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PART I.

A YEAR AMONG THE ORCHARDS OF NOVA SCOTIA.

By Mr. CECIL H. HOOPER, M.R.A.C., F.S.I.

[Read January 31, 1899.]

THE peninsula of Nova Scotia is situated on the eastern side of the Dominion of Canada and south of the entrance of the Gulf of St. Lawrence. The climate is very pleasant, in spite of a long and rather severe winter; the frost is of great advantage in pulverising the soil. The country is remarkably well supplied with water by its countless little springs and its numerous lakes, as well as by the heavy falls of snow in winter and frequent and heavy showers during the summer months, the latter generally falling at night, leaving the days bright, warm, and cloudless. The growth of vegetation is very rapid after the snow has disappeared. The scenery is beautiful, the abundance of native trees rendering it particularly attractive. The most common of these are spruce, fir, pine, larch, birch, maple, ash, alder, and oak. The acacia tree is often seen, and also in some parts the French willow and English elm have been introduced and thrive well. Nova Scotia is said to have the largest variety of flowers, mosses, and ferns of any country. Wild eatable berries are also very plentiful; they include strawberries, raspberries, blueberries, huckleberries, blackberries, and cranberries.

THE CORNWALLIS AND ANNAPOLIS VALLEY.

The Cornwallis and Annapolis Valley is the principal fruit-growing district of Nova Scotia. It is one continuous valley of about 100 miles in length, and varying in width from six to eleven miles, situated between two nearly parallel ranges of hills of about 600 feet in height. The North Mountain shelters the valley on the north-west, and from the

strong winds off the Bay of Fundy; the South Mountain, which is a little higher, bounds it on the eastern and southern side, and runs N.E. to S.W. In the middle of the valley there is a watershed, the Annapolis River running S.W., the rivers of the Cornwallis district running N.E.

These rivers are small; but owing to the great rise and fall of the tide (60 feet), the salt water runs up far inland, carrying with it enormous deposits of alluvial mud or silt, and allowing ships to go several miles inland.

Near the mouths of the rivers there are salt marshes which are overflowed by the tide, and grow salt hay, which is eaten by the cattle during winter. Higher up are the dyked marsh lands reclaimed from the sea, forming very rich meadow land. Grand Pré, the district rendered famous by Longfellow's "Evangeline," the scene of the expulsion of the Acadians, lies in the eastern part of the valley, on the shores of the Basin of Minas, across which Cape Blomodin, the termination of the North Mountain, is clearly seen. Owing to the beauty of the country, its historic interest, and the cooler temperature, it attracts many visitors from the United States during the summer months. Apples and plums are grown throughout the valley, and in the centre, near the towns of Middleton, Aylesford, and Berwick, raspberries, blackberries, and strawberries are grown, also some peaches and a few grapes. One farm I visited had 6 acres of strawberries. Most of the soft fruit is sent to Halifax and Boston, but the market for these fruits is at present rather limited. In the centre of the valley there is a large area of bog land, which, it has been found, is well adapted to cranberry-growing, an industry that is rapidly increasing.

The greater part of the valley was originally covered by forest, which has been cleared, save at the foot and sides of the mountains.

The Soil.

The soil of the valley is partly formed by the disintegration of the Trap rock of the North Mountain, partly from the syenitic granite of the South Mountain, together with the red loam and coarse-grained sand of the New Red Sandstone in the valley, which abounds in oxide of iron, lime, and gypsum, forming a fertile soil admirably adapted to the cultivation of apples, plums, and various fruits, as well as of potatoes, swede turnips, oats, maize, pumpkins, beans, &c. Wheat growing and beef production have lately decreased, owing to the competition of the western provinces. The dairying industries are, however, increasing.

The Farms.

The farms are, almost without exception, occupied by their owners, most of them small compared with the average size of English farms, and still smaller, of course, compared with many farms in the West of Canada and the United States. The labour is largely performed by the farmer and his sons, with but little hired help. The farmhouses and buildings, for the most part, are neat, comfortable, and give the impression of prosperity. They are almost all constructed of wood, painted

white. They are generally situated near the high road; and, as the farms are long and narrow, extending often back into the wood and down through the marsh land to the river, the farmhouses are many of them within a quarter of a mile of one another, which enables life to be of a sociable nature, if desired. Prohibition of intoxicating drinks is rigidly enforced throughout Nova Scotia, with the exception of a few towns. There is consequently very little drunkenness. Roughly speaking, the area of these farms varies from 20 to 120 acres, consisting of about equal parts of grass and arable land, the latter including 1 to 5 acres of apple orchard. There are a few farms with as many as 60 or more acres of orchard, but a large proportion of this has been planted within the last ten years, and is not yet in full bearing. Many orchards are fifty years old, and a few apple trees remain which were planted by the French more than 150 years ago. The apple tree certainly thrives here, and the orchards are generally neatly laid out and well cared for; the growth of the trees is more rapid, and they attain a larger size than is common in England. The fruit is usually large, well coloured and abundant, and of pleasant flavour, particularly the 'Gravenstein.' Owing, no doubt, to quicker growth and shorter season, the flavour generally is not quite as nice as that of good English apples. Although the shape of the trees, the cultivation, and the fruit in the best English orchards equal, I think, anything I saw in this valley, the average of the two countries is much in favour of Nova Scotia.

Throughout the valley there is a telephone system which connects railway stations, shops, doctors' dwellings, and many of the farmers' houses. The charge is £5 for installation; £2. 10*s*. yearly. On one occasion I sent a cable to England from the sitting-room of the farmer's house in which I was staying, and received one back.

Co-operative cheese and butter factories stud the valley every few miles. These encourage the keeping of dairy cattle, which industry profitably accompanies fruit-growing. The local agricultural societies own pedigree cattle for the improvement of native stock. At Canning, in the Cornwallis Valley, there is a vegetable evaporating factory (Kerr's), which was busy drying vegetables for the soup of the miners at Klondyke. It has in former years fulfilled contracts to the satisfaction of the English Government for naval and military supplies, its only difficulty being sudden large orders, with very limited time for manufacture.

Pruning and Training.

The trees are, as a rule, well-shaped, as the farmers begin early in the life of the tree to shape it. They like their trees to have a central leader, with the main branches distributed evenly about it, there being thus less risk of the tree splitting. The height of the branches from the ground is regulated so as to allow horse cultivation under them.

It is found by experience that it is best to saw off the branches as close against the trunk as possible. If it is necessary to remove a large limb they commence by sawing in a short distance from below upwards, in order to avoid splitting the wood and tearing the bark. Large wounds grow over best when the edge is smoothed off with a knife, and then

covered with some substance to exclude moisture and thereby prevent decay. Gum shellac dissolved in wood alcohol is found to be the best substance for this purpose, though white lead paint or grafting wax are both good.

Generally speaking, summer pruning, of which a good deal is done, promotes fruitfulness; winter pruning tends more to wood growth. Pruning in Nova Scotia is chiefly done at the end of winter, whilst snow is still on the ground; when the trees are bursting into bloom is found to be a good time, though the opinion is that pruning may be done any time during winter without disadvantage to the trees, the discomfort being that of the man who prunes.

In case of a tree being split at the forking of the branches, a hole is bored with an auger right through the tree at right angles to the split, and the parts are drawn together by an iron screw-bolt and nut with large heads; this damages a tree less than binding together with a hoop of iron.

On Mr. Ralph Eaton's farm (Kentville), in order to train the young tree to grow upright, in case of the trunk bending, a screw-hook is screwed into the tree, and by means of a wire attaching the hook to a peg in the ground (in some cases two wires and two pegs are used), the tree is drawn into the desired position; these hook eyes and wires are also used to train the branches into correct position where necessary.

Grafting and Re-grafting.

Most of the fruit trees are purchased from nurseries in Ontario and the U.S.A., but some farmers raise apple and plum trees. The apple stocks are from seeds of cider or eating kinds, and not from the crab. They are root-grafted during winter, being kept in a cool cellar. The whip graft is bound together usually by knitting cotton or strips of calico which have been dipped in grafting wax; by the spring the scion and root stock have partly united, and they are planted out.

There is a tendency, by selection of the most suitable market kinds, to decrease the number of varieties; consequently in spring there is a great deal of top-grafting done; the cleft graft, with one or two scions according to the size of the branch, is the method usually employed. The grafting wax commonly used is made by heating together 2 lbs. resin, 1 lb. bees'-wax, ½ lb. tallow, either applied warm with a brush, or made up into a ball and applied by the hand. Grease is rubbed on to the hands, to prevent the wax sticking to them.

The Fertilising of Orchards.

Rotation in the fertilisers applied to the orchard is recommended as advantageous, for example, cattle or horse manure one year, chemical fertiliser another. Farmyard manure greatly benefits old, neglected orchards requiring nitrogen, but its use should be discontinued where trees run too much to wood and leaf, without fruit, and some manure containing potash and phosphate usually proves beneficial. Professor Shutt considers farmyard manure, as a fertiliser for apple orchards,

is deficient in potash, and that potash in some form should be given in addition.

Green manuring or cover-cropping is much employed in Nova Scotia to supply vegetable matter.

In Canada, wood ashes are the best possible manure. They are applied at the rate of twenty to forty bushels per acre, those from hard wood being better than those from fir trees. The ashes contain, when not washed by rain, about 5 to 7 per cent. potash, 2 per cent. phosphoric acid.

As the available supply of farmyard manure and wood ashes is very limited, commercial fertilisers are largely used ; the two in most common use are finely ground bone meal, at the rate of 5 to 8 cwts. per acre, to supply phosphoric acid (23 per cent.) and nitrogen (3 per cent.), and muriate or chloride of potash, at 1 to 3 cwts. per acre, to supply potash (50 per cent.). Sulphate of potash is more rarely used : it contains about the same amount of potash.

In the adjoining valley of the Gaspareau there is a bone mill, to which farmers take bones to be ground.

Nitrate of soda is not, from what I noticed, much used in the Nova Scotian orchards, save sometimes to give young or old trees increased vigour.

In a paper on Fertilisers for Orchards in Nova Scotia, published in *The Farmers' Advocate*, the following ingredients were recommended :—

For small fruits (strawberries, raspberries), per acre :—

150 lbs. nitrate of soda	=	23 lbs. nitrogen.
250 lbs. muriate of potash	=	125 lbs. potash.
800 lbs. bone meal	=	18 lbs. nitrogen. 184 lbs. phosphoric acid.

For apple orchards :—

100 lbs. nitrate of soda	=	15½ lbs. nitrogen.
200 lbs. muriate of potash	=	100 lbs. potash.
550 lbs. bone meal	=	16½ lbs. nitrogen. 126 lbs. phosphoric acid.

For orchards with clover :—

200 lbs. muriate of potash	= 100 lbs. potash.
250 lbs. "Thomas" phosphate (basic slag), at 16 per cent. phosphoric acid	= 41 lbs.

E. B. Voorhes, of the New Jersey Experiment Station, said :—

"To provide vegetable matter and to improve the physical quality of poor soils, apply yard manure once in four years, in fall or winter, at the rate of from five to ten tons per acre. To aid in the decomposition of vegetable matter, and to ensure a sufficiency of lime as plant food, apply lime at the rate of twenty-five bushels per acre once in five years. To provide, in addition, an abundance of all forms of available plant food at

the times needed for the development of the tree and fruit, apply annually chemical fertilisers in the following proportions :—

100 lbs. nitrate of soda	=	15½ lbs. nitrogen.
100 lbs. South Carolina rock superphosphate	=	15¾ lbs. phosphoric acid.
200 lbs. ground bone	=	6 lbs. nitrogen. 44 lbs. phosphoric acid.
200 lbs. muriate of potash	=	100 lbs. potash.

"The amounts to be applied depend upon the character of the soils, the kind of fruit, and the age and vigour of the tree; these given perhaps mark the minimum. In a number of best orchards the quantities applied are very much larger than those here indicated, and the larger application is believed by the growers to be proportionately profitable."

Frank T. Shutt, Chief Chemist of the Dominion Experimental Farms, wrote :—

"Assuming the leaves of a full-grown apple-tree to weigh 50 lbs., and reckoning forty trees per acre, the manurial value contained in the leaves is equal to :—

Nitrogen	17·74 lbs.
Phosphoric acid	3·88 lbs.
Potash	7·84 lbs.

"The leaves are returned to the soil, but the fruit is exported; this, in the case of an orchard twenty-five years old, producing 160 barrels of 140 lbs. = 10 tons per acre, is a loss to the soil of approximately :—

Nitrogen	8·9 lbs.
Phosphoric acid	5·3 lbs.
Potash	32·8 lbs."

Professor Shutt recommends for apple orchards :—

100 lbs. bone meal	=	3 lbs. nitrogen. 23 lbs. phosphoric acid.
100 lbs. superphosphate	=	15 to 20 lbs. ,, ,,
75 lbs. muriate of potash	=	37 lbs. potash.

Professor E. E. Faville, the late professor of the N.S. School of Horticulture, in a paper on Fertilisers for Fruit Plants, gave as the yield and composition of fruit per acre :—

	Tons.	Nitrogen.	Potash.	Phos. acid.
Apples	15	30 lbs.	45 lbs.	3 lbs.
Pears	10	12 lbs.	36 lbs.	10 lbs.
Plums	2	16 lbs.	8 lbs.	2 lbs.
Berries	11½	Trace	7 lbs.	2½ lbs.

The following is given as another useful formula for manuring orchards :—

Good rotten barn-yard manure	10 to 15 tons per acre.
(1 ton = 12 lbs. nitrogen, 12 lbs. potash, 6 lbs. phosphoric acid.)	
Kainit (13 per cent. potash)	300 to 700 lbs. ; or
Muriate of potash (50 per cent. potash)	100 to 200 lbs.
Bone meal (fine ground)	100 to 200 lbs.
(2 to 3 per cent. nitrogen, 22 per. cent. phosphoric acid) ; or	
Superphosphate	125 to 250 lbs.
(16 per cent. phosphoric acid.)	

Orchard Tillage.

The apple trees are planted 33 to 40 ft. apart, in a few instances with plum trees between, in one direction of the lines.

For the first few years the ground is ploughed deeply (8 in.), in order to break up the soil and to encourage the roots to grow down to a sufficient depth to escape injury in case of drought, and to be below the reach of the plough. The whole surface of the orchard is tilled from the beginning. In ploughing, the plough is turned partly out when within a few feet of the trees and runs shallower (4 in. deep), as the roots near the butt are closer to the surface ; immediately round young trees the surface is generally lightly forked over. Between young trees potatos are frequently grown, using bone meal and muriate of potash as fertiliser. The deep ploughing needs only to be kept up for a few years in order to establish root growth.

The kind of plough in general use has no wheels : it has a sharply curved mould-board. The latter, although it increases the draught, yet is more than compensated for by the more perfect pulverisation of the soil. The ploughing is done either in the fall or early spring. In Canada fall ploughing is not recommended for clay land, as it tends to puddle it and make it become hard and stiff; the frost consequently enters to a greater depth, and root injury may result. In ploughing, one aim is to obtain a level surface. Thus one year the soil is ploughed from the trees, the next towards them; one year east and west, the following north and south. Most of the farmers whose land runs down to the river bank, dig and haul the salt marsh mud on sleds during winter, and spread it on the orchard land ; this is disintegrated by frost and more carefully spread in spring. This mud has manurial value, and also the salt in it probably aids in keeping the land moist. Early tillage saves the moisture accumulated during winter and early spring, and puts the soil into fine condition to warm up and get the trees quickly to work. As thorough cultivation renders plant food available and is the best conservator of moisture, tillage is begun early by ploughing as soon as the snow has thawed and the land is sufficiently dry to be worked. Harrowing follows, which stirs the ground thoroughly to the depth of about 3 in. ; this is performed about every two weeks until late in the summer—the drier the soil the oftener it should be done. The varieties of harrow used include the spring tooth, the spike

tooth, the disc, and acme. If the wood growth of the trees is too luxuriant, it may be checked by lessening the tillage and by withholding nitrogenous manure. As the orchard trees stop growing about midsummer, vigorous tillage then ceases, so that the new growth may ripen sufficiently to stand the cold of winter; and as the trees can now spare considerable moisture, catch crops are with advantage sown, such as tares and buckwheat.

The Cropping of Orchard Land.

Young orchards, say for the first twelve years, generally have some crop grown in them, such as early potatos, maize, beans, and other hoed crops. These crops need cultivation during the early part of the season, and are removed about the middle of July or first week of August. Buckwheat and oats are also grown, but are not as satisfactory, as the land cannot be thoroughly worked. Some space is allowed around the trees, so as not to grow crops directly over the roots of the trees. For these crops bone meal and muriate of potash are frequently sown in the drills.

In the older orchards the land is generally uncropped, but frequently harrowed. I have seen orchards almost weedless, due to this frequent cultivation. In some cases, after the trees are about twelve years old, clover is sown and left down for three or four years and mown for hay. This is, however, exhaustive unless some fertiliser is used.

Orchard Cover Crops or Green Manuring.

The object of cover crops or green manuring is to gather and return vegetable matter to the soil, and to protect the roots of the trees from the effects of severe frosts, especially when unprotected by snow.

For this purpose the orchards are very thoroughly cultivated during the early part of the season, and after the close of active growth, about July or August, the surface is sown with some crop which will grow quickly and be large enough to protect the soil during winter.

Crimson clover (*Trifolium incarnatum*), in parts of Canada and the United States where it stands the winter, is found admirably adapted to supply nitrogenous vegetable matter to orchards at little cost. It is, however, rather a risky crop in Nova Scotia.

Mammoth clover is found to be the next best, sowing 14 lbs. per acre. Tares, lucerne, common red clover, peas, buckwheat, rye, and oats are also employed for this purpose. A fair growth will be obtained the same season, which is ploughed in early the following spring, in order not to retard the spring growth of the trees. These crops help to keep down weeds, and, where successfully grown, enrich the soil at less cost than with farmyard manure. Where clover and other plants of the leguminous family are grown, nitrogenous manures may be omitted, as these plants have special power to take up nitrogen.

Spraying for Fungi and Insects.

In Canada both insects and fungi, where they do exist, appear to be more plentiful and more destructive than at home. Canker in apple trees

is, however, very rare. Woolly aphis is not common, and it is said to have come from Europe, and that Europe did not derive it from America.

For horticultural purposes insects may be divided into two classes: (1) those that chew their food, such as caterpillars; and (2) those that feed by sucking the juices, such as scale insects and aphides.

The chewing insects may be destroyed by distributing poison over those parts of the plant upon which they feed.

In Canada spraying is almost universally practised. Useful pumps are manufactured for the purpose, provided with a paddle to agitate the liquid. The pump is usually fitted into a paraffin barrel; the hose-pipe is

Fig. 1.—Orchard Spraying in Nova Scotia.

10 to 15 feet long, often lengthened by a light bamboo tube rod 6 to 10 feet long, in order to reach high up into the trees; the spraying nozzles are mostly of the Vermorel pattern. The barrel is mounted on a cart or low waggon ("sloven"), and drawn by a horse through the orchard, taking two or three persons to drive, pump, and direct the spray. The reproduction of a photograph (fig. 1) illustrates this. In some cases orchards are sprayed quite early in spring to clean the bark of the trees from scale and moss, using $\frac{1}{4}$ to 1 lb. caustic rock potash to 1 gallon of water, or this may be applied to the trunks with a vegetable fibre (not hair) lime-wash brush either at this time or in June. For spraying with the stronger potash solution men sometimes wear old macintoshes, rubber gloves, and strap a macintosh over the horse.

Powdered caustic potash is sold at most grocery shops in Canada, as it is used for soap-making. A 1-lb. tin costs about *5d.*; this is a very convenient form for spraying purposes.

Spraying for fungi, black spot, or scab on apples (*Fusicladium maculatum*) may be done before the blossom or foliage opens in order to kill the spores. For this copper sulphate alone (3 lbs. to 40 gallons of water) can be used without lime, as there is no foliage to burn. The first spraying jointly for fungi and insects, caterpillars of the Codlin moth (*Carpocapsa pomonella*), Tent or Lackey moth (*Clisocampa Americana*), Canker or Winter moth (*Anisopterix pometaria*), is done when the fruit buds begin to unfold, but before the flowers expand; the second time just as the last blossoms fall; and if caterpillars are numerous or black spot shows on young fruit or leaf, the spraying should be repeated, say once every two or three weeks.

The mixture in common use is the Bordeaux mixture as the fungicide, Paris green as the insecticide.

To save time for the former, stock solutions of sulphate of copper and lime are made separately; the Paris green is added direct.

The formula commonly adopted is:—

	For Apple.	For Plum and Peach.
Copper sulphate . .	4 lbs.	3 lbs.
Quicklime . . .	4 lbs.	3 lbs.
Water	40 gallons.	40 gallons.
Paris green . . .	4 ozs.	3 ozs.

Copper sulphate is soluble in cold water, but more readily so in hot. The solution is made by hanging the crystals, contained in a sack or basket, in a barrel of water near the surface, so that it is partly or just covered by the water. Vessels of wood or earthenware should be used for dissolving the sulphate; dissolve 1 lb. of copper sulphate per gallon of water for a stock solution. Thus take 40 lbs. for a 40-gallon barrel. Take, say, one bushel of lime, which is the better for being freshly burnt; place it in another barrel, and pour about 10 gallons of water on it to slake it; afterwards add enough to make it into a creamy mixture like putty, pour on a little more water to exclude the air and prevent change in character; then cover the mouth of the barrel to prevent evaporation.

For making up a 40-gallon barrelful of the spraying mixture, fill the barrel, say, one-third full of water, then add 4 gallons of the copper sulphate solution. Then take some of the lime putty, mix it with water and add it to the solution, straining it through a funnel-shaped box with a fine copper wire mesh strainer at bottom. In order not to add an unnecessary amount of lime, thereby risking the clogging of the machinery, it is advisable to test the mixture so as to ascertain whether the sulphuric acid has been neutralised by the lime. For this purpose a solution of ferrocyanide of potassium (1 oz. in 1 pint of water) is used. After stirring, take a small quantity of the mixture from the barrel in a white saucer or a glass, and add a few drops of the ferrocyanide solution. If a brown colour appears, the mixture needs more lime; if there is sufficient lime no discoloration takes place. Next weigh or measure out about $\frac{1}{4}$ lb. of Paris green, put it into a cup and make it into a paste with water; add this to the mixture in the barrel.

In Nova Scotia, Paris green is sold at most of the hardware stores in

cardboard boxes, containing 1 lb., costing about 9*d*. It may be tested for its purity by ammonia, which should dissolve it completely, producing a deep blue liquid.

When Paris green is used alone without the Bordeaux mixture it is always advisable to add an equal quantity, or twice the quantity, of lime, for the purpose of taking up the soluble arsenic which may exist and might injure the foliage.

To spray twenty-year-old trees, planted 40 to the acre, costs about 2*s*. to 4*s*. per acre per application for materials, and takes about $1\frac{1}{2}$ to 3 gallons per tree to spray thoroughly on both sides. It takes nearly double the quantity to spray when in full leaf that it does before the blossoms open. About four to six applications are generally needed.

Professor Bailey tells us that with a 300-gallon tank drawn by two horses with three men, one driving and pumping, the other two standing on the rear platform two or three feet above the tank, directing the spray, each with a hose-pipe, the pump having an automatic stirrer—with this rig five acres of full-grown apple trees can be thoroughly sprayed in a day.

All the working parts of the pump should occasionally be oiled, also the nozzles.

In using both copper sulphate and potash, iron vessels should be avoided, preferably using wooden pails. Before working with these liquids it is a good plan to rub the hands over with mutton or some other fat not containing salt. Avoid spraying work when the hands have open cuts or sores, and wash the hands well after work. For spraying it is advisable to wear one's worst clothes. A broad-brimmed (straw or rush) hat is of advantage in shielding the face from spray. Spray from the windward side, and only when calm.

For currant and gooseberry caterpillar, freshly ground white hellebore is used, either as powder, or if used as a liquid, 1 oz. to 3 gallons of water is recommended.

The trunks of old apple trees are sometimes scraped with a short-handled triangular hoe or box scraper to clean off loose bark and moss, the dwelling-places of the bark lice, and the winter quarters of the Codlin moth; this is usually done in Canada about April.

Insects, the food of which consists only of the sap or juice of the plant, and which thrust their beaks through the epidermis of the plant before they begin to suck in their food, are unharmed by any poison on the outside of the plant. This class of insect, to which scale and aphis belong, can only be destroyed by some substance which is applied to the insect itself, which either burns or stops the breathing pores of the body, and so kills it.

For apple bark scale (*Mytilaspis pomorum*) the following mixture is used, either in winter or about the middle of June, when the young lice are hatching out:—

Paraffin	2 gallons.
Rain water	1 gallon.
Hard soap	$\frac{1}{2}$ lb.; or
Soft soap	1 quart.

The soap and water are boiled together, then paraffin is added. The mixture is well stirred or agitated with a garden syringe. For use, 1 part of the mixture is added to 9 of water, and applied to the bark either as a spray before the leaf opens or with a brush in summer.

Dr. Fletcher recommends a solution of washing soda so strong that no more will dissolve in the water, then dilute the soap to the proper consistency.

To counteract mildew on the leaves of gooseberry bushes, potassium sulphide, 8 ozs. to 25 gallons of water, is employed.

Fruit Tree Banding.

The placing of bands of sticky material to prevent the ascent of the female Winter moth, in America called the Canker moth, is practised to some extent in Nova Scotia, though it is generally considered that if spraying is thoroughly done at the right periods grease banding is not necessary.

The substances chiefly used are bands of tarred roofing paper painted with printers' ink, or castor oil and resin applied direct to the tree. Professor Craig recommended, for winter use, 2 lbs. castor oil to 3 lbs. of resin warmed together, but not boiled, applied warm with a 2-in. paint brush; and for spring use, 2 lbs. castor oil to 4 lbs. resin. These mixtures are applied after scraping off loose bark, either direct or on the surface of paper. The band is placed about 2 feet from the ground, is about 6 in. wide, and is put on at the end of October or early in November.

Grease banding seems specially useful in the case of large trees, which it is difficult to spray thoroughly.

Apple Picking and Packing.

The kind of ladder commonly used for apple picking is one fairly broad at the base, but the sides of which at the upper end terminate in a point; this construction is liked, as the ladder can be so conveniently placed among the branches. The baskets used are of a rounded shape, with swing handle, holding a little more than a peck. These are convenient for emptying the fruit gently into the barrels, in which they are removed from the orchard without sorting. Fallen apples are picked up and sent to Halifax.

The barrels of apples are placed either in a special apple-packing house, or more generally in the cellar under the barn or house, ready for sorting and repacking. The apples are sent over to England chiefly between the end of September and the end of March. For sorting, the apples are poured out of the barrels on to a table, usually about 5 feet long and 3 feet wide, with a ledge all round 4 or 5 inches high, covered with carpet, felt, or sacking. The sorting divides the apples into :—

1st. Of good size and quality;

2nd. Smaller, but of good quality, both shipped to England;

3rd. Scrubs, which are sound, but scabbed, ill-formed, or otherwise defective, sent to local market; and

4th. Rotten, for pigs.

Sometimes the extra good apples are picked out as specially "selected."

The barrel most commonly used in Nova Scotia is made of fir staves with birch hoops, holding 120 to 140 lbs. fruit, and costing 10*d*. Barrels with staves of maple or elm, with elm hoops, are used to a lesser extent, but are commonly used in Ontario and the U.S.A.; these hold 140 to 150 lbs. of apples, and cost 1*s*.

In packing, the bottom and bilge hoops are first nailed, then a thin layer of wood-wool, called "Excelsior," is placed at the bottom, next a sheet of white paper the same size as the end of the barrel. A layer of "headers" is then laid; these are apples of average size, those best coloured being chosen. These are placed stem downwards. The barrel is then filled by carefully emptying in the fruit, using hinge-handled baskets. The barrel is gently shaken each time fruit is added, so as to pack the fruit closely. It is filled 1 or 2 inches above the rim. In order to get the apples tightly packed, so that they do not move after packing and become "slack" in travelling, a round board lined with sacking or saddlers' felt is placed, padded side downwards, on the top of the apples; the barrel is rocked on the floor, if of cement, or, if not, on a heavy plank. The apples, thus shaken and pressed, sink to about the level of the rim; any spaces are filled with small apples. Then another piece of white paper is placed on the apples, the chine hoops are knocked up to loosen them, to allow the lid to enter the mouth of the barrel; then the lid is laid on, and the screw or lever-press is applied to the barrel to press the lid into position, followed by the tightening of the chine hoops and the nailing of the head and hoops.

The name of the apple, together with the owner's name and address, are stencilled on the top of the barrel; the name of the salesman on the bottom.

The cost of sending over to England—London or Liverpool—from the Annapolis Valley, *vid* Halifax, is about:—

	s.	*d.*
Rail (60 to 160 miles) . . .	1	8
Steamer (3,000 miles) . . .	2	6
	4	2 per barrel.

The salesman's commission in London is usually 5 per cent.

Mr. S. C. Parker tells me the average net price received by the grower was, per barrel, for the crop of 1896, about 4*s*. 2*d*. ($1); for that of 1897, 8*s*. 4*d*.; and for 1898, 6*s*. 3*d*.

The grower considers 8*s*. per barrel, clear of expenses (barrel, freight, and commission), a very good price, but occasionally they do not pay expenses, due to inferior fruit, bad packing, or glutted market.

The apples are sometimes bought on the trees at so much a barrel throughout the orchard; and if packed by the grower, 1*s*. per barrel is paid for picking, packing, and hauling to the station.

There are several large apple buyers who have large stores and packing sheds, capable of holding several thousand barrels. These are generally situated close to a railway station, to enable the barrels to be loaded direct into the cars.

The *London City*, by which I returned, carried 14,050 barrels; the

Furness Line, to which this boat belongs, receives a subsidy from the Canadian Government to run a fortnightly service of steamers.

Cranberries.

Around Berwick, Waterville, Auburn, Aylesford, and Cambridge, in the middle of the valley, cranberry-growing is fast increasing. Here the soil is moist, but not stagnant ; it consists generally of one or more feet of peaty soil over sand. In 1896 there were about 200 acres of cranberry bog, and in 1897 about 2,500 barrels were raised. They keep well in barrels for fully nine months ; when required for shipment they are sorted and cleaned by hand or machinery, and sell in London at 25*s*. to 35*s*. per barrel. The cranberry beds take four years to come into bearing, and are said to

Fig. 2.—"Nonpareil" Apple Tree, Cornwallis Rectory, Nova Scotia. Probably 150 Years Old.

last about forty years. The crop is said to average about forty barrels per acre. The rows are planted 15 to 24 in. apart; plants 4 or 5 in. apart.

Once in three years the bogs are sanded about $\frac{1}{2}$ in. deep, taking fifty two-horse loads per acre. During the winter the plantations are in many cases flooded, in order to destroy insects. One company owning a large area of cranberry bog which had been badly infested with "fire-worm," at the recommendation of the Canadian Department of Agriculture, sprayed the plantation with arsenate of lead ($\frac{1}{2}$ oz. arsenate of soda in 1 quart water, $\frac{3}{4}$ oz. acetate of lead in 1 quart, pouring the two together and adding 5 gallons water). This insecticide has been found very effective, and may take the place of Paris green in orchards, as in a trial at the Central Experimental Farm, Ottawa, in 1895, the percentage of wormy apples (Codlin moth) was even less than where Paris green was used.

For useful information as to cranberry culture, I would recommend purchasing the Report of the Nova Scotia Fruit Growers' Association for 1897. I believe cranberries would be a remunerative crop on moor and heather land in England and Scotland, as I consider the land is of similar character to that of Nova Scotia, in which cranberries thrive so well.

Mr. S. C. Parker writes to me that, on the recommendation of Messrs. Nothard & Lowe (Tooley Street, London), cranberries have been generally shipped this season in boxes holding 10 lbs.; this package gave good results, netting about 2*s*. 6*d*. per box.

Notes of the Yields of Fruits.

At Cornwallis Rectory there is an old French 'Nonpareil' apple tree, probably 150 years old, measuring 10 ft. girth 1 ft. from the ground. The Rector, the Rev. F. J. H. Axford, told me that during the twenty years he has been there the amount of fruit from it has varied from two barrels up to sixteen, the average being nine barrels. A photograph of this tree (Fig. 2), taken by his daughter, is given.

