propagated by division. A native of India.

Primula nivea (Snowy Primrose).—This is another white-flowered kind not very well known, but deserving a place everywhere. It is a little tender, and in the winter should be protected with a good layer of cocoa-nut fibre, which will in some degree compensate for the absence of the snow coverlet, which in its native habitat protects it during periods of low temperature. This is a plant which needs watching, in order that whenever rootlets appear about the offsets a supply of soil may be placed around them, so as to preserve them from the effects of a drying atmosphere. It blooms in the spring months, and is a native of the Alps.

Primula purpurea (Purple Primrose).—A very fine

Primrose coming to us from great elevations on the Himalayas (12,000 feet or more). The flower-heads are three inches across. It is a fine species, and deserves and will repay some extra care on the part of cultivators. It should be grown on exposed situations as far as sunshine is concerned, but should be sheltered from our capricious winds. This statement will be sufficient to suggest that the most suitable positions will be those in which protection from piercing winds will be secured for it. The leaves are larger than those of *P. denticulata*, to which species it is allied.

* *Primula rosea* (Rosy Primrose).—One of the choicest gems of the family. We shall never forget seeing some fine clumps of it on Mr. Elwes' rockery near Cirencester, where it grows more vigorously than we have seen it elsewhere. The flowers grow in somewhat the same fashion as the Polyanthus, but their colour is a soft rosy-pink. It does best in a boggy situation, and though not very particular, except that it resents dryness at the root, we should advise its being planted in the shade, where it would have plenty of moisture. It is easily raised from seed, and we have some seedlings in which the characters of *P. rosea* and *P. japonica* are curiously mingled. We are of opinion it will prove a most useful parent of interesting hybrids. It is a native of the Himalayas, and is readily increased by division as well as from seeds.

Primula scotica (Scotch Bird's-eye Primrose).—This is a local form of *P. farinosa*, than which it has broader leaves, and shorter and broader lobes to the corolla. These are differences of more importance to the scientific botanist than the plant-grower, who will be much more concerned to know that *P. scotica* is a real native gem found almost exclusively in Northern Scotland. It is very small, and must consequently be grown with other small plants. Its native habitat is on moist and boggy mountain-slopes. On the rockery these natural conditions must be secured for it, or it will not thrive. A top dressing of cocoa-nut fibre kept about it in a moist condition will conduce to its advantage, as it must never be allowed to get dry at the roots. It produces seeds freely, and from these it may be very readily propagated if they are sown directly they are ripe.

* *Primula Sieboldi* (Siebold's Primrose).—There are many lovely varieties of this Primrose now in cultivation. It is often named in catalogues *P. cortusoides amana*, but *P. Sieboldi* is its correct name. In many respects it resembles *P. cortusoides*, but it is finer in every way. It blooms early in April, and when in vigour sends up a number of its lovely flowers, which are borne on somewhat tall stems. A good free soil in which there is abundance of vegetable matter,

well drained, will suit it in almost any position; but as the flower-stems are somewhat brittle, it is better to be so placed as to be secured from violent winds. Easily propagated by division and from seeds. It dies down annually, and its position should be plainly indicated by a conspicuous tally, and all digging about it avoided. It comes to us from Japan.

Primula sikkimensis (Sikkim Cowslip).—Imagine a multitude of Cowslip-pips of the finest quality, each depending from a long silken thread fastened together at the extreme end, and *P. sikkimensis* will be mentally visible. It is a plant of the finest quality, and should be grown by every one, for it is hardy, ornamental, and distinct. It is a herbaceous perennial, which makes some growers suppose, when unacquainted with its habit of annually dying down, that they have lost it. A mixture of peat in the soil seems to suit it, no doubt because it maintains a more equable condition of moisture about the roots than ordinary soil would do. It should have abundance of water in the summer, and be placed in a somewhat shady position. Propagated by division early in spring, and from seeds. A native of Sikkim.

Primula vulgaris (Common Primrose).—See *Primula acaulis*, p. 330.

Ramondia pyrenaica (Pyrenean Ramondia).—This little plant is allied to the Verbascoms. It thrives in sloping fissures of the rockery filled with a mixture of peat and loam. It flowers in May and onwards. Increased by seed. A native of the Pyrenees. It is a capital plant for the frame, grown in pots filled with peaty loam, the surface being covered with fragments of sandstone.

* *Ranunculus amplexicaulis* (White Buttercup).—A most beautiful plant bearing white flowers, of much delicacy of appearance, in April and May. Not particular as to soil or position, but it will grace any position in which it is placed, and leaf-mould suits it perfectly. Propagated by division of its fleshy roots. Native of the Pyrenees.

* *Ranunculus montanus* (Mountain Buttercup).—This bears fine flowers, paler in colour than our Common Buttercup. It grows in compact clumps, which spread but slowly. Propagated by division. Native of many parts of Europe.

Sanguinaria canadensis (Blood-root).—A hardy tuberous-rooted plant, producing solitary pure white flowers, nearly two inches in diameter, in spring. Situation, somewhat shady; soil, rich but well drained. Propagated by division. A native of North America, where it is found most frequently in the more open parts of woods.

* *Saponaria ocyroides* (Rock Soapwort).—As this is a very floriferous plant, it is a welcome denizen of

many rockeries. The flowers are of a pink colour, half an inch across, and appear from May to August. It is dwarf in height, but will cover a considerable space if in health: it should consequently be so planted as to have space for development. Easily raised from seeds. A native of France.

* *Saxifragas*.—If our rockeries had to depend on this family alone for their adornment they might be made very beautiful all the year round, for whether in or out of flower they are always lovely. They are abundant in all the great mountain chains of the Northern Hemisphere. They vary from the tiniest size to large-leaved plants of somewhat coarse appearance. The bulk of them, however, are just such plants as are most suitable for the rockery, where they grow in bosses and cushions which are always bright and cheerful to look at. In a very excellent list of Alpine plants issued by one of the leading firms of nurserymen, this interesting family is divided into five sections:—(1) Encrusted Saxifragas: leaves in rosettes, silvery in appearance. (2) Geum type: leaves generally oval or roundish, flowers in dense spikes (London Pride the most widely diffused of the type). (3) Moss-like Saxifragas: these are the kinds forming dense cushions most usually seen on rockeries. (4) The *Oppositifolia* type: plants of prostrate habit, of which one of our most beautiful native Alpines is a characteristic representative. (5) Miscellaneous Saxifragas, which includes a number of diverse plants mostly bearing yellow flowers. The cultivation of the bulk of Saxifragas is so easy that any one can grow them in almost every position. They are readily increased by division, and the smaller the portion planted, provided it be planted firmly, the more likely it will be to thrive. The very small slow-growing kinds require just a little more attention in planting than the more robust sorts, but no real difficulty will be found in planting any of them. The bulk of the Saxifragas grow rapidly, and must be allowed sufficient room to spread. They must not be planted near slower-growing smaller plants, or they will soon smother them. It is also advisable to plant the smaller and slower-growing kinds where they will run no risk of being overgrown by their neighbours. The following are among the best kinds in the five sections enumerated, suitable for rockeries of all descriptions:—

SECTION I.—ENCRUSTED SAXIFRAGES.

<p><i>Saxifraga aizoon</i>. <i>S. aretiooides</i>. <i>S. Burseriana</i>. <i>S. caesia</i>. <i>S. Cotyledon</i>. <i>S. crustata</i>. <i>S. Hostii</i>.</p>	<p><i>S. juniperina</i>. <i>S. lantoscana</i>. <i>S. longifolia</i>. <i>S. pyramidalis</i>. <i>S. Rocheliana</i>. <i>S. diapensioides</i>.</p>
---	---

SECTION II.—GEUM TYPE.

<p><i>Saxifraga Andrewsii</i>. <i>S. Bucklandii</i>. <i>S. Geum</i>. <i>S. Geum crenulata</i>. <i>S. Geum dentata</i>.</p>	<p><i>S. Geum gracilis</i>. <i>S. hirsuta</i>. <i>S. umbrosa</i>. <i>S. umbrosa foliis variegata</i>.</p>
--	--

SECTION III.—MOSS-LIKE SAXIFRAGES.

<p><i>Saxifraga ajugifolia</i>. <i>S. atropurpurea</i>. <i>S. cæspitosa</i>. <i>S. ceratophylla</i>.</p>	<p><i>S. hypnoides</i>. <i>S. Maweania</i>. <i>S. tenella</i>. <i>S. Wallacei</i>.</p>
---	---

SECTION IV.—OPPOSITIFOLIA SECTION.

<p><i>Saxifraga oppositifolia</i>. <i>S. oppositifolia alba</i>. <i>S. oppositifolia major</i>.</p>	<p><i>S. oppositifolia pyrenaica</i>. <i>S. retusa</i>.</p>
---	--

SECTION V.—MISCELLANEOUS SAXIFRAGES.

<p><i>Saxifraga aizoides</i>. <i>S. Cyrabalaria</i>.</p>	<p><i>S. Hirculus</i>.</p>
---	----------------------------

Many other kinds might be named, but the above will doubtless prove quite sufficient for the bulk of growers, and will supply all the types suitable for rockeries except the large-leaved *Megaseas*, which we think too large except for very bold rockeries.

* *Scilla amana* (Pleasing Squill).—A pretty bulbous plant which supplies neat flowers early in the spring; although not so attractive as others of the same genus, it is worthy of a place on a fully-furnished rockery. Ordinary garden soil. Propagated by occasional division of the bulbs. Native country uncertain, but is naturalised in many parts of continental Europe.

* *Scilla bifolia* (Two-leaved Squill).—As this blooms very early it should be planted in a somewhat sheltered position, where, during bad weather, a little protection could be afforded, thus saving the flowers from injury. Several varieties of this useful plant will be found in most of the catalogues, and they are all worth growing. Ordinary garden soil. Europe.

* *Scilla nutans* (Blue-bell Squill).—This is our native wild Hyacinth, as it was formerly called on account of the general form of the perianth—so abundant in woods and elsewhere, and always very beautiful. Suitable for the rougher parts of the rockery where the ground is covered by some dwarf surfacing plant. There are several varieties, some very pretty. Ordinary garden soil, and any position where room can be afforded to grow it in masses.

Scilla sibirica (Siberian Squill).—This is the most universal favourite among the Squills; it blooms after *S. bifolia* and before *S. amana*, and is usually in perfection about the time of the 'Varsity Boats' Race. The flowers are of a lovely dark blue colour. As it blooms so early, the position assigned it should be as protective as possible from rough winds. It is perfectly hardy, and may be grown in almost any soil except heavy clay.

* *Sedums* (Stonecrops).—These universal plants are extremely well suited for rockeries, and being very varied in appearance and colour, may often be employed to produce striking effects of contrast if judiciously used. We have a number of native kinds, all of which are in cultivation. They are most easily grown in fully-exposed positions; any small scrap pressed firmly into the soil will be sure to take root. They are particularly adapted for dry sunny positions, and will thrive on old walls as well as anywhere. The following are some of the most useful and distinct kinds:—

Sedum acre (Common Stonecrop).	S. glaucum (Milky-green Stonecrop).
S. album (White Stonecrop).	S. rupestre (Rock Stonecrop).
S. Anacampseros (Evergreen Orpine).	S. sexangulare (Tasteless Stonecrop).
S. brevifolium (Mealy Stonecrop).	S. Sieboldii (Siebold's Stonecrop).
S. dasphyllum (Thick-leaved Stonecrop).	S. spectabile (Showy Stonecrop).
S. Ewersii (Ewers' Stonecrop).	S. spurium (Purple Stonecrop).

* *Sempervivums* (Houseleeks).—These now popular plants owe their present popularity to their use in panel bedding, which, in some gardens, is much employed for the summer adornment of formally laid-out lawns. Some of the kinds have been long cultivated in this country as curiosities. The most commonly distributed form is the ordinary Houseleek (*S. tectorum*) grown on the tops of walls, and on the roofs of low out-buildings in all parts of the country. They are all adapted for dry, stony, and sandy spots of the rockery, with full exposure to sunshine. It is advisable to let them grow into good-sized clumps, as they then show to most advantage. The smallest amount of soil seems ample for their growth, provided the roots are firmly fixed in it. They are easily propagated by offsets. The following are some of the best of the hardy kinds:—

Sempervivum arachnoideum (the Cobweb Houseleek).	S. globiferum; synonym—S. soboliferum (Hen and Chicken Houseleek).
S. arenarium (Sand Houseleek).	S. Lageri (Lagger's Houseleek).
S. calcareum; synonym—S. californicum (Glaucous Houseleek).	S. montanum (Mountain Houseleek).
S. fimbriatum (Fringed Houseleek).	S. tectorum (Common Houseleek).
	S. triste (Sombre Houseleek).

* *Senecio argenteus* (Silvery Groundsel).—A small plant, the leaves of which are silvery, and which make it useful for contrast with green-leaved plants. A well-drained situation and sandy soil suit it best. Increased by division. A native of Chili.

* *Silene acaulis* (Stemless Catch-fly).—A plant that grows in tufts, and bears masses of rosy flowers from May to July. It is very dwarf, but spreads freely, and should be planted in an exposed position where it will have room for development, and away from small slow-growing plants, or it will soon

overrun and smother them. One of its common names is most appropriate, namely, Cushion Pink. Easily propagated by division. This is one of our loveliest native plants.

* *Silene alpestris* (Alpine Catch-fly).—A charming little European Alpine which flowers in May. The flowers are the purest white, and are produced plentifully if the plant is allowed to remain undisturbed so as to grow to some size. Ordinary soil in an exposed situation, the surface of which should be flat. Propagated by division.

Silene Elizabethæ (Elizabeth's Catch-fly).—A very choice Alpine requiring some care, but amply rewarding it. The flowers are large, and of a rose-colour. Soil, sandy peat and loam with which some fragments of sandstone are mixed. Situation, sunny. Propagated by division. A native of the Tyrol.

* *Silene maritima* (Sea Catch-fly).—The double form of this native plant deserves a place on the rockery, especially on a ledge of rock where it can hang over the face of it. Ordinary soil. Propagated by division.

* *Silene Schafta* (Late Catch-fly).—A hardy Alpine blooming from July to September. Flowers, rosy-pink. Any ordinary garden soil suits it, and it may be placed in any position where there is room for it. Being a late bloomer, a goodly number of plants may be used with advantage. Readily raised from seed. Native of the Caucasus.

Sisyrinchium grandiflorum (Rush-lily).—A native of Oregon, bearing Rush-like leaves, and purple flowers resembling Lilies. It is hardy and flowers early (February and March). As it is a slow-growing subject it should remain undisturbed for several years. Soil, a mixture of sandy peat and loam; situation, a sufficiently large crevice between two stones facing south. There is a white-flowering variety, *S. g. album*.

Soldanella alpina (Alpine Soldanella).—This comes from great elevations on the European Alps. Has roundish dark green leaves, and drooping feathery bell-shaped flowers, of a pretty blue colour. Soil, sandy loam in a chink of the rockery, the surface being covered with fragments of rock or cocoa-nut fibre to prevent evaporation. The drainage must be good, but the ground must be kept moist. Propagated by division directly after flowering.

Soldanella minima (Smallest Soldanella).—This is a truly pigmy Alpine, the leaves often only a quarter-inch across, and the flowers rarely exceeding one inch in height.

Soldanella montana (Mountain Soldanella).—This may be described as a magnified Alpine. The cultural directions for the Alpine form of Soldanella will be found to apply to the two other forms named.

* *Sternbergia lutea* (Yellow Sternbergia).—A fine bulbous plant, blooming late in the year, which may be grown underneath any dwarf-growing surface-rooting plant. It comes to us from South Europe.

* *Thalictrum minus* (Maiden-hair Meadow-rue).—This plant has found a place in our gardens on account of its foliage, which by many is regarded as an efficient substitute for the fronds of the Maiden-hair Fern. It will thrive in any soil, and is easily increased by division. It is a native plant,

* *Thymus citriodorus aureus* (Lemon-scented Thyme).—This is only a variegated form of the green-leaved Lemon-scented kind; very common, but extremely beautiful. Grows readily in any soil; is easily propagated by cuttings, and is a pretty plant always. In selecting shoots for cuttings, those most distinctly variegated should have the preference.

* *Thymus lanuginosus* (Woolly Thyme).—A very hardy plant, of much use for the front of rockeries. It is easily propagated by cuttings, and will grow in any soil and situation. It is supposed to be a variety of our common wild Thyme.

Triteleia uniflora (Spring Star-flower).—A bulbous plant, introduced from Buenos Ayres in 1836. The flowers appear early in the spring, and are always welcome. Contrasted with *Scilla sibirica*, side by side with which they usually appear, the beauty of one enhances that of the other. The bulbs should be planted in good soil in a somewhat sheltered part of the rockery, as the flowers make their appearance so early.

* *Tunica saxifraga* (Mock Tunica).—This is a plant which will thrive nearly anywhere, and under almost any conditions. It is, notwithstanding, worth cultivating. It is a desirable plant for dry situations. A native of the Pyrenees and elsewhere.

* *Veronica Chamadrys* (Germander Speedwell).—A common native plant, of much beauty notwithstanding, and deserving of a place on our rockeries. It produces bright blue flowers in plenty. Easily propagated by division and from seeds. No special cultivation is needed for this, or for most of the other members of this genus.

* *Verona incana* (Hoary Speedwell).—An easily-grown plant which it is better to divide in the spring months than in any other part of the year. It is quite distinct, and a plant worthy of cultivation everywhere.

* *Veronica prostrata* (Prostrate Speedwell).—The flowers of this kind are a deep blue, and though the plant is often mistaken for *V. repens*, it is easily recognised by those who know the respective characters. It should be planted in a sunny situation, and will then flower so freely as to secure its recognition from any other species. This is a good plant to hang down the face of the rockery. A native of

France. Nearly all the hardy Veronicas are worth cultivation.

Viola biflora (Two-flowered Violet).—This is a dainty little yellow Violet, the principal charm of which in this country depends on keeping it alive and blooming. This, however, is not such a very difficult proceeding, provided the grower will pay the needful attention. It grows naturally on the Alps in somewhat damp, sheltered positions. The English grower must endeavour to imitate these conditions, and his success with the plant will be generally proportionate to his success as an imitator. A moist, shady spot having been found for it, its other requirements will not be found exacting. It is really so distinctive as to be worth a little trouble to get it firmly established. This little gem is so widely distributed as to be a native of Europe, Asia, and America. There are many other *Violas* suitable for the rockery, which we are restrained from mentioning on account of our space being limited.

The foregoing list of Alpine plants is indeed and really a "select" one. Hundreds of Alpines have been designedly omitted from it; for our principal objects have been (1) to name no plant unworthy of a place on any rockery; (2) to name no plant not worthy of a place on every rockery; (3) to give a list of plants of beauty of foliage or flower, or of foliage and flower, and at the same time so easy to grow, the conditions of success being so stated, that any intelligent person may undertake their cultivation with a certain degree of hopefulness and confidence; and (4) an additional number of plants of great beauty in some one or more respects, or of great rarity, or requiring attention to some exceptional conditions, involving unusual skill to grow them successfully. The plants most easily grown are all marked with an asterisk (*); the remainder not so marked may be regarded as plants to be avoided by young beginners, but also as plants to be grown later on when they have proved themselves capable of growing successfully the plants of easier culture. Some of the plants most difficult to grow are among the brightest gems of the Alpine flora; but it may also be said that some of the plants most easily grown are equal to those most difficult, except in the one particular of difficulty. Much might be said to encourage intelligent amateurs to undertake the cultivation of Alpines. It involves a study of the conditions in which the plants grow naturally, or to substitute for them such as will compensate for the difference, which involves the employment of brains. It is this consideration which has made the growth of Alpine plants under difficulties such an attraction for enthusiastic amateurs of the humbler class, and no men in our nation have succeeded better in their endeavours than they have.

Annuals.—There are many plants of annual growth raised from seed, which are not mentioned in our list, though they often prove most attractive on rockeries. The reason for their omission is that the plants named in our select list are intended to be permanent plants, and must necessarily be perennials. To compensate for this omission we now name the following, all of which are deserving of a place on the choicest rockery:—

Ageratum (various).
Alyssum maritimum.
Anemones (various).
Antirrhinum (dwarf varieties).
Arabis alpina.
Aubrietias (various).
Begonias (various).
Bellis (various).
Calandrinia umbellata.
Candytuft (the dwarf annual kinds).
Downingia pulchella.
Collinsias (various).
Convolvulus major & minor.
Dianthus (many kinds).
Eucharidium grandiflorum.
Fenzlia dianthiflora.
Helichrysum (the dwarf kinds).
 Ice-plant (*Mesembryanthemum crystallinum*).
Inopsidium acule.

Leptosiphon roseus.
Limnanthes Douglasi.
Lobelia (various).
 Marigold (the dwarf kinds).
Mesembryanthemum cordifolium variegatum.
Mimulus (various).
Myosotis (various).
Nasturtium (the dwarf kinds).
Nycteria selaginoides.
Nolana paradoxa.
Nemophila (various).
Pansies (various).
Phacelia campanularia.
Portulaca (single and double).
Sabbatia campestris.
Silczopetalon Walkerii.
Silene pendula compacta.
Tagetes signata pumila.
Viola (various).
 Virginia Stock.

In the select list of permanent plants we have been particularly careful not to name one which is not offered for sale by those English nurserymen who devote special attention to these plants, and we have been equally careful to avoid plants of great rarity and consequent dearness. This rule has, doubtless, caused the omission of some plants which the more advanced amateur will desire to possess. The nurserymen's lists, which are now very numerous, will enable those who desire the costlier plants to select them with ease; but our chief object, which was to encourage a more general cultivation of Alpine plants, would have been in some degree defeated if we had sacrificed the interests of the many to the few.

Ferns will be found treated of fully in other pages.

DECORATIVE USE OF FLOWERS.

BY JAMES HUDSON.

PERSONAL DECORATIONS.

BOUQUETS (or nosegays, using the old-fashioned term for bunches of flowers) are very popular, as indeed they deserve to be, with nearly all lovers of flowers. Whether it be merely a few flowers culled in a stroll around a garden, without any aim at artistic arrangement in the placing of the same, or whether certain particular flowers are chosen for special occasions and of particular shades of

colour, it matters not which or what the case may be, either will be invariably popular and meet with approval when so arranged as to produce a good effect. This can be done by either blending the colours harmoniously together, or by using those that are of striking contrast in this respect. Bouquets can be effectively produced by individual genera of flowering subjects alone. Thus, what prettier effect, or more pleasing, either in point of appearance or in perfume, than when using Roses and Rose-buds and foliage without exterior aid? Violets, too, will make pretty bouquets, using only their own leaves. The Daffodils or Narcissus require the addition of some other foliage than their own to show them off to advantage; for these we would use some leaves of the *Berberis Aquifolium*, small forms of Ivies, or Fern.

The single Chrysanthemums or Paris Daisies, also called Marguerites, will make very pretty and novel bouquets with the aid of the foliage of the fine-cut-leaved variety with white flowers, and a margin of Fern-fronds. Take, again, the Carnations and Picotees; these favourite garden flowers will quickly form into an *impromptu* nosegay with a few shoots of their own grassy growth alone, or by adding a few spikes of Mignonette with an edging of Oak-leaved Geranium foliage. As another example, which, if not composed of strikingly effective subjects, would yet meet with approval from many who love sweet-scented flowers and foliage, take the light and dark kinds of Heliotrope, the Mignonette, or the Honeysuckle, and a few sprays of Sweet Pea, with such foliage as the Sweet-briar, the Lemon Plant (*Lippia citriodora*), and the scented-leaved Geraniums. This, in the summer, could be easily effected, as also with other common garden flowers. The Irises throughout a somewhat lengthened season can be turned to a good account in bouquet work; forming even by themselves a most handsome arrangement, with some tips of their leaves (narrow kinds) and a few fronds of Ferns as a finish to the same. Either Lily of the Valley or *Astilbe japonica* spikes would be an appropriate addition to the above, as indeed they are to almost all bouquets.