At Wolfville, in 1896, from Mr. Elliot Smith's orchard twenty barrels were gathered from three 'Gravenstein' trees twenty-five years old. In the same year, from the farms on Canard Street, 50,000 barrels of apples were gathered within a distance of 3½ miles along the road.

In the Gaspareau Valley, 1,700 barrels were gathered from thirteen acres of orchard belonging to Mr. Gurtridge.

Strawberries: 100 bushels, or 3,200 quarts, per acre is said to be an average yield, 5,000 being exceptionally good. Price, usually 5*d*. to 7½*d*. per quart, but sometimes as low as 2½*d*. Strawberries are grown on the "matted row" system.

Raspberries: 2,000 quarts average, 5,000 very good; price, 4*d*. to 6*d*. per quart.

Blackberries: 2,000 average; about the same price as raspberries.

Cranberries: 50 to 100 barrels of 150 lbs.; price, 25*s*. to 30*s*.

Price paid for picking all berries, ½*d*. per quart.

Potatos are extensively grown and exported to Cuba in barrels. Burbanks, early and late rose, and Chilis are among the varieties most grown. The average yield is about 200 bushels per acre; price varying from 1*s*. 3*d*. to 3*s*., according to season.

Varieties of Fruit chiefly Grown in Nova Scotia.

APPLES.

'Gravenstein' and 'Banks' Red Gravenstein' are fit for shipping about the middle of September. 'Baldwin' and 'King of Tomkins County.' 'Nonpareil' commands a high price, and is in its prime in the following May and June, and it is mostly grown in Annapolis County. 'Ribston Pippin,' the best apple of English origin. 'Golden Russet,' 'Ben Davis,' and 'Northern Spy.' 'The Bishop Pippin' or 'Belle Fleur,' introduced by Bishop Inglis, the first bishop of Nova Scotia, is much grown for home use, but does not stand shipping. 'Blenheim Orange,' 'Fallawater,' and 'Rhode Island Greening.'

PEARS.

'Bartlett' or 'Williams' Bon Chrétien,' 'Clapps' Favourite,' 'Flemish Beauty,' as standards. (In Ontario, 'Duchesse d'Angoulême' is much grown as a dwarf.)

PEACHES.

'Early Crosby' and 'Early Alexander.'

PLUMS.

'Moer's Arctic,' 'Lombard,' 'Greengage,' 'Magnum Bonum,' and 'Bradshaw.' The wood of the European and American varieties is subject to a very destructive fungoid disease, 'Black Knot' (*Plowrightia morbosa*), which I trust we may never get in England; but from this disease the Japanese varieties are almost entirely free. 'Burbank,' 'Wickson,' and 'Abundance' are the most popular Japanese sorts.

GOOSEBERRIES AND CURRANTS

Are but little grown. The American varieties of gooseberry are small, the best being the 'Downing.' English varieties of gooseberry mildew badly. Red currants fruit well, but black currants do not thrive.

RASPBERRIES.

'Cuthbert,' 'Marlborough,' both of American origin.

BLACKBERRIES.

'Snyder,' of American origin.

STRAWBERRIES.

Wilson's and Crescent Seedlings are most grown in alternate rows, 'Parker Earle,' a new variety, is highly recommended. European varieties do not thrive on the American Continent.

CHERRIES

Are largely grown around Bear River and Digby; it is a district in which wild cherry and oaks grow naturally in the woods. Black and white hearts and French are the varieties most grown.

CRANBERRIES

Are got wild from the North Mountain and near the lakes.

THE ORIGIN OF THE VARIETIES OF FRUIT.

Professor Bailey tells us that, speaking generally, fruits of American origin are the best adapted to American conditions, notwithstanding the fact that there are some foreign varieties which thrive over large areas of the country. The strawberries, raspberries, gooseberries, and grapes are almost entirely from wild American plants, and succeed better not because they are superior to those of European origin, but because they are more perfectly adapted to their surroundings (climate, insects, fungi, &c.).

Thus, speaking roughly, two-thirds of the best varieties of apples and eleven-twelfths of the best peaches are of American origin from foreign parents; half of the best plums and a quarter of the best pears are American, the pear and plum being the most peculiarly European of the various fruits. American fruits constantly tend to diverge from the foreign types which were their parents, and they are as a rule better adapted to their environments than foreign varieties are.

Orchard Implements.

Some of the best orchard implements I saw in use in Nova Scotia were :—

"Pomona" pump (Gould's Manufacturing Co., Seneca Falls, New York), of which a figure is given. (Fig. 3.)

"Eclipse" pump (Morrill & Morley, Benton Harbour, Michigan). Both

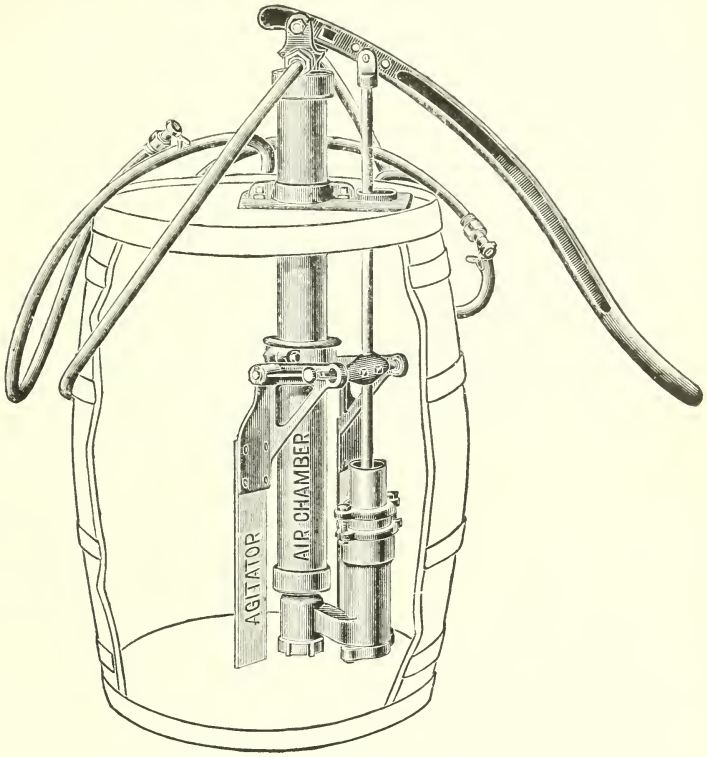

Fig. 3.—The "Pomona" Spraying Pump.
With Agitator. All Working Parts of Brass.

of these pumps have hard brass working parts complete, fitted on a 40-gallon barrel, with hose, bamboo rod, and double Vermorel nozzle, £3. 15*s.*; costing singly about 24*s.* additional for carriage to London.

Orchard spring-tooth harrow (Syracuse Chilled Plough Co., Syracuse, N.Y.), £1. 19*s.*

As an example to us in co-operation amongst farmers and Government aid to agriculture, I will give a short account of the work of the

Nova Scotia Fruit Growers' Association, its school of horticulture, the Nova Scotia Office of Agriculture, and the Canadian Government Department of Agriculture :—

The Nova Scotia Fruit Growers' Association

Was formed in 1863, when the acreage under fruit was probably about 2,500 acres. In 1893 it was estimated that there were 12,000 acres of bearing orchard, with 8,000 more of young trees. In 1871 apples were first sent to England. In 1896, a good year, it is estimated that 750,000 barrels were produced, of which 450,000 were exported to England. The Association has for its objects :—

The increase of cultivation of the various kinds of fruit.

The spreading of information as to the best methods of cultivating, packing, and shipping fruit.

The discussion of subjects of mutual interest : as freight rates by rail and steamer, ventilation on steamer, handling of barrels on embarking and disembarking to prevent damage, condition of fruit on arrival in markets, possible new markets.

Once a year, in January, it has a three days' session at Wolfville, at which papers are read and discussed. I attended it in 1898, and thought it must be very valuable to the farmers, who attend in large numbers. Each member receives the printed report.

The yearly subscription is a dollar = 4*s*. 2*d*.

The Secretary is Mr. S. C. Parker, Berwick, Nova Scotia.

At the Halifax Industrial Exhibition in October there was a fine exhibition of apples, plums, cherries, peaches, and grapes, from Nova Scotia and New Brunswick, under the management of the Association.

The School of Horticulture, Wolfville, Nova Scotia,

Was established in 1894 by the Nova Scotia Fruit Growers' Association, assisted by a Government grant. Horticulture, Botany, and Microscopic Botany are taught by an able professor, Mr. F. C. Sears. The school consists of a class-room, with a good collection of English, Canadian, and American books on horticulture, horticultural journals, about twelve good microscopes, and a collection of pressed wild plants. Beneath the class-room is a potting shed or workshop, and, adjoining, a glass-house with economic and ornamental plants and flowers, in which grafting, budding, and propagating are taught during winter. There is also a root cellar, in which apple stocks for root grafting during winter are kept. Surrounding the school are ornamental grounds, with a nursery of young fruit and other trees and plants close by.

The horticultural course is at present confined mostly to the propagation of plants and to fruit-growing—dealing with wind-breaks, protection from frost, setting out and planting, tillage, manuring, cover crops, renovation of old orchards, grafting, budding, the life histories of fungi and insects, spraying, harvesting, and packing of the fruit, cold storage, &c. The School of Horticulture is attached to the Wolfville University.

The classes are held during the winter months, from the beginning of

November to the end of April. Having myself attended the course, I cannot speak too highly of it.

The course is free, and farmers are invited to come and look round at any time, attend any lecture, and bring any questions. Although there are such exceptional advantages, there are but few who attend regularly.

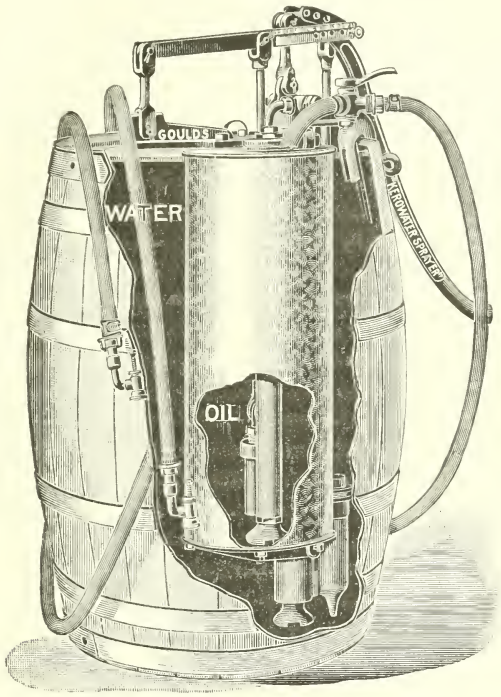

Fig. 4.—"Kerowater" Sprayer.
For Mixing and Spraying Paraffin and Water.

The following were the text-books used at the School of Horticulture in winter 1897–8. They are excellent books:—

"The Principles of Fruit-Growing," by Prof. L. H. Bailey, of Cornell University. 5*s*.

"The Spraying of Plants," by E. G. Lodeman. 4*s*.

"The Nursery Book," by Prof. Bailey. 4*s*.

"The Pruning Book," by Prof. Bailey. 5*s*.

All published by Macmillan & Co., London and New York.

The Nova Scotia Office of Agriculture

In 1897 issued free to all farmers and others interested in the subject, a useful pamphlet, "Practical Hints to Fruit Growers," upon insects, fungi, spray machinery, insecticides, and fungicides.

The Provincial Government has an agricultural and dairy school with model farm at Truro, which deals also with the growth and care of fruit. Lectures on agriculture, dairying, and horticulture are given throughout the province, with field demonstrations which appear to be well attended,

judging from the one on spraying which I attended on Mr. Ralph Eaton's farm, near Kentville.

The Canadian Department of Agriculture

Issues at frequent intervals valuable bulletins on agricultural and horticultural subjects, sent free to farmers. It has an experimental station in each province for trial of different varieties of corn, vegetables, and fruits. That of Nova Scotia is at Nappan. The central experimental station is near Ottawa, where soils and fertilisers are analysed free to farmers, insects are identified, and advice given on matters connected with agriculture and horticulture.

In 1897 it sent over an expert, Mr. J. E. Starr (himself a large apple grower), to report on the condition of the fruit arriving in England and Scotland from various parts of Canada, to see whether any improvements in packing, cold storage (for grapes, plums, &c.), steamer accommodation, marketing, could be suggested, or new markets found.

In conclusion, I can recommend Nova Scotia as a pleasant country to farm in, and as a delightful holiday resort, where a good deal may be learnt in agricultural methods. The people are very kind and sociable, and willing to give information. And, finally, I would here like to record my best thanks to my friends across the Atlantic, and to my wife for the two photographs illustrating the paper; also to the Gould's Manufacturing Company for the use of electrotypes illustrating two of their pumps, the "Pomona" and the "Kerowater." This latter has only recently been introduced and patented this year. It mixes and sprays a combined spray of water and paraffin: the proportion of the latter can be regulated from 5 to 25 per cent.

THE MEANING AND USE OF THE COLOUR AND FORM OF INSECTS.*

By Mr. H. L. T. Blake, F.R.H.S.

[Delivered February 28, 1899.]

We have heard a great deal lately of the dulness of country life and of the monotonous existence of those living in country villages, and it has been urged on that account that many are flocking from the country to the towns. Now, I have lived both in London and in the country, and I must say that I much prefer the latter. In London all the amusements are made for one—they are purely artificial—but in the country a man must have his own resources and must make amusements for himself; and I think that this is best effected by taking a personal interest in one's surroundings and by studying the many wonderful works of nature which those in London have no opportunity of doing. I am therefore going to ask you to take a walk, as it were, with me to-day through your gardens and orchards to see whether we cannot find something that will not only be interesting, but also instructive to us, as horticulturists. And I would invite you to help me in finding the several caterpillars and other insects that may be doing mischief to our fruit trees and other plants. At the same time I shall point out to you how it is that in many instances we are unable to detect these caterpillars. It is not because they are not there; the mutilated leaves are evidence that they must exist in hundreds; but the fact is that many of these caterpillars have the power of assuming the colour of the leaves on which they feed, or the colour and form of the twigs on which they rest, so as to make it extremely difficult to detect them.

For the sake of convenience I propose to divide my lecture into seven divisions, viz.—

(1) The uses and meaning of colour in insects.
(2) Protective resemblance.
(3) Aggressive resemblance.
(4) Protective mimicry.
(5) Aggressive mimicry.
(6) Warning colours.
(7) The combination of the different methods of defence which some insects possess.

The principal "use" of colour is either to assist an insect in escaping from its enemies or to assist it in capturing its prey. The former is called "protective" and the latter "aggressive" resemblance.

Mimicry is where one insect which is palatable mimics another insect which is unpalatable, either for the purpose of obtaining an advantage or for the purpose of injuring its prey; and this likewise divides itself into "protective" and "aggressive" mimicry.

Warning colours are assumed by those insects which are *unpalatable*

* The lecturer in commencing desired to acknowledge his very great indebtedness to Professor Poulton's work.

to insectivorous animals. They have therefore no object in concealing themselves. On the contrary, their safety depends upon their displaying their colour in the most conspicuous manner, so that they may not be mistaken for others which are edible.

Different Methods of Defence.—Under this heading may be included all those insects which have more than one means of defence, such as a nauseous taste, or an unpleasant smell, or a sting, or the power of assuming a terrifying attitude or of ejecting a poisonous liquid, so that if one line of defence is broken through they can fall back upon another.

We will now proceed to examine several insects which afford good examples of the subject under discussion, taking each division in the order I have named.

Protective Resemblance.

There is no better instance of "protective resemblance" than that afforded by "stick" caterpillars, or "loopers" as they are sometimes called, from the loop-like appearance of their body when they crawl. They are extremely common, some 200 to 300 specimens being found in this country; but the majority of them are seldom seen, because of their being able to harmonise so cleverly with their surroundings.

I will now show you * one of these caterpillars resting on a Currant bush, and by comparing it with the twig itself you at once see how very closely the caterpillar can resemble it, both in form and colour. It possesses three pairs of legs at the upper end of its body and two pairs of claspers at the tail end. These claspers not only enable the caterpillar to take a firm hold of the twig, but they assist it in making it appear as though actually growing out of it. These caterpillars rest in this position for hours together, and so long as they remain motionless they are unperceived by their enemies. In order to put this theory to the test, Professor Poulton procured an insect-eating lizard and placed it in close juxtaposition to a bush in which he saw one of these caterpillars at rest. Notwithstanding that the lizard was particularly fond of this kind of food, and notwithstanding that it had been purposely kept from food for two or three days, so as to make it hungry, it entirely failed to detect the caterpillar. Mr. Poulton then pricked the insect, so as to make it move, when the lizard immediately saw it, sprang at it, and ate it up with the greatest relish, thus proving that while perfectly motionless in their attitude of rest these caterpillars are safe from the observation of their enemies.

We will now pass on to another of these "stick" or "looper" caterpillars, viz. the early Thorn moth caterpillar, which is even a still better example of "protective resemblance" than the former one. Here you observe that the colour and form of the insect are very faithful reproductions of the twig upon which it is resting. It is well known that these caterpillars only come down to feed at night or in the evening, and that in the daytime, when their enemies are about, they remain in this attitude perfectly still, resembling a twig itself growing out of another twig. Of course the caterpillar could not remain in that position—at

* The lecture was profusely illustrated by lantern pictures, which greatly added to its interest.

an acute angle with the main stem—without some means of support. Anyone can satisfy himself on that point by holding out his arm from his body, when he will find how soon the muscles will tire. Nature has therefore provided this caterpillar with the power of spinning for itself a very fine silken thread, one end of which it attaches to the twig and the other end to its mouth, and in that way the caterpillar maintains its position for any length of time it pleases.

The next illustration is another very interesting example of protective resemblance. It is that of the caterpillar of the Brimstone moth on the Hawthorn tree. Here the harmony of colour is as perfect as is the resemblance to the form and shape of the twig. Many of the smaller branches of the tree are bent similarly to the attitude assumed by the insect, and at the curve in the branch there is a slight projection which is exactly reproduced in the caterpillar. It is moreover a noteworthy fact that this caterpillar can adjust its colour according to its surroundings. At one time of the year, when feeding upon the young green leaves, it is greenish in hue, whilst when feeding upon the older leaves it becomes of a brown colour. Altogether this is one of the most perfect forms of protective resemblance that is known amongst this class of insects.

Another interesting example is the caterpillar of the large Emerald moth, which, curiously enough, imitates the catkin of the Hazel or Birch on which it feeds instead of the branch of the tree. Here you see it before you short and thick, harmonising in colour as well as in form with the catkin. The rings of its body likewise resemble the overlapping scales of the catkin, while its head is well bent forward, making itself look much more like an eccentric vegetable growth than a living insect.

In all the cases we have thus far examined, the caterpillars make themselves harmonise with their surroundings ; but there are some which act differently, though having the same object in view, and make their surroundings resemble themselves. This is the case with the caterpillar now before us. When feeding, it ingeniously eats away portions of the leaf, leaving rough models of itself near the midrib, and then sits down beside it. Here is the caterpillar—green above and dark beneath—harmonising well with its surroundings, whilst the irregular pieces of leaf which are rejected by it when feeding draw one's eye away from it rather than towards it.

We have noticed instances of caterpillars imitating twigs or branches and others imitating the catkin or blossom of a tree. Our next illustration is that of a spider imitating the lichen on a tree. Here it is lying flat against the lichen, and it will be noticed that that part of its body which is similarly coloured to the lichen it places against the lichen, and that part of its body which is coloured brown it places against the bark of the tree.

Our next picture represents an insect (another spider, a native of South America) imitating a *knot* of a tree. Unlike the method adopted by the former spider, it stands prominently out on a large branch of a tree, and by drawing itself well together it succeeds most admirably in making itself look much more like a knot on the tree than an insect, and in this deception it is greatly aided by its being protectively coloured.

Another very interesting case (also from South America) is a

walking-leaf moth. Surrounded as it is in its natural condition of life by so many leaves with which it harmonises both in colour and form, it is an extremely difficult matter to detect it. Its wings closely represent two leaves, and when the moth lies, as it does, with its wings partially open, the narrow strip of its body, which is seen between them, resembles the midrib of the leaf. Moreover, the head resembles in appearance a bud, whilst its legs are the exact counterparts of the stalks of the leaves.

My last illustration of "protective resemblance" is that of a walking-leaf beetle, and the same remarks apply with equal force here.

Before leaving this division of my subject I should like to say a few words generally on this question. A friend of mine, when discussing the matter with me the other evening, asked what better instance of protective resemblance could there be than a hare sitting in her form. I reminded him, in reply, that protective resemblance in its highest state must not be fixed, but must be capable of adjustment, and that while the English hare could not alter her colour in response to her surroundings, there were other animals, as well as insects, that could. There are some frogs, for instance, that have that power. A party of three gentlemen, when looking for fossils on the south coast of England, came across a frog in a cavern, and they were much struck by its very dark colour. One of the party, being interested in natural history as well as in geology, placed it out on a light-coloured sandstone and put a temporary barricade round it to prevent it from getting away. In the course of half an hour he looked at it again, and found that in that short space of time the frog had changed from dark to light, corresponding with the colour of the sandstone; and when, afterwards, it had been replaced in the cavern, in the course of a quarter of an hour it had assumed its original dark colour again. So, too, all fishermen know that trout caught in a stream with a dark bottom are much darker than those caught in a stream with a light bottom, and that fish can vary their colour as they pass from dark to light, and *vice versâ*. There is also an instance on record proving that blind creatures are unable to respond to the colour of their surroundings. M. Pouchet, a Frenchman, once observed, when gazing into the sea-water, what seemed to him at first to be a single plaice, but a closer scrutiny revealed the fact that there were quite a number of these fish, but that the one which had attracted his attention was very much darker than the others. Prompted by curiosity he succeeded in catching the dark-coloured fish, and was much surprised to find that it was totally blind, the inference being that, as it could not see, it was unable to respond to the colour of its surroundings.

Aggressive Resemblance.

We now pass on to "aggressive resemblance." The first illustration of this division is that of an Asiatic lizard, which I have chosen as an interesting variation, as it is unnecessary for my purpose to confine my remarks entirely to insects or to animals of this country. In the illustration, the colour of the lizard harmonises well with the colour of the sand on which it lies. Growing on the sand are little red flowers which insects love to visit. The lizard itself is partial to these insects. On either side

of its mouth the folds of its skin are similarly coloured to the flowers, and by putting its mouth in a certain attitude it produces a shape very similar to the flower. Insects, attracted by what they suppose to be one of the red flowers, fly within range, and become an easy prey to the lizard.

Another clever instance of "aggressive resemblance" is that afforded by the Indian Mantis, a beautiful pink-coloured creature which feeds exclusively on insects. This Mantis is represented in the illustration. There it lies flattened against the leaf of a tree, and by stretching out its wings and placing its legs in front, it makes itself appear, both in form and colour, like a beautiful flower. The deception is complete, as insect after insect has been observed to fly literally into its open mouth.

Protective Mimicry.

"Protective mimicry" is the most important and perhaps the most interesting part of our subject. Protective mimicry is where one insect which is palatable mimics another insect which is unpalatable. In the illustration you have the Gold-tail moth on the right mimicking the Satin moth on the left. Mr. Poulton, in order to test this theory, threw one of these unpalatable Satin moths to a marmoset, which declined altogether at first to touch it, but after awhile, prompted no doubt by the ravages of hunger, it was compelled to eat it. In doing so, however, the marmoset showed signs of the greatest possible disgust. Mr. Poulton then offered it one of the palatable Gold-tail moths, but the marmoset could not be induced to eat it, although on a previous occasion it had eaten several Gold-tail moths with evident relish, thus showing that the Gold-tail moth owed its preservation to its resemblance to the Satin moth.

Another good example of "protective mimicry" is the drone fly, which mimics the bee. From a superficial glance the two insects very closely resemble each other, but in reality they are very different. The bee has four wings and the drone fly only two; moreover they belong to different orders, the bee belonging to the Hymenoptera and the drone fly to the Diptera. The bee is provided with a sting, and on that account it is seldom, if ever, interfered with; whereas the drone fly has no such method of defence; its safety therefore depends upon its power to mimic the bee.

A still more remarkable case of "protective mimicry" is that of a caterpillar mimicking a dangerous-looking animal. The caterpillar before us is that of the large Elephant Hawk moth. It possesses, as you see, an eye-like mark on each of the first three rings of its body, but these markings do not in the normal condition of the insect attract any special attention. Let the caterpillar, however, be apprehensive of danger or suddenly alarmed, and it immediately contracts the first two rings of its body, leaving only one eye-like mark visible, which gives it the appearance of some venomous-looking reptile; and the effect is considerably heightened by the suddenness with which it changes its position. In order to prove that such caterpillars create fear and alarm to their natural enemies, Professor Weissman put one of them into a trough containing

some food for his chickens, and they declined to come near it. Lady Verney also found that the presence of one of these caterpillars, when assuming its terrifying attitude, completely kept off some small birds from the bread crumbs she had thrown out for them.

"Warning Colours."

We now come to a class of colouring with a meaning exactly opposite to that which we have hitherto examined. The object of "protective colouring" is, as we have seen, to conceal an insect from its enemies, whereas the object of "warning colours" is to render the insect as conspicuous as possible. The explanation is that those insects which are gaudily coloured are, as a rule, unpalatable. All writers on the subject agree that birds, lizards, spiders, and other insectivorous animals decline to eat this class of insects. They have therefore no object in concealment. On the contrary, their safety depends upon their displaying themselves in as conspicuous a manner as possible, so that they may not, by any possibility, be mistaken for other insects which are palatable. In the slide before us we have the caterpillar of the Magpie moth, which affords a good example of warning colours. It is coloured bright yellow with black markings, and although it belongs to the large class of stick caterpillars, it makes no effort to resemble either the form or colour of its surroundings, but stands prominently out as though it were aware that it had nothing whatever to fear; and the effect is heightened by the fact that they are often found in large numbers together.

Another example is the caterpillar of the Cinnabar moth, coloured similarly to the last one, and like it it makes no effort to conceal itself, nor shows the slightest apprehension of danger.

The whole army of insects that are met with in a country walk on a summer's day may be divided into two great classes, viz. (1) those that are protectively coloured, and are therefore difficult to find, and (2) those that are easily seen by their conspicuous markings. And it is a remarkable fact that the former class are palatable, and are much relished by insectivorous birds and animals, whilst the other class are carefully avoided by them.

Combination of Different Methods of Defence.

We now pass on to consider the combination of the different methods of defence which some insects possess, and as an example of this I have selected the caterpillar of the Puss moth. In the majority of the cases we have examined the insects had practically only one method of defence —viz. protective colouring—but there are some insects which are provided with an additional means of defence, such as a sting, or the power of assuming a terrifying attitude, or the means of ejecting a poisonous liquid, so that if one line of defence fails it has another to fall back upon. Now, by a glance at the caterpillar of the Puss moth we see that it harmonises well with the colour of the Willow leaves on which it feeds, and that the veins of the leaf correspond with the lines formed by the rings in the body of the caterpillar; and, further, that the light-coloured line of the midrib of the leaf is reproduced in the transverse

markings of the caterpillar. In addition to this form of defence this caterpillar, if disturbed, can, as we have seen, suddenly assume a terrifying attitude; while it has the still further power of ejecting a poisonous or nauseous liquid, which has a most repellent effect on its foes. The greatest enemy that this caterpillar has is the ichneumon fly, and its method of attack is to plant itself, if possible, on the back of the caterpillar, just behind the head: when once there the fate of the caterpillar is settled, as the ichneumon fly punctures the skin of this caterpillar and deposits her eggs there, and the larvæ, which are hatched in a few days from those eggs, literally eat away the inside of the caterpillar until only the bare skin is left. Mr. Poulton records an interesting experiment he made and the combat he witnessed between these two insects, with the result that when the ichneumon fly got within range the caterpillar ejected its poisonous fluid and the ichneumon fly immediately collapsed.

I have now come to the close of my lecture, and it is possible that some of you may ask in what way this subject is associated with horticulture. If so, I may perhaps be allowed to remind you that the animal and vegetable kingdoms are so closely allied, so inseparably interwoven, the one with the other, that it is frequently difficult to know where the one begins and the other leaves off; and, further, that the life of a gardener is a regular combat with insects, and that the study of such a subject stimulates observation. Moreover it gives him an intimate knowledge of the many devices these insects have of evading his vigilance, and in that way, if in no other, it should prove of great use to him.

Sir John Llewelyn, Bart., M.P., chairman of the meeting, in proposing a vote of thanks to the lecturer, said that he had listened to the lecture with the greatest interest, and thought at first sight it might appear to be a subject more nearly akin to entomology than to horticulture. Yet the two sciences were most intimately related, and whatever made the gardener think of the ways and habits of the insects, by which he was always surrounded, must be productive of great good, and would tend to the accumulation of a multitude of facts and observations connected with the life-history of garden friends and pests which must, in some way or other, be capable of being turned to good account.

The Rev. Professor George Henslow, V.M.H., in seconding the vote of thanks, also expressed himself as having been greatly interested in the subject treated by the lecturer. But he said he wanted to go a step further. The lecturer, for instance, had told them of cases in which animals, fishes, and insects changed their colours, respectively according to the colours of their immediate surroundings: the fact was indisputable. Thus Sir Joseph D. Hooker had noticed a lizard in the Himalayas which was infested with ticks. The lizard's body was covered with scales which in some places were a dark brown and in others of a bright yellow. And he had noticed that a tick on a brown scale was brown-coloured, another on the bright yellow scales was also bright yellow; but in the case of a tick lying upon two scales of different colours the part of the tick over the brown scale was brown, while the rest of its body over the yellow scales was bright yellow. The lecturer had cited the case of a plaice which was dark-coloured though lying on white sand, while all its fellow plaice were light-coloured; and he had mentioned that

the dark-coloured one was quite blind. Prof. Henslow quoted an analogous case in which the eyes of shrimps had been covered, and the result was that these shrimps were not coloured like the normal ones, in imitation of their surroundings. Prof. Henslow then observed that there appear to be two distinct kinds of mimicry: (1) automatic and unconscious; (2) brought about by conscious action of the creatures. As an example of the first he cited colour, mentioning the green-leaf insects and several of the caterpillars shown on the screen by Mr. Blake. The same kind of similarity applies to all desert animals, as may be seen in a case in the entrance hall of the South Kensington Museum. A remarkable illustration of this kind of mimicry has lately been described of domestic mice, which have become established on sandhills in Dublin Bay. Though 14 per cent. are still of the usual dusky slate, the great majority are of the colour of the sandhills, though transitional colouring exists among these mice. That light is not the sole cause would seem probable from the fact that many animals change from brown to white when the temperature is lowered; thus the stoat becomes the "ermine" in winter. Good examples may now be seen of this change in Russian hares—grey-white and buff-white—now being offered for sale in the shops.

In the case of the shrimps and the plaice described above they had not assumed a light colour, because, being blind, light reflected from the sand had not affected the pigment cells of the skin by acting automatically through the optic nerves of the eyes; while in the normal shrimps and plaice these had become adapted in their colouring most probably by that means.

As instances of conscious action, he alluded to the attitudes of caterpillars when alarmed, as described by Mr. Blake; and the habits of certain crabs which fix bits of sea-weed all over their carapaces, and of the "stick" insect which never arranges its legs symmetrically but irregularly so as to resemble more accurately a twig lying on the ground.

Prof. Henslow then alluded to the fact that mimicry in nature is of a very wide extent; for it not only applies in all probability to most families of animals, but to the vegetable kingdom as well. Thus, *e.g.*, the fleshy stems of Cacti, Euphorbias, and Stapelias are almost exactly alike, because they grow under similar conditions, and this case is sufficient to illustrate the general law, that the same or at least very similar external forms and colours &c. arise when the beings live under very similar conditions, since all protoplasm—the living basis of life—has the power to respond to external impulses and to build up similar structures. When, however, we try to investigate the immediate causes, and how they work, we appear to be baffled at almost every point. He thanked Mr. Blake very heartily, for, without any doubt, such subjects, handled in the way this had been, set people thinking, and to be made to think was always of the greatest possible service to every one of us.

THE WOBURN EXPERIMENTS: THEIR OBJECT AND METHOD.

By Mr. Spencer U. Pickering, F.R.S.

[Read March 14, 1899.]

The title which was suggested to me for a paper to be brought before this Society may be taken to imply that I am not expected to deal with the results which we have so far obtained at the Woburn Experimental Fruit Farm, but rather with the general character of the work and the methods adopted in our experiments. The selection of such a title showed much wisdom on the part of your secretary, for the methods employed in any experimental work of this sort must necessarily be of a somewhat novel and unfamiliar character to horticulturists, and, while they may possibly gain something by being introduced to them, we are sure to gain much by hearing their opinions and criticisms on the subject. That these criticisms may not be too severe, perhaps I may be allowed to start by trying to dispel the time-honoured but now erroneous tenet as to the antagonism between practice and theory, and between the practical and scientific man. Such an antagonism should certainly never exist, and is, indeed, in most cases, a mere fiction, arising from a mistaken notion on one side or the other, perhaps on both. If by "practical man" is meant merely a man who works without understanding the object of what he does, and without drawing conclusions from the results which he obtains, or if by "scientific man" is meant one who theorises on a subject of which he has no knowledge, then the dictum may be true: but such are not the true meanings of either of these designations. The term "horticulturist" is certainly a wide one, and may, perhaps, embrace many of the above description, but these can hardly be accepted as the embodiment of "practice," or representatives of a class of which they are merely accidental appendages, whilst as to the mere theoriser, he is a being of the past; the days of alchemy and arm-chair philosophers are gone, and no scientific man can aspire to be called such, unless he bases his conclusions on practical experiments. Indeed, if any man deserves to be called a practical man it is the scientific worker of the present day.

We need only look to the marvellous extent to which science has in recent years been directed towards purely practical and commercial ends in the most practical nation in Europe—Germany—to recognise the fact that the scientific and the practical worker are mutually dependent on each other, and that it is only by such united action that the highest success can be obtained. Each, of course, has his own special functions to perform, and however sound may be the knowledge of the scientific man, it cannot act as a substitute for that technical skill, amounting sometimes to a sort of instinct, which can alone be engendered of long experience in work on which the worker's livelihood depends. This fact, I think, we have not overlooked in our Woburn Farm.

If we examine, however, a little more closely the methods adopted by the scientific worker and the practical horticulturist, we will find that

they rest on the same broad basis—a basis of trial and error—but that with the practical man the results are reached by a longer process. One horticulturist finds that he obtains greater success when he adopts one method than when he adopts another, and he therefore concludes, perhaps too hastily, that the first method is the correct one; his fellow worker, however, working under slightly different conditions, may come to an opposite conclusion, and it is not till the various experiences of many workers, extending often over a great length of time, are brought together and compared, that the proper method of procedure can be settled. Experience gained in this way must, no doubt, lead to correct conclusions in the end, but it is a slow process, as we must acknowledge when we consider how horticultural practice has varied from generation to generation, and how, even at the present day, eminent authorities hold different opinions on some of the most elementary points of their craft. The object of the scientific worker is simply to shorten this process, and, instead of merely drawing conclusions from what may happen to come under his notice, he carries out experiments specially designed to lead to definite conclusions. Once the facts are established, theory may certainly come in to help us to explain these facts and to suggest further investigations; but such theories are not the empty phantasies which are sometimes characterised by such a name, nor can they ever, if true, be opposed to facts, being, indeed, merely the co-ordination of facts themselves. Nothing is so procreative of life and development in any branch of knowledge as a thoroughly good theory, for it knits together hitherto disconnected facts, and explains their meaning and their dependence on each other, and, perhaps, the next best thing to a thoroughly good theory is a thoroughly bad one, for it sets everyone to work to upset it, and the result is a healthy spirit of investigation and activity.

With rigorous scientific experiments in agriculture we have long been familiar, thanks, in the first place, to devoted English investigators, and more recently to foreign and colonial Governments, who have far outstripped us in their efforts to place agriculture on a firm basis of knowledge. In horticulture, however, such work is but little known in England, though it forms an important subject for investigation at most of the foreign experimental stations. There are, indeed, many difficulties in dealing with horticulture in the same way as agriculture. Foremost amongst these is the great space occupied by a tree as compared with that occupied by plants used in agriculture. Every tree or plant, just as in the case of an animal, possesses a certain individuality, and exhibits differences in its constitution, and differences in behaviour under the same circumstances; it is, therefore, impossible to arrive at any reliable conclusions from experiments which are not made on a large number of individuals. In agriculture this is not difficult. A quarter-acre plot of wheat will contain some 300,000 separate plants, and the mean of the results obtained from such a number will render insensible the variations due to the individual personalities of the separate plants; but a single experiment with the same number of trees at 10 feet apart would occupy 700 acres, and to undertake a set of experiments on such a scale would be somewhat impracticable; while, if a quarter of an acre is assigned to the experiment, we should get into it only 100 trees, and the result

would consequently be 3,000 times less certain than in the case of the wheat plot.

Another great difficulty is the length of the life of trees. With annual farm crops the experiment can be completed in a year, but with a fruit-tree the life history may extend over fifty years or more, and we can hardly expect certain of our conclusions to be valid unless they are based on observations for at least half this period.

There is also another serious difficulty, in the existence of the enormous number of varieties of each sort of fruit-tree. For instance, to do any one experiment properly on all the varieties of Apples known would require a much larger area than could reasonably be devoted to an entire experimental station. Yet we can never feel sure, if we restrict our experiments, as needs we must, that our conclusions may not be fallacious when applied to other existing or forthcoming varieties.

There are several other, though less important, difficulties in experiments on fruit-trees as compared with those on agricultural crops. A great deal depends on culture in the form of pruning, and it is quite possible that the adoption of different methods in this respect might lead to contradictory results in different hands, even where the same cultivation of the soil was adopted.

As to experiments with manures, also, there is this difficulty, that if the tree is to be allowed to attain maturity, a great deal more space must be allotted to it than it can utilise in its early years. If we manure the whole of this space we shall be unduly enriching the soil which is now unoccupied, whereas a partial manuring of the ground round the stem lands us in the difficulty of determining how much shall be manured, and to what extent the manure is washed out into the neighbouring unmanured soil. Of course, there are other difficulties which apply to experiments in agriculture as well as in horticulture—the great difficulties of the differences of soil, climate, and seasons; the latter only can be surmounted by extending the experiments over a sufficient time, the other two cannot be combatted in any one experimental station. There are some points which we can hope to solve only when we shall have many such stations distributed over the country.

Great as these difficulties are, I scarcely think that they should be used as arguments for not attempting experimental work in horticulture. No doubt they may lead us to many uncertain and erroneous conclusions at first, but if only they induce others to start similar work under somewhat different circumstances we may be sure that correct conclusions of general application will be arrived at in the end, and our work will not have been valueless.

One essential feature of experiments such as ours is that they must be comparative—that the results of any particular treatment cannot be gauged unless we have another plot under ordinary or normal treatment with which the special plot can be compared. A second essential is that in each experiment one condition of treatment, and one only, must differ from that in the normal plots, for if two or more are altered at the same time it is obvious that we shall not be able to decide to which of these alterations the difference of results is due. This is but an instance of the mathematical principle that one equation can evalue but

one unknown quantity: yet the truth of it is often lost sight of in horticultural work. How often do we hear someone state that, for instance, a certain method of planting is superior to all others, but when he is cross-questioned on the subject it appears that his belief is merely founded on the fact that he has adopted this method and got good results, and if he is asked whether in the same season and in the same soil he adopted other methods with exactly similar trees, the answer will in nine cases out of ten be, No; and his results, therefore, prove absolutely nothing, except that the method adopted is not altogether bad!

In our own experiments on different methods of treatment, as applied to dwarf apple-trees, these are arranged in rows of eighteen, and the treatment adopted in each row differs from the normal treatment in one particular only: the trees in all the experiments (of which there are sixty) were of the same age, and as similar as possible when planted. Yet, even when conducted in this way, experiments on trees can by no means be regarded as perfect, for it is impossible for any two sets of trees to be absolutely comparable. We have in the first place the different individuality of the trees, to which allusion has already been made, and in the second place we have the fact that no two sets of trees can be planted in exactly the same place—and the nature of the soil, even in a suitable piece of ground, is very far from being uniform throughout. To minimise errors due to variation in soil, we have planted at intervals throughout the experimental plots seven or eight sets of trees which are not subjected to any special treatment, and which may, therefore, be termed normal plots. The results from these normal plots, we find, vary a good deal in different parts of the ground, but by plotting them out and drawing a curve through them we can get a diagram representing (probably) the normal results which would be obtained in any part of the ground, and this forms a standard of comparison for the results obtained in the experimental plots, whatever their position in the ground may be.

It was, of course, impossible to perform all these sixty experiments with any large number of varieties, as the space required would have been too great; so the bulk of our experiments are confined to three varieties only—'Bramley's Seedling,' 'Cox's Orange Pippin,' and 'Potts' Seedling,' all on the paradise stock, six of each in each experiment—but these show very characteristic differences in habit, and the results, where they agree, should be of a fairly general application. Some of the more important experiments are repeated on 'Stirling Castle,' as well as on standards of 'Bramley,' 'Cox,' and 'Lane's Prince Albert,' grown on the crab stock. Even in the case of this limited number of varieties it was difficult in the first instance to obtain the requisite supply of trees of the same age and size.

These trees are planted at such distances that they may be left till they attain maturity without becoming overcrowded, and in applying manure to them we have adopted the plan of manuring the ground round them to a certain distance only, but increasing this distance every year (giving, however, always the same amount of manure per square yard) at such a rate that the whole of the ground will be thus manured when the trees attain their full growth. The application of artificial manures in such a case can be made in a much more satisfactory manner than if

dung were used, for when small areas only have to be treated, the great variation in the strength of the latter renders the results very uncertain. Natural manures we have used in some cases, but for the present our manurial experiments are chiefly directed towards ascertaining the more elementary facts as to the relative effects of the three main constituents of all manures—potash, nitrogen, and phosphorus—and this can only be done where we use an artificial manure in which the relative proportion of the constituents can be varied at will. Once the fundamental facts shall have been ascertained, it will be time enough to attack the more complicated aspects presented by natural and special manures. In the case of our plots where the manurial treatment is normal, the manure used corresponds in nutritive value to about twelve tons of dung to the acre, and the growth obtained so far has been as vigorous as is required. I cannot help making mention in passing of the interesting and suggestive results, or rather want of results, which we have obtained at present in these experiments—manures, whether artificial or natural, having had little or no effect on our trees, though on other very different crops in the same ground—for instance, wheat and strawberries—their effect has been very considerable.

I have mentioned in outline the general principles on which our experiments are inaugurated, but the question arises as to how the results are to be ascertained and compared with each other. With any fruit-tree or fruit-plant the ultimate standard by which success must be measured is the value of the fruit produced from it, not that produced in one year only, of course, nor even in several years, but throughout the life of the tree, and even this quantity, if ascertained, would have to be qualified by considerations based on the length of life and the precocity of the tree. It is needless to say that we have not yet completed such data at the Woburn Fruit Farm, even in the case of the shortest-lived of our fruit-bearing plants—strawberries, and it will be long before we can do so with our trees. In the meantime, however, data are being accumulated. But a difficulty arises in ascertaining the true value of our crops. In the case of every separate experiment the weight and number of fruits produced are recorded—in the case of the small berries, currants and gooseberries, the weight and volume are taken—and from these we can deduce the average size of the fruits; but how are we to adjudicate between two results where in one case we have a larger weight of crop but smaller fruits, and in the other a smaller crop but better-sized fruits? The value of a crop depends as much on the size as on the quantity, and we want some means of combining these two factors into one expression so as to represent its true value. This, I have suggested, might be done in the case of apples, and some other fruits as well, by grading them into three classes, as would be done for market purposes, and taking the relative values of equal measures of these three grades to be in the proportion of 4, 2, and 1. By counting the number of apples which make up a bushel of these different grades, we conclude that the relative values of the individual apples of the different sizes are about in the proportion of the squares of these numbers, that is, as 16 to 4 to 1; and, therefore, by dividing the number of apples of each grade by these numbers respectively, and adding the results together, we can get numbers repre-

senting the relative values of the crops in comparative experiments. The method is, obviously, not free from objection, but it is the least objectionable which we have at present been able to devise. One evident defect in it is that it takes no account of the colour and quality of the fruit.

In the case of trees, however, we have hardly arrived at the stage yet when the crops are of sufficient importance to call for great attention, and growth is the paramount consideration at present. We have been obliged to consider, therefore, how the growth may best be measured. This would seem to be almost as simple a matter as appraising the crops, till one comes to study the question carefully. The height and average spread of the trees have been determined annually, but these have not led to any very satisfactory results, and fail altogether in cases where the systems of pruning are varied. The diameters of the stems at a certain height from the ground are still less satisfactory, for the measurements are too much influenced by the irregularities of the stems and the inequalities of the ground. The number and weight of the twigs removed at the annual prunings have also been recorded, but they afford still less reliable data, since the removal of growth depends not only on the length of new wood formed, but on the position of the branch in the tree. The most satisfactory means of measurement, no doubt, is to ascertain the total increase in weight of the tree by weighing it before planting, and lifting it and weighing it again after the completion of the experiment. This plan we have adopted wherever practicable, but its application is evidently very limited; it can only be adopted where the experiment is complete within two or three years, and even then would not apply in all cases, such as in a comparison between pruned and unpruned trees.

The method which we have finally adopted, and which appears to be of more general application, is to determine the weight of the leaves. It is, of course, a matter of common as well as of scientific knowledge that the vigour of a tree is dependent on, and, therefore, may probably be measured by, the leaf area which it exposes. The leaves are the lungs of the tree, and the seat of the manufacture of starch and cellular tissue through the absorption of carbon dioxide and solar energy; and the number, size, texture and colour of the leaves will always give us roughly a fair indication of the health of a tree. Accurate measurement, however, is not an easy matter. The total leaf area of the tree is, doubtless, the proper thing to measure, but, although we have determined this roughly in several cases, the labour which such a determination would entail with the trees, now that they are of a fair size, would be altogether prohibitive. We have therefore adopted the plan of collecting a certain number of leaves (6 or 10) from each tree, taking in every case the sixth leaf from the end of a branch, and determining either the area or the weight of these. Recently we have relied on the weights, taking care, however, that the leaves are properly dried before weighing, and that the weighings, in the case of any set of experiments, are all made under similar conditions. Of course, such a method is obviously open to many sources of doubt and error, and it is not at all apparent that it will yield trustworthy results; it is only by a critical examination of the results obtained in similar experiments on different varieties, and of these results when compared with those obtained by other methods, that we can feel justi-

fied in accepting them. We have, however, compared them in some fifty cases with the values obtained by determining the amount of new wood formed, as measured both by the number of new shoots and by the length of new wood on the tree, also, in a more limited number of cases, with the thickness of the leaf and the total leaf area on the tree. For the details of this comparison we must refer to our first "Report" (1897*); it must be sufficient to say here that the results are highly satisfactory, and that the values obtained by different methods differ only in cases where such differences might reasonably be expected. We are probably well within the limits of the truth when we estimate the error of our mean results with leaf measurement in any single experiment on eighteen trees to be within 5 per cent. of the true values.

In certain cases, of course, such a method will and must fail; but it is all-important to have obtained some means of general, though, perhaps, not of universal, application, whereby the results of horticultural methods may be practically gauged. Without such a method no reliable record of results is possible; personal impressions and recollections are useless in these matters.

It is impossible in a short paper of this character to give any general account of all the subjects which are under investigation on our farm, and I have thought it better to try to give a correct idea of the general character of the work by entering into the details of the methods adopted in particular cases. One class of experiment we have intentionally avoided as far as possible, namely, the testing of varieties. It appears to us that very little good can come out of such testings. There is no doubt that the man who could conclusively prove the respective merits of the enormous number of varieties of certain fruits now known, and could reduce the list of valuable ones to five or ten per cent. of its present length, would be a public benefactor; but this could only be done efficiently by means of numerous testing stations throughout the country all under one organisation. For one man to attempt to determine the merits of different varieties by planting them together in one particular field is absurd, and he might just as well leave the question of good and bad varieties to solve itself, as it is bound to do in the course of time.

We have, of course, collections of considerable numbers of varieties of most of the hardy fruits, but in making these we have always aimed at doing something more than the mere "testing" of varieties. For instance, with apples, we have over 100 varieties of the reputedly best sorts in one plot of ground, but each variety is grown side by side on different stocks; a portion of each lot on each of the stocks will be subjected to a different system of pruning, while the whole plot can be divided into two or four similar sections for comparative experiments with different insecticides. A collection of pears, all of the same age at planting, has been made on similar principles.

With strawberries we also have a collection of about a hundred varieties, and a fresh lot of each variety has been planted every year, so that we now have plants of all of them in five different ages, side by side, and the results, we hope, will give us data as to the powers of lasting, as well as of those of cropping, of these varieties.

* Eyre & Spottiswoode.

In the same way our collections of other small fruits are so arranged that they may be divided into (generally) six similar sections, on each of which some different form of manurial treatment is being tried.

There is one special class of experiment into which, I am glad to say, we have not at present been compelled to enter to any great extent—experiments on diseases and insect-pests. But it is a class of experiment which is most instructive in showing the necessity for the combination of science and practice. In England such diseases and attacks are, for the most part, less serious than they are in other countries—chiefly, I believe, owing to the fact that we rarely grow large plantations of the same variety or kind of fruit; it is natural, therefore, that this subject should have received much less attention at home than it has abroad. But in too many cases we find that the valuable results of our neighbours are entirely unknown or ignored, and remedies are suggested which savour rather of the quack doctor than of the genuine physician. Take for instance the case of canker in apples. How often do we see certain chemical manures prescribed as sure remedies for this disease! Yet it has been placed beyond doubt by the careful work of mycologists that canker consists of a certain fungus living on the contents of the cells of the wood, and nothing is yet known of any remedy which can be effectively introduced into the sap so as to kill this fungus. Of course, proper nourishment either of a tree or of an animal will render it less liable to the attacks of a parasite, whether fungus or insect, and more able to resist such attacks, and in this indirect way a manure, if it happens to supply a deficiency in the soil, may do good; but it can be no more regarded as a true cure for the disease than could a special diet be regarded as a cure for small-pox or any other contagious disease in man. Haphazard remedies may, of course, sometimes hit the mark, but the only sound method of combatting these pests is to start by studying the parasite itself, and finding out its life-history, and when and by what it may be best attacked. Unfortunately we have no one at present connected with our farm who can claim any special knowledge in such matters, and when need arises we have to go elsewhere for assistance. But there is no difficulty in procuring this. The only infestation which we have had occasion to study is one which must be looked upon with considerable apprehension in England, for it appears to be spreading at an alarming rate in many cases—the black-currant mite. In this case we have carried out a numerous series of experiments with various insecticides of different strengths, and another series is now in progress—twigs from the bushes under experiment being sent at intervals to an authority on the subject, who reports to us as to their condition. So far, I may mention, every means which we have tried for combatting this pest has failed.

Since the initiation of our farm in 1894 we have only published one report on our work there, a report which was necessarily of a descriptive and introductory character. We hope very soon to have sufficient materials for a second report, but from what I have already said it will be evident that work of this sort requires much time, and that our conclusions, if they are to be valid, must not be drawn hastily. We shall only be saying what every practical man has found out for himself when

we state that particular methods of treatment bring about very different results in different seasons, and that no results can be accepted as conclusive unless they have been obtained throughout a succession of years. Many instances in illustration of this have come under our notice already; for example, with strawberries, the order of merit of a collection of varieties in the same ground will be very different in one year from what it is in another, and with two similar lots in different situations their relative behaviour in different years will show large discrepancies. In the same way we have found that the actual and relative effects of different manures and liquid dressings on strawberries are largely dependent on the season; and we might mention sundry other instances, all illustrative of the great necessity for caution in drawing conclusions. In fact, work such as that undertaken at the farm cannot be hurried if it is to be done properly, and if it is not done properly it had better not be done at all.

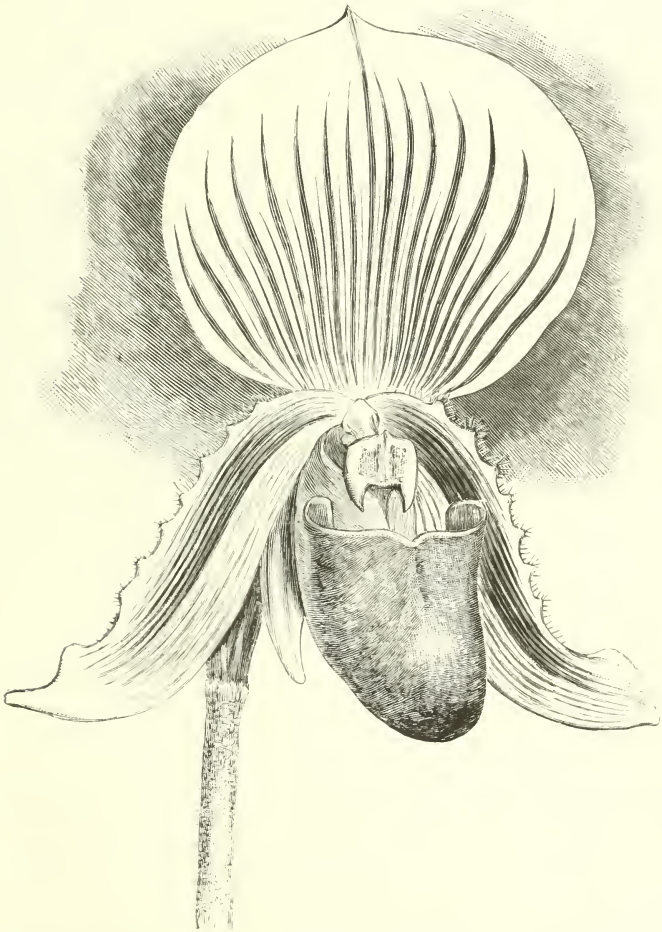

Fig. 5.— Cypripedium callosum Sanderæ. (*Journal of Horticulture.*)

OBSERVATIONS ON SOME OF THE PLANTS EXHIBITED.

By the Rev. Prof. Geo. Henslow, M.A., V.M.H.

[Delivered March 28, 1899.]

Alpine Plants.—Prof. Henslow first drew attention to a selection of alpine plants exhibited by Mr. Purnell, several of which, such as *Gentians*, *Androsace*, *Saxifraga oppositifolia*, &c., are remarkable for their brilliant colours. This is due solely to the climate, as M. Bonnier, having transplanted several flowering plants from the neighbourhood of Paris to sites in high alpine regions and also within the Arctic circle, found that they soon assumed similarly bright tints to the plants normally growing there. A species of *Sempervivum* was characterised by having the young central bud covered with long hairs growing from the tips of the leaves, giving the appearance of cotton wool. He explained that this is a contrivance to avoid either a severe chill or too great heat, since it is a bad conductor. He mentioned that in the deserts of Africa numerous plants have their leaves covered with a felt-like mass of hair to protect them from the intense heat.

In some species of saxifrage exhibited the leaves were more or less incrusted with lime. This is the result of an exudation of water from a pore in which calcareous matter was dissolved, and then it had evaporated on the surface of the leaf. Mr. Henslow observed that some members of the Tamarisk family absorb salts of magnesia and calcium and deposit them outside; but as they are highly hygrometric they absorb the heavy dews which occur in the hottest months of the year, and so impart the water to the plant, which receives no rain for nine months. Thus a group of tall Tamarisk trees grows near the edge of the desert outside Cairo, but they never receive any artificial irrigation whatever. *Soldanella* was interesting as exhibiting visibly the effects of respiration; for the flower-stalk appears through the snow, coming up through a small tube which it has dissolved for itself. This is due to the heat produced by respiration, since all plants respire in order to live, just as animals do, the process consisting of the absorption of oxygen by the living protoplasm and the emission of carbon dioxide, accompanied by vapour and heat.

The next point observed was the dwarfing of alpine plants, as shown by the above-mentioned plants, as well as by *Thalictrum alpinum*, of about 6 to 8 in. in height. Mr. Henslow took occasion to record the fact that in 1866 he used to collect the English *Thalictrum majus* in a small copse on the Surrey side of the Thames, close to Hammersmith Bridge.

Insectivorous Plant.—The little Sundew, also exhibited by Mr. Purnell, afforded an opportunity of again describing the marvellous mechanism of the leaves, which catch insects, then secrete a digestive fluid, and so nourish the plant, the chief use being to increase the amount of seed produced.

Gaultheria procumbens, a native of cooler parts of North America and covered with scarlet berries, was exhibited by Mr. Ware. It is

called 'Mountain Tea.' Mr. Henslow observed that several plants possess the same principle (an alkaloid), which has induced the making of a "tea"—*i.e.* a decoction—by various nations, quite independently of each other: as Tea (proper) in China; Coffee (native of Africa); Cocoa (Tropical America); Paraguay Tea (a species of Holly of South America, the Common Holly being used for Tea by the peasants of the Black Forest); Guarana, from a plant allied to the Horse-chestnut—a valuable drug for headaches—from Tropical America.

Climbing Fern.—A fine specimen exhibited by Mr. Hill of *Lygodium Japonicum* was an illustration of the property of twining acquired by one fern only. Mr. Henslow explained how this has arisen, viz. by plants growing in a shady place in which the stems get "drawn," as direct sunlight arrests elongation. Then, as the elongated stems "circumnutate," they soon find themselves curling up other plants, and thus acquire the true climbing habit.

Xeronema Moorei, a plant shown by Mr. Veitch, is curious for the way the flowers grow on a horizontal instead of an erect spike, consequently they are all turned to the upper side, or "secund" in botanical language. It is a liliaceous plant, and comes from New Caledonia.

New Daffodil.—Mr. Kendall exhibited a remarkably fine Daffodil, named 'King Alfred,' *à propos* of the millenary of England's greatest king. It is believed to be a cross between *N. Emperor* and *N. maximus*. Alluding to hybrid Narcissi, Mr. Henslow observed that the Rev. C. Wolley-Dod had noticed how many natural hybrids among Narcissi were infertile by having defective pollen, as, *e.g.*, between the Daffodil and *N. triandrus*, and *N. Cyclamineus*; though those between the Daffodil and the Poets'—the source of the *Incomparabilis* section—occur wild in Spain, and seem to be fertile.

Azalea Hybrids.—A fine collection of *A. mollis* × *sinensis*, exhibited by Messrs. P. and G. Cuthbert, illustrated the ease with which species of the same "section" will cross; whereas it is by no means easy to get any useful results from attempting to cross the above species with *A. indica*. Similar results occur between the Rhododendrons of the East, which cross freely together; but refuse to do so with those of India and America.

ASPARAGUS—RAISING, GROWING, AND FORCING.

By Mr. George Norman, F.R.H.S.

[April 18, 1899.]

The cultivation of Asparagus was understood by the Romans before the Christian era, and Cato, in the "De re rusticâ," written about 2,000 years ago, gives instructions as to suitable ground and its preparation; the distance apart to set the seed; annual attention and manuring; gathering the heads; and after eight or nine years, when the plants have become old, the renewing of them. In fact, his instructions might be adopted successfully at the present day.

In the first century A.D. Columella and Pliny both mention Asparagus; the former says "that the young shoots were boiled and eaten by the Greeks." The latter says, "Of all garden plants, Asparagus is the one that requires the most delicate attention in its cultivation."

In the sixteenth century Diodorus (1578 A.D.) describes two sorts: the garden, and the wild, called in shops "sparagus."

Gerarde (1597) figures four varieties: (1) garden, the same as now cultivated; (2) marsh; (3) stone, or mountain; (4) wild sperage, a prickly species.

A long account of the cultivation of Asparagus is given in a "New System of Agriculture," by John Lawrence (1726 A.D.).

Miller's "Gardener's Dictionary," in several editions of the eighteenth century, gives instructions for sowing and planting in beds, in much the same way as it is done at the present day.

Abercrombie, another of the older writers of the last century, gives his views very fully on its cultivation, and since the time of these worthies, down to the present day, in most works on kitchen gardening, the subject has been extensively written upon, and the information given has been eagerly read by cultivators, as the mode of treatment carried out in most gardens has testified, by being almost uniform for many generations. It has always been much esteemed by those who have had the means of growing it, and the production of it of good quality has been a delight to gardeners in the past, as it will, I doubt not, continue to be in the future.

Asparagus officinalis, the variety of our gardens, is a hardy perennial, and is supposed by Miller, Bentham, and others to be a native British plant. It is found growing on the south and west coasts of England, in the fens of Lincolnshire, and on the coast of Wexford and Waterford in Ireland. It is abundant in the maritime sands on the shores of the Mediterranean, and in many parts of Europe and Asia. It is found growing so near to the sea that in time of gales the sea breaks over it, deluging the soil with salt water, and these natural waterings demonstrate the necessity of salt in its cultivation, and the alluvial surroundings supply it with lime and nitrogen. The soil is generally of a silicious nature, and the situations are warm.

The chief districts of England famous for growing Asparagus are

Cambridgeshire, Worcestershire (especially the Evesham district), Essex (about Colchester), and in the Thames Valley near London. The best home-grown outdoors Asparagus that is sent to Covent Garden market is produced in these districts.

In Scotland, the south-western parts, comprising the counties of Ayr, Wigton, and Kirkcudbright, are specially favourable. The soil in many places is a rich sandy loam, and the maritime situation, together with the influence of the moisture-laden atmosphere from the Gulf Stream, have a very beneficial effect. Its cultivation is, however, almost entirely confined to private gardens.

On the cultivation of Asparagus in Scotland, it may be here interesting to quote from a paper on the supply of vegetables to the Edinburgh and Glasgow markets, read before the Scottish Horticultural Association by Mr. J. Scarlett, of Inveresk. He says, "There is practically no Asparagus grown in Scotland for market. English, French, and Spanish have ousted home-grown to such an extent that the one or two growers who used to bring anything like a quantity have discontinued its cultivation. This is due probably more to the lateness of the home crop, compared with that of other countries, than to any unsuitableness of soil or climate."

Rich sandy soil of good depth is naturally the best adapted for Asparagus, and in such soil its cultivation is an easy matter. But in these days, whatever the nature of the soil of a garden may be, the cultivation of Asparagus is looked upon as an absolute necessity, and the fact is often lost sight of that if the soil be of a clayey nature and shallow, the produce under such conditions cannot possibly bear comparison with that from a soil naturally suitable for the growth of this plant. With labour and materials at command, heavy, clayey soil may be in time brought into a light, porous condition by the addition of sand of the best kind procurable—sea, river, or grit, sandy deposits from drains, road scrapings, burned earth, and lime, brick, and rubble from old buildings, all these are excellent for rendering soil permanently porous.

Whatever the soil may be, leaf mould, peat, light fibrous loam, old hot-bed material, sea-weed, and farmyard manure (especially that from cows), I have found to be the best fertilizers. The last-named is practically indispensable, for the soil can scarcely be too highly manured, as good quality depends on quickness of growth, which is assisted by richness of soil.

Asparagus is a deep-rooting plant. Frequently after doing away with old beds I have found the soil permeated with roots to the depth of thirty inches; consequently in preparing the soil for planting, it should be made thirty inches deep by trenching, adding, and mixing in the materials already named, from the bottom to the surface as the trenching proceeds, in quantities as required according to the nature of the soil. The advantages of deep trenching and increased depth of rooting medium are that the roots descend so that they do not suffer so much from want of moisture in dry seasons, and it also assists the free percolation of water in wet seasons. For although Asparagus is a seaside plant it will not thrive in stagnant ground, and if the subsoil is of a clayey, impervious nature, insufficiently drained, this defect must be remedied by agricultural drains, put in before doing the trenching, or a layer of a few inches of old

brick, rubble, or cinders will form an effective drainage if placed at the bottom at the time of trenching.

In considering the situation of the ground, the best is that with a slight fall to the south, well sheltered on the side whence come the prevailing winds. For climate, the southern parts of the country are the most favoured.

Asparagus, like other things, to be in the fashion must be large; size, which does not sacrifice quality, is due to soil, cultivation, and situation, and not to any special varieties, as there is believed to be but one. "Red Topped" or "Dutch," and "Green Topped," and the names of places famous for its cultivation, have been given to supposed varieties of it: but variations in size and in colour are, in my opinion, due entirely to the circumstances under which it is grown.