Less Common Flowers.—There are several flowers from what may be termed "out-of-the-way plants" that are pretty for arranging in bouquets; such, for instance, as *Lachenalia tricolor*, and other allied species, *Tritelia uniflora*, *Allium neapolitanum* (which is free from the unpleasant odour pervading most species), *Anthericum Liliastrum* (*Paradisica Liliastrum*), *Tritonia aurea* (*Crocoshia aurea*), *Leucocjum aestivum* and *L. verrum* (the Snowflakes), *Schizostylis coccinea*, *Sisyrinchium bermudianum*, *Nerine sarniensis* (Guernsey Lily), *Ixias* and their allies, with single

Anemones—all useful in composing various colours, &c., in bouquets wherein they can be suitably placed. Most of these bulbous plants are rarely used in this kind of work, but, possessing novelty and distinctiveness, they are all worthy of a place. From the long list of herbaceous plants a few good things may be named which might with advantage be used; for instance, the improved type of Columbines (*Aquilegia*), the Campanulas with slender stems, *Catananche bicolor* and *C. cœrulea*, with Cornflower like blossoms, the Dianthus of the Alpine section, *Francoa ramosa*, *Gypsophila paniculata*, *Statice latifolia*, and other species. These could all be turned to a good account in their respective seasons. Several evergreen and deciduous shrubs can be called into requisition; notably, of the former, the *Daboecias*, or Irish Heaths, *Pieris floribunda* and *P. japonica*, *Ceanothus* of various sorts, *Escalloneas* (these, like the *Ceanothus*, requiring a wall for training against), *Choisya ternata* (from the same position), and *Garrya elliptica*, the catkins of which are an ornament around a goodly-sized bouquet. From the hardy and half-hardy annuals, considerable aid is imparted from such uncommon things as *Gypsophila elegans* and *G. rosea*, *Alonsoa Warscewiczii*, *Nicotiana affinis*, with sweetly-perfumed flowers expanding in the evening, the yellow Sweet Sultan, and the small forms of Ornamental Grasses.

There are not a few subjects from under glass that possess novelty and other features to recommend them; of these we will enumerate some of the most useful. From the green-house we have *Boronia elatior*, with flowers of a deep rose; *Clethra arborea*, having panicles similar to the *Pieris* of our shrubberies; *Jasminum grandiflorum*, very useful in the winter and deliciously scented; *Lonicera semperflorens minor*, a green-house climbing Honeysuckle—very distinct; *Pimeleas* in variety; the smaller types of green-house *Rhododendrons*; *Statice profusa*, extremely pretty in a bouquet; *Witsenia corymbosa*, with bright blue flowers; all of the Cape Heaths also are valuable additions, but most of them will require manipulating with wire before they can be used. A few pretty and most useful additions can be had from the stove-house, which are not nearly so much grown as they deserve to be. Among these are *Clerodendron fragrans flore-pleno*, very sweet-scented; *Dipladenia boliviensis*, the only variety of the genus adapted for bouquets; its white flowers with a golden throat are beautiful; *Eurycles australasica*, a bulbous plant with distinct white flowers; *Gardenia citriodora* (*Mitriostigma citriodora*), a very good substitute for Orange-blossom when this article is scarce; *Glonera jasminiflora*, somewhat resembling a Bouvardia, but with delicate blossoms of the purest white; *Hoya bella*, a well-known old favourite, but neglected of

late years; *Ixora*, Prince of Orange, and other varieties with small trusses; *Rogiera gratissima*, somewhat resembling the *Ixoras*, but quite distinct; *Rondeletia speciosa major*, very useful, with good available length of stem; *Tabernaemontana coronaria flore-pleno*, with beautiful white flowers of sweet perfume; *Torenia Fournierii*, a very useful stove annual, both choice and distinct; *Urceolina aurea*, as pendants around the edges of an arrangement, would be most handsome. There are also *Franciseea calycina major* and *F. Hopeana*, with flowers of a purplish shade, the latter variety being deliciously scented.

What may be called "every-day flowers" will not need any description or enumeration. We have them from among stove and green-house plants and bulbs, from our shrubs and herbaceous borders; many of these are so well known and so frequently used as to have become household words. Those which we have quoted in the foregoing lists will each in their respective seasons be found useful: our object in giving the names of such being to draw attention to them as possessing distinctiveness from that material which is so often used in the composition of bouquets. The best of flowers lose their charm when met with in nearly every arrangement that comes across one's notice. Anything, therefore, that can be brought into use that will impart novelty, at the same time being suitable for the purpose under consideration, should be sought after and appropriated as occasion may occur.

Foliage and Arrangement.—To foliage as a necessary accompaniment to the flowers, it is requisite to devote particular attention. As in the decoration of vases for the house, so also in the case of bouquets, we frequently see an undue preponderance of Maiden-hair Fern. We would not for one minute disparage the use of this, the best of all Ferns undoubtedly, but it is easy to have too much even of a good thing sometimes. So it is in the case of the Fern under notice, the result being that the bouquet will lack in a great measure that distinctive feature which it ought to possess when completed. Take for instance a bouquet in which it is intended to use four, five, or more *Camellias*; these handsome flowers are often denuded of their beautiful leaves to give place to Fern foliage. This is a mistake; one *Camellia*-leaf at least should accompany each flower. Should the leaves be somewhat large, take a few tips of the green-leaved *Euonymus latifolius* instead. The *Gardenias* are another case in point; the pale green of the young shoots surrounding the expanded flower being its best ornament after some of the larger leaves have been removed. Roses, too, should have a few tips of shoots or their own suitable leaves intermixed with them. In the case

of other flowers also, the same rule should be followed where practicable. Where it is not possible to use their own foliage, as in the case of *Eucharis amazonica*, other leaves may be substituted; when in season, *Caladium argyrites* will be found of much service in this way, going well with the *Eucharis*. Of other useful things in the making of bouquets, nothing surpasses the tips of the shoots of the Box-leaved Myrtle (*Myrtus communis angustifolia*); the common Myrtle, too, is very useful for working in between the flowers. When these cannot be obtained in sufficient quantity, some foliage and young growths of the finely-cut-leaved scented Geraniums will be found of great value in preventing the flowers from being pressed too closely together, being better in every way than using Moss for this purpose.

Avoid the placing of any flowers in an unnatural position; thus with *Lapageria* blossoms, more often than not they are arranged in the centre, or in proximity thereto, of the bouquet. It does not follow that because the *Lapagerias* (both the red and the white varieties) are such handsome flowers they are adapted for bouquet-making. It will be well to consider for just one minute in what position a plant of *Lapageria* in full blossom displays its flowers to the best advantage. Most floral admirers will admit that it is when the flowering shoots are allowed to hang suspended from a wire arch or flat trellis-work in such a way that their beauty can be seen from below them. This being so, the mistake of using the flowers in an inverted position will at once be discernible. The more we can copy the natural habit of the flowers to be dealt with, the better will be the effect of the arrangements. There are exceptions of course, but these are few in comparison to the other side of the question. Use the *Lapagerias* therefore around the margin of the bouquet, so that their flowers hang as pendants to the same: unless, however, the bouquet be of more than average dimensions, it is a better plan not to use them at all. Flowers of tube-like formation should as a rule be avoided, such as the *Gloxinias* for example; these beautiful flowers cannot be arranged to advantage in a bouquet by reason of their shape. With the utmost care the other surroundings will press them too closely, unless they are arranged above the other flowers, but for this they will be found too large. These remarks do not, of course, refer to small flowers of this shape, such as *Stephanotis* and *Bouvardias*, which are always welcome. Another awkward flower for a bouquet is the *Bougainvillea*; its peculiar-shaped floral bracts are very pleasing, but not calculated to do the plant justice for these purposes, neither is it of a colour that harmonises with any other but white.

Wiring.—The wiring of many kinds of flowers indispensable for bouquet-making is necessary, by reason of the short available stems with which they can be detached from the plant. This wiring process must be done in a careful manner, so that no such things are visible when the arrangement is complete. Wire of various strength can be had from nurserymen and florists, specially cut into lengths for these purposes. Three sizes at least will be found requisite in most cases: the stoutest, called "stubs," as artificial stems; the next size, more pliable, for wiring the flowers; and the finest, or binding wire, which is sold on reels for better convenience. This last kind can be used to bind the bouquet together as the making process is being carried out, but is not perhaps so well adapted for this work as the tying material called "raffia." We prefer to use this binding wire for the stems of delicate texture, for which purpose it is very handy. Some small twigs will make very good artificial stems for the larger flowers; for this it is better to select the slender shoots of such plants as the Snowberry (*Symphoricarpos racemosus*), and the common Nut, or the Persian Lilac. These shoots can be made pliable by entwining some of the wire around them, and will be found easier to secure in position than a single piece of wire, which cannot always be held in its place sufficiently tight to prevent its moving about. A little wet Moss may be tied around the natural stem of the flower to better preserve the same in good condition; this can easily be accomplished as the wiring process is being carried out.

A few remarks as to the wiring of flowers will not be out of place. In doing this, great care is necessary not to disfigure those flowers which are easily injured if not handled cautiously. The best way to proceed with such as the *Eucharis*, is first to fold a piece of tissue paper around its slender and delicate stem, after which bind this on with the finest wire; no fear need then be apprehended of the larger size of wire cutting through the stem and spoiling the flower. Other flowers with which there is any probability of the same sort of thing occurring may be served in a similar way. Several of the *Orchidaceous* plants have blossoms with very slender foot-stalks; these will all be better for such purposes if served in the same manner. In the case of *Roses* two wires will be sufficient; these should be thrust through the seed-pod at right angles to each other, and not through the lower part of the petals, as some are accustomed to do it. With *Camellias*, however, it is necessary to pierce the lower parts of the petals with the wires; two will suffice for an average flower, three for an extra full one; by taking the flower in the left hand, the petals can be gently pressed together should the same be fully expanded. It is the

best plan, we think, to secure Camellias for bouquets just as they are about to expand, then after the wiring has been done the outer petals can be reflexed by the thumb and finger. We make it a practice to place either a piece of cotton wool or Moss, that has been well soaked in water, close up to the flower; then when the wires are brought together, the same will be pressed close up to where the flower was severed from the stem; this will aid in keeping it the fresher. A small twig will require to be added as an artificial stem before being worked into the bouquet.

Bouvardias, and similar flowers with tolerably good stems of their own, only require one wire twisted around the same in order to bend them into the required shape. We have seen a wire thrust up the tube of each blossom of *B. jasminoides* and *B. Humboldtii corymbiflora* in order to keep them erect; we do not think this at all necessary, being indeed dangerous when, in order to inhale the perfumes, the bouquet is drawn close to the face, the Bouvardias generally being made to project beyond the average distance of most of the other flowers. Hyacinths and the Polyanthus Narcissus will be most conveniently used in bouquet-work if each pip is wired separately; three or more of such pips can then be placed together in one bunch before being arranged in the bouquet. If used singly, we prefer to draw them in between the other flowers after the main part of the arrangement is complete. (The Roman Hyacinths and Paper-white Narcissus are exceptions, being of more convenient size.) Stephanotis is best managed in the same way as the Hyacinths and the Tuberose, of which one blossom will be better than three in a bunch, and can be drawn amongst the other flowers at the finish. Other examples will not be requisite on this subject; it will suffice to say that wiring of flowers is oftentimes carried out too severely; practice in this, as well as in other departments of floral arrangement, being the best teacher.

Forms and Kinds of Bouquets.—Bouquets are made of various shapes and sizes; a great divergence in opinion exists on these points. In shape we incline to that represented by one-third of a circle, or 120 degrees; not rigidly adhering to that form, for no formality should be visible. Bouquets more often than not are made too flat, in which way the flowers cannot possibly be seen to the best advantage. On the other hand, we sometimes see them of the opposite extreme, after the shape of an ordinary bell-glass. As a novelty, they can be made to "one face," as it were. This system has certainly one advantage—viz., that of convenience in laying them down. It does not appear, however, to have

met with general approval, and is now seldom practised. Respecting the sizes of bouquets, it is necessary to consider for what purpose they are intended when completed. For wedding festivities we prefer them slightly in excess of an average size; for the ball-room, and other similar occasions, the average dimensions of bouquets should not on any account be exceeded, or the weight, &c., will cause them to be inconvenient. With bouquets that are intended for presentation, the size may with advantage be increased beyond that of those for weddings, these being rarely used for any special purpose after being presented, beyond retaining them till the flowers fade. With such bouquets it will be advisable to use a little extra Moss round the stems of those flowers which are not long enough to reach the water when placed in a vase. It will also greatly tend to keep them fresher if the bouquet be inverted every morning, and some water poured amongst the stems, afterwards giving a gentle shake and removing any faded Fern, &c., with a pair of scissors. We would advise all choice arrangements of this kind to be kept under a glass globe, comments on which have been made in a previous chapter.

Making up.—In making up bouquets, pay due attention to keeping the centre well elevated above the flowers that are brought into close proximity to it. Rose-buds or Camellias will answer for the centre admirably, by reason of their form. The Eucharis are not well adapted for this purpose, being too flat in appearance; Gardenias would be decidedly preferable; a truss of Stephanotis would also answer very well. After the floral arrangement is completed, two or three fronds of Maiden-hair Fern with small pinnæ may be drawn lightly between the flowers, those of medium size that are of a pale green colour being chosen. For fringing the margin, the same sort of Fern, with an admixture of *Davallia bullata*, or any other closely-resembling kind. Those Adiantums (Maiden-hairs) that partake of a roseate tinge in their younger state will also be found of much service; our British species, *A. Capillus-Veneris*, with its pale green fronds, in the same stage of growth, is one of the most beautiful of our Ferns. A few sprays from *Asparagus plumosus nanus* will be found of convenient form for the same purpose.

This brings us to the finishing point, leaving only the bouquet-paper to be added, with little basket-like holders and ribbon, at the discretion of the maker, to suit individual requirements. Those papers with a cup-like formation, and a tolerably broad margin of an ornamental character, are by far the more preferable. The flat papers of a few years back are not to be compared to them for convenience. If an extra good cup with costly lace fringing is being used, it

will be advisable to cover the inside of the cup with a piece of oiled paper or silk; no stain or moisture will then be so likely to penetrate the same, which, if preserved in good condition, can be made to do service a few more times. When using the little basket holders, in order to draw the handle of the bouquet tightly into them, a piece of string should be securely tied to the bottom of the handle and passed through the small end of the holder. This will draw it close, when it can be fastened with the string at the bottom, and by the use of a stout pin or two at the top, to be afterwards hidden by the ribbon, which should in a general way be white.

Bridal Bouquets.—Bridal bouquets are, more frequently than not, made entirely of white flowers; in fact it may almost be taken as the adopted rule. White flowers may be looked upon as denoting purity and chastity; hence probably they symbolise these virtues on such occasions. We do not think the one colour need be so rigidly adhered to; flowers of pale and of deep golden shades may with appropriateness be used; some of the Orchids being especially well suited for the purpose, notably the Dendrobiums, the Oncidiums, and the Odontoglossums, in which this colour predominates. In *Cælogyne cristata* we have the pure white and golden hues combined, this being one of the best of all Orchids for these purposes. The Tea-scented Roses, with flowers varying from the pale yellow of Marie Van Houtte to the dark apricot shade of Madame Falcot, are all most suitable in the bud state. We can see no objection to flowers of a soft pale pink being employed as well as those shades of colour just mentioned. Orange-blossom is looked upon as being very essential in these compositions; when this article is scarce, the small quantity that is used ought to be worked in near to the centre, where it will more readily catch the eye. Rather more foliage may advantageously be worked into the composition of bridal bouquets when they consist wholly of white flowers.

Another novel change from the stereotyped form of bouquet-making, and one which we think will meet with greater approval when better known (especially for wedding festivities), is in the selection of light ornamental baskets of wicker-work wherein to arrange the flowers. These can be carried with far greater ease, being more portable. The convenience of the basket over the bouquet form will, we think, be appreciated for placing on the "breakfast" table afterwards, which alone is sufficient to recommend the style to the favourable notice of all floral admirers. We strongly recommend a trial of this system by those who desire to see a novelty of considerable merit displayed on these auspicious and joyous occasions. Bridesmaids' bouquets should differ only in

point of colour from the bride's. This addition of colour is generally regulated to suit the dresses that are worn. White flowers, however, should be the predominating feature in their arrangement.

Ball-room Bouquets.—Bouquets for the ball-room and other evening entertainments have oftentimes to be made with the same regard to the dress as in the case of those we have just commented upon. The desired colour should be approached as nearly as possible: a shade lighter rather than a shade darker is preferable when difficult to match. We have previously stated that these bouquets should not exceed the average size, and given the reasons for the same. They should be made as light as possible in every way, using scarcely any Moss or other material round the stems, keeping the handle as small as practicable. When no limit is placed on the colour in such compositions, two shades besides the white will generally be sufficient, although some of the prettiest arrangements we have seen have had only two colours used in making them—*i.e.*, white and another shade. Blue should be avoided as much as possible in all bouquets that are to be seen under artificial light; the nearest approaching shade that looks well is to be found in the lovely blossoms of the stove-flowering plants belonging to the genus *Franciscea*. These are not, however, always easily to be had when wanted. When it is necessary to use blue flowers, those of a light shade will look the best. The buds of the Tea-scented Roses of diversified shades and tints will be found as useful as any material for these kinds of bouquets, all of which will associate well with white flowers.

Presentation Bouquets.—With bouquets that are intended for presentation, the arrangements should be made as varied as possible. The best flowers that are obtainable should be employed in their composition; a greater variety, too, will be admissible by reason of their extra size. Use every means, both by the employment of Moss tied round the flowers with short stems to keep them fresh, and by securing long stems in all possible cases, so that the bouquet is not disappointing to its possessor after he or she has had it only a few hours. In the case of *impromptu* nosegays, or bunches of flowers, long stems should be used on every convenient occasion. The best thing to be done with such as these will be for the possessor to undo them carefully from the bunch and re-arrange into vases in a loose manner.

Flowers are frequently presented to the sick, and no more appropriate use could well be made of them, yielding a solace and a balm to those in pain, and inducing for a time the languid

smile of pleasure. With such as these, if presented in bunches, the better way will be to pull them to pieces as just advised, then arranging only a few in any one receptacle for greater convenience. With

should be packed in a little damp Moss or tissue paper; if the flowers should be susceptible to damage by rubbing each other, a little cotton wool may be used; but we do not advise it to any extent, as it



PRESENTATION BOUQUET ARRANGED BY MRS. H. B. SMITH, OF EALING, AND PRESENTED TO H.R.H. PRINCESS CHRISTIAN.

such the water should be changed every day, if in a confined room. Flowers, too, with strong perfumes should not on any account be allowed to predominate.

With the advantages of the Parcels Post, affording a quicker means of transit for small parcels, flowers could with convenience be forwarded. These

acts as an absorbent rather than as a preserving medium to the flowers. This will be found an excellent means of conveyance for flowers intended for presentation, and suitable boxes are already to be had for this special purpose; the weight of these boxes is but trifling, allowing a considerable margin for the flowers.

Wreaths and Sprays.—Wreaths for the decoration of the head-dress of ladies are not so prevalent now as formerly. They look best when carefully made in the lightest manner possible; that portion which is arranged to the front should be wider and somewhat more imposing than where the two ends meet at the back of the head. In fact, when well made it should graduate each way from the front until both ends meet, with a narrow margin to each, at the back of the head-dress. These wreaths require very careful manipulation; there should not be the slightest pretence at working up the effect by using an extra quantity of flowers and foliage. When the colours are suitable, the scarlet and white varieties of Bouvardias, represented by *B. Hogarth* and *B. elegans* among the scarlet, and *B. Vreelandii* and *B. Alfred Neuner* among the whites, will make an effective arrangement for a wreath of this kind. If lighter colours are desirable, instead of the scarlets there are *B. Priory Beauty*, with pale satin rose, and *B. Queen of Roses*, with bright rosy-pink blossoms. These and other varieties will be found of excellent service in this kind of decoration, of light appearance, and easily arranged. During their long season the Marguerites, or Paris Daisies (yellow and white), will make very appropriate material for the same uses. Among our hardy plants, the Pansies or Heartsease will afford us excellent subjects for head-dresses; so also will the Primroses and Lilies of the Valley. These wreaths having to be made somewhat narrow in proportion to their length, the Fern that is to back them up should be chosen as suitable as possible. *Asplenium Veitchii* would be an excellent kind; the Davallias also, with a small spray only of the Maiden-hair Fern for fear it may fade too soon. Small Ivy-leaves are also extremely pretty, and very durable; these should be chosen with the pale green and bronzy tints on them. During the autumn the extreme points of the shoots of the Virginian Creeper would be of great service.

Sprays for the dress are much more sought after now than a few years back; in fact, great improvements have been manifest for some time past in this style of personal decoration, and some most beautiful devices of this kind are now to be met with. Simple flowers are by far the best for these purposes; take, for instance, a few blossoms of the Poet's Narciss (*Narcissus poeticus*) and a backing of a few small Ivy-leaves and Fern-fronds—the choicest Orchid will not surpass it for beauty. Other kinds of Narcissus or Daffodils can be used, the smaller ones being preferable. Rose-buds, again, especially those of pointed shape, are always sure to give satisfaction. Work in the beautiful tinted leaves of some of the Tea-scented varieties with their own buds, and no other foliage

accompaniment will be needed. All the flowers mentioned for the wreaths will be suitable for the sprays, besides which should be enumerated the choice of rarities among the Orchids and stove plants, and the inmates of the green-house also. Suitable things from among the Orchids are very numerous; those, however, that we have previously quoted will be found among the best, though there are many others that could be named. *Eucharis candida*, *Dipladenia boliviensis*, *Ipomea Horsfalliæ*, and *Hoya bella* will all be choice additions from the stove. From the green-house, among many uncommon things, the small-flowered forms of the tender Rhododendrons will be extremely interesting, with their Stephanotis-like blossoms of many shades. Besides the foliage already advised for the wreaths, some sprays of *Asparagus plumosus nanus*, and the smaller leaves of the gaily-coloured Crotons, will be of durable service from the stove-house; whilst from the cold green-house, and open air in sheltered positions, the fine lacinate foliage of the Japanese Maples would all the summer season be of the greatest use. In form these sprays should taper to a point, using the smallest flowers at the extremity. Avoid going to the extreme in point of size, or the length of the wreath will be an inconvenience rather than an ornament.

Button-hole Bouquets.—Button-hole bouquets and coat flowers are among the easiest of all things to arrange, yet we often see them unsatisfactorily done. The simple coat flowers, such as Rose-buds, Gardenia blossoms, and the like, can hardly be said to require any making, merely requiring the addition of their own foliage in each case, instead of going abroad to seek something else in their place. It is a good plan to be on the safe side with a wire or two thrust through each, in case of accident to the stem, which should be as small as possible. With button-hole bouquets, in which two or more kinds of flowers are arranged together, be careful not to produce them of too large a size; this is frequently the mistake that is made in these compositions. Two colours are enough in any such arrangement, and these must be chosen with due discrimination. With a Rose-bud, a piece of *Astilbe japonica* always looks well; so also does one fair-sized Rose-bud with two or three tiny buds of Fairy Roses round it. Little sprays of Forget-me-nots will be very useful, so also will the Statives, both the hardy and the green-house varieties. A couple of blossoms of the Tuberose, with a little colour addition, will be ample for one arrangement. Wiring will be essential with many flowers, Camellias in particular: these require to be taken when the flower-bud appears to have two or three days longer to go before

it bursts. This will make a much prettier button-hole than if left to expand itself. After two wires have been thrust through the base of the bud, the petals can be carefully reflexed with the aid of some smooth substance, as the end of a budding-knife, or with the thumb and forefinger. This will then make a pretty button-hole with a sprig of the Common Myrtle, or one or two Camellia-leaves of the smallest size. Previous to the wires being brought together, a little piece of cotton wool may be soaked in water and placed close up to the bud to keep it fresher, if no stem exists long enough of its own.