The month of March, when the surface of the ground is dry, is the best time to sow the seed, thinly, in drills an inch deep, the drills a foot apart, at the rate of ½ oz. to 15 yards run of drill.

The trenching of the ground should be completed in autumn, six months before the time for planting, so that the ground has time to settle, and in March, when it is in a suitable condition to work on, the surface should be forked over and made even, after which it will become friable and settled by planting time.

Asparagus is a plant that is amenable to transplanting, providing it is done at the right time, and reasonable precautions taken not to let the roots become dry. When the shoots are grown to a length of three or four inches is the best time to transplant, but the young shoots had better be longer than this, than transplant before the vital powers have become active.

Some growers continue the old beds, and some have introduced the plot system, adopting it from the French; but, whatever the system, the rows should run in the direction of north and south.

I have tried various modes of planting. The one I have found the best and most expeditious is to cut out a trench with a spade by the side of a line, six inches deep, and slanting, in the same way as for laying box. The roots should then be spread out quickly, and carefully covered with soil, leaving the crown of each plant about 2 inches beneath the surface. Care should be taken to separate the plants so as not to have two crowns where there should be but one. After planting, a good watering should be given to settle the soil, and further waterings must be given as often as required, according to the weather, until the plants are well established.

The distance apart of the plants depends on the system followed. Both have their peculiar advantages. The bed system is the one generally employed, and it is the best where the soil is shallow and the subsoil is of a cold, clayey nature; but where the soil is light and rests on a dry subsoil the plot system is the best, particularly in dry seasons.

A width of 5 feet for a bed, and 2½ feet alley between beds, is very suitable for the growth of the plants and for carrying out the necessary work in the different seasons. Three rows are planted in each bed, one in the centre and one on either side, leaving 18 inches between them. The distance between the plants in the rows should be 2½ feet.

With the plot system the distances between the rows should be 4 feet, and 18 inches between the plants in the rows.

These distances by some may be considered unnecessarily wide, but they are not so, for if good results are to be obtained the plants must have room for the tops to fully develop without crowding. The French give even more space than this—they allow 4 feet from row to row, and 3 feet in the rows.

One-year-old plants are much the best; if older they do not transplant so well. Some recommend the sowing of seeds in the permanent beds or plot; by so doing, the ground, according to my experience, is occupied by it one year unnecessarily, as one-year-old plants do equally well.

During the season of planting, besides watering, attention to weeding is all that is required. In the autumn or early winter, after the tops are dead and cleared off, a dressing of decayed manure should be spread on the beds, a stake driven in the corner of each bed, the sides marked off, and about 3 inches of soil from the alleys placed over the manure; or, in the case of the plot, the manure is dug in between the rows. About the same time in each year afterwards a dressing of manure or sea-weed is required to be dug in, and the surface left rough. In the spring, before the shoots begin to push, the surface should be made smooth with a rake, and this is the best time to apply a dressing of salt, not only for its saline qualities as a manure, but it also kills insects and weeds. Of artificial manures I have found nitrate of soda to produce a marked effect when applied early in the spring, to old beds past their best. Where the soil is not of so calcareous a nature as desired, a dressing of fresh lime applied early in the spring will supply the defect.

On the cutting of the crop there is but one opinion of the time to begin on a new plantation, and that is not until the third season of growth; and my advice is to cut them but very sparingly, only taking about two early cuttings of the strongest shoots. After the third year they may be considered in bearing order, and, with liberal and careful management, will continue so for a dozen years or more. Of how to cut, different rules have been advocated by different growers; some cut all that rises above ground until the middle or end of June, others only take the strongest shoots and leave the others to grow up, and no doubt this latter is the best rule, only then more ground must be devoted to Asparagus, a matter which all growers cannot afford. Personally, I adopt a medium rule, by cutting all that rises till the middle of the season, *i.e.* about the middle of May, and after that only the strongest shoots till June 15, and if, by any chance, emergency demands a cutting later, it is very reluctantly supplied.

After the cutting season, growth must have time to develop and ripen before the autumn. On the vigour of the growth to a large extent depends not only the size of the shoots the following year, but even the life of the plants. Many beds are ruined through over-cutting. I have even heard a gardener say that to have good Asparagus, beds should be cut from only in alternate seasons.

As so much depends on the maturing of strong growths, care must be taken to protect them against wind. A few pea stakes stuck into the ground amongst them, for the tops to lean against, form a good wind guard.

The taste in England hitherto has been for green Asparagus, and to have it in this condition it is allowed to grow 3 or 4 inches above the surface of the ground, and then cut 2 or 3 inches below it. The French prefer it blanched, and their method seems to be gaining favour in England. To have it in the French style a greater depth of soil is required over the roots, and the shoots must be cut when they are seen to be heaving up the surface of the soil. The plot system is the best for this; the soil may be drawn over the rows on both sides, in the way in which potatoes are earthed up, and the time to do this is just before the shoots begin to push. At Hatfield we usually begin to cut Asparagus outdoors about April 15, a few days earlier or later according to the season.

Forcing Asparagus.

There are two systems in vogue in this country: one is to grow the roots outdoors for three years or more, and then to lift them and force them under glass. The other method is to plant the roots permanently in brick-built beds, pigeon-holed. The former plan is the one most generally followed.

Lifted roots are quickly excited into growth with very gentle forcing, and this renders Asparagus very suitable for forcing, and it is most valuable as a choice vegetable during the winter and early spring months. In fact it is looked upon as one of the gardener's necessary duties to provide it. When the early days of December come round and it is not included in the vegetables sent up to the mansion, the *chef* not unusually reminds one of the fact, and if it is not soon present his reminder is repeated.

I have forced it in many different structures and positions—in garden frames, with the usual hot-bed heat: in houses over heated chambers, while strawberries over them have occupied their usual position near the glass; and under stages with plants upon them. These are but makeshifts; nevertheless they have answered the purpose, and show how easy Asparagus is to force. The best structures in which to force it are pits or low houses, with hot-bed material or pipes for bottom heat, and pipes for top heat. Suitable temperatures are 65° to 70° Fahrenheit for bottom heat, and 55° to 60° above. In these temperatures cutting begins in from three to four weeks from the start. The quality from the beginning of cutting onward for a month is about the same, after which time it rapidly declines. To keep up a supply from December till the outdoor cuttings begin, batches of roots must be lifted monthly, beginning early in November.

When putting the roots in the forcing quarters, about 4 inches of light soil is laid over the chamber: on this the roots are placed closely together, and about 4 inches of light sifted soil is spread over them. Liberal supplies of water must be given during forcing.

The production of very early Asparagus does not so much lie in the forcing as in strong, healthy, well-grown roots, sown and planted out specially for the purpose, when one year old, on a plot of ground prepared in the same way as recommended for the permanent beds, or plot, in rows 2 feet apart, and the plants 1 foot distant in the rows. After being planted the treatment is the same as for the permanent beds. In the spring of the second season after planting a dressing of salt is given, after-

wards weeds are removed that have escaped the effects of the salt, but no cutting whatever must be allowed. During the second season after planting, a sound watering occasionally during dry weather does a great deal of good, but unfortunately our water supply at Hatfield will not allow of this.

When doing away with old beds and using up the roots for forcing, a few of the shoots produced may be stronger than those from the three-year-old plants, but they are not nearly so numerous, and, taken as a whole, they are not so satisfactory.

The brick bed system has now been in use for many years, and the fact that it is so seldom met with is, I think, a proof that it has not many or great advantages. At the outset it is expensive to construct. One of its few advantages is that the shoots are thicker than from lifted roots, and it is in season for a period of two months before the outdoor. The beds are usually about 6 ft. wide and 4 ft. deep, to allow a foot for drainage, and 3 ft. for soil. The alleys are 18 inches between, and the brickwork is $4\frac{1}{2}$ inches pigeon-holed, with piers for strengthening it. Before forcing begins the beds are covered with several inches of leaf mould, and covered over with shutters. The alleys are generally filled with leaves for heating the beds. Mr. Wythes, at Syon House, forces Asparagus on this system, as also does Mr. Owen Thomas, the Queen's gardener at Windsor, only that he has hot-water pipes to heat the beds instead of leaves.

Asparagus is considered by some the finest vegetable grown. It is not only so pleasant to the palate and can be used in so many different ways in cooking, but it can also with ease, by forcing and outdoor cultivation, be had in season for seven months out of the twelve—from December to June. The most usual way to send it up to table is as a vegetable pure and simple, and for this purpose only the largest shoots are used, the small ones finding their way into the soup tureen and into many fancy dishes. Every shoot that rises to the surface of the ground can be utilised in some way.

My remarks are, of course, more generally applicable to private growers than to market gardeners; and whatever disadvantages some private gardens may have in producing it, they ought certainly to be surmounted, for to have Asparagus at its best it should be cooked and eaten as soon as possible after being cut, as it very quickly deteriorates in flavour when once cut.

For market in this country it can only be grown at a profit under the most favourable circumstances of position, soil, and climate. Where growers are so happily situated, and have experience in growing it, I believe they find it a paying crop; but from time to time many have begun to grow it in places where soil and situation have not been suitable, and have been obliged to give it up.

It is very largely imported into this country from the South of France, Italy, and Spain. In the early months of the year the largest and best comes from France. Prices vary according to size and demand, some giant shoots fetching as much in Covent Garden market as from 10*s.* and 12*s.* to 15*s.* per 100. Many thousands of cratesfull are brought over daily, and every year the communication from the South of France is quicker, and brings it over in better condition. The best home-grown outdoor Asparagus is sold in Covent Garden from 1*s.* to 4*s.* per 100.

THE BRITISH AND SWISS ALPINE FLORAS.

By E. A. Newell Arber, B.A., F.R.H.S.,
Trin. Coll. Camb.

[Read May 2, 1899.]

The flora of the higher mountain ranges of Europe is one of great interest, whether we have regard to its origin, its distribution, or to those special features which distinguish it from all other floras. The extreme beauty and diversity of form and colour which is characteristic of alpine species is such as to impress all who have been privileged to visit alpine regions, whether professedly students of Nature or otherwise. The alpine flora of Switzerland is one of the best known of mountain floras, and many of the commonest plants seen in our rock-gardens are either species or varieties of species belonging to that flora. On the other hand the British alpine flora is smaller and comparatively insignificant, and on this account is rather apt to be overlooked. Many people are perhaps not aware that we have such a flora at all in Britain. If, however, we study the distribution of the plants which make up the British flora, we find that a certain number of species are confined to the summit of our higher mountains, and if we compare this flora with that of Switzerland we shall also find that nearly all these species are represented in the Swiss Alps, and as a rule occur there only at high elevations. I propose in this paper to give a comparative account of the British and Swiss floras, more particularly in relation to their alpine species. Such may, perhaps, be of use to those interested in the cultivation of alpines, and also to others who are familiar with our British plants, and who may at some time or other have an opportunity of extending their observations to the flora of the Swiss Highlands.

As will be seen shortly, the British flora compares not unfavourably with the richer and more diversified flora of Switzerland; a fact which should stimulate the interest of all lovers of our wild flowers.

A Comparison of the British and Swiss Floras.

Before considering the alpine division of the British and Swiss floras, it will be necessary first of all to shortly compare these two floras as a whole, in order to obtain some idea of the chief points of resemblance and difference which they present. The number of Phanerogamic families, genera, and species represented or occurring in the British Isles and in Switzerland is as follows:—

Phanerogams.

1. Families represented in British Isles, 92; Switzerland, 102. Common to both floras, 89.
2. Genera represented in British Isles, 515; Switzerland, 600. Common to both floras, 460.
3. Species* occurring in British Isles, 1,650; Switzerland, 2,350. Common to both floras, 1,250.

* The number of species in the genera Rubus, Rosa, Hieracium, and Salix was calculated from Nyman's "Conspectus Floræ Europææ."

These numbers are derived from the "London Catalogue of British Plants" (ninth edition, 1895), and from Gremli's "Swiss Flora" (translated by Paitson, 1889). In these two works a large number of plants are given under different names, and in addition to this there has been the usual difficulty in discriminating between species, subspecies, and varieties. For, as is well known, the species of one author are frequently regarded as mere varieties by another. The exact number of genera and species recorded in these two works are therefore untrustworthy as the basis of a comparative study. Some sort of standard is required. The standard which I have adopted here is that of the Index Kewensis, to which I have made constant reference; only those species which are stated in Index Kewensis to be real species, and not varieties, having been counted. I would, however, specially emphasise the fact that, while these figures have been drawn up with much care, they are not to be regarded as exactly, but only as approximately, correct.

These figures present several points of interest. In the first place we see that the *families* represented in both the floras under consideration are practically identical. There are only three British families not represented in Switzerland, and these contain but four species. The orders are: Frankeniaceæ, Myricaceæ, and Eriocauloneæ. The genus *Frankenia*, the *Sea Heaths*, are essentially maritime plants, and are represented in Britain by two species, one of which is, however, of doubtful occurrence. The other species are *Myrica Gale, L.* in Europe confined to the northern and north-western districts, and *Eriocaulon septangulare, With.*, a North American plant occurring in Scotland and Ireland but nowhere else in Europe.

In the Swiss flora there are thirteen families not represented in Britain, including fourteen genera and seventeen species. The great majority of the latter are escapes from cultivation, or ingrowths from the Mediterranean flora, as for example, the Vine, Plane, Walnut, and the American Opuntia. The following orders, unrepresented in Britain, are probably indigenous to Switzerland:—

Rutaceæ: *Ruta hortensis, Mill.* and *Dictamnus albus, L.*

Asclepiadaceæ: *Vincetoxicum officinale, Münch.*

Globulariaceæ = Selaginiæ: *Globularia*, three species.

In all, three orders, four genera, and six species.

Turning next to the *genera*, we find that quite 75 per cent. of Swiss genera are represented in Britain, and nearly 90 per cent. of British genera in Switzerland.

There are about 140 genera confined to Switzerland, as compared with Britain. Of these nearly 40 are only represented by naturalised species. This leaves about 100 genera represented in Switzerland by indigenous species, of which none occur in Britain. These genera are distributed among most of the larger families, especially in the Compositæ, Gramineæ, and Cruciferæ.

On the other hand there are about fifty-five British genera unrepresented in Switzerland, of which ten at least have only naturalised species. The Chenopodiaceæ is the only family which has a marked increase in genera peculiar to Britain, as compared with Switzerland.

Lastly, in regard to *species*, we see that 75 per cent. of the British flora

occurs in Switzerland, and more than 50 per cent. of the total Swiss species in Britain.

There are about 1,100 Swiss species which do not occur in Britain, and 150 of these are not indigenous. In the same way, of the 400 species peculiar to Britain, as compared with Switzerland, at least 50 are naturalised. Many of the former are essentially maritime plants. It must not, however, be thought that maritime plants are necessarily absent from a country which, like Switzerland, has no sea-board. On the contrary there are several species indigenous to Switzerland, such as *Glaucium luteum*, *Scrop.* and *Scirpus maritimus*, *L.*, which in Britain are almost entirely confined to our coasts.

The great majority of those species which are peculiar to the British flora as compared with the Swiss, and *vice versa* the Swiss compared with the British, are distributed among the larger of the natural orders and genera.

The following are the chief genera which show an increase in species peculiar to each of these floras, as compared with one another.

In the Swiss flora :—

Hieracium	Gentiana	Senecio
Saxifraga	Crepis	Campanula
Potentilla	Pedicularis	Allium
Viola	Orobanche	Trifolium
Arenaria	Androsace	Rosa
Galium	Arabis	Anemone
Ranunculus	Vicia	

In the British flora :—

Hieracium	Potamogeton	Fumaria
Ranunculus	Euphorbia	Cochlearia
Rubus	Hypericum	Arenaria
Saxifraga	Trifolium	Juncus

To sum up our consideration of these floras as a whole, we may estimate the total flora of

	Families.	Genera.	Species.
Switzerland	102	600	2350
Britain	92	515	1650

The *indigenous* flora confined to one country and not represented in the other :—

	Families.	Genera.	Species.
Switzerland	3	100	950
Britain	3	45	350

We see then that the British and Swiss floras, considered as a whole, are nearly related. In drawing deductions from a comparison of two floras such as these, there are several considerations which must not be overlooked. In the first place it must be remembered that while the British Isles form a natural botanical division of the earth's surface, this is not, however, the case with Switzerland. Switzerland, as defined politically to-day, has a flora which is complicated by the presence of an entirely different type of vegetation along its southern border. The Mediterranean flora, as the latter is termed, overlaps the true Swiss flora in many places, particularly in the Rhone Valley. The total Swiss flora is therefore greater than the true Swiss flora by a certain

number of Mediterranean species ; and this makes the relationship between the British and the true Swiss floras all the closer.

Again, the difference in the climatic conditions of Britain as compared with the Swiss Alps is very great, and to this may be attributed in large measure the differences between their floras. As, however, I shall have occasion to touch upon this subject later in connection with alpine floras, I will postpone its consideration for the present. I think we have seen sufficient from our analyses of these two floras as a whole to realise the point which I wish specially to emphasise, namely, that our British flora is very closely related to that of the Swiss Alps.

The Swiss Alpine and Sub-Alpine Zones.

We may now pass on to consider what is, perhaps, the most interesting section of these two floras, their alpine division. The word *alpine* is one which has been much misused. In a botanical sense it is applied to that division of the flora of *any* country which is situated at or above a certain height above sea-level, the height being mainly dependent on the latitude of the country in question. The term is not therefore confined to those plants which grow at high elevations in Switzerland. On the other hand, the word *Alps* (in the plural) is generally restricted to the mountain ranges of Southern Europe. In Switzerland, however, the word *Alp* (in the singular) is synonymous with the German *Alp*, *Alpen*, meaning a grassy hill-top or a mountain pasturage.

Anyone who has travelled in Switzerland cannot have failed to notice the change which passes over the entire vegetation as one ascends from the lowlands towards the regions of perpetual snow. In the plains the flora bears a striking resemblance to that of our own country, but as we ascend the character of the flora changes with the scenery. The species which are most conspicuous in the lowland flora are one by one left behind, and their place is taken by others which are not to be found in the plains. The deciduous trees are among the first to disappear, the Beech alone remaining at any considerable elevation. If we ascend still higher we reach a region in which Conifers, such as the Larch, Pines, Firs, &c., form the dominating feature in the landscape. But even the Conifers, as a rule, only clothe the bases of the higher peaks. A comparison of the floras of the regions of Conifers and Beeches brings out the fact that in both these zones there are a number of species of restricted distribution, in that they rarely descend to the zone below or ascend to the zone above. To take an illustration. There are three species of Vaccinium common in Switzerland. *Vaccinium Vitis idæa*, L., is found more especially in the zone in which the Beech alone, of all the deciduous trees, flourishes. In the higher zone, the region of Conifers, *V. uliginosum*, L., is the more abundant species, and in the lowlands *V. Myrtillus*, L., the Bilberry. When, as often happens, all three species occur together, one always predominates.

From a study of the distribution of species which have a limited range in regard to elevation, we are able to distinguish between three zones in the Alps—a lowland, a sub-alpine, and an alpine. Each of these may be recognised by the presence of certain characteristic species

which flourish most abundantly in one particular zone, although they may sometimes ascend or descend to that above or below.

On the other hand, while we are able to distinguish between three such zones, it is not possible to definitely define their limits, and this for many reasons. If we determine the mean average limits of a sub-alpine plant in one locality, and compare them with the limits of the same plant in another district, we are almost sure to find a considerable discrepancy, owing perhaps to the more favourable situation in regard to aspect, soil, water, &c., of the former over the latter, or *vice versa*. Then, again, many plants which are essentially lowland species, such as *Caltha palustris*, L., or *Campanula rotundifolia*, L., ascend to high elevations in the Alps, and are not more characteristic of one zone than of another in Switzerland. As, however, such plants are among the commonest in the plains of Central and Northern Europe, there can be no doubt as to their lowland origin. The so-called upper limit of alpines is a good illustration of how impossible it is to define these zones. Until a few years ago, it was commonly stated that the upper limit of the alpine zone was the line of perpetual snow. As a matter of fact, alpine species will flourish at any altitude in the Alps, provided they can obtain a minimum of soil in a situation free from snow for a few weeks in the summer. For instance, in one of the tributaries of the Mer de Glace, near Chamonix, there is, as is well known, a rock called the Jardin, at a height of about 9,000 ft. above sea-level. On this oasis in a wilderness of perpetual snow and ice alpine flowers bloom in August, when for a short period the rock is free from snow. All other vegetation has ceased quite 2,000 ft. below. In other places alpines have been gathered at still greater altitudes—at 12,000 ft. or more.

Although it is not possible to accurately define the limits of the alpine and sub-alpine zones, one is generally able to determine whether one is dealing with one or other of these zones by observing the presence of characteristic sub-alpine or alpine species. In Switzerland the *sub-alpine* zone is especially characterised by the presence of *Vaccinium Vitis idæa*, L., *Melampyrum sylvaticum*, L., *Prenanthes purpurea*, L., *Lonicera alpigena*, L., *L. nigra*, L., and others. The *alpine* zone is distinguished by the occurrence of *Rhododendron ferrugineum*, L., *R. hirsutum*, L., *Pinus Cembra*, L., *Salix herbacea*, L., *S. reticulata*, L., and many species of Anemone, Primula, Androsace, &c.

In studying the flora of any district the knowledge of the elevation at which one is working is often useful in determining the zone. The altitude of any locality can be readily ascertained by reference to maps, &c. The following may be taken as the rough limits of the various zones in Switzerland: *

Lowland, 0 to 3,500 feet.
Sub-alpine, 3,500 to 5,000 feet.
Alpine, above 5,000 feet.

It must, however, be remembered that these limits vary in the different

* The following centres are within the alpine zone: Zermatt, Saas, Arolla, Zinal, Davos, Upper Engadine, Pontresina, Murren, Belalp, &c. Grindelwald and Chamonix are sub-alpine.

mountain groups. In the central Alps of the Bernese Oberland the downward limit of the alpine and sub-alpine zones is considerably lower than in the southern alps of the Vallais.

Let us now consider whether it is possible to distinguish an alpine and sub-alpine flora in the mountain regions of Britain.

British Alpine and Sub-Alpine Zones.

From a comparison of the British and Swiss floras as a whole, we have seen that a very close relationship exists between them. The Swiss flora is not relatively greater in number of species than we should be led to expect when we take into account its more southern situation. For, as is well known, vegetation generally tends to increase as we leave the Poles and approach the Equator.

The latitude of a central point in the Swiss Alps, such as the Jungfrau, is about 46½° N., while that of Ben Nevis is roughly 56½° N., a difference of ten degrees. Taking into account this difference in latitude, we should naturally expect to find an alpine flora in Britain at a considerably lower elevation than in the Alps. The height of Ben Nevis, our highest mountain, is about 4,400 feet, while the average height of our loftier hills is between 2,000 and 3,000 feet. Other things being equal, a difference of ten degrees in latitude would probably bring the summits of many of our British mountains well within the alpine zone, although they would be entirely sub-alpine if in the latitudes of the Alps. It must, however, be remembered that latitude is not the only factor which must be taken into account. The climate of Britain is in many respects anomalous; for, owing to our insular situation and the proximity of the Gulf Stream, our mean average temperature is considerably above that of many places in the same latitude but less favourably situated. While, therefore, we may conclude that the British alpine zone will be found to extend to considerably lower elevations than in the Alps, the effect of climate is too complicated to allow of any exact approximation as to the limits of that zone from a comparison with that of Switzerland. For this we must rely chiefly on observations as to the distribution of our mountain plants in such a region as the Scotch Highlands.

If we examine the phanerogamic flora of our highest mountains, we at once arrive at the conclusion that an alpine flora undoubtedly exists in Britain. It is true that the flora is small, and often extremely local in its distribution. The fact remains, however, that in Britain we find a considerable number of species which are for the most part confined to high elevations in our mountain groups. We have therefore the beginnings of an alpine flora in Britain, which, if our mountains had only been a little higher and more compact, would possibly have rivalled that which is to-day one of the chief glories of the Alps. The close consanguinity which exists between the British and Swiss floras as a whole, and which, as we shall shortly see, extends to their alpine sections, renders this almost certain.

A detailed examination of the flora of our mountains shows that we can divide it into four classes:—

1. Plants which are only found at high elevations, and do not descend below 2,400 to 2,500 feet.

2. Plants which flourish most luxuriantly above 2,400 feet, but which occasionally descend to low elevations, or sometimes even to the sea-level.

3. Plants which are rare or absent in the lowlands, and which are not known to ascend above 2,400 to 2,500 feet.

4. Plants which are typically lowland, and as a rule widely distributed over the plains of Britain, but which ascend to considerable elevations in the mountains.

The plants included in Class 1 and Class 2 we may term alpines, and we may roughly estimate the lower limit of the alpine zone at about 2,400 to 2,500 ft. in the typical area of the Scotch Highlands. In the Lake District and in the Welsh mountains the limit is probably somewhat higher. The species in Class 2 are in the main restricted to elevations above 2,500 ft.

A knowledge of the elevation at which a species occurs elsewhere, especially in the Swiss Highlands, is often useful in determining whether a plant found at a slight elevation in Britain is alpine or sub-alpine. It must, however, be remembered that this rule is not always to be relied upon, since many species which are restricted to the alpine or sub-alpine zones in Switzerland are commonly met with as typical lowland plants in Britain and Northern Europe generally.

The range in altitude in Britain is very limited, even in our highest mountain groups, as compared with the elevations to which plants ascend in the Alps. Even in Switzerland we have seen that the lowland, sub-alpine, and alpine zones pass imperceptibly from one to the other. This is still more marked in Britain, the range of elevation being so short. On this account we can hardly distinguish a sub-alpine zone at all in Britain. We may, however, designate those species which have the distribution indicated in Class 3 as sub-alpine, but it is not possible to fix even rough limits for this zone. Our mountain flora is also too limited for the occurrence of characteristic alpine and sub-alpine species—which we saw to be so useful in the Alps to distinguish between the various zones—to be of any service in Britain.

The British Alpine Flora.

The British alpine flora is, as has been already stated, comparatively small, and often extremely restricted and local. Thus certain species, such as *Erigeron alpinum*, L., *Gentiana nivalis*, L., and some others are confined to the Breadalbane and Clova Mountains in Scotland. *Arabis alpina* is confined to the Island of Skye. Others, again, are still more local, *Saxifraga cernua*, L., is only found on the summit of Ben Lawers, and *Lloydia serotina*, Reich., on the Snowdon range. Several species have become extinct in recent times. On the other hand, such species as *Thalictrum alpinum*, L., *Silene acaulis*, L., *Dryas octapetala*, L., *Cerastium alpinum*, L., are comparatively common on many of the mountains of Scotland, England, and North Wales. Several alpines are known in certain places to descend to the sea-level, among others *Thalictrum alpinum*, L., *Draba incana*, L., *Saxifraga oppositifolia*, L.

The distribution of British alpines, especially in the typical area of the Scotch Highlands, has not been worked out as fully as might be. At present we know little as to the extreme and average limits to which our alpine species descend. Until these details are forthcoming it will not be possible to summarise accurately the extent of our British alpine and sub-alpine flora. In the present state of our knowledge, we may roughly estimate the British alpine flora at about ninety species, of which nearly thirty are confined to elevations above 2,500 ft. The genera Saxifraga, Hieracium, Salix, Juncus, and Carex have the largest number of alpine species. The sub-alpine zone in Britain is ill-defined, owing to the short range of elevation. There are some twenty-five to thirty species which may belong to this zone. Some of these are extremely local, such as *Phyllodoce cærulea*, Bab., only found on the Sow of Atholl, Perthshire. One sub-alpine Saxifrage, *S. Geum*, L., as also the Alpine *Saxifraga umbrosa*, L., London Pride, is confined to Ireland.

Many lowland plants ascend to considerable elevations in the mountains of Scotland, the Lake District, and North Wales, just as we saw to be the case in the Alps. Hooker, in his "British Flora," mentions seven lowland species which ascend to 4,000 ft. These are :—

Ranunculus acris, L.
Viola palustris, L.
Oxalis acetosella, L.
Empetrum nigrum, L.
Achillea millefolium, L.
Rumex Acetosa, L.
Festuca ovina, L.

There are also at least 120 species which ascend to 2,000 ft., and nearly fifty which reach 3,000 ft. These, together with the alpines given below, make up the phanerogamic flora of our mountains at heights above 2,000 ft.

The following tables give the chief alpine and sub-alpine species in Britain. In both cases, especially the sub-alpine, the enumeration is probably not complete, and in the latter a few of those included are perhaps not really sub-alpine, much work being still needed as to the limits of the distribution of these species.

The great majority of the species which are alpine or sub-alpine in Britain occur also in Switzerland, and generally at corresponding altitudes. Such species are marked * in Tables I.–III. Here, again, we have further proof of the close consanguinity which exists between these two floras.

TABLE I.

British Alpines.

Not descending below 2,500 ft.

*Arabis alpina, L.
Draba rupestris, Br.
*Cerastium trigynum, Villars
*Arenaria Cherleri, Benth.
,, hirta, Wormsk.
*Astragalus alpinus, L.
*Potentilla salisburgensis, Haenke
Saxifraga rivularis, L.
* ,, cernua, L.
,, cæspitosa, L.

TABLE I.—*continued.*

*Erigeron alpinum, L.
*Gentiana nivalis, L.
*Myosotis alpestris, Schmidt
Veronica humifusa, Dicks
Salix Sadleri, Syme
*Lloydia serotina, Reichb.
*Juncus castaneus, L.
Luzula arcuata, Swartz
*Carex lagopina, Wahl.
* ,, alpina, Swartz
* ,, atrata, L.
,, rariflora, Sm.
* ,, frigida Allioni
,, saxatilis, L.
*Poa laxa, Hænke
* ,, alpina, L.

TABLE II.

British Alpines.

Descending below 2,500 ft.

*Thalictrum alpinum, L.
Arabis petræa, Lamk.
*Draba incana, L.
*Silene acaulis, L.
*Lychnis alpina, L.
*Sagina Linnæi, Presl.
*Cerastium alpinum, L.
Rubus Chamæmorus, L.
*Dryas octapetala, L.
*Potentilla Sibbaldi, Hall
*Alchemilla alpina, L.
*Saxifraga oppositifolia, L.
,, nivalis, L.
* ,, stellaris, L.
,, umbrosa, L.
* ,, aizoides, L.
,, hypnoides, L.
*Sedum Rhodiola, D.C.
*Epilobium alsinefolium, Vill.
* ,, alpinum, L.
Cornus suecica, L.
*Galium boreale, L.
*Gnaphalium supinum, L.
*Saussurea alpina, D.C.
*Hieracium alpinum, L.
,, nigrescens, Willd.
,, anglicum, Fries.
,, gothicum, Fries.
*Lactuca alpina, Benth.
*Vaccinium Myrtillus, L.
* ,, uliginosum, L.
* ,, Vitis idæa, L.
*Arctostaphylos alpina, Spreng.
*Loiseleuria procumbens, Desv.
*Trientalis europæa, L.
*Veronica alpina, L.
* ,, saxatilis, L.
*Bartsia alpina, L.
*Polygonum viviparum, L.
*Oxyria digyna, Hill
*Betula nana, L.
Salix lanata, L.
,, Lapponum, L.
* ,, Myrsinites, L.
* ,, herbacea, L.
* ,, reticulata, L.
*Juniperus communis, var. nana, Willd.
*Listera cordata, Br.
*Tofieldia palustris, Huds.
*Juncus triglumis, L.
,, biglumis, L.
* ,, trifidus, L.
*Luzula spicata, D.C.
*Carex pauciflora, Lightf.
* ,, rupestris, All.
* ,, rigida, Good.
* ,, vaginata, Tausch.
* ,, capillaris, L.
Alopecurus alpinus, Sm.
*Phleum alpinum, L.
*Sesleria cærulea, Scop.
*Poa cæsia, Sm.

TABLE III.

British Sub-Alpines.

*Trollius Europæus, L.
*Thlaspi alpestre, L.
Subularia aquatica, L.
*Viola arenaria, D.C.
*Polygala amara, L.
*Arenaria uliginosa, Schl.
*Oxytropis campestris, D.C.
*Lathyrus niger, Wimm.
Saxifraga Geum, L.
* ,, Hirculus, L.
*Sedum villosum, L.
*Circæa alpina, L.
*Meum athamanticum, Jacq.
*Carduus heterophyllus, L.
*Hieracium prenanthoides, Villars
,, crocatum, Fries.
Phyllodoce cærulea, Bab.
*Primula farinosa, L.
*Gentiana verna, L.
*Melampyrum sylvaticum, L.
*Ajuga pyramidalis, L.
*Salix Arbuscula, L.
*Habenaria viridis, Br.
* ,, albida, Br.
*Kobresia caricina, Willd.

The Swiss Alpine Flora.

A detailed study of the Swiss alpine flora would require a much longer time than we have at our disposal, and in the short period which remains I shall only be able to touch upon some of its most interesting and characteristic features. As is well known, the alpine flora of Switzerland is a comparatively large one. The late Mr. John Ball,* in his paper on "The Distribution of Plants on the South Side of the Alps," estimated the entire flora of the Alps at 2,010 species, with 335 sub-species belonging to 523 genera and ninety-six natural orders.

Of these, 1,117 species in 279 genera and sixty natural orders are confined to the upper or alpine zone. The area included in this estimate is, of course, considerably larger than that which we are here considering, namely, that of the Swiss Republic. In Switzerland the number of species absolutely confined to the alpine zone is given by Dr. Christ † as 294. As to the actual number of species confined to the sub-alpine zone, we are only able at present to give an approximate guess. There is still much work to be done as to the distribution in regard to elevation of the species which make up the entire Swiss flora. There are probably between 150 and 200 sub-alpine species in Switzerland. A provisional and very rough estimate of the distribution in regard to altitude of the species stated by Gremli to occur in Switzerland is as follows :—

Species confined to the alpine zone	300
,, ,, alpine and sub-alpine zones	350
,, ,, sub-alpine zone	200
Lowland species	1,500
Total flora	2,350

The flora of the alpine zone thus consists of some 650 species, to which must be added a large number of lowland species, many of which,

* Ball, J., *Trans. Linn. Soc.*, 2nd series, Bot., vol. v. 1896.
† Christ, H., *La Flora de la Suisse* (transl. E. Tièche, 1883).

as has already been pointed out, ascend to considerable elevations. The total phanerogamic flora of the Alps above 5,000 ft. is probably at least 900 species.

The following families are especially rich in alpine species:—

Compositæ	Cruciferæ	Leguminosæ
Caryophyllaceæ	Primulaceæ	Scrophulariaceæ
Gramineæ	Ranunculaceæ	Umbelliferæ
Cyperaceæ	Saxifrageæ	Gentianaceæ

One family, the Globulariaceæ (Selaginiæ), is represented in Switzerland entirely by alpine or sub-alpine species. A few genera, such as Androsace, Soldanella, and some others, are also almost entirely alpine. As a rule, however, genera which are rich in alpine species have also one or more lowland representatives. The following genera have the largest number of alpine species:—

Anemone	Sedum	Campanula
Ranunculus	Sempervivum	Gentiana
Aconitum	Saxifraga	Pedicularis
Arabis	Valeriana	Androsace
Draba	Erigeron	Primula
Viola	Artemisia	Salix
Silene	Achillea	Juncus
Arenaria	Senecio	Luzula
Trifolium	Cnicus	Carex
Oxytropis	Crepis	Poa
Astragalus	Hieracium	
Potentilla	Phyteuma	

Many alpine species belonging to these genera are commonly cultivated in our rock-gardens. The fact that many alpines will flourish in our plains is not a little surprising if we take into consideration the entire change in every detail of the environment which such plants must have to contend with. How is it that we are able to grow alpines at all in London? From the point of view of the cultivator of alpines, this is perhaps the most important question arising from this subject, and it is only within a comparatively recent period that botanists have been in a position to offer an explanation of this phenomenon. Even now the explanation can hardly be regarded as complete.

If we were to transplant a number of alpines from their mountain homes to one of our rockeries, we should find that all do not flourish equally. Some alpines refuse to grow at all in England, except perhaps under the most skilful cultivation. Others will flourish for a time, a few years perhaps, and then die; while others, again, quickly adapting themselves to their new surroundings, will survive. These latter are said to have the power of acclimatisation in a marked degree, or, as Bailey* puts it, possess the power of overcoming climate. This power of acclimatisation varies in degree in different plants. We have already seen instances of this in our study of the Swiss alpine flora. It has been pointed out that

* Bailey, L. H., *The Survival of the Unlike*, p. 320.

many lowland plants, such as *Campanula rotundifolia*, L., ascend to considerable elevations in the mountains. Such species must obviously be able to adapt themselves to great changes in climatic conditions. The reason why other species are confined to the lowlands is in part due to the want of this power of becoming acclimatised to different environments. In order to more fully understand the phenomenon which we term acclimatisation, we must look closely into the factors which govern the environment. Schimper,* in his splendid work on plant geography considered from a physiological standpoint, puts forward six factors which govern the distribution of plants. They are: moisture, temperature, light, atmospheric pressure and wind, soil, and the fauna. All these conditions are very different in the Alps as compared with Britain, the intensity of illumination and the extremes of temperature being greater and the atmospheric pressure less. A species growing in an exposed situation in the Alps has to adapt itself to these conditions, otherwise it would perish. In so doing it may become specialised in constitution and in habit. Such a plant if transferred to our plains would stand a poor chance of adapting itself to our climate. For want, perhaps, of the intense illumination to which it had become adapted it dies, or, at the most, exists for a time. In short, it has become over-specialised, and has lost that elasticity of constitution which was necessary to overcome the change of climate. Thus it perishes where another plant less specialised will not only survive but flourish.

Such may perhaps be a provisional explanation of how it is that many alpines can be grown in our rock-gardens. It must, however, be remembered that we are still on the threshold of our knowledge respecting the modifications induced in the constitution of plants due to climatic conditions, or change of conditions. Until we know more of the specialisation of types under these influences, we shall not be able to understand fully many of the phenomena met with in the cultivation of alpines.

The question of the acclimatisation of plants is one of great importance when we seek to explain the origin of alpine floras. The origin of the alpine flora of Southern Europe is a subject which has been much debated, but the problem may be said to be still unsolved. The Alps, like most of our British mountains, are of comparatively recent geological date. The great lateral thrusts which formed the chief mountain ranges of Europe took place in Tertiary times, *i.e.* long after the deposition of the Chalk.

The formation of the Alps need not, however, be considered here in detail, for we are more especially concerned with an event of later date, known as the Glacial period. The Great Ice Age, as this epoch is often termed, took place at the close of Tertiary times, and is the most recent of all the great geological events in the earth's history with which we are acquainted. All the attempts which have been made to explain the origin of the Swiss alpine flora have attached great importance to the influence of this period of cold and ice on the flora which was then existing in Europe, and also as having in the main determined the present distribution of European plants.

* Schimper, A. F. W., *Pflanzen-Geographie*, 1898.

At the end of Tertiary times, before the coming of the Ice Age, the configuration of Europe was in its main outlines much the same as to-day. There were differences in detail, however. At that time Britain was still connected with the Continent, and, as far as our knowledge extends, the fauna and flora of both were much alike. We can thus understand how it is that the floras of the British Isles and of Switzerland present so many points of close relationship, as we have seen to be the case from a comparative study of the two floras. For there is little doubt that our present flora is directly descended from that of Tertiary times.

The close of the Tertiary period was marked by a gradual lowering of the temperature throughout the Northern Hemisphere, the exact causes of which are still disputed. Ice advanced slowly from the direction of Scandinavia over Central and Western Europe. The greater part of Britain became covered with an ice sheet, just as Greenland is to-day. On the Alps extensive glaciers were formed, owing to the intense cold, and these filled all the valleys with an almost unbroken covering of ice. There is evidence, however, that this Glacial period did not come quite without warning. As the temperature gradually sank the flora retreated further and further southward. In Britain the main glaciation did not reach to the southern counties, and there the flora took refuge, or migrated to France, which was then joined to Britain, and which for the most part remained free from ice. In Switzerland the flora was either driven across the Alps into Italy, or across the Jura into France. How long the Ice Age lasted is still disputed, but in all probability it extended over a considerable period. After a time, however, the cold became less intense and the ice began to retreat, and then the flora gradually returned.

The precise influence of the Glacial period in regard to the origin of the present alpine flora of Europe is, however, still in dispute. All are agreed that this flora is ancient, and that part of it at least existed before the Glacial period, and that its present distribution was in the main determined by that period.

Some twenty years ago this point was much discussed by both British and Continental botanists. In 1875 Alphonse de Candolle* published his researches on the causes of the inequality in the distribution of rare plants in the Alps. It has been long known that the south side of the Alpine chain is much richer in species than the northern, just as certain districts in Switzerland are richer than others. According to de Candolle the glaciers on the south side of the Alps were much less extensive than on the north, and consequently, when the cold became less intense, they were among the first to disappear. The pre-Glacial alpine flora found a refuge on the south side of the Alps, and de Candolle thought that when the ice retreated, part at least of this flora returned, those mountains and valleys which first became free from ice having to-day the greatest number of rare species and the most varied flora.

An altogether different origin of the Swiss alpine flora was suggested by Sir J. Hooker about the same time. From a study of the Arctic flora Hooker found that a large percentage of that flora occurs in the Alpine regions of Southern Europe, as well as in many other parts of

* De Candolle, A. Vide *Nature*, April 1876.

the world. He concluded that this flora was originally developed in Scandinavia, and that it flourished there before the Glacial period. During that period it was driven southward by the approaching ice, and afterwards, when the cold became less intense, part of it remained in the Alps, while the rest spread over Europe or returned to the Arctic regions.

The late Mr. John Ball,* in a paper on the origin of the flora of the European Alps, criticised Hooker's theory by doubting whether the present Arctic flora existed before the Glacial period in those regions. On the other hand he suggested that a certain portion of the alpine flora may have been carried there by the retreating ice, and that the European alpine flora probably gave rise to the present Arctic flora, and not *vice versa*. Ball found that nearly half of the plants stated by Hooker to extend beyond the Arctic Circle are ubiquitous, owing to their power of adaptability, and that there was no reason to suppose that they originated in those regions, especially as they flourish to-day most abundantly in the temperate zone.

The foundation of Hooker's theory must, therefore, be regarded as open to severe criticism. It is, however, the best explanation of the origin of the alpine flora which has, so far, been put forward, and it has been adopted by many botanists. It is also of special importance in laying stress on the fact that any explanation of the origin of the Alpine flora must also account for the origin of the Arctic flora.

To return to the consideration of the Swiss alpine flora as it exists to-day. The distribution of alpine species in Switzerland is, as has already been mentioned, very uneven. The Swiss Alps may be divided into three very natural districts: the Central Alps or Bernese Oberland, the Southern Alps of the Vallais, and the Eastern Alps of the Grisons. Of these the Central Alps are much the poorest in number of alpine species, and those of the Vallais much the richest. Many attempts have been made to account for this inequality of distribution, notably that of de Candolle already mentioned. The question is one which is, no doubt, bound up with that of the origin of the alpine flora in general, and until this greater problem has been solved we can hardly hope for a satisfactory explanation of these inequalities in distribution.

In considering the distribution of species over any area it is necessary to take into consideration another factor which we have not, so far, touched upon—namely, the character of the soil. The influence of the soil on vegetation, especially in regard to the distribution of alpine species, is rather puzzling. In Switzerland the rocks are mainly limestones and crystalline igneous rocks such as granites, gneisses, and schists. Certain species of alpines are apparently confined to one or other of these formations, while others seem to be indifferent as to the nature of the soil on which they grow. The two species of Rhododendron, which we have seen to be especially characteristic of the alpine zone, are cases in point. *R. ferrugineum*, L., is indifferent as to soil, while *R. hirsutum*, L., is confined to limestone regions, and does not occur where igneous rocks predominate. Another instance is that of *Anemone alpina*, L., and its variety *sulphurea*, L., the latter only occurring on granite soil. If, however, we trace the distribution of alpine species over a much larger area

* Ball, J., *Royal Geographical Society's Proceedings*, 1879, vol. i. p. 564.

than the Swiss Alps we find that the evidence is conflicting. M. Bonnier * has emphasised this fact by comparing the distribution of alpine species in regard to soil in the Alps of Dauphiny, Austria, and the Carpathians. He finds that a number of species which are entirely confined to calcareous rocks in one district are indifferent as to the nature of the soil in another. For instance, *Calamintha alpina*, L., grows chiefly on sandy soils in the Alps of Dauphiny, on calcareous rocks in the Austrian Alps, but is indifferent as to soil in the Carpathians. He concludes that the chemical nature of the soil has a certain influence on the distribution of some alpine species, but only relatively, not absolutely.

The *chemical* character of the soil alone is therefore insufficient to explain such instances of distribution. We must look more especially to the other factors connected with soils for an explanation of the significance of such phenomena. The *physical* properties of the soil, its permeability to water, and its power of retaining water, vary very largely in different geological formations, and exert a powerful influence on the distribution of plants. The need of a rich humus (*i.e.* decomposing organic material) is essential to the welfare of many plants, as are also the fungal elements known as Mycorhiza, which live in symbiotic association on the roots of some species, and by whose aid the absorption of organic material by the plant is promoted. All these factors have to be taken into account as well as the chemical nature of the soil, and until we know more of the requirements of each alpine species in these respects it will not be possible to explain the precise significance of the distribution of certain alpines, such as those above mentioned.

Another interesting feature of the Swiss flora is the replacement of a lowland plant by another nearly related species at high elevations. The common Daisy, *Bellis perennis*, L., is not found within the alpine zone, but is there replaced by *Bellidiastrum Michelii*, Cass., the Alpine Daisy. Another instance is that of *Ranunculus montanus*, Wild., which in Alpine meadows replaces *Ranunculus acris*, L.

The extreme beauty of alpine flowers, both in respect to form and colour, is too well known to require more than a word in passing. The colours of most alpine species are very intense, and it has been shown by M. Bonnier † and others that the intensity of colouration increases with the altitude. This is especially marked in such species as *Campanula rotundifolia*, L., and *Myosotis sylvatica*, Hoffm., in which there is a considerable difference in the colour of the corolla between the lowland and alpine forms. The number of blue and violet flowers is also much greater in proportion in alpine than in lowland plants. Many alpine species of Gentians, Primulas, Veronicas, Polygalas, Campanulas, &c., have an intensely blue colour, while other alpine genera, such as Saxifraga, Anemone, Phyteuma, and many others, have one or more species with bluish flowers. The massing or clumping together of many individuals of the same species is another natural feature of alpines, especially in high Alpine regions. It is due to this, in combination with their bright colours, that alpines are rendered so conspicuous—an adaptation connected with cross-fertilisation.

* Bonnier, M. G., *Ann. de Sci. Nat.*, 6th Series, vol. x. 1880.
† Bonnier, M. G., *Bull. de la Soc. Bot. de France*, 1880.

The habit of alpine species is no less remarkable than their form and colouring. If we examine the flora of one of the Alpine meadows in an upland valley, we find that it is largely composed of what are popularly called "flowers" as distinguished from grasses. The hay, in fact, consists of species of Geranium, Ranunculus, Rhinanthus, Polygonum, and several Umbelliferæ, and other Dicotyledons, many of which are British plants. The habit of these plants is considerably more vigorous than in the lowlands, and the flowers are often larger and more striking.

In the mountain pastures, high up, in less sheltered situations, the habit is altogether different. Here the plants are dwarf. The leaves are mostly radical, often in rosettes. The flowers are solitary or umbellate, rarely in racemes, and the height of the whole plant does not exceed a few inches. *Silene acaulis*, L., *Saxifraga bryoides*, L., and *Draba azoides*, L., are good illustrations. Those plants which grow close to the snow-line (8 to 10,000 feet) or above it show this characteristic habit even better. Some of these species are quite minute, but at the same time rendered conspicuous by their brightly coloured flowers. Such are for example *Dianthus glacialis*, Hänk., and *Androsace alpina*, Lam.

High mountain plants, such as these, are a good instance of what botanists call an ökological plant association. In recent years plant geography has been studied from two distinct points of view. The study of floristic plant geography is concerned with the distribution of species over any area, and tries to account for their origin in any particular district. On the other hand ökological plant geography is concerned more especially with the association of species in nature by common habits and adaptations due to the life conditions (heat, moisture, &c.) of any district. The latter is the scientific study of vegetation as opposed to flora: and within the last few years the researches of Warming * and Schimper † on the distribution of plants from the ökological standpoint have done much to establish what must now be regarded as an important branch of vegetable biology. In the high Alps we have seen that the habit of the plants is characteristic, and there can be no doubt that this and other adaptations are due to the great extremes of temperature, the intense illumination, and the short period during which such plants are free from snow. All these species, although many of them are not related in any way, are united into a plant association, owing to the common characters or adaptations induced by common conditions of life.

In conclusion I may remark that in this paper I have endeavoured to show the close relationship which exists between the Swiss flora and that of our own country. This relationship extends to both the lowland and alpine sections of these two floras, for, as we have seen, the great majority of our alpine species occur at similar elevations in Switzerland. The fact that we have an alpine flora in Britain is one which is apt to be overlooked, and my object here has been especially to call attention to this point. I trust that this short *résumé* of a large subject has not been without interest to those here who are attracted by the study or cultivation of alpines.

* Warming, E., *Lehrbuch der Ökologischen Pflanzenanatomie*, Berlin, 1896.
† Schimper, *ibid.*

OBSERVATIONS ON SOME PLANTS EXHIBITED.

By the Rev. Prof. G. Henslow, M.A., V.M.H.

[Delivered May 16, 1899.]

Cerasus pseudo-Cerasus, "James H. Veitch."—This new importation of Mr. Veitch's is valuable, inasmuch as it is in full bloom three weeks later than the old one, and bears leaves simultaneously with the blossoms. It was introduced by Mr. J. H. Veitch from Japan.

Amherstia nobilis, a leguminous tree from the Malayan Peninsula, is remarkable for the distorted arrangement of its petals, the cause of which Mr. Henslow had previously explained in the case of other flowers in which it occurs (as the Horse-chestnut); viz. the visits of insects, which, resting on the stamens, cause them to become declinate, and by their searching for honey the petals have assumed irregular positions.

Clianthus puniceus, another plant of the Leguminosæ, has peculiar flowers resembling the claw of a lobster. It is also called Parrot's-bill in New Zealand. It was introduced in 1831. Another species, *C. Dampieri*, is a native of desert regions of Australia.

Alpine Plants.—Besides a selection of species with brilliantly coloured corollas, a peculiar Campanula, *C. thyrsoides*, was exhibited, a dwarf plant with small, densely compacted and greenish flowers. The native *Primula auricula*, and a much improved garden form, as well as the old-fashioned *Centaurea montana*, precisely like its present wild congeners of Alpine slopes, as about Muren, were taken as other representations of the Swiss flora.

Euphorbia.—A species with brightly coloured bracts—greenish-yellow—afforded material for observing the diversity of the powers of nature in constructing flowers. For instead of having a coloured corolla there was neither calyx nor petals, but only bracts; while the inflorescence, composed of a number of males represented by a single stamen apiece, surrounded one female flower consisting solely of a pistil of three coherent carpels.

Dicentra, sometimes misspelt *Dielytra*, illustrated an ingenious apparatus for protecting the stamens and stigma by means of a cap which was hinged to the petals. This was pushed to one side when an insect visited the flower and exposed them, scattering the pollen thereby on to it, and so securing cross-fertilisation.

Cut-leaved Elder.—A specimen of this afforded material for the explanation of the origin of compound leaves from single ones: by first making the blade lobed, then by separating the two lobes as leaflets, and by thus repeating the process, a trefoil, cinquefoil, or 7-leaflets might be obtained, as in *Potentilla reptans*; Blackberries and Raspberries illustrating transitions from one to five leaflets to a leaf.

Pelargonium, new Double.—A new double scarlet was shown in which the numerous petals were narrow. This feature is characteristic of the wild form with "windmill-sail" petals, and the peculiarity of the

plant in question is that it was a reversion to this primitive form of petal, instead of its being rounded, as in ordinary forms.

British Plants, Cultivated.—A group showed what could be done with our wild flowers under cultivation. *Ranunculus acris*, double, was the old-fashioned Bachelors' Buttons. *Lychnis dioica*, allied to Ragged Robin, also double. *Scilla nutans*, the Blue-bell, alters to white and pink in colour, shortening the perianth till it becomes campanulate. Mr. Henslow observed that all three forms occurred in his garden at Ealing, from the wild Blue-bell having been grown on very gravelly and poor soil. *Saxifraga granulata*, so called from the numerous little bulbs it bears, is a not uncommon field wild-flower, the cultivated plant being double. *Leucojum æstivum*, the Snowflake, was also shown, but it appears difficult of cultivation. It grows naturally in moist meadows and marshes, as on the banks of the Isis and on islands and banks of the Thames, so that it may not be treated properly. The double Furze, remarkable for having the *scent* resembling the *taste* of cocoa-nut. And lastly *Cytisus scoparius*, var. *Andreanus*, with crimson wings to the flowers, said now to have been found wild in England as well as in France.

EXAMINATION IN HORTICULTURE.

1899.

The Annual Examination in the Principles and Practice of Horticulture was held on April 11 : 165 papers were sent in.

Three hundred marks were allotted as a maximum, and all candidates who obtained 200 marks and upwards were placed in the first class. The total number was 80, or 48·4 per cent.

The highest number of marks (285) was awarded to Mr. Harrington H. Eaton, from the County Technical School, Stafford.

Those who secured 150 and less than 200 marks were placed in the second class. The number was 50, or 30·3 per cent.

Those who obtained 100 and upwards were ranked in the third class. The number was 30, or 18·1 per cent.

Five candidates, obtaining less than 100 marks, were not placed.

Comparing the results with those of the last two years, the entry has fallen from 190 (in 1898) to 165, the percentages of the number in each class being as follows :—

	1897 (184).	1898 (190).	1899 (165).
First class	48·3 ...	45·7 ...	48·4
Second class	29·8 ...	32·6 ...	30·3
Third class	15·2 ...	19·0 ...	18·1
Not classed	6·5 ...	2·6 ...	3·0

The answers were, on the whole, again very satisfactorily given, no very serious mistakes occurring anywhere. The purely botanical questions dealing with the structure and classification of flowers were generally avoided, but the physiological questions were mostly chosen, and were well answered.

It is very gratifying to report that there is again a general improvement in the department of Practical Horticulture. The candidates have more fully described the minor details : this is important. Candidates should also realise that it is only by grasping the full meaning of the questions that they may expect to obtain the highest honours. Some candidates wandered from the question, and answered what was not in it, and in this way wasted time which might have been of much value near the close of the examination. These were exceptions ; but it is well to allude to them.

George Henslow, }
Jas. Douglas, } *Examiners.*

First Class.

		No. of Marks gained.
1.	Mr. H. H. Eaton, County Technical School, Stafford	285
2.	Mr. G. A. Bevan, County Technical School, Stafford	280
2.	Mr. C. J. Gleed, Horticultural College, Swanley	280
2.	Mr. C. Wragg, County Technical Laboratory, Chelmsford	280
5.	Mr. J. M. Abbott, 5 Holmes Terrace, Darley Dale, near Matlock	275
5.	Miss F. Meadmore, Horticultural College, Swanley	275
7.	Mr. J. Burden, Brightwell, Baldwin, Wallingford	270
7.	Miss C. E. Mallins, Horticultural College, Swanley	270
9.	Mr. G. Underwood, Saffron Hill Gardens, Aylestone Park, Leicester	260
10.	Mr. C. Andrews, Ferniehurst, Rownhams, Southampton	255
10.	Mr. H. T. Baugust, County Technical School, Stafford	255
10.	Mr. W. Hamnett, 11 Granville Terrace, Stone, Staffordshire	255
10.	Mr. N. Marston, County Technical School, Stafford	255
10.	Mr. J. F. Mitchell, Horticultural College, Swanley	255
10.	Miss E. F. Squier, County Technical Laboratory, Chelmsford	255
16.	Mr. R. F. Cock, Royal Gardens, Windsor	250
16.	Mr. W. Hulbert, The Hermitage, Jarvis Brook, Tonbridge Wells	250
16.	Mr. W. E. Johnson, Middle Cottage, Hales Road, Cheltenham	250
16.	Mr. W. Nield, County Technical Laboratory, Chelmsford	250
16.	Mr. C. W. Payne, 36 Lower Bank Road, Fulwood, Preston	250
16.	Mr. G. W. Pyman, County Technical Laboratory, Chelmsford	250
16.	Miss E. Wontner, County Technical Laboratory, Chelmsford	250
23.	Mr. J. Anderson, Drumlanrig Gardens, Thornhill, N.B.	245
23.	Mr. F. Brown, The Gardens, Fairlawn, Tonbridge	245
23.	Miss M. M. Larkin, County Technical Laboratory, Chelmsford	245
23.	Mr. A. J. Pye, County Technical Laboratory, Chelmsford	245
23.	Mr. C. Pyke, St. Michael's School, Swaton, Folkingham	245
28.	Mr. W. Brown, The Gardens, Carriden, Bowness, N.B.	240
28.	Mr. T. L. Chapman, Horticultural College, Swanley	240
28.	Mr. W. Dives, Horticultural College, Swanley	240
28.	Mr. T. P. Jackson, County Technical School, Stafford	240
28.	Miss J. B. Larkin, County Technical Laboratory, Chelmsford	240
28.	Mr. J. T. Lewis, County Technical School, Stafford	240
28.	Mr. W. Lucas Lyenne, Firgrove Hill, Farnham, Surrey	240
28.	Mr. F. E. Tremain, Horticultural College, Swanley	240
28.	Mr. E. M. Watkins, Horticultural College, Swanley	240
37.	Mr. J. Birtwistle, Horticultural School, Holmes Chapel	235
37.	Mr. C. Hughes, Horticultural School, Holmes Chapel	235
37.	Mr. A. S. Maskelyne, County Technical Laboratory, Chelmsford	235
37.	Mr. F. Maxey, Drumlanrig Gardens, Thornhill, N.B.	235
37.	Miss G. Pugh, Horticultural College, Swanley	235
37.	Miss A. Young, Horticultural College, Swanley	235
43.	Mr. H. J. Benians, Horticultural College, Swanley	230
43.	Mr. S. Burgess, Rookery Gardens, Pendleton, Manchester	230
43.	Miss S. Van Houten, Horticultural College, Swanley	230

		No. of Marks gained.
43.	Miss C. M. Hull, County Technical Laboratory, Chelmsford	230
43.	Mr. W. J. Vickers, County Technical Laboratory, Chelmsford	230
48.	Mr. F. E. Belcher, 26 First Avenue, Bush Hill Park, Enfield, N.	220
48.	Mr. C. L. Branson, Coleshill Park, Coleshill, Birmingham	220
48.	Miss M. C. Brooks, Horticultural College, Swanley	220
48.	Mr. H. C. Chapelow, Ivy Cottage, Cheshunt Street, Cheshunt	220
48.	Mr. H. Dobbie, Mulbarton, Norwich	220
48.	Miss C. Dunham-Massey, Horticultural College, Swanley	220
48.	Miss F. E. Gervais, Horticultural College, Swanley	220
48.	Mr. W. Morris, Horticultural School, Holmes Chapel	220
48.	Mr. B. Smith, County Technical Laboratory, Chelmsford	220
57.	Mr. A. D. Cotton, 2 Eccleston Houses, S.W.	215
57.	Mr. C. Ely, Cote Wall Lodge, Mirfield, Yorkshire	215
57.	Miss M. Hawkes, Horticultural College, Swanley	215
57.	Mr. J. P. Holt, Horticultural School, Holmes Chapel	215
57.	Mr. W. S. Sharp, Ness Neston, Cheshire	215
57.	Mr. C. W. Tombs, County Technical School, Stafford	215
63.	Miss E. Boorman, Horticultural College, Swanley	210
63.	Mr. A. J. Brabner, Avalon, 16 Nassington Road, Hampstead	210
63.	Mr. T. P. Carr, Undermount Gardens, Bonchurch, Isle of Wight	210
63.	Miss L. M. Simes, County Technical Laboratory, Chelmsford	210
63.	Mr. R. W. Norman, 46 Church Road, Wimbledon	210
63.	Mr. S. Philpott, 87 James Street, Sheerness	210
63.	Miss E. Powell, Horticultural College, Swanley	210
63.	Mr. S. Smith, 7 Hawthorn Terrace, Heaton Moor, near Stockport	210
63.	Mr. S. W. Whalley, Streatley, near Reading	210
72.	Mr. W. Free, County Technical Laboratory, Chelmsford	205
72.	Miss M. Harbinson, Horticultural College, Swanley	205
72.	Mr. T. Payne, High Street, Camberley	205
72.	Mr. J. G. Walker, The Grove, Carisbrooke, Isle of Wight	205
76.	Mr. R. Brinsmead, Horticultural College, Swanley	200
76.	Mr. E. Brown, Rose Cottage, Wood Green, Waltham Abbey	200
76.	Mr. J. W. Hewison, Great Ayton, R.S.O., Yorkshire	200
76.	Mr. J. F. Mundy, Horticultural College, Swanley	200
76.	Mr. G. E. Wood, The Worthys, Kingsworthy, Winchester	200

Second Class.

1.	Mr. A. Broughton, Horticultural School, Holmes Chapel	195
1.	Mr. G. A. Fryer, Horticultural School, Holmes Chapel	195
1.	Mr. G. E. Hubbard, 32 Requity Road, Leicester	195
1.	Mr. J. Walker, County Technical School, Stafford	195
1.	Mr. G. Wilson, F.R.H.S., 21 Christchurch Road, Streatham Hill, S.W.	195
6.	Mr. W. M. Archibald, Horticultural College, Swanley	190
6.	Mr. A. A. Butcher, County Technical Laboratory, Chelmsford	190
6.	Miss H. Draper, Horticultural College, Swanley	190
6.	Mr. M. Field, Newnham House, Wallingford	190
6.	Mr. J. Gillibrand, Horticultural School, Holmes Chapel	190
6.	Mr. W. Godsmark, Newton, Great Ayton, R.S.O., Yorkshire	190

		No. of Marks gained.
6.	Mr. J. H. Groves, Sunnyside Cottages, Caterham Valley	190
6.	Mr. J. H. Shirley, Heaton Mersey, near Manchester	190
6.	Mr. F. Smith, 3 Harestone Lane, Caterham	190
6.	Mr. F. South, Horticultural School, Holmes Chapel	190
6.	Mr. R. J. Southerton, Winterfold, Cranleigh, Surrey	190
6.	Miss M. Sparkman, Horticultural College, Swanley	190
18.	Mr. H. P. Appleton, Saffron Hill Gardens, Aylestone Park, Leicester	185
18.	Mr. R. Garner, Horticultural School, Holmes Chapel	185
18.	Mr. J. Good, Falkland Park Gardens, South Norwood Hill, S.E.	185
18.	Mr. H. Holmes, Garvald Gardens, Dolphinton, Peebleshire, N.B.	185
18.	Mr. J. Hygate, The Briary, Cowes, Isle of Wight	185
18.	Mr. G. W. Hunt, South Knighton Road, Leicester	185
18.	Mr. W. B. Sanday, 165 Knight's Hill Road, West Norwood, S.E.	185
18.	Mr. W. J. Strong, County Technical Laboratory, Chelmsford	185
26.	Mr. C. Craig, Drumlanrig Gardens, Thornhill, N.B.	180
26.	Mr. H. P. Glaister, 50 Clifton Gardens, Chiswick, W.	180
26.	Mr. J. Hughes, 39 Trinity Road, East Finchley	180
26.	Mr. P. Jago, County Technical Laboratory, Chelmsford	180
26.	Mr. J. Silbey, 102 Hubert Road, Wimbledon	180
26.	Mr. T. Skilton, Heath Farm, Hedley, Epsom	180
32.	Mr. T. Dent, Howbery Park, Wallingford	175
32.	Mr. C. E. Keene, County Technical School, Stafford	175
34.	Mr. D. G. McIver, County Technical Laboratory, Chelmsford	170
34.	Mr. W. E. Langton, 32 Gipsy Road, Leicester	170
34.	Mr. C. Stanwell, Ipsden Vicarage, Wallingford	170
34.	Mr. A. Taylor, Easby, Great Ayton, R.S.O., Yorkshire	170
38.	Mr. A. Deane, Crown Street, Egham	165
38.	Mr. G. J. Goodall, Strealy House, Wallingford	165
38.	Mr. G. H. Larnder, Horticultural College, Swanley	165
38.	Mr. G. H. Webster, County Technical Laboratory, Chelmsford	165
42.	Mr. W. Eason, Heathfield, Wimbledon Common	160
42.	Mr. G. Nye, Horticultural College, Swanley	160
42.	Mr. W. H. Wield, Burches Lodge, Kingston Hill	160
45.	Miss K. F. Anderson, Horticultural College, Swanley	155
45.	Miss E. B. Pitman, Basford Vicarage, near Nottingham	155
47.	Mr. H. M. Rhind, Horticultural College, Swanley	150
47.	Mr. A. Walker, Drumlanrig Gardens, Thornhill, N.B.	150
47.	Mr. A. Wilkins, Martyr Worthy, Winchester	150
47.	Mr. W. Yeomans, The Gardens, Pinchurst, Farnborough	150

Third Class.