We find it an excellent plan to keep several glass tubes of different sizes by us for the better preservation of the flowers. These will hold just sufficient water to keep the flowers fresh the greater part of the day. These tubes are now produced so very cheaply that any admirer of a coat flower may possess them. The button-hole through which they are placed for security should not be relied upon to keep the same in its place. It is a good plan to have a narrow strip of silk sewn to the coat near the button-hole, so that the glass tube when placed through the latter will rest in this strip, which should be of the exact shape of the tube itself, thus holding it securely. This necessitates several coats perhaps prepared in this way, but the little extra trouble of that is immaterial in comparison to the increased comfort in wearing the flower itself. Many flowers made up for these purposes by florists and others have a needless amount of wire used in their composition. With these some difficulty will be experienced at times in procuring a tube of sufficient size to hold them; when this is the case, a portion of the wire can very well be taken away without any inconvenience. If a little of the backing comes away at the same time, it will matter but little, rather more than is necessary being more often than not used in the making.

In the event of small glass tubes not being considered desirable wherein to fix the stems of the flowers, it is an excellent plan to envelop them in a small quantity of tinfoil paper. This material, being a non-absorbent, tends to keep the stems, and consequently the flowers also, in a fresh condition for a greater length of time.

COMMON GARDEN FLOWERS.

The Feverfew, or Pyrethrum.—This represents a somewhat numerous genus of very useful plants, especially the double and single forms of the Caucasian *P. roseum*, now so common in gardens, and so striking and showy during the summer months, to

be alluded to more in detail farther on. *Pyrethrum* is the name of a plant described by Dioscorides, and seems to be a name compounded of the two Greek words, *pyr*, "fire," and *ethron*, "the lower part of the body," evidently in allusion to the pungency of the root; for Dioscorides describes the plant as "with foliage and properties something like Fennel, and with a root the thickness of a finger, having a most burning flavour." No species of our native Pyrethrums quite come up to these characteristics. *P. inodorum*, the Corn Feverfew, is the common British species of our fields; *inodorum* meaning "scentless;" and the fact of its lacking fragrance intimates that the species certainly is not identical with the Pyrethron of Dioscorides. *P. inodorum* is also known as *Chamomile goldius*: the generic name refers to its flowers being the shape of those of the Chamomile; *goldius* refers to the yellow colour of all the florets. It is also known as the Scentless Mayweed, which alludes to the form of the flowers being like those of the Common Mayweed, and to the whole plant being inodorous. It must not be supposed, however, that the Common Chamomile is a Pyrethrum; it is *Anthemis nobilis*, a native of the Continent, but extensively cultivated in the herb gardens of this country for the supply of druggists. Chamomile is of two varieties, the single and the double-flowered; but though the latter is frequently preferred, the former is more powerful, and possesses in the greatest degree the essential properties of the plant. It is the flowers that are used, and they are well known for their tonic properties. The common name Feverfew is really *Pyrethrum Parthenium*, and is derived from the Latin *febrifuga*, from its supposed febrifugal qualities. This is a well-known native plant, common in gardens, flowering freely in summer; found also in Europe and the Caucasus, and in all probability not truly indigenous to this country. There is a double variety also. The yellow-leaved Pyrethrum known as Golden Feather, so much used in flower gardens during the summer, and so widely distributed, is a sport from the single-flowered form; and this again sported to a handsome cut-leaved form known as *laciniatum*, and again to a dwarf type with charming mossy foliage, known as *selaginoides*. All these golden forms come true from seed. A double-flowered variety with golden foliage, named Golden Gem, is a sport from the double-flowered form.

There are a few hardy perennial species of Pyrethrums found in gardens, that deserve a passing notice, such as *P. achilleaefolium*, the Narrow-leaved Pyrethrum, remarkable more for its graceful leaves than for its few golden-yellow flowers; a native of the Caucasus; *P. lacustre*, the Marsh Pyrethrum, known also as *Chrysanthemum lacustre*; a native of Portugal, bearing pure white flowers with a yellow

centre; *P. serotinum*, the Late-flowering Pyrethrum, a showy tall perennial, growing four to six feet in height, bearing large pure white flowers in autumn;

caria inodorum flore-pleno is sometimes classed with the Pyrethrums. It is a vigorous-growing hardy herbaceous plant, producing in summer numberless



PYRETHRUMS, SINGLE AND DOUBLE, NATURAL SIZE.

a native of North America; *P. Tchihatchewii*, the Turfing Daisy, a dwarf, hardy evergreen species, forming a dense turf, useful for carpeting slopes and dry soil and rockwork, where little else will grow; a native of Asia Minor; *P. uliginosum* is mentioned above as *P. lacustre*. What is best known as *Matri-*

compact, double, pure white flowers, that are extremely useful for cutting from. It does well in any ordinary garden soil.

Too much cannot be said in praise of *P. roseum* and its many single and double varieties. They are among the most useful of summer flowers. *P. roseum*

(also known as *P. carneum*), in its original form, came to us from the Caucasus many years ago. Originally the flowers were single in character, and being found to produce seeds, new varieties were obtained in this way. A quarter of a century or so ago, M. Themisterri, of Belgium, obtained a large variety of a distinct shade of rose-colour, showing a tendency to produce superfluous florets. This was sent to the late Mr. John Salter, of the Versailles Nursery at Hammersmith, and under the careful cultivation he gave it, this, and other forms produced from it, gradually filled up the centre disc with quilled florets, until in course of time perfectly double flowers were developed. The first really double flower put into commerce was one named *roseum album*, having several rows of external florets of a lively violet-rose, with a centre of white quills. This found its way to the Continent, was used by the Continental florists for seed purposes, and from it were obtained other double varieties of an improved and valuable character. One of the most prominent present-day raisers of the Pyrethrum is Mr. Kelway, of Langport. He has a very large and varied collection of single and double varieties, accessions to which are made every year in the shape of seedlings. The Langport collection consists of about three hundred varieties, and several thousand seedlings are bloomed each year.

The Pyrethrum will stand the severest winter unharmed; it is perfectly hardy, and generally of a vigorous habit of growth. In order that there should be a good free growth and heads of fine flowers, the plants should be in a good deep sandy loam, well enriched by the addition of some thoroughly decomposed manure. The plants should be at least eighteen inches apart, and it is a good plan to fork in some manure in autumn, giving a surface dressing of the same also in spring. The plants are exposed to one great source of danger, namely, through slugs harbouring in the roots, and eating the crowns of the plants away. It is therefore customary with those who grow them largely to go over the plants in autumn, clearing away any decayed foliage, and then placing a layer of silver sand about the crowns: the slugs do not like it, and so are kept at bay. The best position in which to grow Pyrethrums is in a heavy loam resting on a bed of gravel.

The Pyrethrum is propagated by means of division of the roots, when the plants have done flowering; and any side shoots that have not formed roots can be made into cuttings. The cuttings can be pricked off into pots of light sandy soil, and placed in a cold frame, and shaded from the sun when it shines out warmly. The divided pieces can be put into a prepared bed in a cold frame, or planted out on a shady border and covered with hand-glasses, and in due

time they will grow into nice plants. But slugs and snails will prove very injurious if not closely looked after. As soon as the divided pieces are strong enough, they should be planted out in beds in a fitting soil of the character above mentioned.

Pyrethrums can also be raised from seed. Formerly we were dependent upon the Continental florists for seed, but of late years, owing to the more extended culture of the varieties in this country, seeds have been more freely saved. The seed should be sown in pans, pots, or boxes of fine soil, and placed in a cold frame until it has germinated; then hardened off, planted out in a bed in the open ground, and grown on strongly to flower fifteen months afterwards. It is found that seed from double varieties invariably produces double flowers, and seed from single varieties, single flowers.

SELECTION OF DOUBLE PYRETHRUMS.

Amphitrite, rosy-carmine.	Marquis of Bute, rosy-pink and yellow.
Captain Nares, crimson.	Melton, crimson-magenta.
Chamois, chamois.	Mons. Barrel, purplish-crimson.
Delicetissimum, bright rosy-lilac.	Nancy, blush-white.
Emile Lemoine, rosy-lilac.	Nemesis, red and orange.
Fulgens plenissimum, carmine, tipped white.	Niveum plenum, pure white.
Galopin, crimson - edged white.	Placida, peach.
Gloire d'Italie, rosy-red.	Prince Feck, bright crimson.
Haage et Schmidt, deep rose and white.	Rembrandt, rosy-purple.
Hermann Steuger, rosy-lilac	Rose Perfection, lilac.
Imbricatum plenum, crimson.	Roseum album, rosy-purple and white.
Iturbide, purplish-crimson.	Sulphureum plenum, blush-white and yellow.
Iveryana, bright rose.	Sylphide, pure white.
J. N. Tweedy, maroon.	Uzziel, deep rosy-crimson.
Lady Derby, silvery-flesh.	Wilhelm Kramer, deep rose, tipped white.

SELECTION OF SINGLE PYRETHRUMS.

Albatos, deep pink.	Nabis, maroon.
Bellona, rich carmine.	Nestor, pink.
Caprius, rich purple.	Octavia, rosy-pink.
Carbo, rosy-carmine.	Ophis, dark purple.
Damia, dark purple.	Faceus, rich rose.
Ethel, white and rose.	Roseum, soft pink.
Hamlet, rich pink.	Sherlock, crimson-scarlet.
Juliet, white and pink.	Valentia, pale pink.
Letus, white.	Vistula, flesh.
Melon, rich pink.	Zeithen, white and pink.

The Dropwort, or Meadow-sweet (*Spiraea*).
—The true Dropwort is *Spiraea Filipendula*, and, according to Turner, it has received its common name on account of its small tuberous roots hanging like drops by slender threads. *Spiraea* is from *speira*, anything wreathed. The flowering branches are used in garlands.

Spiraea Filipendula is very common in meadows throughout Europe, in fact it is a rather common native herb, flowering in summer, yellowish-white. There is a form of this that finds a place in gardens; it bears numerous corymbs of double white flowers, which, as in the case of the single form, have a slight creamy tinge; the foliage is elegant and Fern-like. It does well in ordinary garden soil.

S. Aruncus is the Goat's-head Spiræa, a vigorous and stately perennial, a native of Europe, Asia, and America, growing to a height of four feet, producing in summer small white flowers, freely produced in long spikes forming a terminal panicle. It does well in the open border, and if roots be taken up in the autumn, and put into pots, it forces well in early spring.

S. japonica, as it is termed, but subsequently known as *Hoteia japonica*, and more recently as *Astilbe japonica*, is a well-known plant, largely used for forcing in early spring, and throwing up numerous feathery panicles of white flowers.

S. japonica variegata is a beautiful variegated form of this, every leaf traced throughout with golden-coloured veins, the flowers larger than in the case of the type. Both are hardy, and should have a rich moist soil. The green form is very largely grown on the Continent, and sent to England in great quantities in autumn, where it is extensively forced into bloom in spring, and largely used in floral decorations. It is also an excellent decorative plant for a warm green-house when well grown in pots. It is a native of Japan.

S. palmata, the Palmate Spiræa, so named on account of its handsome Palm-like leaves, is one of the most beautiful hardy plants in cultivation; the deep purple-red of the stems and branches passing into the crimson-purple of the glorious broad corymbs of flowers, contrasts finely with the foliage, which in the autumn assumes beautiful tints of brown and gold. It does well in a deep sandy loam, on a moist border, and near to water; it also makes a good forcing plant in spring, and is largely imported from abroad for this purpose. A variety named *elegans* is said to be a white form, but is not pure; it is certainly very distinct, and a pretty plant, in habit and foliage very similar, the pale flowers having conspicuous red stamens. Both are natives of Japan.

S. Ulmaria is the Meadow-sweet, or, as in Turner, Mede-swete, a meaningless name. Supposed to be a corruption of Meadowort, or honey-wine herb. Hill, in his "Herbal," states that "the flowers mixed with mead give it the flavour of Greek wines," and this is said to be unquestionably the source of the word. Dr. Prior, in his "Popular Names of British Plants," states that "the Latin name, *Regina prati*, Meadow's Queen, has misled our herbalists, in their ignorance of its use, to form the above strangely-compounded word, Meadow-sweet."

S. Ulmaria is a common British plant, bearing yellowish-white flowers in summer, sweet-scented, small, and numerous. It is a native of Europe and Britain, flourishing in borders in any soil and in waste places, and, like the foregoing, increased by division of the roots. There is a double variety of this also,

which makes an excellent border plant; and also one with handsome variegated foliage.

S. venusta is known as the Queen of the Prairie—a handsome hardy perennial, a native of North America and Siberia. Its lovely deep rosy-carmine flowers are produced on stems from two to four feet in height, forming huge cymes six to twelve inches across. It is undoubtedly one of the finest of the Meadow-sweets, and one of the best of hardy perennials for planting in a shady moist situation.

A recently introduced species is *S. astilboides*. It is a native of Japan, and one of the most handsome of hardy herbaceous perennials. The stems are furnished with triternate leaves, and terminated by compound feathery branches of elegant white flowers; it makes a charming pot plant for decorative purposes in the early spring months; it is of free growth, and its flowers are produced in the greatest profusion.

There are many Spiræas that are hardy flowering shrubs, some of great beauty—such as *ariaefolia*, which produces large feathery panicles of white flowers abundantly in July; *Lindleyana*, a noble shrub from the Himalayas, with very large compound leaves and immense bunches of white flowers, quite hardy; *opulifolia*, with showy white flowers, succeeded by red bladder-like fruit, which remain on the tree a long time, and are quite as ornamental as the flowers; *pachystachys*, that bears immense bunches of pinkish flowers, abundantly produced; *prunifolia*, a handsome species producing double white blossoms; *salicifolia*, having erect spikes of rose-coloured flowers; and *trilobata*, when in blossom a mass of snowy flowers. All the shrubby Spiræas are free bloomers, and are very gay when in flower. Most of them, however, throw up suckers rather too profusely.

The Catch-fly (*Silene*).—*Silene* is the generic name adopted by Linnæus from the Greek word *sielos*, "spume or saliva," on account of the stickiness of some of the species. The common English name—Catch-fly—was given in consequence of flies being often caught in the viscid fluid which, in some species, surrounds parts of the stem. *Silene* is a very numerous genus, but comparatively few are cultivated generally, and of these the hardy annuals find most favour.

Of our British species, the best known are *S. acaulis*, the Cushion Pink or Moss Champion, and *S. noctiflora*, the Night-flowering Catch-fly. *Acaulis* means "stemless." Moss Champion refers to "the number of heads of small green leaves, very thick set together in tufts, in that manner spreading much ground, and covering it like Mosses;" so writes old Parkinson. Champion is thought to be a corruption of "champagne," or open country, alluding to the

native place of all the species. It is a very dwarf Alpine herb, tufted into light green masses like a wide-spreading Moss, but quite firm. It does well in the rock-garden, in exposed parts, and in any

S. Elizabethæ is Elizabeth's Catch-fly; a beautiful species, the flowers of which look more like those of some handsome but dwarf *Clarkia* than those of the commonly-grown *Silenes*; it bears large bright rose-



SILENE PENDULA.

open moist soil. This plant, though humble in stature, aspires to the highest of dwelling-places; for whether in the British Islands, in Germany, or even Lapland, it is found only near the summits of mountains. It is said to have been the last flowering plant observed by Saussure in ascending Mont Blanc.

S. noctiflora is the Night-flowering Catch-fly, and the common name alludes to the time of flowering; the border of the petals being rolled inwards during the day, but unfolding in the evening, and emitting an agreeable fragrance in mild weather. It is an annual, flowering in July, and found in corn-fields on sandy or gravelly soil.

S. alpestris is the Alpine Catch-fly; a charming evergreen rock or border plant, growing with the greatest freedom in almost any soil or situation; forming tufts of dark green foliage, completely covered with panicles of glossy white flowers; grows about six inches in height, and flowers in early summer. A native of the Alps of Europe.

coloured flowers in summer. It is a native of the Tyrolese mountains, and does well in the rock-garden, in warm spots, in well-drained sandy loam, and on the margin of the choice mixed border.

Silene maritima is the Sea Catch-fly. The double variety of this is a choice hardy plant in gardens, growing in the form of prostrate tufts of glaucous foliage, scarce an inch in height, bearing double flowers as large as the old double white Pink; very easily grown and exceedingly free-flowering, and one of the most conspicuous rock-plants in culti-

vation. The single form is a native of several parts of Britain and Norway.

S. regia is a very effective North American species, growing about nine inches high, with rough erect stems, thick leaves, and clusters of deep scarlet flowers.

S. Schafta is a neat trailing autumn-flowering species, with bright rosy-purple flowers. It is very free-blooming, and makes a fine edging mass. It is

known as the Autumn Catch-fly, and is a native of the Caucasus.

Of the annual Catch-flies there are several handsome varieties of *Silene pendula*, all hardy and early flowering, therefore valuable in the spring garden. They should be treated as biennials, sowing the seed in July. In addition to *pendula*, with rose-coloured flowers, there are its white variety, and its double form also, but it is somewhat difficult to keep it true when raised from seeds; *ruberrima*, with crimson flowers and dark foliage; *Bonnetti* deep rose; and *pendula compacta*, a very dwarf tufted form, having rosy flowers, and a white variety also; *pseudo atocion* is a very pretty, free-blooming pink-flowered type. All do well in good garden soil.

The Ragwort (*Senecio*). — Ragwort is derived from the German *ragwurz*, a term expressive of supposed aphrodisiac qualities,

and originally assigned to plants of the Orchis tribe, as it is in Germany at the present day, and as we find it in all our early herbals. In our modern floras the name Ragwort is, for no other assignable reason than its lacinated leaves, transferred to a large Groundsel, *Senecio Jacobææ*. The generic name *Senecio* is derived from *senex*, "an old man," the naked, dotted, smooth receptacle being like a bald head, the down of the seeds being white, and many of the species hoary, all characteristics of age. The specific name of the common Ragwort, *Jacobææ*, is from *Jacobus*, the Latin for James, because the plant blooms about St. James's Day, July 25th. It is a very common weed in waste grounds and by waysides.

The common Groundsel of our gardens and fields is *Senecio vulgaris*, and it is a favourite food of many birds. Groundsel is from the Anglo-Saxon *grund-*

swelge, "ground-glutton," from *grund*, "ground," and *sweigan*, "swallow;" still called in Scotland and on the eastern border, Grundy-swallow.

Under the head of *Jacobææ* we find in seed catalogues a group of hardy annuals, varieties of *Senecio elegans*, known also as American Groundsels. They are natives of the Cape of Good Hope, and have been greatly improved by seedsmen. They are double-flowered, and of such good colours as crimson, blue, purple, &c. Formerly they were much used for bedding purposes, but are now somewhat neglected;

too much so, we think, for although old-fashioned, they are very pretty and useful, growing a foot or so in height, and blooming very freely and continuously. They grow freely in good garden soil, and can be raised from seed with ease. Why they are termed "American" Groundsels we cannot say, unless they have been improved in quantity in that country.



SENECIO BALBISIANUS.



There are a few *Senecios* that are included among choice hardy perennials—as, for instance, *argenteus*, the Silvery Groundsel, very dwarf, and like a miniature *Centaurea ragusina*. It is a native of the Pyrenees, and should be grown in a sandy loam as a dwarf silvery edging plant.

S. Balbisanus, the variety figured, comes from Piedmont.

S. Doronicum is a free-growing border plant, with large golden-yellow flowers on stems twelve inches in height. It is a first-class decorative plant, and very useful for cutting from.

S. incanus is the Hoary Groundsel from the South of France, but is not so valuable or so easily grown as *S. argenteus*; yet it is a pretty dwarf silvery-leaved plant, forming dense tufts, and a little gem for planting on rockwork.

S. japonicus is an ornamental composite from

Japan, growing about four feet in height, bearing lax panicles of large golden flowers; quite hardy, and well worth growing.

But the king of the herbaceous *Senecios* is *S. pulcher*, known as Tyerman's Groundsel. It is a native of Uruguay, and was originally discovered by Tweedie nearly fifty years ago, at the foot of the Sugarloaf Mountain, near Maldonado, in South Brazil. It was introduced to English gardens by Mr. J. Tyerman, Tregony, Cornwall, who raised it from seeds received from Buenos Ayres. It forms a valuable addition to our autumn flowers, and if plants are lifted from the open ground just as they come into bloom, placed in pots, and kept in an ordinary green-house, they will flower freely. It is quite distinct from any other species. The leaves are fleshy, and of a glossy dark green colour, the radical ones measuring nine to ten inches in length. From the centre rise numerous erect stems three feet in height, terminating with branched cymes of brilliant purplish-crimson flowers with a golden-yellow disc, of good form and great substance, measuring at least three inches in diameter. It is exceedingly vigorous in growth, and perfectly hardy, and it is in all respects a first-class border plant.

THE PINE-APPLE.

BY WILLIAM COLEMAN.

INSECTS WHICH AFFECT THE PINE.

White Scale (*Coccus bromeliæ*).—This destructive insect spreads with alarming rapidity over the largest collections of plants when it once finds its way into the Pinery, and it is most difficult to eradicate. It is a small, whitish-grey insect, and is found firmly attached to the surface of the leaves, where it feeds upon the juices, and very soon ruins the plants. Many poisonous and expensive remedies have been proposed for cleansing the plants; but it is questionable if any of them can be applied with satisfactory results. Therefore, to avoid the heavy loss, inconvenience, and annoyance which follow in its wake, the greatest care should be observed in the introduction of fresh plants to a clean stock without first placing them in quarantine sufficiently long to allow the young to show themselves, and even then to keep a sharp eye on them. The cheapest and best way to deal with infested plants, and all that have grown near them, is speedy committal to the flames, root, soil, and stem, and to thoroughly cleanse with caustic lime and burnt sulphur preliminary to a new start with clean stock. Cultivators who have tried once, rarely try a second time to cleanse a house of plants—a pretty strong proof that the

remedies some eulogise are not so satisfactory as one could wish. The following recipes are strongly recommended:—2 lbs. sulphur, 2 lbs. soft-soap, $\frac{1}{2}$ lb. tobacco, 2 oz. nux vomica, 1 oz. camphor dissolved in spirits of turpentine, boiled in 8 gallons of soft water for one hour. When the liquid has fallen to 120° immerse each plant, roots and all, having previously shaken away all the soil. After the plants have drained and dried, re-pot and plunge in a clean, fresh bed.

The late Mr. Tillery, of Welbeck, recommended the following:—He says, "I mixed equal quantities of the driest new soot and flour of sulphur together, syringed the plants with a fine syringe, and then dusted them, above and below, with a common sulphur puff. It was done in the dead time of the year, and not syringed off for three weeks. The syringing washed the mixture into the axils of the leaves and to the roots, where it acted as a stimulant when the plants began to grow in the spring. Out of several houses of plants so treated, not one insect survived."

A very dear friend once supplied the author of these pages with a few plants "warranted clean." They were placed with sixty-five successions, worth as many pounds. White scale broke out. Tillery's system was tried, and adhered to, to the letter; but the soot and sulphur burnt the roots instead of feeding them, and ultimately every plant was consigned to the fire.

Some Pine-growers have advocated placing the plants in strong steam from fermenting horse-litter; others syringe with clean hot water at a temperature of 120° to 130°; while others, again, say there is nothing like paraffin, a wine-glassful to a gallon of warm soft water, for syringing with. The latter modern remedy is undoubtedly a most excellent one if properly applied, otherwise it will soon kill the strongest plants.

As paraffin does not mix well with water, it is necessary for one person to keep the water and paraffin in constant agitation with a syringe, while a second, also with a syringe, applies it to the plants. The Pines should be laid on their sides, to prevent the paraffin from settling on the roots or resting in the hearts, and in the course of half an hour they should be well syringed with clean warm water before they are re-plunged in a new bed.

Brown Scale sometimes gets on Pines from other plants; but it is comparatively harmless, and is easily destroyed by the first application of paraffin, or water at a temperature of 130°. Before the plants are dressed for brown or white scale, it is a good plan to loosen all the insects that can be conveniently reached with a hard, half-worn painter's brush, to insure the destruction of the larvæ. When

once disturbed, the full-grown insects never again establish themselves on the leaves of the plants.

Mealy Bug (*Coccus adonidum*).—This insect is so well known to every gardener, and so much dreaded by all who have had to contend with it in fruit-houses, that further description of it may be considered superfluous. It has already been treated of under "Vines."

When it gets established on Pine plants, it is most difficult to dislodge, as its white mealy covering seems to protect and render it almost impervious to hot water, unless it can be driven against it with great force. It very soon spreads from the leaves to the stems and roots, when it becomes almost as formidable, and quite as destructive, as the white scale itself, as it is capable of gaining a secure resting-place under the soil and in every crevice throughout the house in which the plants are located. A great number of poisonous mixtures have been recommended for its destruction, and were it possible to bring every female under their direct influence, there can be but little doubt that the next generation of gardeners would know it only by name, but disagreeable facts to the contrary prove that annihilation has not yet been accomplished. Consequently its first appearance should be the signal for immediate warfare, and no pains should be spared, even to the burning of infested plants, in preference to allowing a single bug to remain in the Pinery. By those who have the misfortune to be engaged in the destruction of this loathsome insect, the solution recommended for the white scale may be applied; or the following, which has been taken from the "Transactions of the Royal Horticultural Society":—"To three gallons of soft water add two pounds of soft-soap, eight ounces of sulphur vivum, and two ounces of camphor; boil together for an hour, and then add three ounces of turpentine. Turn the plants out of the pots, shake out the balls, and immerse the roots and tops in a trough filled with the liquid, at a temperature of 120° to 130°. Allow the plants to remain five minutes in the liquid, turn them up for it to drain out of the hearts, re-pot and re-plunge in a pit that has been properly cleansed and prepared with fresh plunging material." All who have had to use these powerful ingredients know how dangerous they are, and it is now well known that turpentine is the most active agent in the destruction of the insects. With this knowledge for their guide, growers of the present day have dispensed with all but the spirits; but instead of using turpentine, they apply paraffin, one wine-glassful to a gallon of water, with the best possible result, provided the plants are taken in hand before the bug gets into the soil.

As previously advised, the water should be kept in constant agitation to prevent the oil from floating on the surface, during the operation of syringing. The plants should be taken out of the beds, but not out of the pots, and laid on their sides, heads inclining downwards, to prevent the spirit from lodging in the hearts or reaching the roots, to which it might prove injurious. In half an hour they should be well syringed with clean water at a temperature of 90°, and left to drain before they are re-plunged.

Methylated spirit, as obtained from the chemist, and applied with a camel's-hair brush, causes instant death to every insect which can be reached by the hand. When operations of this kind are going on, and for some time afterwards, prudence suggests drawing down the blinds during bright sunshine.

VARIETIES OF PINES.

Although the varieties of Pines are numerous, it is not necessary to grow many kinds to keep up a supply of good fruit throughout the summer and winter; and as many of the kinds formerly grown have given way to the few which are now considered the best, this list will be confined to the names of those which have been found indispensable in ordinary private Pine-growing establishments. As all the varieties contained in this selection of the best are not alike well adapted to summer or winter, it is my intention to give a brief description of each, with remarks as to their keeping qualities and seasons of use.

The Queen.—Of this fine old Pine several varieties are grown, but none are better than the Ripley. It is a dwarf compact grower, with broad mealy leaves, produces many suckers, and propagates freely. Fruit: cylindrical, bright yellow, pips prominent, but quite flat when perfectly swelled; flesh pale, juicy, rich, and of first-rate quality. It is a sure starter, finishes its fruit quickly, and on this account is the best and most generally grown for giving a supply for the early London season. As an exhibition Pine, its handsome appearance and superior quality always insure for it the first place in the front rank. Its quality as a summer and autumn Pine is not excelled, if equalled, by any other kind; but being rather tender it does not swell well in winter, when it is generally deficient in juiciness and flavour. Weight of fruit, from three to eight pounds. The latter weight is exceptional, but fruits weighing from five to six pounds are now frequently produced by successful growers. It keeps in good condition three weeks after being ripe.

Hurst House, or Fairrie's Queen.—This remarkable Pine is well adapted for small places where

space is limited; but, being a very dwarf, if not a bad grower, and a shy fruiter, it is only fit for summer use. When under good management, it produces fruit six pounds in weight. Owing to its dwarf habit and much-recurved leaves, this Pine is easily distinguished from all others. Three plants in eight-inch pots can be grown in a space equal to that occupied by two old Queens; the fruit, however, is not so handsome, neither is it so good. It keeps good three weeks after it is ripe.

Thoresby Queen, or Bennett's Seedling.—

Leaves very long, and broader than those of the common Queen, upright and compact in growth, with a light-coloured, mealy surface. Spines fine and thickly set. Fruit large, six to eight pounds, barrel-shaped, and broader than the better-known Charlotte Rothschild; pips flat and even; flesh deep yellow, firm, and moderately juicy. Flavour good, but not equal to any of the true Queens. It has a small crown, and produces suckers freely.

Charlotte Rothschild.—A strong spreading grower, taking up rather more room than the Smooth-leaved Cayenne. Leaves broad, leathery, slightly curved, dark green on the upper side, mealy beneath, thickly set with large strong spines, giving the plant the appearance of an unusually robust Queen, which the fruit also resembles. It starts freely into fruit, which it swells to a large size, good samples weighing seven to ten pounds. It is slightly barrel-shaped, with large flat pips of a bright yellow, almost rivaling the Queen, but the quality is not so good when ripened under the most favourable conditions. It is, however, worthy of a place in the front rank, as it stands well as a winter Pine. To bring out its full flavour and quality it should be grown in a high temperature, where it can have an abundance of solar heat and light. If removed to a dry room before it is quite ripe it will keep three to four weeks.

Smooth-leaved Cayenne.—This handsome Pine has caused greater sensation amongst Pine-growers than any other variety; the leaves being long, broad, dark green, and smooth or almost free from spines. Inferior kinds have often been substituted for it to meet the demand for stock; but its superior quality being so marked, the spurious varieties are now seldom met with, and this splendid Pine stands very high as a winter fruiter.

Fruit very large, cylindrical, oval, dark orange-colour; pips large and flat; flesh pale yellow, juicy and excellent. Average weight from six to nine pounds.

Mr. D. Thomson, the most successful grower of this fine variety in Britain, says of it:—"This is the

finest Pine I know for supplying fruit from October to May. It swells more freely and is more juicy than any other Pine that I have grown, and its flavour is excellent."

This is the variety grown by British gardeners in the Azores, and with which every fruiterer's shop in England is so well stocked from November to May. Unfortunately it does not produce suckers freely. The ways and means of making stock have been discussed in the chapter on Propagation. If removed to a dry airy house before it is quite ripe, it will keep five weeks in good condition.

Black Jamaica.—Of all the winter Pines grown this is undoubtedly one of the very best, and it should be in every choice selection where high quality is appreciated. It is tall and erect in its growth, with long, dark green leaves, tinged with red and finely serrated. It can be grown and fruited in small pots in a temperature which is considered too high and dry for Pines generally. Fruit cylindrical when well swelled, bronzy-yellow when ripe; pips flat with a slight depression in the centre; flesh firm, rich, juicy and highly flavoured. As it swells well in winter, when it attains a weight of three to five pounds, the principal stock of plants should be in a condition for starting into fruit in August and September.

Montserrat.—A variety at one time much grown in the neighbourhood of Manchester, under the name of Black Jamaica, was known to southern growers as "Montserrat." It is a most delicious Pine, quite equal to the Black Jamaica; but the plant and fruit being smaller, the latter more barrel-shaped, it is better suited to small houses where space is limited. Unfortunately the demand for Pines of larger size has almost thrown this variety out of cultivation. It can be kept in good condition five weeks after it is ripe.

Lord Carington.—Although the history of this fine Pine is not well known, thanks to Mr. Miles, the clever gardener to the earl whose name it bears, it is likely to soon become a general favourite. Like the Jamaicas, a section to which it undoubtedly belongs, it is an upright grower, with broad fleshy leaves, the young ones tinged with brown; spines medium-sized, thickly set. Fruit long, pyramidal, dark brownish-yellow; pips flat, but not so smooth as those of the Jamaica; flesh fine pale yellow, rich and very highly flavoured; weight four to seven pounds. Like the preceding variety, the Lord Carington seems eminently adapted for winter culture, as it swells well through the dark sunless months, and ripens evenly from the base to the crown. As this variety is inclined to grow tall, it is very suitable for

placing in a back row in the winter fruiting-house. It is a sure fruiter under Jamaica treatment, and does well in a ten-inch pot. The section to which it belongs should be a sufficient guarantee of its keeping qualities.

Lady Beatrice Lambton.—This large, handsome variety was raised at Lambton Castle by Mr. Stevenson some twenty years ago; but the credit of bringing it before the public is due to Mr. Hunter, the present gardener, who has exhibited remarkably fine fruit, weighing from seven to ten pounds each. It is described as being of tall growth, with dark green leaves, covered with an unusual quantity of whitish meakiness. Fruit pyramidal with a small crown, and closely set in the foliage; pips broad and flat, orange-coloured, bright yellow in the furrows; flesh pale yellow, abundantly juicy; flavour rich and excellent. Mr. Hunter reports its average weight to be nine pounds, the heaviest he has cut weighing eleven and a half pounds, as being one of the handsomest of the large varieties of Pine-apple, free-bearing, more robust in growth and less spreading than the Smooth-leaved Cayenne. Mr. D. Thomson, the great authority on Pines, is now fruiting it extensively, and speaks very highly of it. It should be classed with the winter fruiters.

White Providence.—Though this Pine is now seldom met with, the fact that it produces the largest fruit should give a few plants a place in large collections. It is a tall, strong-growing variety, with broad mealy leaves, is easily grown and fruits freely. The fruit is oval, with large nearly flat pips of a reddish-yellow colour; flesh white, sweet, and juicy, but not highly flavoured when ripened in summer. It is of no value as a winter Pine, and does not keep long.

There are several other distinct varieties, such as Moscow Queen, Enville, Black Prince, Prince Albert, Globe, and Prickly Cayenne, which might be described; but as they are not in every respect equal to the kinds which have been proved worthy of a place in this list, their enumeration only will suffice for the guidance of those who may wish to give them a trial in their Pine-stoves.

THE ROSE AND ITS CULTURE.

By D. T. FISH.

ROSES FOR PILLARS, PYRAMIDS, ARCHES,
ARBOURS, TENT-BEDS, RUSTIC RESTS, &c.

WHILE Roses multiply and increase at a ratio and improve with a speed far exceeding all the most fervid imaginings of the older Rosarians, it is more than doubtful whether our use and enjoy-

ment of them is so appropriate and pleasing as theirs. Under the Roses was with them synonymous with the sweetest rest and most satisfying pleasure; and they took pains to get under them. Hence the prevalence of arches, arbours, and covered seats in gardens. To these, philosophers came to think, poets for inspiration, lovers for sweet fellowship, and the uneasy for rest. With the abolition of arbours, shady flower-covered verandahs, and garden seats, much of the restfulness, and not a little of the sweet cultured enjoyment of the old-fashioned gardeners of the older gardens, has passed away. The best of gardens have now, certainly, more of promenades than quiet resting-places such as those of which Moore sings—

“ In the time of my childhood it was like a sweet dream,
To sit under the Roses and hear the birds' song.

* * * * *

Long, long be my heart with such memories filled;
Like the vase in which Roses have once been distilled;
You may break, you may shatter the vase, if you will;
But the scent of the Roses will hang round it still.”

And thus may the memory of some of the Rose bowers or arbours in which Addison, Shenstone, Wordsworth, Scott, or Moore sat or walked, cause a revival of this innocent and useful form of garden ornament and furnishing; for assuredly Roses never look more truly “the glory of the day” than when they shelter us with their verdure and beauty from the noonday heat at midsummer, as we sit or walk under their shadows, or gaze up at them flooded with light or pearly over with rain or dewdrops.

While the foundations or base-lines of arches, &c., must of necessity be highly artificial, the art should be as much as possible concealed by the Roses, so that the results in general landscape should look natural. To achieve this is most difficult; still it is more or less possible, and should be aimed at by landscape gardeners. The weakest point in most gardens, from a picturesque point of view, are the Roses—stiff, squat, or formal to a fault, as a rule. By twisting them over arches, allowing them to wander wild and free over arbours, covered ways, and seats, the Roses in our garden may be made to equal, if not rival, in the same wild luxuriance and artistic effects, those occasionally to be found in out-of-the-way places. The highest art in the matter of Rose-training is, as it were, to “clothe upon art with nature.”

This is very difficult, next to impossible, in regard to pillar and pyramidal Roses, but becomes comparatively easy in regard to the covering of arches and the clothing of seats and arbours.

Pillar Roses.—The distinguishing feature of these is uniformity of breadth, as far as may be,

from base to summit. They may taper very slightly towards a point at the top, but if they taper much they simply merge into pyramids.

They may vary in height from six to ten or even twelve feet. Pillars under six feet are hardly worth setting up; they lose stateliness and dignity, the chief merits of Roses of this character and form. Nine feet is a capital height for this class of Rose, and nine to eighteen yards apart is close enough to plant them. They look well in single, and better still in double lines—one on each side of a main walk or road. For the latter, twelve feet in height would not be excessive, provided they could be grown tolerably uniform to that height.

Few things, however, savour more of ambitious pretence, indifferent culture, or lack of knowledge than the sight of unclothed pillars of iron or wood with Roses struggling in vain to reach their summits. Better far than such sights as these, which are all too common, would it be to cut down the pillars to match the growing powers or climbing capacities of the Roses.

Pyramidal Roses.—These are seldom so lofty as those grown as pillars, though there is no reason in their form for any reduction of height; on the contrary, their greater breadth of base would give greater real and apparent stability to an increased height of stem. They differ chiefly from pillar Roses in their greater breadth at bottom and more regular tapering from base to summit. Those not familiar with pyramidal Roses or other trees can hardly do better than choose for a model a sugar-loaf enlarged in size to any desired extent.

Pyramidal Roses seem rather to have gone out of fashion, chiefly on account of the craze for perfec-

tion of bloom in Roses, chiefly or only. Neither the form nor the best mode of clothing pyramidal Roses with a maximum amount of beauty, by clothing them from base to summit with Roses, favours mere size of single blooms. But thus clothed and marshalled in rows on either side of main walks, or planted singly or in groups in any part of the garden or pleasure-grounds, each pyramid becomes a show in itself, compared with

which the most brilliant display of Roses in boxes becomes stiff and even poor.

Pyramidal Roses are perhaps most effective in double lines, twelve or eighteen feet apart in the rows, with a space of eighteen, twenty-four, thirty, or thirty-six feet between the rows. This distance affords room for a gravel walk between, and, if on turf, affords ample space for a delightful promenade, from which the Roses may be seen and enjoyed in all their richness of floral grandeur.

As to the varieties to plant for running up into pillars or spread-

ing out into pyramids, the more hardy Noisettes and prolific Ayrshire and Evergreen Roses are among the best. The often-named Gloire de Dijon and Gloire de Bordeaux form admirable pyramids. Most of the free-growing Teas would do almost equally well in warm localities and sheltered places, while the Hybrid Chinas, Coupe d'Hébé, Chenodole, Charles Lawson, Paul Verdier, Vivid, and Madame Plantier are as well adapted for pillars as for pyramids. Cheshunt Hybrid grows so rapidly and blooms so freely that it is equally well adapted for pillar or pyramid, and every addition to this class of hardy Hybrid Teas will be eagerly welcomed for these purposes. But the more vigorous and floriferous Hybrid Perpetual Roses are also admirably fitted for moulding into pyramidal shapes;



A ROSE ARBOUR.

though they do not bloom all the year like the Chinas or Teas, the majority of them bloom in the autumn as well as in the summer. The foliage of many of them is also so fine as to add another element to their beauty. Many varieties also produce very good blooms from pyramidal plants, though, of course, this is not a form that would be chosen by the grower for exhibition, quantity of bloom being far more to the purpose on pyramidal Roses than the mere quality of individual blooms. One of the oldest Hybrid Perpetuals, *Baronne Prévost*, still forms one of the finest pyramids.

Roses for Pyramids.—The following Hybrid Perpetuals are among the best varieties for this purpose.

Anna Alexieff.—Bright salmon-rose, very large.

Antoine Mouton.—Next to Paul Neron, the largest Rose grown; rose with reversing petals, silvery.

Auguste Neumann.—Deep scarlet, shaded violet.

Baron de Bonstetten.—Dark velvety-crimson.

Baronne Haussmann.—Light red, blooming in clusters.

Camille Bernardin.—Light red with white border.

Charles Lefebvre, and the climbing variety, both form capital pillars, and have been already described. The flowers of the climber are, however, not equal to the older and better variety.

Charles Turner.—Vivid red, full and large.

Comtesse de Serenye.—One of the best show Roses of the soft rose-coloured class, also a good pillar Rose.

Countess of Rosebery.—Brilliant carmine.

Dean of Windsor.—Rich vermilion, shaded with crimson.

Docteur Baillon.—Crimson-red, shaded with purple.

Dr. Hogg.—Pretty shell-shaped, deep violet.

Duchess of Bedford.—Brilliant scarlet.

Duke of Edinburgh.—Equally good as a show and a pillar Rose; its rich vermilion showing brilliantly in contrast with other Roses when placed in a line with them as a pillar.

Egeria.—Delicate silvery-pink.

Elie Morel.—Almost pure white, slightly tinted.

Félicien David.—Vivid red, suffused with scarlet.

General Jacqueminot.—Still one of the best for pyramid or post, and one of the brightest of all the scarlet Roses.

Gloire de Bourg La Reine.—About the most brilliant of all scarlet Roses.

Glory of Cheshant.—Bright crimson.

John Bright.—Rich glowing crimson.

Jules Margottin.—Rich rosy-carmine.

Louisa Wood.—Bright rose, very beautiful.

Madame Hippolyte Jamin.—White, with a slight tint of rose.

Madame Lacharme.—Pure white, slightly suffused with rose; these are very effective in bud.

Madame Marie Girodte.—Pure rose, large and full.

Madlle. Eugénie Verdier.—Soft flesh-coloured rose.

Magna Charta.—Bright pink, suffused with carmine.

Marchioness of Exeter.—Clear rose, shaded with cherry.

Maréchal Vaillant.—Brilliant crimson.

Monsieur E. Y. Teas.—Rich purple-cerise.

Mrs. Veitch.—Bright rose, large and good.

Paul Neron.—Deep rose, immense size.

Penelope Mayo.—Rich carmine-red.

Président Grévy.—Rich purple-red, blooming in clusters.

Président Willermoz.—Bright rose, large striking foliage.

Red Dragon.—Dazzling crimson, very robust and vigorous.

Reine des Blanches.—White, suffused with rose.

Souvenir de John Gould Veitch.—Crimson, shaded with violet-purple.

Thomas Methven.—Light carmine.

Thomas Mills.—Rosy-carmine, with white stripes.

Arches and Arbours.—Roses for arches, chains, tent-beds, arbours, drooping pendants, &c., should all be of similar character, and it would only confuse the general reader to maintain any further distinction between them. They should be of climbing habit, have small and semi-evergreen leaves, flower in clusters or very profusely, and continue in bloom as long as possible. Hence if only sufficiently hardy, and could it be induced to bloom perpetually or twice a year, which it occasionally does to some extent, there is no Rose to equal the Banksian as a climbing chain or drooping Rose. As seeing is said to be believing, we give an illustration in proof of this statement.

Unfortunately, however, it is scarcely sufficiently hardy for our climate, though, as it is seldom actually killed in the open, it is worth growing in warm and sheltered places for the simple grace, decorative and clothing value, of its leaves and branchlets alone. Crossed with the Stanwell or Perpetual-flowering Scotch Rose, the Banksian might produce a race of most valuable climbing Roses, combining the rare and valuable qualities of extreme hardiness, delicious fragrance, and small leaves and flowers, and plenty of the latter in continuity. As the hardy Scotch Perpetual Rose is one of the sweetest of all the many deliciously fragrant Roses, and is also a stronger grower than any other of its interesting class, it might be used to clothe the bottom of arches, or run up the pillars of arbours, to form supports for drooping chains, &c.

Where the *Maréchal Niel* Rose can live in the open through the winter, it forms a magnificent Rose for

arches, though its leaves and flowers alike set our rules in favour of smaller blooms in climbers at defiance. Yet, as an arch-clother, the Maréchal Niel is simply and wholly magnificent. Its weakness at the neck becomes a merit in such a position, as the flowers all droop under the arches, where they can be seen to best advantage. Celine Forestier and Triomphe des Rennes, and Rêve d'Or, also look rich and beautiful on arches, in mild sheltered places. Among the Tea Roses, Homer, Climbing Devoniensis, Wm. A. Richardson, and the two Glories, Dijon and Bordeaux, are the very best for arches, arbours, &c., though any of the Teas may be planted at the base of the more rampant and truer climbers. Among the more suitable for this purpose are Belle Lyonnaise, Madame Trifle, Safrana, May Paul, Anna Oliver, Innocente Pirola, Madame Denis, Madame B. Durrschmidt (flesh, tinted salmon). The Hybrid Teas, Cheshunt Hybrid, Prince Olga de Wurtemberg, and Reine Marie Henriette, are also admirable on arches. The so-called climbing varieties of the following Hybrid Perpetuals, and most of those strong-growing sorts already named and described as suitable for pillars and pyramids, are also good for furnishing arches, &c.—Climbing Bessie Johnson, Jules Margottin, Charles Lefebvre, Victor Verdier, Captain Christy, Edouard Morren, Middle Eugénie Verdier.

All the old-fashioned, strong-growing Chinas, such as Gloire de Rosamene, Bourbon, and Noisette Roses with their many hybrids, most of which will be found in our list of garden Roses, are more or less suitable for arches, arbours, &c. Such strong growers as Chenodole, Fulgens, Blairii No. 2, Madame Plantier, and Coupe d'Hébé will run over arches ten feet high and twelve feet span. The climbing Aimée Vibert will also run to almost any length.

But when all this rich and valuable furnishing material is exhausted, it will be needful still to hie back to many of the oldest and hardiest of all our climbing Roses for the furnishing of arches, draping of dependent chains, and clothing of arbours and garden seats with verdure and beauty.

Much may also be done in these directions by the planting of strong-growing briar and other stocks, carrying them over the arches or other structures to be ultimately clothed with Roses, and budding any suitable sort of Rose—such as the sweet and beautifully clustered white Hybrid Perpetual, Boule de Neige—on to the briar, just where they are wanted. The curious possessor of only one arch might clothe it by such simple means with almost any number of separate and distinct Roses.

Boursault Roses form admirable stocks, and the following are still worth growing for their rampant growth, beauty of foliage alike in summer and autumn, and also for the brightness of their flowers

whilst they last, which is not long: Amadis, crimson; and Gracilis, rosy-pink.