1.	Mr. G. Atkins, Rose Cottage, High Street, Caterham	145
1.	Mr. H. G. Chick, Moray Villa, Elm Grove, Upper Caterham	145
1.	Mr. R. Keeble, Waltham St. Lawrence, Twyford, Berks	145
1.	Mr. H. Smith, 3 Harestone Lane, Caterham	145
1.	Mr. A. Sowman, 122 Trinity Street, Ipswich	145
1.	Mr. F. J. Wells, Kine Croft Hills, Wallingford	145
7.	Mr. J. Coombes, Fulford, Arreton, Isle of Wight	140

		No. of Marks gained.
7.	Mr. J. Jeffery, Moor Court Gardens, Oakamoor, Stoke-on-Trent	140
9.	Mr. E. H. Scott, 3 Gladstone Villas, Wallingford	135
9.	Mr. A. Turner, Osier Cottages, Liss, near Petersfield	135
11.	Mr. W. Fortune, The Gardens, Rownham House, near Southampton	130
11.	Mr. J. Fudge, Horticultural School, Holmes Chapel	130
11.	Miss M. Hitchfield, Horticultural College, Swanley	130
11.	Mr. H. T. Marcham, Wood Street, Wallingford	130
11.	Mr. C. Rhymes, 28 Cottage Grove, Surbiton	130
16.	Mr. J. F. Sargeant, Horticultural College, Swanley	125
17.	Mr. J. Garner, Horticultural School, Holmes Chapel	120
17.	Miss E. McKinnell, Horticultural College, Swanley	120
17.	Mr. A. E. Say, Horticultural College, Swanley	120
20.	Mr. A. Atkins, Rose Cottage, High Street, Caterham	115
20.	Mrs. Chapman, 1 Leopold Road, Wimbledon	115
20.	Mr. C. New, 11 Blendworth Terrace, Ventnor, Isle of Wight	115
20.	Mr. W. T. Taylor, 114 Church Gate, Leicester	115
24.	Mr. J. H. Brand, Essendene Cottages, Caterham	110
24.	Mr. W. Felstead, 28 Abbey Lane, Belgrave, Leicester	110
24.	Miss L. Reading, County Technical Laboratory, Chelmsford	110
27.	Mr. A. Painton, Winterbrook, Wallingford	105
27.	Mr. H. Rhodes, Trafford Road, Leicester	105
27.	Mr. G. Astridge, Easton, Winchester	105
30.	Mr. R. Y. White, 67 Queen Street, Cheapside, E.C.	100

ROYAL HORTICULTURAL SOCIETY'S EXAMINATION IN HORTICULTURE.

APRIL 11, 1899.

Two and a half hours are allowed for this Paper, but Eight Questions only may be answered; four from Division A, and four from Division B.

Each Candidate must write his name and address very legibly on the first sheet of his answers, and must securely fasten all the sheets together in their right order.

DIVISION A.

ELEMENTARY PRINCIPLES.

1. Compare the structure of a Bean with that of an Onion Seed. How do they differ in germination? Describe the peculiar movements which germinating seeds exhibit.

2. What differences exist between the manner and places where rootlets arise from roots, and branches from stems? Of what use are branches, and what trees have none?

3. What hinders the proper functions of leaves, and what should a cultivator attend to, in order to enable them to exercise their complete action?

4. Give any instances of failures, and state your opinion as to their causes, in crossing distinct species. What are the general characteristics of hybrids?

5. What is meant by "fixing" a new race, and how is it to be effected, if possible?

6. Describe the flower of the Pea, of a Primrose, of a Salvia, and of any Orchid, and explain how they are adapted to insect pollination.

7. What are the injurious effects of (i) too much water; of (ii) too great a heat; and of (iii) excessive drought, upon plants?

8. To what natural orders do the following plants belong, and why—Clematis, Malope, Geum, Gunnera, Fuchsia, Scabiosa, Cobœa, Amaranthus, Ixia, and Ruscus?

DIVISION B.

Horticultural Practice.

9. What is generally understood in this country by an "American Garden"? Give the names of the most suitable plants for it, and the best kind of soil.

10. What is meant by a "Sub-Tropical Garden"? Describe the best position for such a Garden; also the most suitable plants, and how to cultivate them.

11. What is the right width for garden paths and carriage drives? Describe their formation, and the best materials to use.

12. Is it possible to obtain a supply of Roses all the year round from an English garden? Describe their propagation and culture under glass and in the open ground.

13. What are the most useful Fruit Trees* to grow under glass? Describe the best form of glass structure for the purpose, and the method of culture.

14. How would you proceed to obtain a succession of Garden Peas and Dwarf Kidney Beans? Can they be obtained all the year round? If so, how?

15. What plants are generally grown for Salads in British Gardens? How may a supply be obtained all the year round?

16. What is the best aspect for a Flower Garden? How would you proceed to lay it out and stock it?

* The word is intended to exclude Vines.

REPORT ON THE KEEPING QUALITIES OF ONIONS, 1899.

In Vol. XXII. page 228, a descriptive report of sixty-nine stocks of Onions—in each case Autumn and Spring sown—was given; to enhance the value of the report, the Fruit and Vegetable Committee wished the keeping qualities of each variety to be tested. The trial proved that all the Tripoli section were useless by the end of the year (1898). And also that in every case the transplanted Autumn-sown bulbs kept longer and were more shapely than the non-transplanted ones; and, further, that in every variety the transplanted Autumn-sown bulbs kept equally as long as the Spring-sown ones; and that the non-transplanted Autumn-sown bulbs were the first to sprout or rot. The dates given are those when the bulbs commenced to grow or decay.

Name of Variety.	Limit of Keeping.
A 1	May 19, 1899.
Ailsa Craig	March 15, 1899.
Alderton	February 27, 1899.
Anglo-Spanish	May 11, 1899.
Banbury Cross	March 18, 1899.
Bartella Silver Skin	December 13, 1898.
Bassano Red Tripoli	November 2, 1898.
Bedfordshire Champion	June 6, 1899.
Blood Red	June 6, 1899.
Cocoa-nut	February 27, 1899.
Cranston's Excelsior	February 27, 1899.
Crimson Globe	June 7, 1899.
Danvers Yellow	May 20, 1899.
Eclipse	May 17, 1899.
Forde Defiance	January 30, 1899.
Forde Long Keeping	June 5, 1899.
Giant Lemon Rocca	December 5, 1898.
Giant Rocca Brown	December 1, 1898.
Giant Rocca Tripoli	December 1, 1898.
Giant Zittau	May 25, 1899.
Globe Tripoli	December 27, 1898.
Golden Ball	May 25, 1899.
Golden Globe	May 19, 1899.
Golden Noble	February 14, 1899.
Improved White Globe	May 19, 1899.
Italian Tripoli	December 14, 1898.
Magnum Bonum	June 5, 1899.
Monarch	January 31, 1899.
New Globe Winter	May 19, 1899.
New Golden Globe	February 27, 1899.
Nort Pale Red	May 23, 1899.
Nuneham Park	May 11, 1899.

Name of Variety.	Limit of Keeping.
Prizetaker	February 2, 1899.
Prizewinner	May 17, 1899.
Rousham Park Hero	May 11, 1899.
Sandy Prize White Spanish	May 19, 1899.
Selected Red	January 18, 1899.
Southampton Champion	February 16, 1899.
Spanish Giant	January 18, 1899.
The Queen	December 14, 1898.
The Sutton Globe	June 6, 1899.
The Wildsmith Exhibition	March 7, 1899.
The Wroxton	June 6, 1899.
Trebons	March 7, 1899.
White Globe	May 19, 1899.
White Naples	December 6, 1898.
White Spanish or Port	May 13, 1899.
Yellow Globe	May 20, 1899.

NOTES.

I.

There are now growing at Chiswick plants of a very interesting Vine called 'Pearson's Ironclad,' which is said to resist the Phylloxera better than any other Grape known. Its history is worth recording:—An English gentleman named John Pearson went out from Chester to North America with William Penn, and named his first settlement 'Chester,' which is now a large city on the Delaware River. He afterwards moved on, and became the first settler at Darby, near Philadelphia, in Pennsylvania, where the family have now lived for more than 200 years. In 1872 Mr. Alexander W. Pearson, a descendant of John Pearson, began the regular cultivation of Grapes at Vineland, New Jersey; and a relative living at Darby sent him some cuttings of a Vine which had long been known there as the 'Ash' Grape, because it grew on the property of a Mrs. Ash, who was great-great-grandmother of Mr. Alex. W. Pearson. This Vine spread entirely over a huge forest tree, and was in great repute as being the only wild Vine in the neighbourhood of Darby which bore fruit of real value. It was, of course, well known to the early settlers, who all used to come to it for fruit, of which it was said to yield as much as two tons a year. Its trunk was almost 12 inches in diameter. Mr. A. W. Pearson grew the cuttings of this Vine when first sent to him at Vineland simply as a relic of his family's antiquity, and on account of its having been the first native Grape known to William Penn and his companions. As soon as it fruited he noticed that it was not a *Labrusca* (the common 'Fox Grape' of the American woods), but an *Æstivalis*, or possibly a hybrid between the two. It was of value for wine mainly on account of its flavour and its remarkable colour—a rich purple, so intense that the juice was often used as a substitute for ink, and letters written with it nearly twenty years ago are said to be as fresh now as if they had been written with ink yesterday. When, however, "grape rot" became epidemic in New Jersey, on all the varieties of the *Labrusca*, Mr. A. W. Pearson noticed that the 'Ash' Grape, as he still called it, was proof against the rot, although its leaves suffer from mildew in wet summers. Its fruit, however, never rots with that most dreaded disease in America, the fungus *Phoma uvicola*, which ruins the *Labrusca*, and it was for this reason that he re-named it 'Pearson's Ironclad,' and called public notice to its fungus-resisting qualities. Subsequently, when the Phylloxera invaded and ruined all the *Viniferas*, he observed that the 'Ironclad' was apparently untouched by it. This, however, was not quite the case, as further observation showed that the 'Ironclad' appeared to be the natural home of the Phylloxera, which would go to it in preference to any other Vine; but the strange thing is, they do not seem to hurt it, as it is so vigorous that it makes new roots as fast as the old ones become infested. It then occurred to Mr. Pearson that this 'Ironclad' might be found useful in Europe as a stock on which to graft the *Viniferas*, and

he accordingly sent cuttings of it to this country and to France. Mr. Pearson says that for making port wine this Grape is better than the Oporto Grape, being richer both in flavour and in colour. He writes:—"By fermenting its juice, mixed with an equal quantity of pure water, and adding three pounds of grape sugar to each gallon of liquid, I have made port wine better than any I have seen, which retailed in Philadelphia at $5 a gallon." The 'Ironclad' is being grown in all the State Experiment Stations in America, and one private Grape grower in California, having visited New Jersey on purpose to see the Vine, at once ordered 20,000 cuttings of it, thus practically showing his opinion of its value.

II.

H.M. Customs:
16*th March*, 1899.

Sir,—You are no doubt aware that the imports of raw fruit into the United Kingdom are rated by the bushel as the unit of quantity. It has been represented that this unit of quantity is indefinite and unsatisfactory, and that some other unit should be used. The descriptions of imported raw fruit are as follows:—

Apples . . .	Bushel.	Oranges . . .	Bushel.
Cherries . . .	,,	Pears . . .	,,
Grapes . . .	,,	Plums . . .	,,
Lemons . . .	,,	All other sorts* .	,,

In each case the bushel is supposed to represent a weight of 56 lbs., but perhaps a more definite unit of quantity could be used, and one more in unison with the daily transactions of the trade in raw fruit.

I should be greatly obliged if you would consider this question as to unit of quantity, for doubtless the Royal Horticultural Society, which exists for the encouragement of the Home Industry, is fully acquainted with the need of obtaining information of such a character that, while showing the volume of Foreign and Colonial competition, it also at the same time sets forth the opportunities of our own growers.

I am, Sir,
Your obedient servant,
A. W. Wood,
Deputy Principal.

The Secretary,
Royal Horticultural Society,
117 Victoria Street, S.W.

The Council of the Society sent the above letter on to the Fruit and Vegetable Committee, requesting their opinion.

The Committee, not wishing to debate so large a matter as a Committee, suggested that the Council should appoint a Sub-Committee of five to consider and report.

The Council therefore appointed Philip Crowley, Esq., F.L.S., Master of the Worshipful Company of Gardeners and Chairman of the Fruit and

* In this are included Currants, Gooseberries, Blackberries, Strawberries, Bananas.

Vegetable Committee; Mr. George Bunyard, V.M.H., of Maidstone; Mr. George Monro, V.M.H., of Covent Garden Market; Mr. W. Poupart, of Twickenham; and Mr. James Walker, of Ham. These gentlemen, having carefully considered the matter, sent the following Memorandum to the Fruit and Vegetable Committee, who unanimously adopted it, and sent it up to the Council, and the Council ordered it to be forwarded as the Society's reply to Her Majesty's Customs :—

Royal Horticultural Society,
117 Victoria Street, S.W.:
May 12, 1899.

Considering the fact that all fruits, and even varieties of the same fruit, differ very considerably in their weight per bushel, we consider the quotation of imported fruit by measure altogether misleading.

We are very strongly of opinion that all importations of fruit should be recorded by weight, and not by measure at all.

The best weight to use in this country is the ton of 2,240 lbs., not the cubic ton.

Philip Crowley.
James Walker.
W. Poupart.
George Monro.
George Bunyard.

III.

An excellent essay of ninety pages on the House Sparrow, by W. B. Tegetmeierby, F.Z.S., with an appendix by Miss Ormerod, has recently been published by Messrs. Vinton & Co., of New Bridge Street, E.C. The work is most thoroughly done, dealing with the natural history of the bird, citing countless opinions on its use or destructiveness, and suggesting various means of combating its phenomenal increase, which in many places is so great as to have become a veritable plague. Moreover, the type used in printing the essay is excellent.

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PART II.

ON THE IMPORTANCE OF LIGHT AND HEAT TO PLANTS.

Lecture at Chiswick Gardens.

By Rev. Prof. G. HENSLOW, M.A., V.M.H., &c.

[June 7, 1899.]

OBVIOUS EFFECTS OF LIGHT.—The most universally conspicuous effect of light upon ordinary flowering plants, ferns, &c., is the greening caused by it; for if light be excluded, blanching occurs, the plants being white or yellowish. All rays of the luminous portion of the solar spectrum will cause plants to be green, though not quite so strongly as when they are exposed to pure light. There is, however, an optimum amount of light for every plant. This is easily seen in the leaves of *Aucuba japonica*, which are of a deep green within the bush, but more or less spotted with yellow on the circumference. The yellow becomes more uniform on a very bright summer's day. Similarly young conifers turn to a yellowish green if the light be too great. When the difference is not visible to the naked eye, the spectroscope reveals it.*

FORMS OF LEAVES.—As a general rule broad leaves are exposed horizontally—*i.e.*, more or less at right angles to incident light; while narrow or linear leaves are approximately vertical. The foliage of our common timber trees, Oak, Elm, Lime, &c., illustrate the former; while herbs that naturally grow thickly together or tufted have erect leaves, as Grasses, Sedges, Pinks, Thrift, and certain species of genera, which differ from the rest in this particular, as *Ranunculus gramineus*, *Stellaria Holostea*, *Lathyrus Nissolia*, &c., which grow among Grass or other foliage, which necessitates an erect habit.

But the difference may occur on one and the same plant, the early-formed leaves being broad and horizontal, but those on the stem linear

* See Mr. Sorby's experiments alluded to in *Origin of Plant Structures*, p. 115.

and erect, as in *Campanula rotundifolia*, the common Harebell. Experiments have shown that if the plant be grown in semi-obscurity, the stem leaves will grow like the first formed, with broad blades and not linear—probably in consequence of growing less vertically.

Besides the obvious fact that these differences of form are correlated to the habits of growth respectively, Mr. Scott Elliot has proved experimentally that as a rule length increases in shade and moisture, so that the ratio of the length to the breadth is always less in exposed leaves than in shaded ones.* This appears to apply to naturally broad leaves. Similarly in monocotyledonous aquatic plants the submerged leaves growing erect, being supported by the water, are long and narrow, but as soon as they reach the surface, and either float upon it or are erected into the air, they acquire broad blades, as *Potamogeton heterophyllum*, *Sagittaria sagittifolia*, &c.

Light cannot be separated from heat in the rays of the sun which fall upon plants, and we find that a linear leaf-blade may be imitated by another structure also placed in a vertical position as a protection against injurious influences. Thus by suppressing the horizontal leaflets and developing the leaf-stalk into a phyllode, as in Australian Acacias, the end is gained of guarding against injury by radiation. In Gum trees this is done by clothing the tree with scimitar-shaped leaves, which hang vertically. In some cases the leaves are all suppressed, while the stem itself acquires green wing-like appendages, which answer all the purposes of leaves, but are, of course, vertical.

Effects of Light on Flowers.—A very obvious and often noticed difference exists between the bright colours of flowers of Alpine and Arctic regions and those of lower latitudes and altitudes. This is due to the extreme brilliancy and continuance of the light and clearness of the atmosphere in those regions, as has been proved by experiment. For when plants were transferred to them from, say, the neighbourhood of Paris, their flowers acquired a similar brightness when they were grown with the native floras.

Conversely in this country the colours of many flowers, especially crimsons, were much altered to paler hues in the too intense heat of the late dry seasons, showing that there is probably an optimum for every kind of flower.

The fact that the common pink Lilac, when forced, is white-flowered, while a purple Hyacinth allowed to blossom in total darkness may be still purple, results from the fact that while the latter is well provided with properly organised food, upon which the colouring matter of the flowering depends, the Lilac has not been provided with it, or at least sufficiently so.

Buds on Roots.—Roots, as a rule, do not produce leaf-buds, but when they become exposed to light they are much more inclined to develop them, as may be seen in any hedgerow where Elm roots are exposed. The ordinary behaviour of roots is to grow towards the darker side and avoid the light, as in Ivy growing against a wall. A curious instance of want of light is the production of tubers. Thus a Potato, if it

* "The Effect of Exposure on the Relative Length and Breadth of Leaves," *Journ. Linn. Soc.*, xxviii. 1891, p. 375; see *Origin of Plant Structures*, p. 239.

happen to have grown in a dark cellar, may send out shoots covered with small tubers. Such are occasionally found on the aërial branches of overcrowded plants, and they have been artificially produced by placing growing leafy shoots in darkness. Similarly *Ranunculus Ficaria*, the lesser Celandine, when growing in damp, very shady places, bears no flowers, but axillary corms instead.

Anatomical Structure of Leaves.—This varies immensely under the influence of light. Leaves that are horizontally situated are said to be "dorsi-ventrally" constructed, the back (under side) and front (upper side) being very differently composed. Thus on the upper side the cuticle is thicker, and there are often no stomata; while beneath it has one to four or more rows of oblong, vertical, compacted, the so-called pallisade cells; whereas on the under side this is replaced by loose tissue full of air-spaces, with a thinner cuticle and numerous stomata.

In erect, narrow leaves, more or less equally illuminated, both sides become more nearly alike. Peculiar lozenge-shaped cells of the epidermis of a Grass are exactly imitated in a Liliaceous plant, *Pasitheca*; while internal peculiarities of a grass-blade occur also in a Pink; and Thrift imitates Barley.*

Now these imitative microscopical structures are evidently the result of the leaves growing in precisely the same manner; and since modifications can be traced in accordance with various degrees of illumination, it is safe to deduce the law that such structures are the direct outcome of the plant's responsiveness to light.

The Functions of Leaves.—The two great uses of all green structures are to elaborate the carbonic acid gas of the atmosphere into organised substances, and to transpire water. These are called assimilation and transpiration, and they can only be done by means of the rays of light. As light, however, is composed of many rays, and the solar spectrum embraces many others which do not afford light to our eyes, the question arises as to which of the rays are most efficient in the execution of these functions. Numerous experiments have been made by growing plants under coloured glasses or behind coloured fluids, or even in the different bands of the spectrum itself.

The results of the writer's experiments upon assimilation have already appeared in this Journal,† and I would only repeat the fact that red, green, and violet glasses give "minima," the green only feebly, while for transpiration these three colours give "maxima"; in other words, while more moisture is transpired with red and violet light, more organic matter is stored up under yellow, blue, and especially clear, white light.

* For other details the reader is referred to *Origin of Plant Structures*, p. 238.

† Vol. xvi. 1893, p. 59. For the writer's experiments on transpiration see *Journ. Linn. Soc.*, Botany, vol. xxii. p. 81, and vol. xxiv. p. 286.

ROCK-GARDENS, PONDS, AND STREAMLETS IN OUR PLEASURE-GROUNDS.

By Mr. F. W. Meyer.

[Read June 13, 1899.]

Introduction.—Among scenes of natural beauty there are, perhaps, none more attractive than those of the mountains, or at least such parts of the mountains as consist not merely of bleak and barren waste, but which are composed of the most essential constituents of all picturesque scenery, viz., rocks, vegetation, and water in various forms and combinations.

No traveller to Switzerland would fail to become deeply impressed with the glorious pictures unfolded to his gaze. It is the combination of sublime grandeur with delightful charms that fascinates us and draws us again and again to such scenes of beauty, which hold us spell-bound in admiration.

It is no wonder, therefore, that we should make an attempt at least to introduce into our own gardens that which we appreciate in nature, and, as a consequence, rock-gardens in our pleasure-grounds are deservedly becoming more popular every day.

It is true we cannot transfer to our gardens that majestic grandeur which fascinates us when we visit the mountains, but many of Nature's most pleasing scenes may nevertheless not only be introduced successfully, but might be permanently adorned with a wealth of lovely flowers selected from the gems of the mountain flora, not only of one particular locality, but practically of all parts of the world. In fact, such are the capabilities of the much abused British climate that some kinds of Alpine plants will thrive in this country even better than in their native home.

One of the chief advantages of a well arranged rock-garden is that by a careful selection of the plants used it can be made a most interesting feature of our pleasure-grounds almost all the year round.

On the other hand, it must be confessed that few things look more repulsive than a rockery which has not been arranged with due regard to effect.

Unfortunately we still find only too often so-called rockeries consisting merely of a heap of soil on the top of which stones have been stuck endways, and on which none but the coarsest and roughest plants could possibly thrive.

Another frequent fault even of better rockworks is that the latter are often too massive, and not sufficiently broken up.

Sometimes elaborate pains are taken to imitate natural strata by piling flat stones on each other in a more or less horizontal position and connecting them by cement throughout the work.

This kind of arrangement becomes very monotonous, and is, moreover, not suited to most of the choice alpines. It may be argued that such

parallel strata—if found in the natural rocks whence the stones were obtained—should also occur throughout the artificial work; but wherever this idea is carried out the result is a failure from a picturesque as well as from a practical point of view, even if the rocks so constructed do have a resemblance to natural rocks.

What we admire most in nature are not the regular sedimentary layers, such as we find in a quarry pit, but rather such rocks as bear unmistakable evidence of having, at some period or other, passed through violent convulsions, and were, perhaps, cleft asunder and traversed by a deep chasm or ravine through which a streamlet found its way, now tumbling merrily over rocks and boulders, now meandering through green sward bedecked with flowers, and broken here and there by other rocks, which pierce the surface, and at one moment are high above the general level, and in another dip down far below the sward and are lost to view. Not only are such rocks infinitely more picturesque than a less broken and varied surface, but they also are far better adapted for choice alpines, owing to the fact that these natural projections and recesses afford in most cases precisely the conditions the plants require.

Whether a rock-garden should be large or small must always depend on circumstances; but whether it be of the most extensive or of the most modest proportions a natural appearance is absolutely indispensable.

Unfortunately it is not always easy to effect this natural appearance, as work of this kind requires a special study of the rocks of nature, especially that of natural rocks in their simplest form cropping up from the ground.

Having been asked to give a paper on this subject I have great pleasure in doing so. I do not by any means profess to have mastered the art of rock-building, but having been for nearly a quarter of a century landscape gardener to Messrs. Robert Veitch & Son, at Exeter, and having in that capacity designed and constructed a very large number of rock-gardens of all sizes and under the most varying conditions, I can at least lay claim to practical experience, an account of which may possibly be of service to others, and prevent them from making mistakes, which I must confess to having frequently committed myself in my earlier works.

With this object in view I will now venture to briefly explain my own method of arranging rock-gardens.

Choosing a Site is not always quite as easy as it seems. The best is undoubtedly an uneven surface, away from large trees, and, in the case of large gardens, not too near the house, because here the wild character of rock scenery would be incongruous and not in harmony with the necessarily geometrical surroundings. Sometimes, however, it may happen that the house abuts against a hill or that there is an undulating slope or some other irregular feature, in which case it would be quite in keeping to have groups of rock apparently breaking through the sward here and there.

It is still often supposed that any odd and useless corner even under trees is quite good enough for a rockwork. But unless the adornment of

rocks in such a place is confined almost entirely to those few species of ferns and other plants (mostly of the rougher class) which will exist under the named conditions, a site of this kind should be avoided.

The better class of mountain plants require an abundance of light; and though bamboos and trees or shrubs at a considerable distance may be a help in forming an admirable background, the site for our rock-garden should be neither obstructed by them, nor should it be within reach of their roots. If it cannot be avoided to have large trees, especially Elm trees, within such a distance as to cause apprehensions lest their roots might eventually reach the site selected, such roots can often be rendered harmless by an underground wall of concrete, which would make their encroachment impossible.

Preparatory Work will always be necessary to produce that unevenness of surface without which the imparting of a bold character is impossible. But even on a perfectly level site it can generally be so arranged that, where soil is excavated to produce depressions, the material thus gained may be utilised close by for filling up the portions for which a higher level is desired.

Where the surface is naturally undulating, it will often be found just as well to take advantage of what nature has done already, and, instead of filling up a depression in the ground or levelling down a hillock, it will often be found much more advantageous to make the hill still higher and the valley still deeper, and thus emphasise them both.

When ground is excavated it should always be sunk to a level lower than is actually required to allow for a sufficient supply of good soil to go back. But where elevations are to be made it would be a mistake to raise the ground to anything approaching the intended height during the preparatory stage.

I have always found it a far better plan to commence the elevations with the stones and not with the soil, which latter should be filled in behind the stones as the work proceeds. It will be a great saving of labour (especially if the rock-garden is to be on a large scale) to postpone at least some of the preparatory excavations till the work of rock-building actually commences, when the excavated soil can be filled in behind the stones as required without having to be moved twice. But where this would be inconvenient, good soil and inferior soil should at any rate be kept apart, and stored till required at some convenient spot close to the work. For ponds and streamlets special preparations are required, with which I will deal later on.

That the preparatory work must include proper drainage goes without saying.

What Stone to Use is a question of no little importance, for on this much of the success of the work must naturally depend. If a stone quarry is near at hand, it will in most cases be found preferable to use the material which is easiest to be obtained, unless this should be of a nature quite unsuitable.

But when a choice of several kinds of stone can be had I should certainly give preference to pieces showing an old weather-beaten surface, toned down by long exposure, and perhaps even covered with moss and lichens.

Stones of a glaring light colour should be avoided, and on no account should pieces be used which are covered with glassy crystals. Stones of the latter class may be pretty to look at individually, but, for being combined together to form picturesque effects in a rock-garden, they are utterly unsuited and give the work a downright vulgar appearance. The beauty of a rock-garden should depend on its natural arrangement generally, and not on individual stones.

For constructing rocks, true to nature at least, a little geological knowledge is indispensable. Geologists divide all rocks into two great classes, namely, the unstratified, or igneous, and the stratified, or sedimentary.

To the first-mentioned group belong the plutonic rocks, which through heat have been upheaved from the interior of the earth, such as granite or porphyry, and the volcanic rocks, like trap, greenstone, or basalt, which are the direct result of volcanic forces, and consist almost entirely of lava.

The second class, namely, the stratified or sedimentary rocks, were formed under water, and include different kinds of limestone, slate, oolite, sandstone, flint, chalk, &c.

Allied to these are metamorphic rocks, which were crystallised through contact with heated rocks of the plutonic class.

In constructing a rock-garden stratified and unstratified rocks should never be arranged in the same way, least of all when the work is on a large scale. If the stones at disposal are of the igneous kind it will be found advisable to select as many different shapes and sizes as possible; but if they belong to the sedimentary class flat stones and long narrow stones of all sizes should have the preference.

For small rockworks stones varying in weight, say from ½ cwt. to 15 cwt., will probably be found large enough to manage; but when the work is on a larger scale, and facilities exist for using proper appliances for lifting, some pieces weighing even several tons may be used with advantage; but in any case let us have as much variety as possible.

The General Arrangement of a rock-garden is naturally of the utmost importance. Not only is this almost entirely a matter of taste for which hard-and-fast rules are out of the question, but in addition to this difficulty, if such it can be called, there are generally a host of other things to be considered, such as the purse of the owner, the climate, the amount of care required in looking after the rock-garden after its completion, the size of the work, the material at disposal, and several other items.

After due consideration of all these points the work is best commenced by marking it out in the ordinary way with pegs. If a pond or streamlet be contemplated this should be marked out first, as the soil gained through its excavation would probably be required in the higher parts of the work, which should also be at least roughly marked out. In order to judge of the various effects in planning the work I have always found it a good plan to let several workmen hold up at the same time pieces of wood or other materials at the different heights and angles, which the various groups of rock would eventually occupy, so as to have at least an approximate idea before starting of the ultimate effects.

No doubt slight alterations and probably further improvements may

suggest themselves as the work proceeds, but the principal effects should not only be planned beforehand, but it will also be found advantageous to at least roughly construct the parts intended for special effects at the beginning of the work and fill in the details afterwards, much in the same way as an artist would proceed to paint a picture of a landscape.

No plan can be worse than commencing to fix stones at one end and continuing to do so bit by bit in succession, till either the other end of the site is reached or the material at command is used up.

Such continuous pieces of rockwork will always look more or less like a procession of stones, and can (in my humble opinion) never become things of beauty.

No matter how large or how small the work is to be, it should never look like a collection of single stones, which is unavoidable if, as is so often done, the latter are placed at more or less regular intervals. If, on the other hand, the stones are combined together to form apparently groups of real rocks of various sizes, then the stones themselves will entirely lose their individuality, and this is as it should be. Even in the case of a single stone a great change might apparently be effected.

Let us place, for instance, a stone of any size we like on a piece of green sward. It will look, what it is, a single stone, because we can plainly see the bottom edge. Now let us sink the same stone a few inches into the ground, and let us raise the turf a little so as to form a kind of undulating slope around it. What a transformation! It looks like a stone no longer, but has assumed the appearance of the summit of a rock which has been upheaved from below till it pierced the surface, and might, for all the uninitiated would know, be continued underground for miles.

Now let us place at some distance from this stone, not another single stone, but a group of ten, of fifty, or of a hundred stones, either joining each other, or connected apparently, by filling the interstices, not with cement or mortar, but with suitable plants. Let us fill the interior of the block thus formed with soil and stones, covering them with more plants. Let us further hide the bottom edges of all visible stones either by raising the turf around them, or by surrounding the base with a dense carpet of plants. Let us do all this with care, and the result will be almost magical in its effect. The stones will look like stones no longer, but will appear consolidated into a large block of real rock connected underground with the single stone previously referred to. Thus not stones, but apparently groups of rock, should form our rock-garden.