Almost all the Ayrshire Roses are worth growing for these purposes: the three whites, Thoresbyana, Rampante, and Countess of Lieven; the two whites with pink or red eyes, Dundee Rambler and Splendens, the last the sweetest of the family; and the well-known flesh-coloured variety Ruga.

Among semi-evergreen climbing Roses the following are the best:—

Banksiaeflora.—White, with pale yellow centre.

Félicité Perpetuelle.—Small, creamy-white.

Leopoldine, or *Adelaide d'Orléans*.—White, shaded with rose.

Myrianthes renoncule.—Bluish, edged with rose, the centre sometimes white.

Donna Maria.—Pure white, flowering in large houses.

Flora.—Bright rose-coloured.

Princess Louise.—Rich creamy-white.

Spectabile.—Rich rosy-pink.

Princess Marie.—Small double red.

These Roses bloom in large clusters, and consequently have a rich effect depending from arches, chains, or arbours. From the fact of some of the clusters containing so many as fifteen to fifty blossoms, and the staying properties of some of the double varieties, the Evergreen Roses continue a long time in bloom. Two or more of them, Rampante and Spectabile, have also a dash of Perpetual blood in them, and not seldom show a fair sprinkling of bloom in the autumnal months.

There are several other vigorous and hardy climbing Roses, mostly Prairie, or Multiflora Roses, or hybrids from them.

Prominent among these is La Grifferaie, a pink-coloured Rose of such vigour of growth that it has been much used as a stock.

Laure Davoust.—Pink, fading into white, very large trusses, rather tender.

Russelliana.—Dark crimson.

Baltimore Belle.—French white, double.

Madame d'Arblay.—Pure white, in large clusters.

Gem of the Prairies.—Crimson, blotched with white, very fragrant.

The Garland.—Unique in colour, nankeen and pink fading into white.

Queen of the Prairies.—Rosy-purple, large and double.

Madame Vivian Morel.—Bright carmine, with rosy-white under petals.

Setina.—A fine American Rose, vigorous, with delicate, silvery-pink flowers.

Tricolour.—Pink, mottled white.

To these may be added the Fringed Musk Rose, and Rivers' Musk, varieties of rapid growth, that

would be suitable for clothing the bases of arches, arbours, &c.

The Single White Himalayan Briar Rose, Brunoniana, with yellow stamens; the Camellia Rose of Japan, single white, with large yellow stamens; Paul's Single White and Single Red; and the Waltham Climbers, 1, 2, and 3, all strong-growing red seedlings from Gloire de Dijon; and the Common, Scarlet, Double, White, and Celestial Sweet-briar, should also be used for drapery as well as for fragrance. True, their flowers do not last long, but while on arch or bower none are more brilliant or beautiful, and the fragrance of Sweet-briar is indeed a joy for ever.

GREEN-HOUSE PLANTS.

BY WILLIAM HUGH GOWER.

Pultenæa.—A showy family of Australian Pea-flowered shrubs, which may be treated in the same manner as previously recommended for *Charozema*.

P. ericoides.—Branches slightly tomentose; leaves linear; flowers in dense terminal heads, red and yellow. Spring and early summer.

P. rosea.—A dwarf, compact, and handsome plant, with closely-set tomentose leaves, and dense heads of soft rosy-purple flowers. Spring and early summer.

P. villosa, a stronger-growing plant than either of the preceding; branches hairy; leaves linear-oblong; flowers yellow. Spring months.

Rhododendron.—A family of plants now so familiar to every one that a lengthy description is quite unnecessary. They belong to the order *Ericaceæ*, although at first sight there seems a wide difference.

The numerous fine species from Northern India, which were for the most part discovered and introduced to cultivation by Sir Joseph Hooker, Director of the Royal Gardens, Kew, took all the plant-growing public by surprise, and they were eagerly sought after and highly prized. The majority of these species are handsome strong-growing plants, whilst some of them are dwarf, free-growing, and profuse bloomers; these have been the originators of a numerous class of small-growing hybrids, which are rapidly and deservedly becoming favourites with the horticultural world, for independent of their floriferous character and the great beauty of their flowers, many of them are deliciously fragrant. A few of the best and most desirable are here sub-joined.

Rhododendrons should be potted in good sandy peat, and are all very easily cultivated.

R. argenteum.—Leaves large, flowers white, beautifully spotted with black. North India.

R. Aucklandii.—Flowers some five inches in diameter, white, suffused with rosy-pink. North India.

R. Boothii.—A fine variety; flowers soft buff-colour. North India.

R. ciliatum.—A dwarf-growing species, which has been the parent of many fine hybrid forms now so much admired; leaves small, obovate, bright green on the upper side, glaucous beneath, hairy on the edges; flowers white or pale rose. North India.

R. Countess of Haddington.—A robust grower; flowers large and extremely handsome, bluish-white; hybrid.

R. Dalhousia.—A noble plant, with gigantic flowers, produced in dense heads, white, suffused with rosy-pink, very fragrant. North India.

R. Denisoni.—Flowers white, stained and spotted with pale yellow; hybrid.

R. Duchess of Edinburgh.—Flowers brilliant scarlet, shading to crimson; hybrid.

R. Duchess of Teck.—Tube creamy, ground pale yellow, shaded with orange-scarlet; hybrid.

R. Edgworthii.—Leaves bright green above and densely woolly beneath; flowers large, white, tinged with pink, very fragrant. North India.

R. fragrantissima.—Flowers white, shaded with bluish, deliciously sweet; hybrid.

R. Gibsonii.—Compact grower; leaves small; flowers white, tinged with bluish. North India.

R. jasminiflorum.—Umbels large; flowers tubular, with a spreading limb, pure white with pink eye, very fragrant. Mountains of Malacca.

R. javanicum.—Rich bright orange flowers. Mountains of Java.

R. Nuttallii.—Leaves large; flowers pure white. North India.

R. Prince of Wales.—A fine, compact-habited plant; flowers with long tubes, rich orange; hybrid.

R. Princess Alexandra.—A superb variety; flowers pure white, with long tubes; hybrid.

R. Prince Leopold.—Fawn-colour, tinged with rose; fine variety; hybrid.

R. Princess Alice.—Flowers bell-shaped, very fragrant.

R. Princess Helena.—Tubes long; flowers soft pink, with darker shading; hybrid.

R. Princess Mary.—Flowers white, tinted with rosy-pink; hybrid.

R. Princess Royal.—Flowers funnel-shaped, rich rose-colour.

R. tubiflorum.—Flowers tubular, much contracted in the mouth, dark reddish-purple, tinged with bronze. Mountains of Java.

R. retusum.—Very dwarf; flowers reddish-orange.

R. Sesterianum.—Flowers large, pure white, spotted with yellow on the upper petals, and very fragrant; hybrid.

R. Taylori.—Heads of bloom very large; flowers tubular, tube white, the spreading limb brilliant pink; hybrid.

R. Veitchianum.—Flowers large, with crisp margin, pure white, with pale yellow markings at the base. Mountains of Moulmein.

R. Veitchianum levigatum.—The counterpart of the preceding, but instead of the beautiful crisp edges, they are plain in this plant. Mountains of Moulmein.

Richardia.

—These plants are very showy; better known perhaps by the old name of *Calla*. Amongst amateurs they will be more familiar as the *Arum Lily*, *Nile Lily*, *Trumpet Lily*, &c., the last name being very characteristic, although they do not belong to the Lily family.

The genus bears the name of a celebrated French botanist, and belongs to the order *Aracea*. They soon make large massive specimens if all the growths are left on them; but when confined to single stems, they produce the finest spathes, and in this condition are best adapted for window plants, or indeed any kind of in-door decoration. After flowering, *Richardias* lose their leaves, and lie dormant for some time. In the autumn they commence to show signs of returning life, when they should be re-potted in good rich loam and well-decayed manure, and be liberally supplied with water. Treated in this manner, they will grow

vigorously, and produce their large trumpet-shaped spathes in the spring and early summer months.

R. ethiopica.—A bold-growing herbaceous plant, producing from its fleshy corm, large sagittate cordate leaves, which, together with the long clasping petioles on which they are borne, are of a uniform bright green. The plant is indebted for its beauty to the large fleshy, pure white, trumpet-shaped spathe which surrounds the flowers, and not, as is the usual case, to the flower itself. It is a native of swampy places from Egypt to the Cape of Good Hope.

R. albo-maculata.

—Leaves sagittate, bright green, profusely spotted with ivory-white; the spathe pure white. It flowers during the spring and early summer months. Cape of Good Hope.

Solanum.

—A numerous genus, which gives its name to the order; it contains plants very diversified in form and character, which are widely distributed over both hemispheres. In some

instances they attain the dimensions of small trees, others are dense shrubs; some are herbaceous, and others simply annual plants. Their properties are also very variable: some are very poisonous, and others, such as "the Potato" (*S. tuberosum*), are highly nutritious.

Some of the annual species of *Solanum* have bold leaves variously ornamented with large spines on the



RHODODENDRON JASMINIFLORUM.

upper side, and are very effective during the summer months in the sub-tropical garden. *S. anthropophagorum* is a robust plant, producing large dull red fruits, which are not, however, sufficiently numerous to render it very ornamental; these fruits were formerly used in the cannibal festivities of the Fiji Islanders. *S. ciliatum*, again, is a very ornamental kind; the fruits are large and bright orange-red, but they do not last very long in beauty. *S. Melongena*, and its varieties, are remarkable for their large oval fruits of various colours, the plants being known popularly as "egg-plants"; these fruits are much used in French cookery, and are known by the name of *Bringals*. All of these, however, are far surpassed in beauty and usefulness by the improved hybrid forms of *S. Capsicastrum*, which are literally laden with their large, round or ovate, bright scarlet berries, that last many months in full beauty, and may be used for many decorative purposes.

S. Capsicastrum is easily obtained from seed, and if kept growing through the season, will form handsome plants the same season; they vary much in the size and shape of their berries, but when a fine variety is obtained it should be propagated by cuttings in order to perpetuate it; seeds of the finest berries should be sown, and each season the best ones can be selected for a maintenance of the fittest. Where small plants are required, they should be raised from cuttings or seeds every season, as the young plants produce the largest fruits, and after their beauty is past they may be thrown away; but if large specimens are wished for, then cut the plants back hard, and place in a close frame until they begin to

push forth their young growths, then re-pot into larger pots, and repeat the potting process as the plants require it.

These varieties are very easily grown. On the approach of autumn, some few plants should be given a little heat, which will speedily cause the green berries to ripen and turn to the red of a soldier's coat, and thus a longer succession is obtained.

The soil they thrive well in is equal parts of rich loam, leaf-mould, and well decomposed manure; and when the pots are tolerably well filled with roots, weak soot-water may be given about once a week with much advantage.



RICHARDIA ETHIOPICA.

Sollya. — A small genus of the order *Pittosporaceæ*, consisting of half-climbing shrubs, of dwarf growth; indeed, they make very pretty objects upon small trellises.

Sollyas are plants with simple leaves and small heads of blue flowers; the colour not being very common, they are usually

very attractive when well grown. For soil use equal parts of peat and loam, and about a fourth part sand. They are all from Australia, and all have blue flowers.

The chief varieties are:—*S. angustifolia*, *S. Drummondii*, *S. heterophylla*, and *S. linearis*.

Statice.—A large family of showy plants popularly known as "Sea-Lavender," and containing a quantity of hardy species and varieties, which may be reckoned amongst our most attractive border plants, several being indigenous to Britain.

The green-house kinds are also very ornamental, and maintain a rich display throughout the greater

part of the season, bearing large branched panicles of flowers, which, however, individually are not showy, but as the calyx and corolla are both coloured the mass is very conspicuous.

Statice belong to the order *Plumbaginacea*, and are characterised by their peculiar dry, papery, funnel-shaped calyx, which is not divided into lobes, but is entire, and usually blue or yellow, and the corolla white. The soil should consist of peat and light sandy loam; the pots must be well drained, as they enjoy a liberal supply of water when growing.

S. brassicaefolia is a very beautiful species, with large, deeply-lobed, dark green leaves, which are slightly hairy; panicles much branched; calyx deep blue; corolla white. Summer months. The Canary Isles.

S. Halfordii.—A bold-growing plant with entire, somewhat cordate leaves, dark green; flowers bright blue and white, and borne on large much-branched panicles. Summer months. Of garden origin.

S. profusa, also known by the name *S. Rattrayana*, is a dwarf and compact-growing plant of garden origin; leaves obovate, bluntly lobed, and dark green; panicles much branched and dense; calyx deep purple; corolla white. It is almost a perpetual bloomer.

Stenocarpus.—A small genus of *Proteacea*, natives of the tropical parts of Australia and New Caledonia. They require the same treatment as *Banksia* and *Dryandra*.

S. Cunninghamii, sometimes called *Agnostis sinuata*, becomes a lofty tree, but grows and blooms freely in a young state in cultivation. The leaves are entire, deeply sinuate, from nine to twelve inches long, thick and leathery in texture, and dark green; flowers in axillary racemes, arranged in the form of a corona, rich orange-yellow, very showy and handsome. Queensland.

Tacsonia.—A very beautiful family of climbing plants, so closely resembling *Passifloras* that there seems very little to distinguish them saving the length of the tube in the flowers, and even this is not a character to be depended upon; they are gorgeously beautiful when in bloom, and some of the kinds should find a home in every collection of plants. For treatment see *Passiflora*.

T. eriantha.—This, like all the species, has three-lobed leaves; the tube of the flower is very long, the whole being rich rosy-pink in colour. Summer months.

T. exoniensis.—Flowers large, freely produced, colour rich crimson.

T. ignea.—Flowers bright fiery-red.

T. manicata.—Flowers a rich crimson-scarlet. Summer and autumn. Peru.

T. mollissima.—Not a free-flowering plant in a young state, but very profuse with age; flowers large, deep rose. Quito.

T. sanguinea.—Flowers large, deep blood-red. Summer months.

T. Van Volzemi.—A very profuse bloomer during the autumn months; tubes long, flowers large, rich crimson-lake. New Grenada.

Tecoma.—A family of climbing plants belonging to the order *Bignoniaceae*, and nearly related to the genus *Bignonia*. They require about the same treatment, for which see Vol. I., page 278.

T. capensis is a very fine bloomer, producing in abundance its panicles of large rich orange-yellow flowers; the leaves are pinnate, with small ovate segments, serrated at the edges, deep green. Summer and autumn months. Cape of Good Hope.

T. fulva.—An exceedingly beautiful species, bearing a profusion of large rich-coloured flowers, which are red and yellow during the summer and autumn months. Bolivia.

T. jasmimoides is a rapid-growing kind, producing its charming soft pink and white flowers during the late summer months. Australia.

Testudinaria.—A genus of climbing plants nearly related to *Dioscorea*, and grown principally in the gardens of the curious on account of its weird and old-world appearance. There are a few species only, and all are very similar in general appearance. Pot in good rich loam.

T. elephantipes.—This curious plant has a thick woody root-stock, peculiarly ribbed and plated, which has given rise to the names of Tortoise-plant and Elephant's Foot; the root-stock attains to very large dimensions, often measuring three to four feet in diameter, and nearly or as much in height; it produces from the top several herbaceous twining stems, which are furnished with alternate, cordate, bright green leaves; the flowers are yellow, but very small and insignificant. There is another species, *T. sylvatica*, which resembles it very closely; the root-stock, however, is usually flatter than *T. elephantipes*. Both are natives of the Cape of Good Hope.

Tetratheca.—These plants belong to the small order *Tremandræceae*, and are frequently, though erroneously, called *Tremandras*. All are natives of Australia.

Tetrathecas are handsome, small-growing, Heath-like shrubs, with soft linear leaves and axillary flowers, which only open on fine days; they always

close again at night, and if open in the day, when rain is about to fall the *Tetrathecas* begin to shut up their blooms.

They are very showy when in flower, and are well suited for exhibition purposes; the treatment required to obtain good specimens is similar to that recommended for *Ericas*, but they will not bear the exposure to the full sun like those plants. For soil use about two parts of peat, one of light loam, and one of sand. *Tetrathecas* dislike fire-heat, but damp and mildew must be kept from them during winter by a free circulation of air.

T. ericoides.—A free grower and a profuse bloomer; the leaves arranged in whorls, linear and dark green; the flowers rosy-lilac. May and June.

T. hirsuta.—Leaves small, oblong, clothed with long hairs on the upper side, downy beneath; it is an abundant bloomer; flowers purple. Spring months.

T. verticillata.—A very free grower, and almost a perpetual bloomer; it makes very slender branches, and the narrow leaves are disposed in whorls; these are slightly hairy and bright green; flowers large, on long foot-stalks, rich violet-blue in colour. After flowering, the stems should all be cut back to within one or two joints of the old wood. This species blooms in the spring and summer months. (The correct name of this is *Platythecca galioides*.)

Thibaudia.—The plants of this genus are remarkable for the beauty of their flowers; they belong to the *Vaccinia*—an order we have noticed under the genus *Ceratostema*—and require the same treatment.

Thibaudias are deserving of the notice of all plant-growers, though careful attention is requisite to produce good specimens and to keep them in health.

T. acuminata (*Cavendishia acuminata*).—A beautiful evergreen shrub, with drooping branches, and alternate ovate lanceolate leaves, which taper sharply to a point; when young these are purplish-red, but change to dark green with age; flowers tubular, produced in large clusters towards the points of the shoots; tubes swollen at the base, scarlet, tipped with greenish-yellow. Naturally this plant is an almost perpetual bloomer; in cultivation, however, it flowers during the winter months. Ecuador, at 10,000 feet elevation.

T. cordifolia (*Cavendishia cordifolia*).—Leaves broadly-oblong, thick and leathery in texture, smooth, and deep green; flowers in dense terminal racemes, tubes tapering upwards, about an inch long, and bright rosy-red, tipped with white. Winter months. New Grenada.

T. coronaria (*Themistoclesia coronilla*).—An elegant shrub, with small Myrtle-like leaves; flowers tubular, on long drooping footstalks; tubes swollen at the base and ribbed, deep red. January and February. New Grenada.

T. Jessica.—A robust plant with large broadly-ovate leaves, which taper to a long point, eight to ten inches long, bright green above, paler below; racemes almost sessile, dense; flowers large and tubular, swollen at the base, both calyx and corolla being soft rosy-red. Autumn months. Caraccas. (Correct name *Psammisia Jessica*.)

T. sarcantha (*Psammisia sarcantha*).—Leaves broad, somewhat ovate, leathery in texture, dark green;



TESTUDINARIA ELEPHANTIPES.

flowers tubular, much swollen at the base, deep red, tipped with yellowish-green. The early spring months. New Grenada.

Vaccinium.—This genus is the type of the order to which so many beautiful plants have been referred in previous pages, and to it belong our native species, which are popularly known as Cranberry, Bilberry, Blueberry, and Cowberry, the fruits of which are great favourites with grouse and such-like birds.

The exotic kinds require the same treatment as recommended for *Ceratostema*.

V. Imrayi.—This can scarcely be called a showy species; it is, however, very peculiar and interesting. A bold-growing plant with ovate-acuminate leaves, leathery in texture and shining deep green; racemes crowded into dense heads at the points of the shoots; flowers large, campanulate, yellowish-green. It requires to be kept rather warmer than its allies. Summer months. Island of Dominica, at considerable elevations.

V. reflexum.—A charming plant, with long, slender, pendent branches; leaves closely set, small, somewhat oblong, leathery in texture, deep shining green above, vinous-red beneath; flowers in dense clusters at the ends of the shoots, coral-red. Winter months. Bolivia.

V. Rollissonii.—In this we have another tropical species, but it does not require great heat; it is an erect-habited plant, having angular branches and obovate leaves, leathery in texture, and deep shining green; racemes terminal; flowers bright scarlet. May and June. Mountains of Java.

FLORISTS' FLOWERS.

BY RICHARD DEAN.

The Petunia.—The term *Petunia* is derived from *petun*, the Brazilian name for Tobacco, to which the *Petunia* is allied. The fine varieties now in cultivation have in all probability sprung from the white-flowered *P. nyctaginiflora*, the Marvel of Peru flowered *Petunia*, introduced from South America in 1823, and *P. violacea*, the Violet-coloured *Petunia*, introduced from Buenos Ayres in 1831; so, as compared with many other plants, the *Petunia* is of comparatively recent introduction. These were cultivated, and being found by our English florists to seed freely, seedlings were raised; and the progeny showing a tendency to vary, crosses were made with the best varieties, the result being the production of new and improved forms. These were taken in hand and grown for exhibition purposes, a

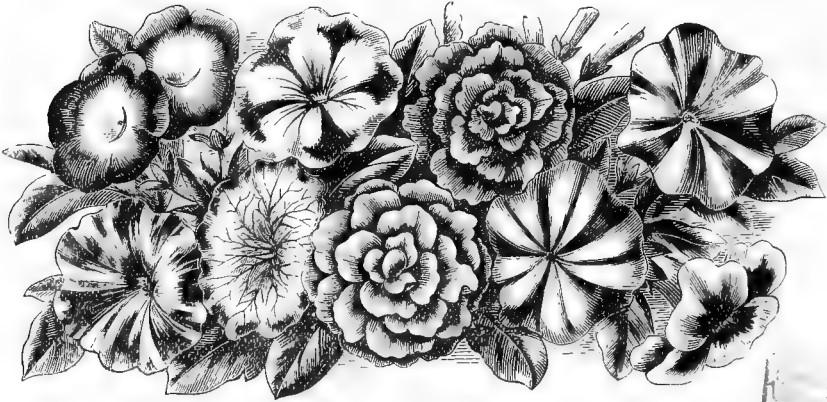
dwarfer and more compact habit of growth being associated with larger, stouter, and better-formed flowers; eventually the most promising were named, and in this way the *Petunia* came to be regarded as a highly desirable and popular plant. In the first efforts in crossing the *Petunia*, the early productions were much alike in character. It is a fact that in the first generation all hybrids are much alike, but in the second they vary in the most remarkable degree. Thus, in the case of the *Petunia*, some of the first seedlings reverted to the white species, others to the violet type; some showed tints of colour between the two. Then, by fertilising these, a third generation was obtained much more part-coloured, and eventually these gave extremely varied forms. In all crosses of this character the fancy of the operator will actuate him to select what forms he pleases as his models, whether symmetrical in form and harmonious in colour on the one hand, or grotesque in outline and ill-defined and confused in colour on the other; but the variations of any flower that are to find a place in the garden should at least partake of the characteristics generally considered essential by florists—form, colour, substance, distinctness, &c.—and not be hideous and unlovely formations merely, that have neither attractiveness nor utility to recommend them. To these essential points must be superadded a short, stiff, and yet vigorous habit; a propensity to flower freely; and, as far as it can be obtained, a hardihood that can sustain to some extent, when bedded out of doors, the effects of cold and inclement weather, which is sometimes characteristic of an English summer.

For a time the flowers of the *Petunia* were single. Then, as one of the results of selection, added petals began to show themselves in the centres of some of the flowers. These were carefully fertilised with the pollen from blossoms of a like character, and eventually a race with fully double flowers was obtained. They, like the single forms, vary considerably in character. Some are compact and small in size, others loose and very large. Of late years there has been obtained from the Continent a strain of both single and double *Petunias* of strong spreading growth, and very large, loose, but singularly rich and fantastically marked flowers. The favourite English section is represented by a strain of compact growth, and small-sized, well-formed, finely-striped, and self-coloured blossoms, both double and single.

In regard to the cultivation of the *Petunia*, it may be observed that such fine varieties can now be obtained from seeds, that naming of distinct kinds is seldom resorted to. Raisers of fine varieties, desirous of preserving a new and distinct variety which pleases them, do so by means of cuttings, but

nurserymen's catalogues in the present day seldom contain lists of varieties of named Petunias. In order to obtain cuttings, the best method is to keep a few plants through the winter in an ordinary green-house; and if these are put into a gentle heat in the month of February, they will break forth into a number of young growths; and when these are from one and a half to two inches in length, they make excellent cuttings. If inserted in pans of silver sand or light sandy soil, kept thoroughly moist and placed in a brisk heat, the cuttings will be rooted in a few days, and they should then be potted singly into small pots, in a light compost made up of silver sand, loam, and leaf-mould, be placed in

make excellent plants for green-house and conservatory decoration, lasting in bloom for a long time. The dwarfier and more compact-growing double varieties are well suited for this purpose. In order to have a good supply of plants, growers of Petunias for exhibition take some cuttings in August or early in September, and about a dozen of these are inserted in six-inch pots in good light soil, then watered very gently, and kept close in a frame and shaded for a week or so, and finally removed to a warm green-house to be kept for stock. In the early spring they put forth growths more quickly than do older plants, and they can be struck as indicated above. If extra strong specimen



PETUNIAS, SINGLE AND DOUBLE.

heat again to get started into growth, and then removed to a cooler temperature to get hardened off a little, and finally placed in the green-house. In order to make nice bushy plants of these, the main shoot should be pinched out, and as soon as fresh shoots are formed, the plants should be shifted into larger-sized pots. Never stop and re-pot at the same time, is a rule of universal application in cases of this kind. Those who have no heat, but desire to strike a few cuttings, must take them later in the season, when the wood is stouter and harder; and if these are inserted in pots of fine soil, and placed on a warm shelf in a green-house, they will strike root. If the pots of cuttings can be placed under a bell-glass (which will need to be shaded from the sun) they will strike all the more readily, and when rooted they should be potted off and grown on as recommended above.

We often observe in schedules of prizes at horticultural exhibitions, classes for specimen Petunias grown in pots. In this form they are very handsome and attractive if well grown. And they also

plants are wanted, the best of the autumn-struck cuttings are selected, potted, and grown on during the winter, well looked after, and on no account allowed to become pot-bound. Thus a good start is secured, and the plants go ahead with great rapidity in early spring. To have fine exhibition plants, take at the end of March spring cuttings that have been stopped twice; the last time of stopping at about the fourth or fifth joint. As soon as they begin to break, they should be shifted into five-inch pots, using a compost made up of one-half good loam, one-quarter leaf-mould, and one-quarter peat and sand. After this shift, and as soon as they begin to grow, they will require a lower temperature. The grower must keep stopping according to the best of his judgment, tying out the main branches so as to secure a good bottom to the specimens and a symmetrical shape. About the first or second week in June the plants should be stopped for the last time, pinching back every shoot, and doing this so as to preserve the symmetrical character of the specimen. The plants so treated

will require but little tying. By the middle of July they should have their last shift, placing them in nine-inch pots or a size larger, using a compost of one-half fibry loam, one-quarter leaf-mould, and one-quarter rotten cow-dung and sand, equal parts of each. As the plants grow, great attention must be paid to pegging down and training, also to watering, for if at this period the specimens be allowed to become dry at the roots, it proves very injurious to them. As the buds begin to swell, the plants will require stimulating with liquid manure, which should be given them rather weak every time they are watered, until the flowers begin to expand, after which it should be discontinued. They will require shading from the hot sun. Such plants will be in fine condition at the end of August or beginning of September.

As far as the general garden culture of the Petunia is concerned, it is simply necessary to sow the seed early in March, in heat, pricking the little plants into boxes of fine soil, if a number of plants are required. If only a moderate quantity are wanted, they can be pricked off into pots or pans; when these are hardened off in a frame after they have commenced to grow, they can be planted out of doors in beds, a foot or so distance between the plants, and if required they should be watered in dry weather. These plants will begin to flower in July, and continue until the frosts and rains of autumn destroy their beauty. A few pods of seed should be gathered from the best varieties for sowing in early spring.

It may be added that in the West of England, and especially in Wiltshire and Somersetshire, exhibition Petunias are trained to circular wire frames, perfectly flat, and which can be fixed in the soil of the pot in which the plant is growing by means of a peg; these frames when so fixed incline backwards somewhat, and are therefore on a slope. The plants are trained over the frame, and when they are fully in bloom, they are densely covered with their bright blossoms, and make a very effective display.

A few of the best named Petunias are as follows :

SINGLE VARIETIES

<p>Avananche, pure white. Delicata, white and purple. Dr. Daniel, rich crimson. Elegance, white, barred crimson. Juno, rosy-purple. Lady Jane, rose. Little Pet, soft pink.</p>	<p>Mrs. A. Mayes, white and purple. Mrs. H. Cannell, white and crimson. Mrs. S. Hibberd, white and maroon. Purpurea, purple. Spitfire, bright purple.</p>
---	---

DOUBLE VARIETIES.

<p>Adonis, white, blotched purple. Antigone, rosy lilac.</p>	<p>Arc-en-Ciel, mauve and white. Berenger, rose and lilac.</p>
--	--

<p>Cratere, bluish-purple. De Candolle, deep crimson. Gigantes, bright lilac-purple. Hermione, white. Hibernia, rosy-purple and green. La Chine, purplish-crimson. M. A. Lohier, white, blotched with magenta.</p>	<p>Madame Hengist, purple, edged white. Marie Careme, light rose. Neptune, white and lilac. Ophelia, white and purple. Perfection, deep rose. Rubens, rosy-mauve and white. Tapageur, rosy-purple and white.</p>
--	--

The Phlox.—This well-known plant, so common in many gardens all over the country, does not appear to possess a common name that is generally recognised, therefore we can write of it simply as the Phlox. It takes its name from *phlox*, "flame," suggested by the brilliancy of its flowers. Phloxes can be divided into three distinct sections: 1st, the herbaceous, which are hardy perennials, but lose their foliage in winter; 2ndly, the perennial, which retain their foliage all the year round; and, 3rdly, the annual, as represented by *Phlox Drummondii*. The race mostly grown in England consists of varieties obtained from *P. decussata*, which means "the Cross-leaved Phlox." When two right lines cross each other at right angles they are said to be decussate; leaves are often placed in this position. *P. decussata* came originally from North America. There is another distinct type named *P. suffruticosa*, suffruticose meaning shrubby in a slight degree; and the varieties forming this section appear to be much more grown in Scotland than they are south of the Tweed. Really they appear to possess much in common with the former section, but they are dwarfer in growth and earlier to flower. On the other hand, the varieties of *P. decussata* are of taller and more robust growth; the stems are more naked at the base, throwing out lateral flower-stems towards the top. Well-established plants of both sections grow freely in good soil, and throw up several main stems, crowned with fine spikes of flower. New varieties are constantly being raised from seed both in the United Kingdom and abroad, the result being that we now possess collections of great merit, and it is common to see the flowers exhibited at flower shows in a cut state. In hundreds of cottages and old-fashioned gardens throughout England, and especially in the south, south-east, and west, can be seen huge clumps of these Phloxes, throwing up many spikes of flower year after year, that are objects of considerable beauty in summer; but having no special cultivation, the flowers are poor in quality.

The propagation of the Phlox is a very simple matter. The roots, which largely increase in size in a year or two, can be divided and made into several plants, and these re-planted. But when a quantity is required, it is usual to make cuttings in early autumn of the young growths thrown up from the

roots at that season. If these are taken off just below a joint when five or six inches in length, and put into pots of light sandy soil pressed firmly about them, and then stood in a cold frame, they will root, and make very useful plants for the following season. Or if old plants in pots be placed in a brisk heat in early spring, they will throw out young growths, and from these cuttings can be made and put in pans of sandy soil, kept moistened, and on a bottom heat, and they will strike root in a very short time. They are then potted off singly into small pots, hardened off, and placed in a cold frame for a time, to become inured to exposure.

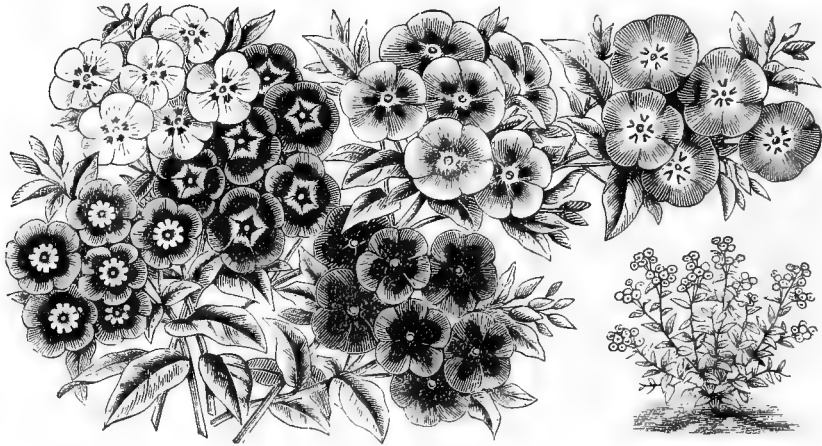
the seeds germinate irregularly, many of them not till months after being sown.

Selection of varieties of *P. suffruticosa*, or early-flowering Phloxes:—

Allan McLean.	Mrs. Hardie.
Annie Lockhart.	Mrs. Hunter.
Burns.	Pauline.
Clipper.	The Shah.
Hercules.	Van Houtte.
Lianet.	Venus.
Magnum Bonum.	Vulcan.

Selection of varieties of *P. decussata*, or late-flowering Phloxes:—

Andrew Keddie.	George Sand.
Austen Withers.	Jeanne d'Arc.



PHLOX DRUMMONDII.

Young plants intended to flower in the open ground should be transplanted into a rich deep loam. The stronger and more holding the soil, the finer will be the spikes of flower. As the flower-stems rise in height, they should be neatly tied to stakes, to secure them from being blown about by the wind. The plants need to be kept watered in dry weather, and it is a great assistance to the plants, especially when they are required for exhibition purposes, to thoroughly cover the surface of the bed with short dung, as this keeps the soil cool and moist, besides being a valuable fertiliser. This is what is termed "mulching."

Then the herbaceous Phlox can be raised from seed, and it is in this way that new varieties are obtained. Some of the varieties produce seed fairly freely, and in order to secure germination as quickly as possible, it should be sown as soon as it is ripe, using a shallow pan or box, and a sandy loam mixed with leaf-mould, which should be placed in a cold frame and kept moist. Some patience is needed, as

Baronne Schlickler.
Becky.
Cameron.
C. Darwin.
Cortambert.
De Freycinet.
Frederic Faillie.

John Alexander.
Lucie Baltet.
Madame Verschaffeldt.
Mrs. James Anderson.
Pelletou.
Suffrage.
Victor Hugo.

There is a section of extra dwarf-growing varieties of *P. decussata*, which form a very elegant group, entirely distinct from the two preceding sections, and are specially fitted, from their dwarf habit, for growing in pots, for they assume a comparatively miniature growth, neat and compact in appearance, and produce large heads of bloom:—

Atlante.
Cassiope.
Concours.
Floreat.
General Frolow
Mulgache.

Michel Servantes.
Montezeuma.
Le Soleil.
Tomboucton.
Protec.
Toreador.

Perennial Evergreen Phloxes.—These are in the main what are known as procumbent species, and are very useful indeed for covering rockwork

and placing in borders. There is *P. nivalis*, which forms dense evergreen tufts, growing two or three inches in height, and clothes itself in April with many pure white flowers. It is an excellent companion to the purple Aubrietias. *P. verna* flowers very early in spring, producing heads of red blossoms, and is very handsome. *P. frondosa* is also a charming species, and bears bright rose-coloured flowers



GROUP OF PRIMULAS.

inches in height, and clothes itself in April with many pure white flowers. It is an excellent companion to the purple Aubrietias. *P. verna* flowers very early in spring, producing heads of red blossoms,

early in the season. *P. Nelsoni* is also white-flowered, and makes a dense carpet of evergreen Moss-like foliage. Then there are *P. setacea*, and several of its varieties, all of which form dwarf compact masses

of evergreen foliage, covered in early spring with bright, lively-coloured blossoms, varying in the variety from white to deep rose, and all perfectly hardy. This group of hardy Phloxes is earnestly commended to the attention of our readers.

Phlox (Annual), *P. Drummondii*.—This very interesting species was sent over from Texas by Mr. Drummond in 1835, and in the original form the blossoms were of a rosy-red colour. Since the species was received, half a century ago, many varieties have been produced, and they have also become considerably improved in point of size and colour. The German florists have obtained a section known as *grandiflora*, or large-flowered; and one of the varieties, named *Splendens grandiflora*, is among the most beautiful half-hardy annuals in cultivation. The varieties come true from seed, and if a little seed be sown in a gentle heat in early spring, they will soon germinate; and when the plants are large enough they should be pricked off into pots or boxes, or into a prepared bed in a cold frame, there to remain until they are wanted for planting out in the open ground.

There is a section of annual Phloxes selected from *P. Drummondii*, perhaps fertilised with the pollen of some other form, known as *P. Heynholdii*; they are of dwarfer and more compact growth, but not nearly so handsome or so effective in the flower garden. We cannot recommend them.

The Pink.—This is the *Dianthus plumarius* of botanists, and the common name Pink is derived from a supposed Dutch word, *pink*, meaning an eye. The Pink, according to Linnaeus, is a native of the colder parts of Europe, and it is also found in the North of England, and is known in some districts as the Pheasant-eyed Pink. It is said the Pink was first cultivated about the year 1629; and since then, by means of cultivation, it has sported into many new and beautiful varieties. It is during the present century that such a marked improvement has been made in this flower. We may venture to assert that a Pink called Major's Lady Stoverdale, raised from seed in the southern parts of England by the person whose name it bears, was the first variety that deserved to be classed among such as are now held in esteem by florists; this was produced about 1770, and was the first Pink possessed of that singular and beautiful ornament called a "lacing," which is a continuation of the colour of the eye round the white or broad part of the petal. The original Pinks had toothed or serrated edges to the petals, and the first objects of the florists who attempted their improvement were to extend and intensify the lacing, and to secure rounded instead of serrated edges to the petals. After many years of patient labour

these objects have been accomplished, as can be seen in the fine round varieties of the present day.

This has long been a favourite flower with many, because so hardy, so free of bloom, and so exquisitely fragrant; but of late years it has unfortunately ceased to be grown so much as it deserves to be, especially as a subject for exhibition. There are, however, indications that a new interest is being taken in it; and a revival of the Pink may take place at no distant date.

The fine laced florists' Pinks are not cultivated in pots, but in the open air. The usual practice is to cultivate them in beds carefully prepared and raised above the level of the ground. In preparing the bed, a good quantity of well-decomposed manure should be dug into it; for a stimulus of this kind is necessary in order to have the flowers well laced. The bed should be prepared some time before planting, and the soil forked over occasionally to become sweetened and mellowed by exposure. It is all the more necessary that the bed be raised if the soil be wet and retentive—even to a height of nine or twelve inches, and rounding off the sides to throw off heavy rains that fall in autumn and winter.

The work of planting the beds is generally done from the middle of September until early in October, so that the plants can establish themselves before winter sets in. The usual practice is to plant in lines, having the plants eighteen inches to two feet apart. During the winter the beds should be kept free from weeds, and the surface soil stirred in dry weather. If frost happens, and the soil about the plants becomes loosened, it should be pressed firmly about the roots so soon as it can be conveniently done. In March a top-dressing will be found of great service. This should be in the form of partially decomposed manure, or half-rotten cow-dung if the soil be light; and it is a good plan to place boards round the sides of the beds, or turves can be used for the same purpose, thus bringing the surface to a level, or nearly so, that the plants may receive copious waterings as required without danger of the water running off at the sides. During April and May the surface of the bed should be kept stirred, and at the end of the latter month fresh top-dressing may be added with advantage, and water given copiously twice a week if at all dry; and in June and July a good head of bloom should reward the cultivator. As a matter of course, those who grow Pinks for exhibition disbud their plants so as to throw all their strength into the production of a few finely-marked flowers, and superfluous side growths are removed for the same object.

If any grower is unable, from causes over which he may have no control, to plant his bed so early in the season as he would like, it will be better to pot up

his plants in a suitable soil and winter them in a cold frame, than run the risk of planting them out and not getting them established before the winter sets in. The latter is a matter of vital importance in the successful culture of this fine old flower.

The propagation of the Pink is accomplished by means of pipings or cuttings. To do this effectually a piping-bed is necessary, which is made up of stable manure, or this and leaves mixed together. The bed is built up as one would a hot-bed, and the time allowed between doing this and piping is no more than is requisite to get rid of the heat, none being required for the pipings. The compost necessary for the purpose should be previously prepared—it needs to be sharp and sandy; a good one is made up of half road scrapings from a gravelled road, a good proportion of sharp sand, and the remainder of decomposed leaf-mould and a little turfy loam.

Pipings are made from what is termed the "grass" thrown out round the sides of the plants. These can be slipped off by the hand, stripping the foliage from the stem to the third joint, and then with a sharp knife cutting it off close under the bottom joint, taking care not to injure the buds. The pipings thus prepared are placed in water to stiffen, in order that they may be more easily planted in the ground. Previously to this the soil is placed on the bed to the depth of four or five inches, and then the pipings are pricked into the soil about an inch apart, and arranged in groups according to the shape and size of the hand-glasses used to cover them; and having filled the requisite space, they should have a slight sprinkling with water, and the hand-glass placed over them, but not close down until the wet has dried from the foliage. The pipings must be shaded from the mid-day sun, and this is best done by placing hoops, covered with light calico, over the glasses. These shades should remain over the cuttings for a considerable portion of the day when the sun shines brightly. After six or eight weeks have passed the glasses may be removed entirely, and in seven or eight days more the young plants may be planted out in a prepared bed to strengthen, preparatory to being planted out in autumn in the blooming-beds.

The following varieties form a very useful selection of laced Pinks:—

Bertram.
Boyard.
Charles Turner.
Clara.
Christabel.
Dr. Maclean.
Emerald.
Ernest.
Galopin.
Godfrey.
Harry Hooper.
Jessica.
John Ball.
John Buxton.

Lady Craven.
Mincroa.
Mr. Hobba.
Mrs. Howarth.
Mrs. Waite.
Prince Frederick William.
Reliance.
Rosy Gem.
Rosy Morn.
Sarah.
Shirley Hibberd.
Victory.
William Paul.

Forcing Pinks.—There is a useful section of Pinks, including a few very choice and fragrant varieties, that are of great value for the forcing into bloom previous to the ordinary Pinks flowering. And in order to have these well in bloom, it is essential to have them thoroughly established in pots; and they should be brought on gradually, but not forced too much, and especially not in too great a heat; and they should be placed as near the glass as possible, and have a little weak manure-water about twice a week.

This class of Pinks should be prepared as soon as pipings can be obtained, and they will be found to strike freely in a gentle bottom heat. So soon as they have struck root and will bear re-potting, they need to be shifted, and by-and-by planted out in a bed during the summer, and potted up early in the autumn to bloom. A few of the best of these are:—

Anne Boleyn.
Ascot.
Clifton White.
Derby Day.

Lord Lyons.
Mrs. Sinkins.
Newmarket.
Rubens.

THE LIFE-HISTORY OF PLANTS.

BY DR. MAXWELL T. MASTERS, F.R.S.

GROWTH.

AS a consequence of the processes of nutrition which have been sketched in previous sections, we have now to consider the phenomena of growth. In the first place we must make a distinction between growth, extension, and development. Though inseparably connected, these processes are different; moreover, the difference is practically important, because the conditions requisite for the one are not the same as for the other.

By growth is meant increase in bulk, the result of the formation of new tissues; old cells divide, or bud out into new ones, and so the organ increases in size without any necessary change of structure or other difference than that of size.

By extension is meant mere elongation or stretching without the addition of new material.

By development is meant a progressive change in internal structure and external form from a simpler to a more complex condition—a change that becomes requisite to enable the plant or any of its parts to fulfil different offices.

To start with, all plants consist of a mass of protoplasm which ultimately becomes shut up in one cell. In due course the protoplasm divides, the old cell-wall disappears, new ones are formed around each of the divisions of the protoplasm, and thus an aggregate of cells of similar size and form is produced. We might suppose a plant of such humble organisation growing in this way, without further

change, so long as sufficient nutriment were afforded and so long as circumstances remained unaltered. In point of fact such relative stagnation often does occur. We see commonly the "mould" or spawn of a fungus maintaining its existence for very long periods, but not developing into any other stage of growth. So among higher plants we have illustrations of the same thing in the fact that we may grow certain plants in our stoves year after year without inducing them to flower or materially to alter their character. Change the conditions, supply a little more heat, a little less water at particular seasons, a fuller exposure to light, and the heretofore sluggish plant wakes up into new life, and forms flowers, fruits, and seeds. In other cases, the soft "herbaceous" stem stiffens into woody branches, the leaves become altered in character, and assume the form of petals or of stamens, still further changes take place in the pistils as they ripen into the fruit, and the ovules mature into seeds. All these are phenomena of development, inseparable from growth, but obviously different from it.

The cultivator has constantly to take account of the two processes. To grow a crop of Potatoes is one thing, to secure a quantity of "Apples," or Potato fruits with their contained seeds, is another matter. Again, the cultivator must bear in mind that, though growth implies increased bulk, yet that increased bulk does not necessarily imply enhanced growth. The gigantic mangels and other roots that one sees at shows are often of less value for feeding purposes than others of smaller size. The reason is that the bulk in the one case is principally made up of water and of the extension of old rather than the multiplication of new cells. The true test of value in such cases is afforded by the microscope or by the chemist, who finds a much larger proportionate amount of "dry matter" (*i.e.*, matter left after driving off all the water by means of heat) in the smaller than in

the monster roots. Mere bulk, then, without growth is of no practical advantage.

The necessary conditions for growth have already been mentioned in general terms under the head of Germination. (See *ante*, Vol. I., p. 23.) With a sufficient knowledge of general principles the cultivator can readily adjust his practice to particular plants, and to his own particular requirements. It may, however, not be inappropriate to allude to certain phenomena of growth which it is especially necessary to bear in mind.

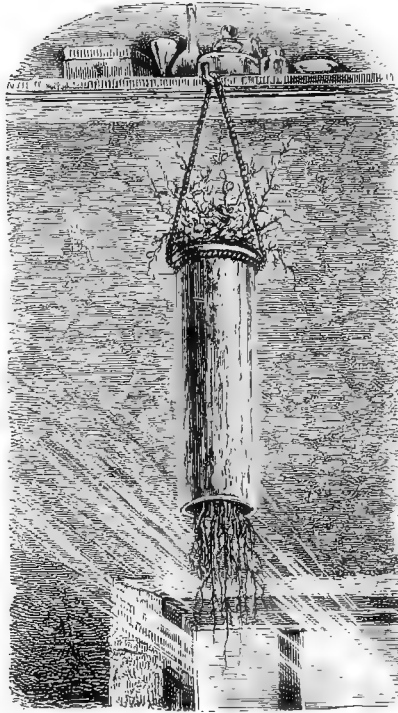


Fig. 51.—Experiment to show the Downward Tendency of Growth in Roots even when illuminated from below.

Continuous or Intermittent Growth.—

Strictly speaking, growth, at least in the higher plants, is never absolutely continuous, it is always arrested at times to be resumed at another period. But bearing this qualification in mind it is easy to see that, by maintaining uniformity of conditions, we induce more or less continuous growth. In forcing operations, where the heat is regularly kept above a certain temperature, we have an illustration of this. But even here it is the practice to lower the temperature at night and to raise it in the day. At night, though the temperature may not be deficient, the light is absent, and it is consequently good practice to lessen the temperature so as to secure a more even balance of conditions. Even in the tropics the night

temperature, we must remember, is invariably lower than the day temperature.