These groups should, of course, vary in their shapes and sizes and in their respective distances from each other, being separated now by grassy banks, now by naturally grouped colonies of plants, by rocky steps, or by a chasm, a cave, a pond, a streamlet, a piece of level sward, or any other apparently natural cause; but they should never form an unbroken mass, not even in the smallest rockwork.

In the case of igneous or unstratified rocks these groups should be as scattered and as varied as possible; but in the case of stratified rocks the sedimentary character should be plainly visible in each group; and this can be done without actually placing the stones on each other, to the detriment of plant-growing.

I often find it a much better plan, especially in the case of choice Alpine plants, to form more or less narrow vertical crevices, but keeping the tops of the stones so as to form irregular little terraces, appearing like strata.

Neither is it necessary to take such elaborate pains to have the strata throughout the work running at the same angle.

On the contrary I consider it a mistake to do so, and for the sake of greater variety prefer to have such groups of rock as are distinctly separated from each other, showing the strata at a different angle from the adjoining group—which would suggest that the separation and the scattering of the rocks was the result of volcanic action or other violent forces. Since in nature such scattered groups are not only found in abundance, but constitute the most picturesque scenery, we need have no hesitation in adapting this principle.

The Planting of a Rock-garden can only briefly be mentioned here; but a full list of plants for various purposes and for different situations will be published in due course as an appendix to this paper. I will therefore mention only a few facts in connection with plants and their requirements in the rock-garden. It is, I think, a great mistake to let one man erect the rocks and to let another man plant them when the stone-work is finished. Whoever designed or superintended the stone-work should also be responsible for the planting; otherwise intended effects may easily be lost; for two men, however good they may be, can never have precisely the same ideas.

A good plan is to plant some of the depressions and recesses with very dwarf stuff only, so as to emphasise the more prominent portions, which latter should be planted with taller things. But if planted by a novice the reverse would probably be done, and instead of the intended effect being emphasised it would be utterly lost. Then, again, during the construction of the rocks an expert will prepare the soil according to the special nature and requirements of the plants he intends to use, and of whose effects he is able to judge beforehand. The choicer kinds of Alpine plants, for instance, require in most cases rock specially suited to them, such as narrow crevices filled partly with pieces of broken lime-stone, or (in the case of lime haters) with granite or sandstone mixed with the soil. These plants demand moreover greater watchfulness against the ravages of slugs and other unwelcome intruders, and it is best, therefore, to devote certain groups of rocks entirely to these mountain gems, planting the latter, not singly, but in groups or masses and choosing for their companions such as would either harmonise with them in colour, or would flower at a different season, and thus ensure succession of bloom.

But above all things the small and slow growing plants should be associated with such companions as would grow about at the same rate without the danger of overcrowding and killing each other.

In the same manner we may have rocky groups for plants of quicker growth, for ferns, for rock-scrubs, &c., but in planting we must always look ahead and allow for the full development of the plants rather than be misled by immediate effect.

Vertical or abruptly sloping fissures between the stones are, as a

general rule, not utilised at all, but are filled up with cement or mortar. This I consider a great mistake. Besides being unsightly, the cement often cracks and forms a harbour for vermin, while we have many hundreds of varieties of lovely plants to choose from, which would delight in just such a position, as, for instance, most Androsaces and Saxifrages, and especially all plants with their leaves arranged in the form of rosettes like Sempervivum, Ramondia, and a host of others. As a rule these vertical fissures are best planted during the progress of the work, as some of them would be more difficult to get at afterwards.

The roots of such plants, instead of being in the usual more or less vertical position, would be in this case almost horizontal, and by means of small stones and soil the plants would have to be wedged in sideways in such a way that no water can rest in the centre of the rosettes of leaves.

Where plants which develop large roots are used care must be taken that the earth among the rocks communicates with the general soil, so as to allow the roots to penetrate to a substratum of good earth, as otherwise the rocks might be forced apart by the development of the roots.

Planting the surroundings of the rock-garden requires almost as much care as the planting of the rock-garden itself, if we wish to ensure that picturesque effect without which the work can never appear natural.

Single specimens, too, judiciously placed will do much to enhance the character of the work, and might occur, not only here and there among the rocks, but also on the green sward between and around the groups of rocks and plants. But always will it be necessary to look ahead and to have due regard to the future proportions of the plants chosen.

Water in the Rock-garden is indeed a most desirable feature from every point of view.

It must not be supposed that a rock-garden could not be beautiful without it; but water gives life to the scene, and, with the exception of a stagnant pool, it is most acceptable in any form, whether it be a natural brook meandering through ground bedecked with flowers, or a murmuring spring, a streamlet, a bog-bed, a rushing torrent leaping from rock to rock in a series of waterfalls, or a pond partly filled with choice Water-lilies and adorned on its banks with plants from the riverside.

Even when water is introduced artificially, and has to be laid on in pipes, the rock-garden offers probably a much better chance of making the most of it than any other part of the garden, as even a small supply can be made to do duty in quite a variety of different forms.

In the case of a natural streamlet little need be said except that its banks should be judiciously adorned with suitable plants, of which a list will be appended.

But in the great majority of cases water, if it can be had at all, is laid on artificially, and it is this form which I will briefly consider.

There is one advantage in water thus introduced, and that is it is under our absolute control, and we can shape its course where and how we like; whilst a natural stream traversing the ground remains in most cases master of the situation, and its original level or course can seldom be altered without considerable trouble.

The most pleasing form of water in a rock-garden is, I think, a spring emerging apparently from a cleft among the rocks and then winding its way through the rock-garden as a murmuring streamlet, forming a waterfall or two in its course and then flowing more lazily and broadening out into an irregular pond, the overflow of which might supply a bog-bed or two, or emerge again from the pond as a rippling brooklet, which is finally lost to view beneath a rock.

All this, and more, might be done with only a comparatively small supply of water, and if well done there should be no visible trace of any artificial work, but the whole should look like the work of Nature.

To accomplish this result we must learn a few lessons from Nature before we attempt to imitate her.

In arranging for a waterfall, for instance, there is a strong temptation (if the water is introduced by a pipe) to place this as high as possible, sometimes even in the highest part of the rockwork. This is wrong. Unless we can see beyond the waterfall still higher ground which apparently supplied its source, such a fall will look unnatural, and therefore ugly. In the case of a streamlet the flowing water, which meets with an obstacle, say a rock, will be diverted at an angle, and, if the ground be soft, a hollow place will be washed out on the opposite bank. Hence the curves of our artificial streamlet must be arranged accordingly, and where a convex line occurs on one side the shore should be concave on the other, and *vice versa*.

As ponds are in most cases simply broadened streamlets this rule applies to them also.

In planting the sides of a pond the most natural result will be obtained by planting thickly the portions which project into the water and leaving the concave parts comparatively bare. This will also have the effect of obscuring some parts of the pond from view when seen from any particular point, with the result that the pond will appear larger than it really is on account of the artificial perspective thus created.

For securing the sides and bottom of ponds and streamlets there is no better material than cement-concrete. But this must be entirely hidden from view, namely, on the bottom by river-gravel and pebbles of all sizes, and on the sides by rocks and grassy banks. The latter should dip at least 6 inches below the surface of the water, as otherwise the ripple of waves, however small, would undermine them.

The roots of Iris, Spiræas, Astilbe, and other waterside plants planted into such banks would have free access to the water, and would soon feel at home.

For Nymphæas and other aquatics I find the best way of preparing a home for them is to build up with loose stones various compartments and filling them with soil till a depth of 15 inches or so below the water-level is reached. Or in the case of large ponds the Water-lilies can be sunk in baskets to the same level.

Artificial bog-beds, which might, as already indicated, be fed by the overflow of the pond, are also best secured by cement-concrete, and so arranged that supply and drainage can be regulated. Since the whole of the cement work would be covered with soil, &c., its ugliness does not matter.

I regret that time and space forbid my going more fully into this subject, which I love so well; and I am afraid that I have disappointed those who expected new theories on rock-building. But I nevertheless venture to hope that my few hints, which are based on the study of nature and on practical experience alone, may at least not be altogether unwelcome to those about to embellish their gardens by the addition of a rock-garden, pond, or streamlet.

APPENDIX.

The Plants suitable for the rock-garden, ponds, and banks of streamlets are numerous indeed: a mere list of them alone would fill a large book. I can make no attempt, therefore, to give anything like a complete list, but I will, under various headings, give the names of at least a few as indicating the type of plants which from experience I consider worth recommending for various positions. For easier reference I have divided most of the plants into two groups, namely, for sunny or slightly shaded positions and for more or less shady positions. It is of course impossible to draw a hard-and-fast line between these two groups, and some of the plants enumerated under the shady section will be found almost equally as suitable for sunny positions, and *vice versa*. The distinction made must therefore be considered a rough guide only.

List No. 1.

Small Plants for vertical or abruptly sloping fissures, suitable for being associated together in the most select part of the rock-garden, where they might be planted sideways, *i.e.*, with their roots in a more or less horizontal position, as previously described.

A.	B.
Choice Plants requiring a sunny position:	Plants suitable for the shady side of rocks (not shaded by trees):
Androsace cylindrica	Androsace Laggeri
,, helvetica	,, ciliata
,, pubescens	,, Chamæjasme
,, sarmentosa	,, Vitaliana
,, lanuginosa	Draba bruniæfolia
,, ,, Leichtlini	Haberlea rhodopensis
,, arachnoidea	Linnæa borealis
,, Chumbyi	Primula Allionii
Cerastium lanatum villosum	,, Clusiana
Dianthus cæsius	,, denticulata
Edraianthus dalmaticus	,, glutinosa
,, Pumilo	,, marginata
,, serpyllifolius	,, minima
Erigeron trifidus	Ramondia pyrenaica
,, Trimorphæa	,, serbica
Eritrichium nanum	Saxifraga juniperifolia
Geranium argenteum	,, sancta
Petrocallis pyrenaica	,, aspera

List No. 1—*continued.*

A.

Saxifraga longifolia
,, aretioides
,, Burseriana
,, paradoxa
,, valdensis
,, lantoscana superba
,, calyciflora
,, longifolia hybrida
,, Frederici Augusti
,, scardica
,, apiculata
Sedum latinervum
,, dasyphyllum
Sempervivum arachnoideum
,, ,, Laggeri
,, triste
,, Pomeli
,, pumilum
,, globiferum
Umbilicus chrysanthus
,, spinosus

B.

Saxifraga oppositifolia
,, ,, alba
,, ,, var. pyrenaica superba
Silene acaulis

List No. 2.

Choice Small Plants for more or less level ground, or for little plateaux in the select part of the rock-garden, where narrow fissures filled with suitable soil and broken stone should be prepared for them below the surface of the ground.

A.

Choice Plants for sunny positions:

Æthionema diastrophis
,, coridifolium
Acantholimon venustum
,, glumaceum
Anthemis Aizoon
Antirrhinum glutinosum
Asperula Athoa
,, nitida
Calandrinia Tweedii
Campanula Allionii
,, alpina
,, nitida
,, ,, alba
,, pulla
,, Rainerii
,, ,, hybrida
,, Waldsteiniana

B.

Choice Plants for partly shaded positions:

Androsace glacialis
,, carnea
,, Wulfeniana
Cyclamen in great variety
Gentiana bavarica
Houstonia cærulea
,, serpyllifolia
Myosotis cæspitosa
,, Rehsteineri
Morisia hypogæa
Campanula cenisia
Primula Sieboldi in var.
,, Auricula
,, Allionii
,, Balbisii
,, farinosa
,, nivalis

List No. 2—*continued.*

A.

Campanula G. F. Wilson
„ turbinata and var.
„ Zoysii
Dianthus alpinus
„ callizonus
„ glacialis
„ neglectus
Erigeron compositus
„ leiomerus
Epilobium obcordatum
Draba aizoides
„ Mawii
„ tridentata
Gentiana brachyphylla
„ verna
„ Clusii
„ septemfida
„ acaulis cœlestina
„ Cruciata
„ angustifolia
Globularia nana
Leontopodium alpinum
„ himalayanum
Lewisia rediviva
Lithospermum petræum
Opuntia rhodantha
„ xanthostema
Cereus phœniceus
Potentilla nitida
„ „ atrorubens
Romanzoffia sitchensis
Saxifraga retusa
„ Boydi alba

B.

Primula Poissoni
„ imperialis
Polygala Chamæbuxus
„ „ purpurea
Rhododendron Chamæcistus
Pyrola rotundifolia
Ranunculus alpestris
„ Seguieri
„ glacialis
„ parnassifolius
Saxifraga Hirculus
Shortia galacifolia
Soldanella in variety

List No. 3.

Neat Carpets, or plants which grow only a few inches in height, and may be associated together for carpeting either level or sloping places in the rock-garden, where they will succeed in ordinary well-drained soil, which has received an admixture of broken stones.

A.

Neat Carpeting Plants for sunny positions :

Antennaria dioica
„ tomentosa
Acæna Buchanani
„ microphylla

B.

Neat Carpeting Plants for positions more or less shaded by stones :

Arenaria balearica
„ cæspitosa
Alsine verna fl. pl.
Erodium Reichardi

List No. 3—*continued.*

A.

Achillea rupestris
Alyssum montanum
„ spinosum
„ argenteum
Astragalus hypoglottis albus
Alsine pinifolia
Campanula cæspitosa
„ pusilla
„ pumila
„ Portenschlagiana
„ turbinata
„ pelviformis
Cardamine trifoliolata
Convolvolus lineatus
Coronilla iberica
Erinus alpinus
Gentiana acaulis
Gypsophila cerastioides
„ repens
Hutchinsia alpina
Linaria alpina
Lithospermum prostratum
Phlox subulata
„ „ Aldboroughensis
„ divaricata
„ Nelsoni and others
Pterocephalus Parnassi
Sedum corsicum
Sempervivum californicum
Thymus Serpyllum albus
„ azureus
„ lanuginosus
Veronica alpina
„ corymbosa
„ rupestris
„ prostrata

B.

Gaultheria nummularioides
„ procumbens
Frankenia lævis
Herniaria glabra
Mazus Pumilio
Mitchella repens
Linaria Cavanillesii
Lobelia littoralis
Saxifraga hypnoides atropurpurea
Nepeta Glechoma
Saxifraga adscendens
„ gemmifera
„ Sternbergii
„ Rhei
Salix retusa
Azalea procumbens
Linnæa borealis
Cotula squalida
Veronica herbacea
„ Allionii

List No. 4.

Large Carpets, or dwarf plants of somewhat rapid growth for planting in bold masses for effective bright colours. Those plants will grow in almost any kind of ordinary soil, but should not be put too close to the smaller mountain plants of slower growth, which they would speedily overrun. They will be found most useful for carpeting the ground between tall specimens of plants.

List No. 4—*continued.*

A.

Plants for large carpets in sunny positions:

Acæna argentea
Achillea tomentosa
Alyssum saxatile
Sedum album
,, Anacampseros
Anemone alpina
,, Pulsatilla
Arenaria grandiflora
,, montana
Armeria maritima, var. Veitchi
,, ,, alba
Aster alpinus superbus
Arabis albida
Aubrietia Leichtlini
,, Hendersoni
,, violacea
,, Eyrei & many other var.
Campanula carpatica
,, Portenschlagiana major
Cerastium tomentosum
,, alpinum
Cheiranthus alpinus
Corydalis lutea
,, ochroleuca
,, cava
Dianthus alpestris
,, plumarius
,, arenarius
Erigeron mucronatus
Erysimum pumilum
Iberis corifolia
,, sempervirens
,, semperflorens
,, gibraltarica
Dryas Drummondii
,, octopetala
Helianthemum all varieties
Mesembryanthemum uncinatum
Papaver nudicaule
,, alpinum
Platycodon grandiflorum Mariesii
Plumbago Larpentæ
Scutellaria alpina
Prunella grandiflora
Sedum Ewersii
,, ,, turkestanicum

B.

Plants for large carpets in more or less shady positions:

Anemone sylvestris, fl. pl.
,, apennina
,, blanda
,, nemorosa Robinsoniana
Hepatica triloba
,, angulosa
Epimedium pinnatum
,, macranthum
,, roseum
,, versicolor
Helleborus niger and many sub-varieties
Ompholodes verna
Primula acaulis and many other sorts
Pulmonaria officinalis
Tiarella cordifolia
Trillium grandiflorum
Saxifraga Huetti
,, furcata
,, pentadactylis
,, trifurcata
,, muscoides
,, Wallacei and many other kinds, especially the mossy section, &c.

List No. 5.

Medium-sized Rock-plants, which will thrive in almost any soil, and vary in size from about 9 or 10 inches to 18 or 24 inches.

A.

Medium-sized plants for sunny position:

Achillea Clavennæ
Ethionema grandiflorum
Carlina acaulis
,, acanthifolia
Erodium cheilanthifolium
Euphorbia pilosa
Heuchera sanguinea
,, ,, grandiflora
,, alba
Francoa appendiculata
Dianthus Atkinsoni
Fuchsia macrostema pumila
Polemonium humile
Opuntia arborescens
,, camanchica major
,, missouriensis
,, spirocentra
Hieracium villosum
Saxifraga pyramidalis
Scilla peruviana
Sedum Middendorffianum
Statice elata
,, bellidifolia
,, spathulata
Waldsteinia fragarioides
,, trifolia
Zauschneria californica
Camassia esculenta
Dianthus Napoleon III.
Geum montanum
,, miniatum
Lithospermum Gastoni
Ononis rotundifolia
,, fruticosa

B.

Medium-sized plants for partly shaded positions:

Adonis vernalis
,, pyrenaica
Anthericum Liliago
,, Liliastrum
Aquilegia glandulosa
,, Stuartii
Arnebia echioides
Campanula glomerata dahurica
,, Hendersoni
,, Burghalti
,, Van Houttei
Delphinium cardinale
Geranium cinereum
Iris, many varieties
Lychnis fulgens
Polemonium reptans
Sanguinaria canadensis
Saxifraga Stracheyi
Sisyrinchium striatum
Wulfenia carinthiaca

C.

Medium-sized plants for shaded positions:

Hormium pyrenaicum
Hypericum Moserianum
,, olympicum
Bergenia cordifolia
,, purpurea
Mertensia virginica
Spigelia marilandica
Gentiana asclepiadea
Primula japonica
,, sikkimensis
Saxifraga Fortunei
Spiræa Filipendula
,, astilboides
Anemone japonica and varieties

List No. 6.

Dwarf Kinds of Rock Shrubs suitable for the rock-garden. These might be arranged partly in groups or colonies, and partly scattered as single specimens for prominent points, &c.

A.

Dwarf shrubs for sunny or only slightly shaded positions:

Betula nana
Calluna vulgaris and varieties
„ argentea
„ aurea
„ pumila
Cytisus Weldeni
Erica carnea
„ „ alba
„ herbacea
„ ciliaris
„ vagans
Genista germanica
„ humifusa
„ præcox
„ tinctoria
Indigofera Dosua
Juniperus nana
Hedysarum multijugum
Juniperus Sabina
„ tamariscifolia
Menziesia empetriformis
„ polifolia
Philadelphus microphyllus
Rhododendron ferrugineum
„ hirsutum
Rubus deliciosus
Spiræa crispifolia (bullata)
Pinus Pumilio
Smilax aspera
Veronica pinguifolia
„ buxifolia
„ carnosula
„ Colensoi
„ cupressoides
„ salicornioides

B.

Dwarf shrubs for more or less shady positions:

Arctostaphylos Uva ursæ
Azalea amœna
Daphne Blagayana
„ Cneorum
„ Genkwa
„ neapolitana
„ Fioniana
Empetrum nigrum
Gaultheria procumbens
Hedera conglomerata
Hydrangea stellata
Leiophyllum buxifolium
Skimmia japonica
„ oblata
Vaccinium Vitis Idæe minus

List No. 7.

Small Ferns, which will succeed in only slightly shaded and often even in sunny positions:

Asplenium adiantum nigrum, Asplenium fontanum, A. germanicum,

A. lanceolatum, A. maritimum, A. ruta muraria, A. Trichomanes, A. T. cristatum, Ceterach officinarum, Cystopteris fragilis, C. obtusa, C. montana, C. regia, Polypodium vulgare, P. Robertianum, Woodsia alpina (hyperborea), W. glabella.

List No. 8.

Small Ferns for Shady Nooks.—Adiantum Capillus Veneris, Allosurus crispus, Athyrium Filix fœmina apicale, A. F. J. crispum, A. F. J. Friselliæ, A. F. J. cristatum, A. F. J. multifidum, A. F. J. ramo-cristatum, Blechnum Spicant, B. s. apiculatum, B. s. serratum, Hymenophyllum tunbridgense, H. Wilsoni, Lomaria alpina, Polypodium Dryopteris, P. cambricum, P. vulgare cornubiense Whytei, P. v. elegantissimum, P. v. trichomanoides, Polystichum, among others the varieties: angulare parvissimum, Lonchitis, munitum, imbricans, Scolopendrium vulgare capitatum, S. conglomeratum, S. cristatum, S. fissum, S. marginatum, S. grandiceps, S. muricatum, S. multifidum, S. sagitto-cristatum, Selaginella helvetica.

List No. 9.

Large Ferns for the Rock-garden or Waterside.—Adiantum pedatum, Athyrium Filix fœmina corymbiferum, Edwardsi, Elworthi, Fieldiæ, grandiceps, Iveryanum, Moorei, plumosum, plumosum elegans, Thysanotum, Lastræa dilatata, L. cristata, L. Filix mas cristata, angulata, depauperata, grandiceps, Iveryana cristata, Ingrammi, Onoclea sensibilis, Osmunda regalis, O. r. cristata, O. cinnamomea, Polystichum aculeatum, P. a. proliferum, P. angulare grandiceps, P. a. cristatum, P. a. imbricatum, P. proliferum, P. densum, Struthiopteris germanica, &c.

List No. 10.

Very Large Plants, suitable for planting in large groups or as single specimens to give bold effects:

Acanthus mollis, A. longifolius, Aciphylla Colensoi, A. squarrosa, Asphodelus luteus, Asphodelus subalpinus pyrenaicus, Aconitum Napellus, Anthericum Liliastrum, Lupinus arboreus, Hemerocallis fulva, H. flava, H. aurantiaca, Eremurus robustus, Phormium tenax and varieties, Ph. Colensoi, Ph. Hookeri, Yucca aloifolia, Y. a. tricolor, Y. angustifolia, Y. filamentosa, Y. flaccida, Y. recurva, Gunnera manicata, Telekia speciosissima, Romneya Coulteri, Desmodium penduliflorum, Clematis recta, Eryngium Bourgati, Olivieranum, amethystinum, giganteum, Arundo Donax, Eulalia japonica, E. j. zebrina.

List No. 11.

Very Dwarf Plants for bog-beds or the waterside.

A.	B.
Dwarf plants for sunny Bog-bed:	Dwarf Plants for shady Bog-bed:
Cardamine trifolia	Galax aphylla
Dondia Epipactis	Gaultheria nummularioides
Drosera rotundifolia	Gentiana bavarica

List No. 11—*continued.*

A.

Sarracenia purpurea
Parnassia palustris
Mimulus cupreus
„ cardinalis
Dryas octopetala
„ Drummondi
„ lanata
Primula rosea grandiflora
Pinguicula, several var.
Pratia angulata
Lysimachia Nummularia

B.

Linnæa borealis
Mitchella repens
Polygala Chamæbuxus
„ „ purpurea
Epigæa repens
Rhexia virginica
Spiræa Filipendula
Shortia galacifolia
Vaccinium Vitis Idæe minus
Silene virginica.

List No. 12.

Medium-sized Plants for bog-beds or for the waterside.

A.

Medium-sized Bog-plants for sunny positions :

Carex pendula
„ riparia
Juncus effusus spiralis
„ zebrinus
Dodecatheon in variety
Myosotidium nobile
Iris germanica in var.
„ Kæmpferi of sorts
Funkia Sieboldiana
Hemerocallis of sorts
Caltha palustris, fl. pl.
„ leptosepala

B.

Medium-sized Bog-plants for shady positions :

Primula japonica
„ sikkimensis
Mertensia virginica
Saxifraga peltata
Podophyllum Emodi
„ peltatum
Rodgersia podophylla
Bergenia cordifolia
Polygonatum Sieboldi
Trollius of sorts
Cypripedium spectabile
„ pubescens
Orchis foliosa
Habenaria in var.
Sanguinaria canadensis
Saxifraga Fortunei
Ourisia coccinea

List No. 13.

Large Plants of bold appearance, suitable for the waterside :

Gunnera manicata
„ scabra
Rheum Emodi
Rheum palmatum
„ undulatum
„ carolinum

Arundo Donax, Arundo conspicua, Spiræa gigantea, S. lobata, S. venusta, Inula Helenium, Lythrum Salicaria roseum superbum, Senecio japonicus, Chelone barbata, Ch. glabra, Ch. Lyoni, Liatris pycnostachya, Meconopsis Wallichi, Osmunda regalis, Struthiopteris germanica.

List No. 14.

Aquatics for Shallow Water.—Acorus Calamus, Typha minima, Typha angustifolia, Sagittaria sagittifolia, Menyanthes trifoliata, Pontederia cordata, Calla palustris, Ranunculus Lingua, Thalia dealbata, Butomus umbellatus, Scirpus in variety, Arum italicum, &c.

List No. 15.

Aquatics for Deeper Water.—

Aponogeton distachyon
Nymphæa alba
,, Aurora
,, flava
,, Laydekeri rosea
,, ,, lilacea
,, ,, fulgens
,, ,, gloriosa
,, ,, sanguinea
,, ,, purpurata
,, lucida
,, Marliacea albida
,, ,, chromatella
Nymphæa Marliacea carnea
,, odorata alba
,, ,, exquisita
,, ,, rosacea
,, ,, sulphurea
,, pygmæa alba
,, ,, helvola
,, Robinsoni
,, Seignouretti
Stratiotes aloides
Villarsia Humboldtiana
Vallisneria spiralis

THE MOVEMENTS OF PLANT ORGANS.

Lecture at Chiswick Gardens.

By Rev. Prof. G. Henslow, M.A., V.M.H., &c.

[June 14, 1899.]

The old distinction between plants and animals, that the latter can move, but the former cannot, has long since been abandoned as unscientific; for probably all plants, even when permanently fixed to the soil, have their stems, leaves, flower-stalks, &c., in almost perpetual motion.

Germination.—The first movement observable is in the tendency of the radicle to turn earthwards. As this is the case at all points of the globe it is attributed to the force of gravity, but its action is confined to the "growing point" immediately behind the apex protected by the root-cap. In the Cabbage the sensitive part consists of ·02 to ·03 of an inch, for it was found by Darwin that the influence was conveyed—doubtless by the continuity of the protoplasm from cell to cell—to a point some distance back; for when a radicle is placed horizontally, though it soon curves earthwards, the point of curvature is behind the actual growing point.

Besides this movement radicles circumnutate, or "bow around," as the word means, thus finding the line of least resistance for entering the soil.

The plumule rises upwards in opposition to gravity, originally under the influence of light; but it has become so fixed in the constitution that seedlings will rise up vertically, even in total darkness, in opposition to gravity. But that light is the cause was proved by Mohl, who sowed seeds in earth on a gauze shelf placed near the bottom of an inverted box which was illuminated by a mirror from below. They now grew downwards, both in the direction of light as well as of gravity.

Roots.—Though the primary or tap root grows vertically downwards, the secondary roots, which issue from the deep-seated layer called the pericycle, and emerge at right angles to the surface, are inclined at various angles to the vertical, and do not turn into the perpendicular direction unless the primary root be cut away. The object of searching the ground in every direction for moisture and food is thus secured.

The expression "searching" is metaphorical, for the real process is due to the sensitiveness of the growing point to moisture, so that it grows in the direction in which the moisture lies. A Poplar has been known to send its roots under a hard road into a ditch on the opposite side, and many like illustrations are known which gave rise to the expression as if the plant were conscious of the presence of water in any particular direction. Sach's experiment of growing Beans within a trough made of gauze full of wet moss showed that as soon as the tips of the radicles protruded below, having grown vertically downwards while within the moss, the attraction for the moisture of the moss in the trough—which was inclined to the horizon—caused the tips to penetrate it again. Gravity

acting afresh they came out, and by repeating the process the root "threaded" the gauze.

Another important property of the growing point is the extreme sensitiveness to mechanical obstructions which induces the apex to turn away from them. Mr. Darwin observes that this is the only known instance of an organ turning *away* from an object. By fixing cards to one side of the tips of vertically growing radicles they were caused to turn upwards, as if trying to escape from the cards, sometimes even forming complete circles; and in one case a radicle actually tied itself into a knot. This sensitiveness is confined to the tips for a length of from 1 mm. to 1·5 mm., while the upper adjoining part of the radicle, for a length of from 6 or 7 to even 12 mm., is excited to bend away from the side which has been irritated.

Another feature of roots is to grow towards the darker side. This is well seen in the aërial roots of Ivy against a wall, or of Orchids, so that they can cling to the supporting objects. Creeping stems have the same tendency to avoid light; hence they keep along the ground instead of rising vertically.

Stems.—Stems which grow erect support themselves by putting on sufficient mechanical tissues—wood-fibres, liber-fibres, sclerenchymatous cells and collenchyma—in order to resist the influence of gravity to make them fall down. Circumnutation succeeds growth, and becomes a valuable acquisition in the case of climbing stems or twiners, such as the Convolvulus, Hop, &c.

Expansion of Leaf-buds.—As young leaves escape from buds in spring-time, the petioles and blades undergo movements much resembling those involved in the sleep of plants, and for the same object. In the immature state the commonest condition of vernation is to have the two halves of a blade folded together or "conduplicate," the upper surfaces being in contact. The petiole at once curves downwards. This places the blade in a vertical position. Thus the two objects are gained—viz. of protecting the upper surfaces especially, and the avoiding having any surface horizontal. Thereby radiation, and any consequent injury by chill, is greatly avoided. Mr. Darwin found that these objects were also secured by the process of sleep or "nyctitropic" movements.

Taking Clover as an example, a young leaf has each leaflet conduplicate: all three are pressed together, and stand in a vertical plane. When, however, an adult leaf sleeps, the three leaflets having been horizontal by day, they do not resume the above condition; but the two basal leaflets first rotate and stand vertically; they then approach one another until their upper surfaces are in contact. Lastly, the terminal leaflet passes through nearly 180° and comes down upon the edges of the others. It then partially closes like a sloping roof over them, its upper surface becoming now the underside. The various methods of sleep and the movements connected with them in different plants can be studied in Darwin's work.*

Flowers.—There are many instances of the various parts of flowers moving under the influence of stimuli: they are mostly connected with the process of pollination. Commencing with bracts, it may be easily seen how

* *The Power of Movement in Plants.*

the erect bracts of the involucre of the Dandelion become reflexed as soon as the fruit has ripened, thus allowing the parachute-like achenes to escape easily. Moving corollas are very numerous. A large series of plants might be mentioned of which the corollas close up either as soon as the sun is obscured, as species of *Mesembryanthemum*, *Anagallis arvensis*, *Convolvulus*, &c., or else at evening, such as many Compositæ, including the Daisy and Dandelion, re-expanding on the return of light. Conversely some night-flowering plants open their petals only at night, coiling them up by day. As an illustration *Silene nutans* may be taken, concerning which Dr. Kerner tells us * that a flower lasts three days and three nights. With the approach of dusk the bifid limbs of the petals spread out with a flat surface and fall back upon the calyx. In this position they remain through the night, curling themselves up into an incurved spiral and becoming longitudinally creased at the same time on the return of sunlight and a warm temperature. No sooner does evening return than the wrinkles disappear, the petals become smooth, uncurl themselves, and falling back against the calyx the corolla is again expanded.

In the Pea family there are several instances of the corolla having a power to move when irritated. Thus in the genera *Genista* and *Indigofera* the claws of the petals act like springs kept in a state of tension; for when the corolla is touched, as by an insect in search of honey, the claws suddenly curl downwards, and the petals consequently drop vertically; while the stamens, previously concealed within the keel petals, are violently thrown upwards, showering the bee with pollen.†

The movement of stamens is perhaps more curious, and apparently intimately connected with the phenomenon of insect pollination. As an example of slow movement the Grass of Parnassus, *Parnassia palustris*, may be mentioned. In this flower each stamen in succession rises up, places its anther on the stigma, and having shed its pollen retires and falls back upon the petals. Each stamen occupies about twenty-four hours in rising up and discharging its pollen, and takes about the same time to recede, the whole period being eight days, but varying according to circumstances of temperature, moisture, &c.