Day and Night Growth.—Strange as it may seem at first sight, there is no doubt that growth is arrested in the day-time under the exposure to light—not absolutely, but certainly relatively. The energy of growth is decidedly greater at night than in the day. During the day, when the leaves are exposed to the action of the sun, food or food-materials are absorbed or transformed in the manner already alluded to. The greater energy is devoted during daylight hours to these processes. At night

the case is reversed—the greater energy then is exercised in the subdivision of cells and the consequent growth and formation of new or additional tissue, for the formation of which the food-material stored up during the day is absolutely essential. There is, therefore, in plants a well-marked intermission and variation of growth by day and by night respectively. How the sèves become emptied of their starch at night has been told in a previous section; that starch is conveyed to the store organs or to the growing points, and is either stored up or directly applied to the growing tissues. But it may be said that plants grow by day as well as by night; such growth can be proved by observation and experiment. This is quite true, still the greater amount of growth is by night.

Forcing.—Growth by day, or at any period, moreover, is easily accounted for where there is an available store of food-material to draw upon. Thus in the early stages of forcing operations, provided the heat and moisture be sufficient, light is of relatively little consequence. The work

effected by light was completed last season, and through its agency at that period a sufficient store of food-material was accumulated. But in the case of a weak seedling plant, or of any other in which there is little or no store of food, growth can hardly go on at all during the day. Such energies as the plant possesses must then be devoted to laying in a provision during the day to be utilised at night. Again, growth may be facilitated on a dull day in summer by the heat and moisture of the atmosphere, while the amount of light may be inadequate to exert any restraining influence. On the other hand, at night, while the absence of light is favourable to growth, the diminished temperature is less advantageous. The comparatively even temperature of the soil must also exert a marked regulating influence. The truth is that with living beings the conditions are

so mixed in their incidence, and the actions of plants are so controlled by conflicting circumstances, that it is rarely any absolute or dogmatic statement can be made. The spirit of compromise and reciprocal adjustment reigns supreme in nature, and the more fully the cultivator recognises this and puts it into practice the more successful he is likely to be. The physiologist in the laboratory, for his purposes, is constantly endeavouring to unravel and do away with these compromises, in order that he may the more clearly ascertain what is the separate effect of

heat, of light, or what not, independently of other agencies; and consequently he is in a position to make dogmatic statements based upon what he sees in the laboratory. But unfortunately he is not able to tell us much of what goes on in the living plant under natural circumstances. Like the practical cultivator, he only sees the results, although his previous knowledge gives him a better opportunity for understanding how those results are brought about.

It may then be certainly assumed that light retards

growth, and consequently that growth is most active at night, though it may be modified and controlled by other agencies.

Rate of Growth.—Taking the daily life of a plant, the energy of growth rises from a minimum to its culminating point, and then descends; and this “curve of growth” is found to be especially favoured by a certain amount of heat, the exact amount varying in the case of different plants, and in the case of different parts of the same plant. The most suitable temperature can only be ascertained by experience, because the meteorological details obtained from a study of the climate of the plant’s native country are only suggestive, and afford no direct indication of the power a plant has of adapting itself to the altered circumstances of cultivation. The heat in

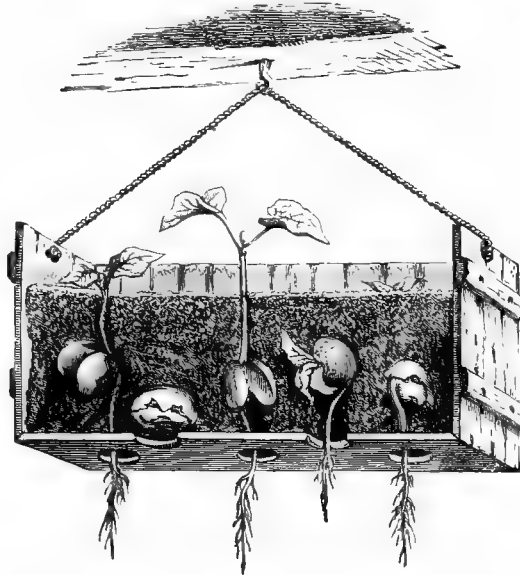


Fig. 52.—Experiment to show the Downward Tendency of the Roots even when provided with moisture above, showing that moisture alone does not influence their direction.

any case must be accompanied by an adequate supply of moisture and of nutritive material, the latter, as we have seen, having been accumulated under the influence of light.

Swelling and Shrinking.—Growth is inseparably connected with a swollen or turgid condition of the cell, due to the afflux of liquid matter and to the elasticity and extensibility of the cell-walls. Hence anything that promotes turgescence in so far favours growth, and anything which checks or prevents it has a restraining influence on growth. A withered shoot, one in which evaporation has been in excess of the supply, ceases to grow—it shrinks, receives a check as gardeners say, and it may or may not revive when fresh supplies are forthcoming.

Effect of Pressure.—Pressure also necessarily checks growth by the resistance it affords to expansion. A branch of a tree fastened tightly against a wall will naturally grow much less on the side next the wall. The trunk of a tree tightly tied up to a stake will increase less in proportion than the free part above the tie, where the trunk and branches have fair play. This is one reason why trees that have been too tightly or too long staked are apt to have their heads blown off or injured by the wind. Not only is there thus a greater leverage on the head, but the confined stem below is less able to resist the strain.

The benefit resulting from incising the bark of "hide-bound" trees may likewise be explained by the lessened pressure so obtained, and the free growth of trees such as the Plane may be explained by the shedding of large slabs of the outer bark, or the deep cracks and furrows in the bark of other trees, which diminish the resistance offered by the bark to the growing tissues underneath, thus enabling them to grow faster and further.

Direction of Growth.—The direction in which growth takes place depends partly on external conditions, partly on internal inborn circumstances, handed down from plant to plant as its inheritance from its predecessors. Thus, if the food-supply and the illumination be equal on all sides, we may expect a spherical form to result; while if the conditions act more powerfully in certain directions than in others, we may expect growth in more or less vertical lines, as in the case of the stems of trees, or in flat planes, as in the case of leaves; and there will be all

kinds of intermediate forms according to the varying circumstances or varying combinations of circumstances. The downward tendencies exhibited by roots in their growth when unfettered by hampering obstacles have been shown to be due to the action of gravitation, for even when exposed to light or moisture as in Figs. 51 and 52, the roots are not turned from their course. The cause of the upward tendency exhibited by the stem, see Figs. 52 and 53, though connected with the



Fig. 53.—Shows a "Procumbent" Stem, in which the Stem is at first acted on by gravitation, and afterwards ascends towards the light by the agency of unequal growth on the two sides.

necessity for exposing the leaves to light and air, is not understood, and such terms as "geotropism," "negative geotropism," "heliotropism," "hydrotropism,"* and the like, now frequently used, are mere expressions of phenomena, and not explanations of them.

In the accompanying illustrations the varying direction of plants is exemplified. In Fig. 51 the roots are seen descending by gravitation; though exposed to light from below, they neither bend towards nor from it. In Fig. 52, where the Beans are supposed to be planted in damp moss, the roots still descend away from their supplies of moisture, thus

* Heliotropism—the tendency of growing parts to turn to the sun; geotropism—the tendency to turn towards the earth; hydrotropism—the tendency to turn towards moisture. The reverse conditions are implied by the prefix "negative."

showing that neither light nor moisture of itself deflects roots from their course. In Fig. 52 is also shown the gradual uplifting of the stem and the spreading of the leaves towards the light by "heliotropism." In Fig. 53 the stem is at first "procumbent," the attraction of gravitation is more powerful than the upward tendency of growth; but the latter gets the upper hand and the stem turns upwards.

One-sided Growth, or that in which the energy of growth is much larger on the one side than on the other is, as has just been remarked, due to the unequal pressure of some obstacle which checks growth on the one side, which consequently remains flat or concave, while on the other side, where growth is not checked, it becomes convex. This is the explanation of the coils and twists we often see, and in which the side that has been pressed upon or obstructed in its growth acts like a curb upon the other side, where growth is going on more freely, and causes it to assume a convex form (Fig. 54). The upward turn of the stem in Fig. 53 is accounted for by the more rapid growth of the lower surface of the stem than of the upper, which is exposed to the light and consequently restricted in its development.

Heliotropism. — "Heliotropic" curvatures, or such as are due to the tendency of a growing plant to turn its leaves to the direction whence the light comes, also cause one-sided growth. Here the necessity for light and the consequent storage of food induces a bending of the side exposed to the light, although when all conditions are equal the actual amount of growth is most active on the side turned from the light. Most plants exhibit these so-called heliotropic curvatures to a marked degree, and not only are the stems or branches curved in accordance with the direction whence the light falls, but the leaves have the power of so altering their position as to place themselves in the most favourable condition as respects the light. This is especially observable in the leaves of Silver Firs, the grey under surfaces of which are much more conspicuous during bright

light than at duller periods, owing to the power the leaves have of twisting themselves round, and of raising or depressing themselves as the case may be. The leaves of a species of *Pothos*, in which the broad stalk is jointed transversely to the blade, also show these heliotropic movements very markedly, the leaf assuming almost every possible angle with reference to its supporting stalk, in accordance with the different directions from which the light falls.

The Ivy affords a curious illustration of what has been somewhat absurdly called "negative heliotropism." In it the shoots when growing against a wall bend away from the light when they get the chance, probably for the purpose of securing a firmer hold on the rock or wall.

Alternations of Growth.

—Intermissions of growth such as those alluded to in the last paragraph have reference more particularly to time, but there are other alternations of growth connected with particular parts of the plant. Growth in length, as has been pointed out, occurs principally at certain well-defined growing points, as adjacent to the tip of the root, at the points of the buds, and so forth. Besides this, there is what is called "intercalary growth," in which centres of active growth are insinuated in the midst of tissues otherwise passive. The occasional and sudden outgrowths of buds or other excrescences from the surface of



Fig. 54.—Stem of a Climbing Plant, to show the manner in which it ascends its support.

leaves or other parts where such growth is unusual may be explained in this manner; but such growth is more or less irregular, and not to be confounded with the alternation of growth—now in this part, now in that—which constitutes so marked a feature in the regular course of things. In a rapidly-growing shoot, for instance, it is found by direct observation and measurements that the greatest activity of growth at one time is along one particular line or strip of tissue (the others being comparatively or completely at rest), at another time along another, and so on round the shoot, until the whole circuit has been accomplished. Such alternations in the direction and locality of active growth appear to be

universal, though, of course, materially modified by circumstances.

Growth Movements.—Connected with these variations in the direction of growth are certain movements. The wriggling movements of the tips of the roots during their period of active growth have been previously alluded to as among the most marvellous and, till lately, little suspected phenomena of plant-life (Vol. I., p. 86). Similar movements take place in all parts where active growth is going on, and where circumstances do not prevent them. If the tip of any fast-growing shoot be continuously examined, it may be observed to move through a circular or elliptical orbit with more or less rapidity. Even the leader shoots of Conifers, which appear so rigid, will be found, if watched from time to time, to move round from point to point. A simple method of observing this is to procure a circular piece of cardboard marked with degrees and perforated in the centre. Pass the leader shoot of the tree carefully through the hole in the card, so that the shoot may have free play, and fix the card to one end of a stake, inserting the other end in the ground, or even tying it to the stem of the tree below the leader. When the card is so fixed, note the time, and mark with a pencil upon the card the position of the end bud of the shoot and the direction in which it points. After an interval, repeat the observation, when the shoot will be found to have shifted its position, and it will continue to do so day and night for some weeks during the period of active growth. Of course, by more delicate means in the laboratory, the direction and amount of movement can be more accurately traced, and even made to register itself, but the above method is amply sufficient to establish the fact.

Climbing Plants.—The phenomena exhibited by climbing and twining plants, where the free-growing shoots are found to swing round from point to point, till at length they come in contact with something around which they twine and support themselves, are explained in like manner, the growth in such cases being checked on the one side and continued on the other, so that the point of the shoot is thus made to travel round the support. The free-growing ends of such shoots exhibit sensibility to touch just as the tips of the roots do. See Vol. I., p. 87; and for a full account of various degrees of sensibility and of movement in plants, sometimes so perfect as almost to suggest a degree of consciousness and voluntary effort on the part of the plant, see Darwin's works on "The Power of Movement in Plants," and on "The Movements and Habits of Climbing Plants."

Such facts as these, with many others that might be cited, suffice to impress the notion that all the parts of a plant in active growth are in a state of movement. Arrested or suspended in one part, it manifests itself in another; relaxed at one time, it is the more active at another. Invisible to the naked eye, except in the cases we have mentioned, it is still certainly going on beneath the surface. It occurs in the fluids of the living cells, in the constantly mobile protoplasm, even when it is not traceable on a large scale. Truly, in the plant, as in the animal, life and motion, motion and life are inseparable!

FERNS.

BY JAMES BRITTON, F.L.S.

The Onoclea.—According to some authorities the only plant included under the generic name *Onoclea* is *O. sensibilis*, frequently called the Sensitive Fern, but having no claim to this name beyond the fact of its speedily withering when cut. In the "Synopsis Filicum," however, the Ostrich Fern, *Struthiopteris*, is merged as a section into *Onoclea*, so the latter genus, as understood here, comprises three species—*O. Germanica* (perhaps more widely known as *Struthiopteris Germanica*), *O. orientalis* (*Struthiopteris orientalis*), and the one mentioned at the commencement of these notes. They are large-growing herbaceous ferns, quite hardy in this country, and make distinct and striking objects in the out-door fernery. All are dimorphic, that is to say, the fertile fronds are unlike the sterile ones. These latter, in *O. sensibilis*, rise separately from the naked, extensively-creeping root-stock, are long-stalked, bright green in colour, broadly triangular in outline, deeply cut into lance-oblong pinnae, which are entire or wavy toothed. The fertile fronds are twice-pinnate, much contracted; the pinnales short and revolute, usually so rolled up as to be converted into berry-shaped closed involucre, filled with sporangia, and forming a one-sided spike or raceme. The Sensitive Fern is one of the most distinct of all hardy ferns, and it should be allowed plenty of room to develop and display its peculiarly-formed bright green fronds. It likes a soil rich in vegetable matter, and should be planted where it is constantly moist; it is common in the United States and Canada, and also occurs in North Asia, Amur, Japan, and Manchuria. *O. Germanica* is widely dissimilar in habit from the last-named species; it is remarkable for its handsome and symmetrical mode of growth—the fronds growing erect in a circular tuft from the short upright caudex, the large sterile ones forming the outer series, the inner being formed

of the shorter fertile ones. The latter have bead or necklace-like pinnæ, whilst in outline the former are broadly-lanceolate, the narrowly-lanceolate deeply pinnatifid pinnæ being very numerous, the lowest ones gradually much smaller. The name Ostrich Fern is given in allusion to the plume-like arrangement of the divisions of the fertile fronds. *O. Germanica* was, it is said, introduced to British gardens by Peter Collinson in 1760, and is a native of Northern and Eastern Europe, North Asia, and North America. The only remaining species, *O. orientalis*, hails from Sikkim—where it ascends to 12,000 feet above sea-level—and Japan. It has ovate-oblong fronds, not attenuated towards the base as in the last-named species, the contracted fertile ones often attaining a length of two feet.

All the *Onocleas* like a rich alluvial soil and plenty of moisture; under these conditions they attain their maximum development. They will, however, grow well in almost any garden soil.

The *Lygodiums*.—The genus *Lygodium* belongs to the *Schizæaceæ*, a sub-order which comprises not a few remarkably handsome and elegant ferns; one of its allies, *Anemia*, has already been described in these articles. Not more than a score of species of *Lygodium* are known to science, and of these perhaps not more than half are in cultivation. They are readily recognised by their widely-scandent, slender, twining stems, some of which attain a length of twenty feet or more. The capsules are solitary (now and then in pairs), in the axils of large imbricating clasping involucre, which form spikes either in separate pinnæ or in lax rows along the edge of the leafy ones.

STOVE KINDS.

L. dichotomum.—A strikingly beautiful plant in all its stages; a native of Chusan, Hong Kong, the Philippines, Ceylon, and the Malayan Peninsula and Islands. It is one of the most robust of the species hitherto introduced, the main rachis in fully-grown specimens being about twenty feet in length. The emerald-green leathery pinnules are digitate, with five or six narrow lobes—sometimes once or even twice forked—reaching nearly down to the base. In *L. lanceolatum*, from Madagascar, the pinnules are a fine glossy-green, both above and below, and their texture leathery; they measure from four to

six inches in length, and each has from three to six somewhat lanceolate, never cordate, segments. *L. pinnatifidum* resembles the first-named species in habit, and is nearly as vigorous: the pinnules clothing the lower portion of the rachis are often pinnate, with five to seven oblong, alternate, shortly-stalked segments. The rachis is a reddish-brown colour, and forms a pleasing contrast to the dull light green of the leathery pinnules. It occurs in Hindostan from the Himalayas to Ceylon, the Philippines, the Malaccas, North Australia, Angola, and Guinea. *L. reticulatum* (like *L. lanceolatum*) has netted veins, and on this account is placed by some pteridologists in a genus apart. Mr. J.

Smith, the veteran ex-curator of the Royal Gardens, Kew, raises it to the rank of a genus under the name of *Lygodietyon*, and not unfrequently it will be found under this name in gardens. The pinnules are six to nine inches long by four to six inches broad, with a terminal segment, and from four to six nearly uniform ones on each side; in texture these are not so leathery as those of the foregoing species; they are dull light green above, and bright green below. The rachis is naked or slightly hairy, sometimes polished. It is a native of the Polynesian Islands and eastern tropical Australia.

L. venustum differs from the species already described, in having the rachis and both surfaces of the pinnules densely clothed with hairs. The pinnules measure from six to twelve inches long by four to six inches broad, with a terminal segment, and from four to twelve simple ligulate-oblong ones on each side, the lower ones usually spear-shaped or pinnate below. It is a native of the West Indies and Mexico, to Brazil and Peru. *L. volubile* has pinnules six to twelve inches long by six to ten inches broad, somewhat leathery in texture, and with both surfaces either naked or slightly hairy. The terminal segment is stalked, three to six inches long by one inch to one and a quarter broad, uncut and ligulate-oblong in outline; there are from three to five similar segments on each side of the central one.

GREEN-HOUSE KINDS.

Perhaps the most widely-known species of the genus is *L. japonicum*, a native of Japan, Hindostan, from the Himalayas to Ceylon, Java, the Philippine Islands, Hong Kong, and North Australia. It may



ONOCLEA SENSIBILIS.

be grown to maturity in a six-inch pot, and with this amount of root-room will often produce a beautiful column of foliage ten feet or more in height. The pinnules are herbaceous in texture, four to eight inches in length, and nearly as broad; the terminal segment is pinnatifid or hastate, and the lateral ones—of which there are two or three on each side—are very unequal in size and irregular in outline, the lower ones being long-stalked and pinnate in the lower part, with the divisions entire or crenulated. *L. palmatum*, the Climbing Fern of the Northern United States, is one of the most desirable of all the species, as well as one of the most elegant and graceful of all ferns. The slender, flexible, straw-coloured stalks measure from two to three feet long, and are produced from slender running root-stocks; the short alternate branches are two-forked, each fork bearing a round heart-shaped, palmate, four to seven-lobed pinnule; the fertile pinnules are contracted and several times forked, forming a terminal panicle. In the United States the pressed fronds of this species are largely used for decorative purposes, and command a high price. To such an extent was the collection of these fronds carried on a few years ago that there was a danger of the species being exterminated, and to prevent this the aid of the Legislature was invoked. One of the largest dealers wrote a few years ago that he employed between two and three hundred hands in collecting and preparing the fronds for market. The ones with fructification, being more finely cut and forming with their rich brown colour a striking contrast to the delicate, pale glaucous-green, barren pinnules, are the most highly prized. The time of gathering lasts from about the middle of August until about the last of November. In pressing, the fronds are put between the leaves of large books, where they are allowed to remain for a couple of days; they are then transferred to dry paper under pressure, and changed again and again until all moisture is absorbed. They are then fastened in bunches containing thirty "strings" each. As before stated, the fruited specimens command the best price. In a wild state *L. palmatum* is confined to the New World, where it occurs from Massachusetts to Florida. *L. scandens* is another very handsome species, with a much more extended geographical range than the last-named; it is found in South China and the Himalayas to Queensland, the Malayan Archipelago and Ceylon, and is also found on the Guinea coast. The pinnules are a light glaucous-green in colour, four to eight inches long by two to four inches broad, with a terminal segment, and four or five on each side; these vary very considerably in shape; they are usually simple, ovate or ligulate-oblong, with a rounded or heart-shaped base, sometimes spear-shaped or even slightly pin-

nate below. The texture is firm, and the surfaces are naked, or nearly so.

Cultivation.—The best soil in which to grow all the *Lygodiums* (except perhaps *L. palmatum*) is a mixture of equal parts of good fibrous loam, leaf-mould, and peat, to which may be added a little coarse sand. All require an abundance of moisture, but dislike water-logged soil, so thorough drainage is essential in order to prevent such a condition from obtaining. They like frequent syringing overhead, and such a course of treatment will tend to keep down thrips, the only insect pest which troubles the grower of *Lygodiums* to any extent. Fumigation, too, is effective with thrips, and this should be repeated at short intervals until the thrips have been entirely got under. If kept clear of insects, and provided with suitable conditions in other respects, the fronds last for a long time from top to bottom in a perfectly fresh and green state; should, however, they become rusty and discoloured from any cause, it is better to remove these entirely and start the plants afresh. They will soon make new growths, and cutting off the whole of the fronds in order to induce new ones to develop does not appear to injure most of the species. *L. scandens* makes a beautiful screen to hide unsightly walls, and for this purpose it is best to strain a series of perpendicular wires from the top to the bottom of the surface it is desired to hide, and to allow the fronds to climb them. The plants, too, are best planted out in a well-drained prepared border, as with an abundance of root-room they furnish a good supply of cut fronds, which are most useful for innumerable decorative purposes, such as wreathing round large epergnes, &c. For lightly arranged arches few plants form such elegant objects as some of the *Lygodiums*, and the smaller-growing ones may be used to hide the suspending wires of large hanging baskets. Several also make beautiful specimen plants trained to balloon-shaped trellises. Light—provided the direct rays of the sun be excluded—is enjoyed by the *Lygodiums*, and with no more shade than is necessary to attain this object they thrive admirably.

L. palmatum has proved itself thoroughly hardy in some places in this country, and there is no doubt that with suitable conditions as regards soil, shade, and moisture, it would be found to be hardy in very many localities. A well-drained but constantly moist peat bed, such as is found best for some of the North American *Cyrtopodiums*, suits this species. The plants should be put out early in the season so as to become established as well as possible before the approach of winter; and it is desirable, the first winter at any rate, to shelter by means of Bracken fronds or Spruce branches. It is to be hoped that

this very lovely species will be cultivated by many fern-lovers; it as yet seems to be very far from common, as only three or four years ago a specimen which had been grown in the open air in Surrey was awarded a first-class certificate at one of the meetings of the Royal Horticultural Society.

ORCHIDS.

BY WILLIAM HUGH GOWER.

Cyrtopodium.—A small family of strong-growing terrestrial plants, producing long fleshy stem-like pseudo-bulbs, which bear large plaited membranous leaves, and erect panicles of remarkably showy flowers.

These plants are of easy culture, and should be potted in about equal parts of loam, peat, and well-decomposed cow-manure; during the growing season they require an abundant supply of water, but when the pseudo-bulbs are mature very little water is necessary, and a lower temperature is requisite; when the young growth commences they should be at once removed into a little more heat, and a liberal supply of water again be given them, as the scape rises with the growth, and if neglected at this period the flowers will be deformed.

C. Andersonii.—Pseudo-bulbs stout, thick, and fleshy, fusiform in shape, attaining a height of four to five feet; leaves plicate, membranous, large, and spreading; panicle large, bearing a profusion of flowers of a uniform rich yellow. Spring months. Brazil.

C. punctatum.—This species resembles the preceding in habit; it is, however, a much dwarfer plant, and produces its flowers more freely; the sepals are tawny-yellow, blotched and spotted with red; petals rich clear yellow; lip yellow in front; the incurved side lobes crimson; an additional adornment is also found in a large bract at the base of each flower, the same colour as the sepal. Spring months. Brazil.

Dendrobium.—This is a very large genus, and contains an immense number of species and varieties of a highly ornamental character. Numerous as the species are, however, the hybridiser has been busy with them, and produced many new forms equalling or even surpassing anything we have yet seen in the wild plants for individual beauty.

Dendrobiums belong to the Eastern Hemisphere, the majority being natives of India; a great number of them are also to be found in the Indian Islands, some few even extending to Australia, and one outlying member is a native of New Zealand. The word Dendrobium is of Greek origin, and signi-

fies "living upon a tree"—thus, *dendron*, "a tree," and *bios*, "life." As a genus it is distinguished by its two-celled anther, with four pollen masses, which have no caudicle or separate stigmatic gland, and are of uniform breadth at the end.

The various members of this genus are very dissimilar in habit of growth, although in the shape of the flower they all bear a close resemblance. Some species form terete stem-like pseudo-bulbs, varying from a few inches to several feet in height; some cast their leaves and become deciduous in the resting season, whilst others have stout angular stems, producing thick leathery leaves, which are persistent. Many of the kinds which produce long terete pseudo-bulbs are pendent in habit, and these require to be grown on a block of wood or in a hanging basket, in order to display their charms to the best advantage. As a rule Dendrobiums are not difficult to cultivate, but as their habit of growth is so different, different methods must be adopted to promote vigorous growth and to maintain them in health.

It may be accepted as a rule that Dendrobiums enjoy a decided period of rest, although, as we have previously remarked when treating upon other genera, the drying off must not be carried to such an extent as to cause the growths to shrivel; the leaves of the deciduous kinds will of course turn yellow and fall off, but if this occurs with such species as *densiflorum* and *Farmeri*, it is a proof that the drying off has been carried to excess, and the health of the plant is sure to suffer in consequence.

Dendrobiums, whether in pots or baskets, should have a compost consisting of half fibrous peat and half Sphagnum moss; the drainage must be good, and the soil should be pressed down firmly. In the case of those species which thrive best upon a block of wood Sphagnum only must be used. They enjoy a copious supply of water during the growing season, and also frequent showers from the syringe, but during the resting period little or none will be required; at this time also they should be placed in a lower temperature than that in which they have been grown.

Although many of the species are natives of Northern India, they enjoy a high temperature and an atmosphere well charged with moisture when growing, but they require care and attention to finish them off in a cooler temperature. East Indian House.

D. albo-sanguineum.—Pseudo-bulbs thick, erect, nine to twelve inches high; flowers two to three, nodding, and three to four inches in diameter; sepals linear-lanceolate, creamy-white; petals oblong, incurved, twice as broad as the sepals, creamy-white with a few reddish-purple streaks at the base; lip

large, roundish or obovate, entire, white with a large reddish-crimson blotch at the base. Spring and early summer. Native of the forests on the Attran River, Moulmein.

D. aggregatum, var. *majus*.—As the name implies, this is a larger form than the type. The pseudo-bulbs form dense clusters; they are stout, some four inches high, and bear on the summit a solitary thick and deep green leaf; racemes longer than the growth, bearing numerous large flowers of a uniform clear yellow. It thrives best upon a block. Spring months. Northern India.

D. Ainsworthii.—This is a hybrid raised in the gardens of Dr. Ainsworth, of Manchester. The parents were *D. heterocarpum* and *D. nobile*. In habit of growth it resembles the last-named parent, but is even more floriferous, and must take rank as one of the finest of the family. Sepals and petals pure white; ground-colour of lip white, bearing a large central blotch of rich amaranth, feathered at the edges. Another form called *D. Ainsworthii purpureum*, from the same batch of seedlings, is distinguished by its intense rich purple lip. February and March. Garden origin.

D. amenum.—An elegant slender-growing species, having pseudo-bulbs one to two feet high, bearing thin linear-lanceolate leaves, some three to four inches long and bright green; the peduncle very short, usually bearing about three flowers, each two to three inches in diameter; sepals and petals ovate-lanceolate, white, the upper parts being purplish-violet; lip trumpet-shaped, rich purplish-violet, white at the edges, and blotched with yellow in the throat. Its fragrant flowers appear in the early summer. Sikkim Himalayas, at 5,000 feet elevation.

D. barbatulum.—An elegant small-growing plant,

thriving best when grown on a block. It flowers on the leafless stem. This species has frequently been mixed up with *D. Fytchianum*, but it is nevertheless abundantly distinct. The pseudo-bulbs are terete; leaves narrowly-lanceolate and deciduous; racemes

lateral, slender, half the length of the stems, and many-flowered, pale green, changing to pure white when expanded, faintly stained with lemon at the base; spur long. Spring months. Mountains of Western India.

D. Bensonia.—A truly beautiful species, which should be grown upon a block of wood. The pseudo-bulbs are somewhat pendulous, and from one to three feet long; these shed their leaves before the flowers appear, the young growths only having leaves at that time. Flowers upwards of two inches across; sepals and petals pure white; lip white, with a blotch of deep orange on the centre, and two large velvety-black spots at the base. May and June. Moulmein.

D. bigibbum.—This species was originally sent to this country from the north-east coast of New Holland, and was for some time an extremely rare plant in cultivation; more recently, however, it has been sent to us in great abundance from New Guinea, and proves to be a profuse flowerer and most charming plant. The pseudo-bulbs are slender, tufted, one to two feet long, fusiform in shape, and bearing

numerous sheathing linear-oblong dark green leaves. Peduncles arising from the apex and also from the joints near the top—these are erect, and bear from six to eight flowers, which are in the sepals and petals deep lilac; lip rosy-purple, with a white crest on the disc. The old stems continue to produce flowers for several years. It blooms nearly the season through. Tropical Australia and New Guinea.

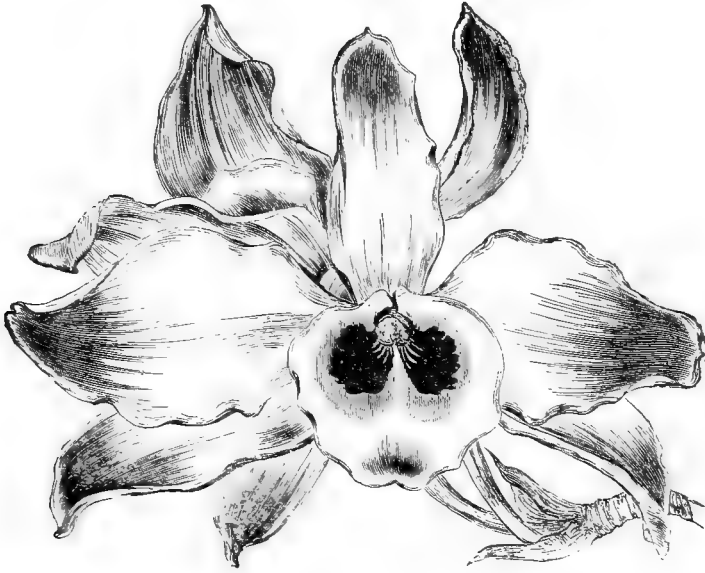


DENDROBIUM BARBATULUM.

D. Cambridgeanum.—This handsome species succeeds best when grown upon a block of wood or in a basket suspended from the roof, and thrives under somewhat cooler treatment than the majority of the *Dendrobiums*. The pseudo-bulbs are clustered, pendulous, thickened at the joints, and about a foot long; the leaves are sheathing, ovate-acuminate, and dark green; the flowers are produced on the young growths only. Peduncle short, and usually two-flowered: these are two to three inches in diameter; sepals and petals about equal, and of a clear orange-

in pairs, each two to three inches in diameter; sepals and petals milk-white, tipped with bright rose, the petals being much the larger; lip entire, velvety-white, tipped with deep rose, and stained with bright orange-yellow on the disc. The winter and spring months. Found in Moulmein, on the Arrakan Mountains, at an elevation of 2,500 feet.

D. crystallinum.—A deciduous species of great beauty, producing slender terete stem-like pseudo-bulbs, which are upwards of a foot long. The leaves are only found on the young growths, and the



DENDROBIUM WARDIANUM.



colour; lip large, deep orange with a large velvety-black blotch at the base. Spring months. Northern India.

D. chrysotoxum.—An evergreen erect plant, with clavate or spindle-shaped pseudo-bulbs upwards of a foot high, bearing near the summit three or four dark green oblong-acute coriaceous leaves. Peduncle arising from the side of the pseudo-bulb just under the leaves, bearing a pendulous, rather lax raceme of large rich deep yellow flowers. Sepals and petals—the latter much the larger—all rich golden-yellow; lip deep orange on the disc, the edges beautifully fringed. Winter and spring months. Moulmein.

D. crassinode.—This most beautiful and distinct species produces pseudo-bulbs one to two feet long, which are deciduous. As its name implies, the joints or nodes are very much swollen, which gives it a peculiar appearance. Flowers freely produced, usually

flowers are produced on the naked stems of the previous season; these are usually produced in pairs on short peduncles; sepals and petals white, tipped with rose, the petals much the broader; lip round, white, orange-yellow at the base, and faintly tipped with rose in the front. Summer months. Burmah.

D. Dalhousianum.—This is one of the largest and grandest species in the genus; the pseudo-bulbs are terete and stem-like, in fine specimens attaining a height of three to six feet or more, distinctly streaked throughout with reddish-crimson; the racemes are produced on the previous year's growth, and bear from six to twelve or more flowers, measuring upwards of four inches in diameter. Sepals and petals ovate, the latter very much the broader, creamy-yellow, suffused with pale rose; lip large, flat, and oblong, same colour as the petals,

ornamented with two large spots of deep crimson. May to July. Northern India.

D. densiflorum.—An erect evergreen species, with clavate pseudo-bulbs, a foot or more high, bearing near the summit three or four coriaceous, oblong-acute, deep green leaves; racemes lateral from below the leaves, pendulous, many-flowered, resembling a bunch of grapes in outline; the sepals and petals spreading, rich clear amber colour throughout; lip darker. Spring and early summer. Widely distributed in India.

D. densiflorum, var. *albo-lutea*.—A grand form of the original species; it varies considerably, and thus it is to be found in gardens under the name of *D. Schroderii*, *D. densiflorum album*, and *D. thyrseiflorum*; there is, however, little doubt that they are forms of the same plant, and any of them are worthy of a place in the best collection. This variety produces more slender pseudo-bulbs than the normal form; the raceme of bloom is usually longer, and the flowers are more laxly set; sepals and petals equal, somewhat oblong and blunt at the points, pure white; lip large, orbicular, rich amber, shading to orange, and prettily fringed in front. Spring and early summer. Moulmein.

D. densiflorum, var. *Griffithii*.—This is a magnificent form of the species, being a much stronger grower, and the inflorescence is about double the size in all its parts; the large drooping raceme is of a uniform rich golden-yellow. Spring and early summer. Northern India.

D. densiflorum, var. *Guiberti*.—A very strong-growing variety; the pseudo-bulbs stout, producing towards the apex three to four coriaceous and intense deep green leaves; the pendulous raceme of bloom is nearly eighteen inches long, and very broad; sepals and petals soft amber; lip deep orange at the base, rich amber in front, where it is prettily fringed. India.

D. Devonianum.—A quarter of a century ago this species bore the title of the King of the Dendrobes; and although an immense number of rivals have been introduced since, it may still hold its ground, the only objection being the short-lived properties of its flowers, as they seldom last many days. This plant should be grown in a hanging basket, as its pseudo-bulbs are long and slender; the leaves are deciduous, and the flowers are produced on the naked stem. Flowers usually in pairs; sepals and petals soft creamy-white, tinged with pink, and tipped with purple; lip large, white, tipped with rosy-purple, with two orange-coloured spots at the base, the margin being beautifully fringed. Spring and early summer. Khasia Hills, at an elevation of 4,500 feet.

D. aburneum.—A stout and erect-growing plant of

dwarf habit, belonging to the *D. formosum* group; the flowers are produced on the young shoots about the time growth is complete. Racemes erect, bearing three to seven flowers, which resemble polished ivory in their purity, saving the base of the lip, which is streaked with lines of deep red. Spring months. Moulmein.

D. Falconerii.—This fine species is a slender, pendulous plant, and it should be grown either on a block of wood or in a hanging basket. It has obtained the character of being a shy bloomer; this, however, is rather the fault of the cultivator through not drying it sufficiently, and although the plant will suffer if allowed to get very dry, a thorough rest can be given to it by lowering the temperature. Pseudo-bulbs slender, with swollen nodes, pendulous. Leaves few and very small; peduncle short, one-flowered; flowers large, and of good substance; sepals and petals white, tipped with a broad patch of rich deep purple; lip cucullate, spreading in front; ground colour white, tipped with purple; the disc is rich orange, and the base is covered with a rich dark purple blotch. May and June. Bootan, at an elevation of 4,000 feet.

D. Farmerii.—An erect evergreen species of great beauty. Pseudo-bulbs club-shaped, about a foot high, bearing near the summit several thick ovate-acute coriaceous leaves, which are deep green above, slightly paler below. Racemes pendulous, as long or longer than the stems. Flowers numerous; in one variety the sepals and petals are pale straw-colour tinged with pink, in another they are soft rose; lip white, the disc being rich golden-yellow. May and June. Assam and Moulmein.

D. Farmerii, var. *aureo-fulvum*.—This form resembles the species in habit of growth, but the flowers differ in having bright yellow sepals, and a deep golden lip. May and June. Moulmein.

D. Ambriatum.—An old inhabitant of our plant-houses, consequently common, and thus within the reach of those even with limited means. It is a very handsome erect-growing species, bearing its flowers in pendulous racemes on the previous years' growth, which are destitute of leaves. Racemes many-flowered, sepals and petals spreading, and with the lip of a rich deep orange, the front margin of the lip being beautifully fringed. In the variety *oculatum*, the base of the lip is covered with a large dark purplish blotch. Spring and early summer. Nepal.

D. formosum, var. *giganteum*.—A bold-growing form of the species; it belongs to the *nigro-hirsute* section; the pseudo-bulbs are erect, bearing numerous stout bright green leaves, from whence the racemes arise, which bear four to five flowers, five inches across, and of the purest white, saving the disc of

the lip, and this is light amber. Spring and early summer. Rangoon.

D. Fytchianum.—This is a charming little species, which thrives best upon a bare block of wood. It is often confounded with a species previously quoted (*D. barbatulum*), but from which it is abundantly distinct; the stems are terete, slender, slightly increasing in size upwards, and not swollen at the base; the racemes are terminal upon the naked stems; flowers pure white, saving the lateral lobes of the lip, which are pink.

D. heterocarpum.—There are numerous varieties of this species, but all have to some extent lost favour with Orchid-growers; it is true they are somewhat deficient in colour, but the delicious fragrance of the Violet which they emit should recommend them to all. The pseudo-bulbs are terete and somewhat pendulous, flowers abundantly produced: the sepals and petals are pale yellow; lip same colour, with a dark blotch on the disc. Other forms of this plant are very numerous, but all are fragrant. Winter and spring months. Widely distributed through India and also the Indian Islands.

D. Hookerianum.—This beautiful and free-flowering plant is also to be found in collections under the name of *D. chrysois*. It is an erect-growing plant, attaining a height of three to four feet when strong; the racemes are five to nine-flowered, and these are borne on the young growth with the leaves, and not on the previous years' naked stems. Flowers three to four inches in diameter; sepals and petals about equal, somewhat oblong-acute, deep apricot-yellow. Lip convolute at the base, with a large cordate middle lobe, soft apricot-yellow, edged with a beautifully moss-like fringe nearly half an inch long, and marked at the base with two dark purple blotches. It is undoubtedly a near relative of *D. fimbriatum oculatum*, but it differs from that species in producing its flowers upon the young stems with the leaves, and in having two blotches at the base of the lip instead of one. Autumn months. On trees in hot valleys in Sikkim, at an elevation of 1,500 feet.

D. infundibulum.—This is one of the very finest of the *nigro-hirsute* section, a class which enjoy an abundant supply of water during the growing season, but it must never remain about the roots. It is nearly allied to *D. formosum*, and is to be found in some collections under the name of *D. Moulmeinense*. Pseudo-bulbs terete, clothed with short black hairs; leaves narrowly-lanceolate, acute, and dark green. Racemes three to four or more flowered; flowers three to four inches across; sepals linear-oblong; petals very broad and obtuse, all pure ivory-white; lip white, stained with yellow at the base, and streaked with lines of Roman red; the middle lobe

is broad and spreading, serrated on the edge, side lobes forming a complete hood over the column. Spur about an inch long. Spring and early summer. Moulmein, at an elevation of 5,000 feet.

D. Jenkinsii.—An old inhabitant of our plant-houses, which must be grown upon a block of wood; the pseudo-bulbs are small, bearing a single dark green leaf, the whole plant never exceeding two inches in height. The flowers are usually produced in pairs, large and showy, of a uniform pale yellow. Spring months. Northern India.

D. Leechianum.—This beautiful plant is a hybrid, raised by Mr. Swan in the gardens of Mr. W. Leech, of Fallowfield, Manchester; and although *D. Ainsworthii* was raised in gardens near by, and from the same parents, the result is totally different. Sepals and petals soft white, tipped and suffused with flesh-colour, the petals waved at the edges, and twice as broad as the sepals. Lip white, with a large blotch of purplish-crimson, the base of the lip covering the column. It is an abundant bloomer, continuing from autumn into the late spring months. Garden hybrid.

D. lituiflorum.—A pendulous deciduous species, which should be grown upon a block of wood or in a basket. The peduncle is usually two-flowered. Flowers large, upwards of three inches in diameter. Sepals and petals spreading, the latter being much the broader, all of a rosy-lilac. Lip convolute, resembling a Roman trumpet in shape, from which the specific name is derived; white, with a margin of soft rose, and deep violet eye. Spring months. Upper Assam.

D. macranthum.—This grand species has been for many years known in gardens by the name of *macrophyllum*, and also *superbum*; both, however, were told, are erroneous. The pseudo-bulbs are stout, long, and pendulous, in the variety *giganteum* often attaining a length of from four to five feet. The young growths are furnished with numerous broadly-ovate, many-ribbed, dark green leaves. Flowers, usually in pairs, five to six inches across; sepals and petals large and spreading, pale rose; lip deep rose on the outside, pale rose on the front lobe, with a dark blotch of deep crimson at the base, which is very beautifully toothed on the margin. The flowers have a strong perfume, resembling Turkey rhubarb. Spring and summer. Island of Luzon.

D. macranthum, var. *Huttonii*.—An exceedingly rare variety, resembling in habit the normal form, but somewhat more slender. Sepals and petals pure white; the lip rose-colour, with a deep crimson blotch at the base. Spring and summer. Malay Islands.

D. Mycarthiz.—In its native country this is known

by the name of Rainy-month Flower. The pseudo-bulbs are slender, erect, and slightly swollen at the base, and very prettily spotted with crimson. The flowers are borne in short racemes of three or four together, each upwards of three inches across; sepals and petals very pointed, bright cerise; lip pale cerise and white, with a deep purple blotch at the base. Spring and summer, lasting very long in perfection. Ceylon.

D. nobile.—This fine old species is a general favourite, and has long been an inhabitant of our plant-houses. It may be grown in either pot or basket, or on a block of wood; but if a large specimen is required, pot-culture must be adopted. The pseudo-bulbs are erect, one to two feet long, pale green, and very transparent. It is an abundant bloomer, flowers usually two or three on the raceme; sepals and petals waxy-white, tinged and tipped with pink; lip white, with a large crimson blotch at the base. In the variety *Wallachianum*, the flowers are larger and much deeper in colour; there are numerous varieties, but for size and richness of colouring all are far surpassed by the variety *Rollissonii*, sometimes called *nobile nobiliss*; in this the flowers are large and spreading, and rosy-purple in the sepals and petals, the lip being of a deep velvety-purple. Winter and spring months. Widely distributed throughout India.

D. Parishii.—This is a distinct and beautiful species when in flower, but the thick bent-down pseudo-bulbs give it a somewhat ungainly appearance when not in bloom. It may be grown either in a pot or basket, but appears to thrive best and display its beauty to the greatest advantage in a basket. Pseudo-bulbs thick and bent downwards, one to two feet or more long, bearing on the naked stems a profusion of its purplish rose-coloured flowers in May and June. Moulmein.

D. Pierardii and its varieties are all very desirable plants, producing very long pendulous pseudo-bulbs. They must be grown upon a block or in a basket, as their beauties cannot be seen unless suspended. Pseudo-bulbs two to three feet or more long, deciduous; these are beautifully festooned with its flowers, which are in the sepals and petals creamy-white or pink, the lip usually pale primrose. It appears to chiefly grow upon Mango-trees in a wild state. The variety *latifolium* is stronger in its growth, and produces larger flowers than the original type. Spring months. Delta of the Ganges.

D. pulchellum.—An elegant small-growing plant, with slender pseudo-bulbs, seldom exceeding six inches in length. It succeeds best in a basket. The flowers are solitary, on rather long foot-stalks; sepals and petals pale purple, the latter much the broader. Lip large and spreading, deep orange on the disc,

with a border of white, the edge beautifully fringed. Winter and spring months. Silhet.

D. suavisimum.—This most beautiful species resembles *D. chrysotoxum* somewhat in its habit of growth, and also in its raceme being somewhat lax. The flowers are very large, of a uniform rich golden-yellow, and the lip is ornamented with a large velvety blotch of deep crimson or black. Summer months. Burmah.

D. speciosum.—A very robust evergreen species, and perhaps the least showy of the genus; but as it can be kept in an ordinary green-house, it can be grown by those having no hot-house. When growth is complete, the best method to insure a crop of flowers is to stand it in the open air for several months. Pseudo-bulbs very stout, twelve to eighteen inches high, bearing near the summit several very thick and leathery deep green leaves. Racemes erect, as long as the growths, densely set with waxy flowers of a creamy-yellow, the lip prettily spotted with purple. Winter months. Australia, where it is known as the Rock Lily.

D. speciosum, var. *Hilli*.—By some this is considered a distinct species, but its differences, although marked, are scarcely sufficient to entitle it to specific rank. The pseudo-bulbs are much longer and more slender, the racemes are also longer and pendent, densely furnished with its creamy-white, fragrant flowers. Winter months. New South Wales.

D. transparens.—An elegant and compact-growing species. Pseudo-bulbs erect, smooth, bearing numerous ovate-lanceolate pale green leaves. Flowers usually in pairs. Sepals and petals spreading, the latter much the broader, all of a transparent pale pink, or purplish lilac; lip the same colour, with a deep crimson blotch in the centre. Spring and early summer. Nepal.

D. Wardianum.—If only one species of this genus could be grown in a collection, this species, for its large size and wondrous combination of colours, would in most instances be selected. The pseudo-bulbs are very long, pendulous, and swollen at the joints, and furnished with numerous ovate-lanceolate leaves, which are deciduous. Flowers, two to three, very large, often measuring four to six inches across. Sepals lanceolate and obtuse, petals much broader than the sepals, oblong-ovate, all waxy-white, broadly tipped with rich magenta. Lip cucullate, somewhat ovate in front, the sides rolled over the column; the basal portion deep orange-yellow, bordered in front with white, broadly tipped with magenta, and ornamented near the base with two deep crimson blotches. It is a profuse bloomer. Winter and spring months. Originally introduced from Assam, but more recently a more robust-growing form has been discovered in Burmah.