Berberis furnishes an instance of rapid motion, for if the stamens be touched at the base of the filament they instantly spring forward and strike the stigma, having previously lain on the surface of the spreading petals. The effects of the irritation on the filament of *Berberis* have been observed by Heckel. It appears that the cells of the irritable part are arranged in a parallel manner, the back of the filament being insensible. Their contents are yellow and disseminated through the cavity. After irritation they undergo aggregation, and contract into the centre of the cell, and the cell-wall is striated transversely. The cells of the back of the filament are contracted in repose but extended in irritation.

The stamens of common Lucerne, *Medicago sativa*, as also other species of that genus, suddenly curve upwards and remain rigidly fixed in an arched condition, having been previously horizontal.‡

* *Flowers and their Unbidden Guests*, p. 132.

† These I have described more fully in *Journ. Linn. Soc.*, ix. p. 355, and x. p. 408.

‡ *Journ. Linn. Soc.*, ix. 327.

Darwin has described numerous instances of movements in the flowers of Orchids, in which the pollinia, as of the common *Orchis mascula* and others, or of *Catasetum*, &c., have remarkable powers of movement—in the former case, slow, but in the latter rapid.*

Stylidium affords another illustration of rapid motion. In this flower the stamens and style are consolidated into a column, which is curiously bent and hangs over one side of the flower. If it be touched near the base it instantly flies over to the other side. A very similar movement occurs in the pistil of *Maranta*.

Some flowers have the stamens in a certain position on first expanding, but they take up a different one subsequently. This is not infrequent, as in May, Water-plantain, &c., in which the stamens are spread out at first, but subsequently curl inwards upon the pistil, apparently to secure self-fertilisation if the flower has not been crossed.

In several flowers of plants of quite different orders the filaments retire after the anthers have shed their pollen to make room for the style and stigma, which are later in developing, and then stand where the stamens were before. This occurs in the lemon-scented *Pelargonia*, in *Teucrium Scorodonia*, our Wood Sage, and many other plants.

All the above described movements are vital, in that they are connected with the living protoplasm which executes them. They must, therefore, be distinguished from purely mechanical movements of bursting of seed-vessels, the uncoiling with a spiral movement of awns of Grasses and of *Erodium*, which are due to moisture.

* *Fertilisation of Orchids.*

OBSERVATIONS ON SOME OF THE PLANTS EXHIBITED.

By the Rev. Prof. G. Henslow, M.A., V.M.H.

[Delivered June 27, 1899.]

Orchids.—After calling attention to the remarkable similarity in the flowers of some Orchids to insects, as in that of the "Bee," the "Fly," the "Butterfly," and *Oncidium papilio*, the lecturer described the curious processes of pollination by insects in *Orchis maculata* and *Catasetum*, as explained by Darwin in his work on "The Fertilisation of Orchids." He observed that, with all their elaborate structures adapted for intercrossing, Orchids were, as a rule, so far as the production of seed was concerned, much worse off than other flowers which could fertilise themselves; since in most kinds the pollen masses could not be removed without insect agency, and if the proper visitors failed to come they bore no seed at all. On the other hand, those species which can effect their own pollination, as the "Bee" *Ophrys apifera*, *Chysis aurea*, and some cleistogamous species of *Phaius*, *Arundinia*, *Eria*, &c., set an abundance of seed. Darwin's dictum, "Nature abhors self-fertilisation," had been proved to be as groundless as "Nature abhors a vacuum." Were the latter true, she would have long ago put some stop to our having incandescent electric lights!

Eryngium.—A species of this genus illustrated one of the numerous instances of plant mimicry, in that having its flowers grouped in a massive head, with an involucre of bracts, it greatly resembled a Thistle in outward appearance, but the structure of the flowers and fruit revealed the fact of its not being a composite, but an umbelliferous genus.

Iris, Gladiolus, Crocus, and Ixia.—These four genera, so unlike each other, all belong to the family Irideæ, inasmuch as they agree in having only three stamens instead of six, the usual number in Monocotyledons, while the anthers burst outwards instead of inwards. In *Iris* each stamen stands under a petaloid style, which is pressed down upon one of the outer leaves or "fall." The style carries a small stigma just above the tip of the anther, at the base of the terminal flap. When an insect forcibly enters between the fall and the style it gets dusted on the back, and if it have brought any pollen the inverted spoon-like style picks up the pollen, which is then lodged on the stigmatic ledge. In *Gladiolus* the three stamens, by bending the filaments, are all situated on the posterior side of the flower; the anthers standing side by side and over-arching the tube, so that the insect visitor receives the pollen from all three at once. The extended overhanging stigmas then strike the latter where pollen has been deposited, *i.e.*, brought from another flower. In *Crocus* the bee crawls head downwards by grasping the stamens and style, which together make a column in the middle. It thus receives the pollen on the abdomen. On flying to another flower it alights on the brush-like stigmas, which then sweep off the pollen.

As another instance of mimetic forms, *Crocus* (Irideæ) resembles *Stillingia* (Amaryllideæ) and *Colchicum* (Liliaceæ). This same form of perianth has probably arisen from having been visited by similar insects in the same way.

Hybrid Clematis.—Mr. Jackman exhibited some varieties of a hybrid between *C. coccinea* and *C. Jackmanni*, itself a hybrid. The dark purple colour of the latter had modified the original scarlet of *C. coccinea*, while the flower itself had enlarged.

Mr. Scaplehorn, of Woking, informs me that from his experiments, *C. coccinea*, when used as the female parent, did not produce any material results. It was only when the various varieties of *C. Jackmanni* were crossed with the pollen of *C. coccinea* that the production of hybrids seemed possible.

Sweet Peas.—As examples of varieties obtained without hybridising, these furnished a good example, there being now between two and three hundred sorts cultivated by the Messrs. Sutton at Reading. The lecturer observed that as florists of the last two centuries did not practise hybridising they depended upon seedlings for their varieties, though very probably a good deal of crossing was done by bees unknown to them. Thus Sharrock, in "The History of the Propagation and Improvement of Vegetables" (1672), observes, in speaking of the production of variations in the colours of Tulips:—"To hasten which effect let such of your colours as are strong and luxuriant be set in lean and hungry, but fresh ground, and the next year after in that which is fat and well manured; and so yearly removed to contrary soils until you obtain the end desired."

Similarly Rose, in his "Elements of Botany" (1775), says:—"The soil changes plants, and thence varieties arise. . . . A botanist who will exercise himself in finding out the varieties shall never be able to come to the end of the various forms of sporting nature."

Calochortus and Cyclobothra.—These genera, united under the first name by Bentham and Hooker, afford a problem in geographical distribution; for being allied to the Tulip, *Calochortus* is only found on the west of N. America, as in California; while *Tulipa* occurs everywhere else around the northern hemisphere. The former there replaces the Tulip, and the question arises, What were the local conditions which evolved it out of Tulips? It differs in having the parts of one whorl smaller than those of the other, not all alike as in Tulips; and the fruit dehisces septicidally, *i.e.* the three carpels separating from each other; not loculicidally, as in Tulips, *i.e.* bursting through the back of each carpel.

Ornithogalum arabicum.—This plant, with its large white bell-like flowers and black-green ovaries, is somewhat difficult to grow in this country. It is one of the commonest "weeds" in the fields of Malta. The Maltese being very indolent in keeping their fields clean, numerous wild flowers abound in them, which we prize in England, such as *Gladiolus*, tall species of *Allium*, purple *Anemone coronaria*, Pheasant's Eye, and the too-abundant golden-flowered *Oxalis cernua*, introduced there from the Cape in 1806.

Selaginellas.—A fine group of these plants afforded a subject for remarks upon their geological history. Being all humble herbs at the present day, *Selaginella*, *Lycopodium*, and a few other genera compose an entire family. They are the sole existing representatives of a numerous one boasting of great trees which flourished during the "Coal Epoch." Numerous forests, which were the source of that useful commodity, were, with Ferns, mainly composed of members of that and closely allied families.

THE FERTILISATION OF FLOWERS BY INSECTS AND OTHER AGENCIES.

Lecture delivered at Chiswick.

By Rev. Prof. G. Henslow, M.A., V.M.H., &c.

[June 28, 1899.]

Early Knowledge of Plant Sexes.—The belief in the sexes of plants was held by the ancients. Thus Pliny, writing in the first century of our era, quoting from Theophrastus of the fourth century B.C., says: "The more diligent inquirers into the operations of Nature state that all trees, or rather all plants, belong to either one sex or the other; one which manifests itself in no tree more than in the Palm." *

Besides the Date, here alluded to by Pliny, the Persians fertilised the Terebinth tree; the natives of Chios, the Mastick; those of Sicily, the Pistacia-nut tree, but not the Fig, for "caprification" only ripened it.

They nevertheless held fanciful notions about plants, frequently calling one the male and another the female, with no real reason whatever; in fact, in certain plants now known to be diœcious these terms were actually reversed. This practice was carried down all through the middle ages even to the eighteenth century, as by Tournefort. The male was sometimes noted as having larger leaves and flowers, the female more dissected leaves and smaller flowers. †

Sir Thomas Millington, Savilian Professor at Oxford, is credited with being the first re-discoverer of the doctrine of sexes in the seventeenth century. Linnæus, in his "Dissertation on the Sexes of Plants," ‡ says:—"Dr. Grew, in his 'Anatomy of Plants,' relates that in a conversation on the nature of the antheræ of flowers Sir Thomas Millington hinted to him that those parts might probably be analogous to the male organs of animals, and serve for the impregnation of the fruit. Grew approved of the idea and pursued it. This is all the account of the matter." §

Though Linnæus most distinctly proves the basis of his classification on the sexual system to be sound, yet the question was by no means settled even in the middle of this century. Investigation by the microscope raised fresh difficulties, for Schleiden maintained that the embryo was formed within the pollen-tube, and it was not until Henfrey and others proved conclusively that he was wrong, that the matter was thoroughly cleared up. Lastly, it may be added that botanists have now known for some years that the pollen-tube contains two "antherozoidal" nuclei, and that while one fertilised the germ-cell or nucleus in the embryo-sac, it was not known what became of the other. M. Guignard has now explained what takes place. Both the pollenic nuclei enter the embryo-sac, and

* *Nat. Hist.* bk. xiii., ch. 7.

† *The Compleat Herbal*, A.D. 1719. Such were the so-called male and female Paeonies.

‡ Translated by Jas. Ed. Smith, F.R.S., 1786, p. 7.

§ The note which contains this was probably added by the translator, J. E. Smith.

while one unites with the germ-cell, the other fuses with the two "polar" nuclei, which unite together to give rise to the endosperm.*

Teleological Deductions.—When the fact was thoroughly grasped that the stamens were male structures, and the pistil female, then it was thought that these organs gave good illustrations for teleology, that in flowers with pendulous stamens, the stigma hung *below* these, so that the pollen could fall upon it, as in Fuchsias; but that an erect flower had a shorter style, so as to keep the anthers still above the stigma, as in the Crocus. It did not seem to occur to these observers (even including Linnæus) that it would be wiser to put the anthers *against* or in close contact with the stigma in every case to avoid all chance of loss. Nor is it true, for in the pin-eyed Primroses the stamens are below the stigma. Moreover, in the majority of conspicuous flowers the anthers are mature before the pistil, which remain unreceptive until all the pollen is shed. In those days it was thought that every flower which contained both stamens and pistil was thus arranged to fertilise itself.

Methods of Pollination.—One of the first botanists to observe the correlations between the structure of flowers and insects which visited them for honey or pollen was Sprengel,† who, as Darwin says, "clearly proved by innumerable observations how essential a part insects play in the fertilisation of many plants. But he was in advance of his age." ‡ It was not until Darwin's "Fertilisation of Orchids" appeared in 1862 that botanists really became alive to the great importance of this subject.

As now recognised, plants are seen to be pollinated in three ways, called respectively "self-fertilisation," when the pollen of the stamens is naturally applied to the stigmas of the same flower; "insect-fertilisation," when it is carried from one flower to another; and "wind-fertilisation," when the air takes the place of the insect.

The question next arose as to what is the relative value of each of these three methods respectively. Darwin studied the subject experimentally, but in the main employed garden flowers of fair or considerable size, or at least conspicuous flowers. Now all these are naturally adapted to receive the visits of insects, and are, so to say, not only in the form of their flowers, but also physiologically adapted to be fertilised by foreign pollen rather than their own.

The general result of his comparative experiments between cross and self-fertilisation gave the benefit to the former in height, &c., and in fertility by seeding; from which he deduced a supposed advantage in a plant being crossed, and he drew the opposite conclusion that "Nature abhors self-fertilisation." A careful analysis of his results, however, prove that when a plant is artificially self-fertilised for a few years (*i.e.* a plant usually visited by insects) the ratio of fertility steadily improves till it often beats that of the individuals regularly and artificially crossed every year. Secondly, Darwin found many of the plants he experimented upon, though specially adapted by the structure of the flowers to insect

* *Revue Générale de Botanique*, 15 avril 1899, p. 129. The paper is entitled "Sur les Anthérozoïdes et la Double Copulation Sexuelle chez les Végétaux Angiospermes."

† *Das entdeckte Geheimniss der Natur*, 1793.

‡ *Cross- and Self-fertilisation of Plants*, p. 5.

agency, yet were nevertheless naturally highly self-fertile, and at the same time they showed no outward sign of physical weakness or degeneracy. He gives a list of sixty such plants and another of sixty-two which were sterile without insect aid. Of these, however, some were on other occasions very fertile, as Mignonette, or could re-acquire fertility, as *Eschscholtzia*.

When, however, we turn to Nature we find that plants which are regularly self-fertile or wind-fertilised are by far the most prolific, and soon gain the mastery over others in the struggle for life, as every gardener knows with Chickweed, Groundsel, *Solanum nigrum*, Shepherd's Purse, *Poa annua*, Daisy, and many others; while Plantains, *Urtica urens*, *Rumex Acetosa* and *Acetosella*, illustrate most prolific wind-fertilised plants. Such self-fertilising and wind-fertilised plants are the only kind which, as a rule, are cosmopolitan, being found all over the world where the climate permits of it: all, too, being always perfectly healthy.

Hence Darwin's dictum is proved to have no foundation in fact, for the only two "ends" of plant life are a healthy existence for the individual, and that it may have plenty of good seed every year or when it ceases to exist.

How Flowers are Made.—Now the evolution of flowers corresponds with these three methods of pollination, and the theory of their origin is that conspicuous flowers with all their peculiarities have arisen under the direct and mechanical influences of the insects themselves; that the living protoplasm has *responded* to the external forces and built up special tissues to meet the various strains to which the floral organs are submitted.

It is by observing the innumerable coincidences, similar processes in different plants, the minute correlations of all parts of a flower to one and the same end, upon which the theory is based, such being established by inductive evidence. Thus, *e.g.*, assuming the early type of a flower to have been regular, one has to explain how its descendants became irregular, as of a Salvia or Snapdragon. The phenomenon of such plants bearing occasionally regular flowers thereby proves that their ancestors, to which they have thus reverted, bore regular flowers.*

Illustrations.—Taking irregular flowers as examples, one observes that all the features presented by them—as by calyx, corolla, stamens, and pistil—are so correlated as to facilitate the pollination of the flower, while providing food for the insect, in the most direct way.

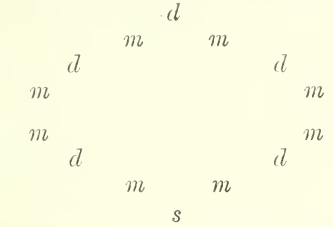
Thus in the *Labiatæ* the calyx is often more or less two-lobed, with three sepals on the posterior side and two on the anterior, giving the appearance of having been stretched forward. The corolla has a lip furnishing a landing place, the two uppermost petals forming a hood over the stamens, the anthers of which are brought together. They are erect, standing just where the thorax of the insect comes, and so receives the pollen. The forked stigma projects forwards so as to strike the insect exactly where the pollen will have been deposited from a previously visited flower of the same kind.

The honey gland is situated precisely where the insect's proboscis will

* The reader is referred to the author's work, *Origin of Floral Structures by Insect and other Agencies*, for illustrations and proofs.

reach it on arriving at the bottom of the corolla tube; and if special marks, the so-called "guides," be on the corolla, they invariably indicate the right direction to the store of honey.

All these correlations meet the two ends—viz. of supplying the insect with food, and that the latter should pollinate the stigmas. They consequently necessitate some common cause to account for them. And since there is no known external agency other than the insect itself, it is a fair *à priori* assumption that such, in some way or other, has been the actually inciting cause of the floral irregularities. Let us take, for example, the calyx of Salvia. It is two-lobed, and if we examine the position of the "cords," they are found to be arranged as follows:—



It is, of course, composed of five leaves, each has a midrib or dorsal cord (*d*). The margins properly have none, but in the united state of a gamosepalous calyx one, at least, is run up where the edges cohere (*m*). These we may call marginal cords. But now additional ones are present. Instead of there being one only, two are added on each side, where the tendency to split the calyx occurs. Again two are added in front, while here a supernumerary cord (*s*) lies between them—exactly where the greatest strain is felt.

The explanation is simple. An insect alights on the corolla-lip, its whole weight is to the fore: this bears down upon and presses against the calyx tube, tending to stretch it in front. To meet this strain Nature has cunningly run up little girders exactly where an engineer would have placed them, especially round the anterior half of the calyx, where the strain is greatest.

This power of responding to external strains is universally to be seen in plants. It is a property of living protoplasm. It is well seen in climbing plants, and can be shown by experiment; for if a growing shoot or petiole be weighted so as just not to break it, in a few days it will be found capable of supporting much greater weights than it would naturally be able to bear.

Self-fertilising Flowers.—If a conspicuous insect-loving flower cease to receive its visitors it ceases to secrete honey, and its corolla becomes reduced in size; in fact the flower may altogether cease to open its flower-buds. Such is the origin of the so-called "cleistogamous" flower-buds—a word signifying "concealed unions." Such may be easily seen on Violets below the leaves during the summer.

Wind-fertilised Flowers.—With regard to these they appear, in the majority of cases (excluding Fir trees and their kin), to be degradations, but have become adapted to receive the pollen from other flowers by the agency of the wind. They are often unisexual, as the Nettle, Sorrels, and in most cases the stigmas are large and often feathery, so that they readily catch the pollen, as in Grasses, Burnet, Saxifrage, &c.

THE DISPERSAL OF SEEDS.

By G. S. Boulger, F.L.S., F.G.S., Professor of Botany,
City of London College.

[Read July 25, 1899.]

Every agriculturist and every gardener is familiar with many of the results of the dispersal of plants—dispersal to small and dispersal to great distances. The weeds in our gardens are, it has been said, merely plants out of place, which have often not travelled very far—perhaps only from the land of a slovenly neighbour—to reach an open space. We often find, on the other hand, that two species of some one genus that we cultivate may have come from regions widely removed from one another, or that the area of distribution of a single species may be of vast extent.

After having, by the exercise of its nutritive functions, attained to maturity, the one physical object of every organism is the perpetuation of the species. This, as is so generally the case in organic nature, is an end effected by many diverse methods, which may well be classed roughly into the two heads of vegetative and sexual. To the former class—in the vegetable kingdom—belong "innovations," rhizomes, bulbils, tubers, runners, offsets, suckers, proliferous leaves, besides many kinds of spores (among Cryptogams). Beyond remarking that, as these cases consist essentially in the detachment of a shoot of the parent plant, the detached "offspring" closely resembles the *one* parent to which it owes its origin, we are not to-day directly concerned with them. It is, however, a matter of considerable interest to note, as showing the identity of the physiological requisites in all cases of dispersal, that we have in this class of lower or vegetative methods a foreshadowing, as it were, of almost every method of dispersal which obtains among fruits and seeds. For example, the extreme lightness of the spores of many fungi, of Lycopodium and of other plants, undoubtedly facilitates their dispersal by wind, as does the lightness of the seeds of some Orchids and of many parasites and saprophytes. The bursting of puff-balls, the explosion under the influence of hygroscopic action of the annulus of the sporangia in Ferns, the threads of the capillitium in the Myxomycetes, and the elaters in Hepaticæ, and the scattering of Moss-spores between the teeth of the capsule as it sways in the wind, similarly anticipate the cases of the Sandbox-tree (*Hura crepitans*, L.), the Balsam (*Impatiens*), the hairs in the capsule of *Vanda teres*, the "jaculators" in the fruits of Acanthaceæ, and the so-called "censer action" in a Poppy-head or in the fruit of one of the Pinks. So, too, water serves to carry the "hibernacula" or winter buds of *Hydrocharis* as it has dispersed the fruit of the Cocoa-nut Palm; wind rolls along offsets of some species of *Sempervivum*, as it does the globular fruit-heads of several species of *Trifolium*; and flies carry the spores of the Stinkhorn (*Phallus impudicus*) or the Ergot (*Claviceps*), and the higher animals the spinous offsets of Cactuses; just as ants carry the seeds of *Chelidonium* or *Melampyrum*, or the burr-like fruits of thousands of flowering plants are entangled in the hair of any passing animals.

Of the sexual processes, on the other hand, the essence is that the offspring owes its being to *two* individual organisms, being developed from a cell of the one under the stimulus of fusion with the active principle of a cell of another, so that it may naturally be expected to partake—at least to some extent—of the characteristics of both its parents. Now, it may well be, as suggested by my friend Mr. Thomas Meehan, of Philadelphia, that, while all merely reproductive functions could be quite adequately performed by vegetative processes, the great object of sex may be the introduction, by the competing influences of the two parents, of variation, *i.e.* the predominance of characters derived now from one, now from the other, and now from both parents.

Now, the severest competition for the necessaries of life—food, air, and light—will be between organisms which, being nearly identical in structure and physiology, are also nearly identical in their requirements. In other words, the struggle for existence will, among plants, be particularly keen among what we term "social" plants and where vegetation is dense, and this competition will present the most favourable opportunity for the self-assertion of any variation. At the same time an organism may obviate much of the danger of home competition if it can secure removal to some other area—"to fresh woods and pastures new." For this purpose a short journey may suffice. A few hundred yards or less may bring fruit or seed to the newly-upturned soil of a railway bank, a ploughed field, or a garden border; and, though we do find structures which may suffice, under exceptional circumstances, to carry them further afield, the direct primary adaptations for dispersal seem to be all mainly calculated for small distances. The well-filled fruitlet of the Thistle, for example, when the fruit-head has been pulled to pieces by the goldfinch or other small bird, will not have floated far before the heavy ovary and the seed it contains will have detached itself from the ring which bears the parachute of down, and will have fallen to the earth, whilst the specimens of Thistle-down that come floating down from the sky in the heart of London will be found to be light, abortive fruits. The variously-shaped and twisted double fans of the Maples, which exhibit all the varied features of the screw-propellers of our ocean steamers, may be torn, when just ripe, from the tree by high wind and carried a considerable distance; but if they merely fall to the ground, when ripe, in a dead calm, their structure is such as to produce a rapid gyration which will at least carry them beyond the shadow of the parent tree. While some of these, and similar, samaroid fruits and winged seeds have a spiral twist, in almost every case the seed is eccentric, which serves to give the initial twirl in the fall. If, again, an animal in passing brush against the ripe fruit of the Squirting Cucumber (*Ecballium Elaterium*), one layer in the wall of which is in a state of tension from turgescence, the fruit will detach itself from its stalk and eject its contents violently from the opening thus made. The pulp-covered seeds may then adhere to the coat of the animal, and be so carried to a distance; but the main purpose of the adaptation would seem to be accomplished by their being thrown to the distance of a few feet.

Before saying more as to special adaptations to dispersal, it may be well to point out the numerous cases in which seeds may be most

effectually dispersed without any expressly facilitative adaptations. Such are the recorded cases of mud adhering to the webbed feet or feathers of migratory waterfowl, or the mere washing of soil, with its contained seeds, down a hillside in time of flood.

Even when we come to examine most effective adaptations for the dispersal of fruits and seeds, we may perhaps convince ourselves that the most successful are, as Kerner has urged, not too highly specialised, but may serve either for dispersal by wind, water, or animal agency. It has been usual of late years to classify dispersal-mechanisms under four heads, viz. (1) ejection by the plant; (2) transport by water, (3) by air, or (4) by animals. Though it is true that, in the initial stages of adaptation, there is less modification in the first of these groups than in the others, there are, higher up in the series, so many elaborate contrivances that I prefer to take the case of water-borne fruits and seeds first, as being the simplest of the four cases throughout.

Mere lightness of seeds or fruit would seem to be more often an adaptation to wind transport than to water carriage, the most noteworthy cases being those of epiphytic Orchids, parasites, and saprophytes on the one hand, and steppe plants on the other. There is, however, a class of cases in which small seeds, readily carried by runnels of rain-water, seem to be of special utility, viz. plants living in stony, arid, or almost soil-less situations, clinging with difficulty to vertical faces of rock, and liable, if not carried into crannies, to be speedily killed by drought. Such is the case of the Stonecrop (*Sedum acre*, L.), in which the five follicles remain closed in dry weather, but burst when a drop of rain falls into the shallow basin-shaped hollow at the top of the fruit. The Ivy-leaved Toadflax (*Linaria Cymbalaria*) has small seeds which may be similarly washed into crevices. So, too, the capsules of the South African species of *Mesembryanthemum* only open when moistened. In the genus *Veronica* we have slightly different arrangements in different species according to their habitat. *V. serpyllifolia* and others living in dry places have capsules which open when wetted, as in *Sedum acre*; whilst *V. Beccabunga* and *V. Anagallis*, though they may crack their capsules on ripening, do not open fully until thoroughly wetted, when the seeds become mucilaginous, like those of the Flax, and stick to the ground unless washed away by a strong current. With regard to another adaptation for water carriage, which figures largely in books, viz. the power of withstanding long immersion in fresh or salt water, I should like to suggest that this power may in some cases be otherwise acquired, may in fact be an adaptation to quite distinct purposes, the resistent pericarp or testa being perhaps initially a protection against the gastric juices of animals, or against the moisture and warmth which might bring about premature germination on land, rather than against prolonged submergence. When, for instance, we read in the papers a few weeks ago that the shore of one of our Western Islands was covered with seedling Apple trees as the result of the wreck of a cargo of Apples, we could hardly conclude that the flesh, the core, and the testa of the Apple were adaptations for the dispersal of the pips by the sea. Nevertheless, it is worthy of note that the seeds of Asparagus, a fleshy-fruited plant that occurs apparently wild at several places along our sea-coast, will withstand

immersion in sea-water for more than a year, and that more than a century ago Linnæus observed the tropical *Entada scandens* germinating on the coast of Norway.

A more direct adaptation, however, is the imprisonment of air in structures surrounding the seed. The swamp-plants *Carex ampullacea*, *C. vesicaria*, and other species may well derive advantage from the balloon-like membranous utricle which surrounds their fruit. The white Water-lily (*Castalia speciosa*, Salisb.), which, by the bye, spread downstream from a park near Banbury through the Cherwell into the lower Thames, discharges its seeds in coherent lumps, rendered buoyant by the presence of air between the spongy aril and the testa of each seed. As the arils slowly decay, single seeds detach themselves from the lump and sink to the mud at the bottom. In the yellow Water-lily, however (*Nymphæa lutea*), there is no aril, but air bubbles are imprisoned within the slimy pericarp of the dehiscent berry-like fruit, and the seeds are liberated by its gradual decay. A somewhat similar air-filled cortex prevails in such well-known aquatics as *Alisma*, *Sagittaria*, *Butomus*, and *Sparganium*. More highly specialised are the fruits of the Cocoanut Palm (*Cocos nucifera*), the Double Cocoanut of the Seychelles (*Lodoicea Seychellarum*), and *Nipa fruticans* (Thunb.). In these cases the fruit has a membranous waxy epicarp, a fibrous mesocarp rendered buoyant by the presence of air between its fibres and a singularly dense and impervious endocarp. No instances speak more unmistakably as to the efficacy of these arrangements, for the Cocoanut is almost universal on the coasts of the scattered islands of the tropics; the "coco de mer" obtained that name from having been known as flotsam and jetsam before it was found growing; whilst the much smaller *Nipa* is common in the brackish Sunderbunds of the East, floating for many miles in the waters of the Ganges and the Bay of Bengal without losing the power of germination, as its fossil ally *Nipadites*, now abundant in the London clay of Sheppey, seems to have done in a tropical British sea in the remote Eocene past.

When we turn to the adaptations to dispersal by the plant's own means we find far greater variety and complexity of contrivance, so that I am at a loss to suggest any adequate classification of the cases. There is, I think, however, a decided progression from slight to more complete adaptation, and I feel inclined to place at the base of the series those cases of what has been termed—not very happily—"censer action," by which small-seeded capsular fruits practise an economy of seed by only opening partially and by the reaction to passing breezes or the brushing contact of animals of their somewhat resilient peduncles. In the capsules of Caryophyllaceæ, Primulaceæ, Scrophulariaceæ, Liliaceæ, and Iridaceæ the seeds are unplumed, unwinged, and often large and heavy; but they are sometimes flattened, as in *Tulipa* and *Iris*, and the capsules open only upwards and in dry weather. The follicular fruits of *Delphinium*, *Aconitum*, *Helleborus*, &c., are similar, whilst the Poppy-head exhibits an additional refinement in the lids with which its pores are furnished. What is in effect only another case of this "catapult" or "balistic" action, as it has been termed, is presented by many of the Compositæ; as, for instance, in the genus *Centaurea*, the Knapweeds. Here there is an erect rigid resilient peduncle, a common receptacle

which by drying or by change of form may detach its numerous fruitlets at their bases, dry hygroscopic bract-scales forming the involucre, which are highly polished on their inner surfaces, and bristle-like pappus-hairs, which cannot be called organs of flight like the feathery plumes of Thistle or Dandelion. In damp weather the pappus-bristles are pressed together, and the bract-scales close over; but in dry air both expand. "Censer-action" of breeze or passing animal jerks the loose fruitlets up over the polished curve of the involucre, and its pappus-bristles, like the feathers in a shuttlecock, serve to determine the direction in which each fruitlet shall fall. Another closely similar series of comparatively slight adaptations is presented by the Labiatæ. Here we find a short but resilient pedicel to each flower; a dry, persistent bell-shaped bilabiate calyx the curvature of the two lower sepals of which may determine the path of projection; and a fruit which when ripe splits into four dry one-seeded nutlets. In some species of *Teucrium* stiff, pliable converging hairs in the throat of the calyx have an action which has been compared to the rifling of a gun. A parallel but perhaps less specialised case is that of some species of *Cerastium* (Caryophyllaceæ) in which the S-like curvature of the capsule itself acts like the reflexed calyx teeth of the Labiatæ, while the teeth of the capsule only recurve in dry weather, and the shortness of these teeth and ordinary "censer action," set up by gusts of winds or animals brushing past, economise the often abundant seed.

Kerner describes yet another case of balistic action, which he defines as dependent solely on elasticity of stems and fruit-stalks, viz. that of *Polygonum Virginicum*, one of the Knot-grasses. Here there are strongly lignified cells in the cortex of the short pedicel; the capsule is jointed to the pedicel and is horizontal; and the persistent style hangs vertically downwards, ending in two divergent hooks. If these hooks catch in the hair of a passing animal the fruit will detach itself from its stalk as if from a watch-spring, whilst mere wind action will suffice to detach it, when it may be thrown two or three yards.

We may perhaps class as a sort of appendix to the balistic group those fruits which creep or hop along the ground, though this action is essentially hygroscopic. It is in all cases dependent upon the presence of stiff hygroscopic bristle-like structures, though these bristles may be barbed awns, as in such grasses as *Ægilops*, *Secale*, and *Elymus*; calyx-teeth, as in *Trifolium stellatum*; or parts of the pappus, as in the teazles and some Compositæ. The most striking instance, perhaps, is that of the Barren Oat (*Avena sterilis*), in which the fruiting spikelet bears two awned glumes. The two awns twist hygroscopically in opposite directions, cross, and then slip apart with a jerk, making the whole spikelet jump up.

Undoubtedly more complex are those adaptations which have been collectively termed "sling-fruits," in which the propelling force is due either to turgor or to the drying up of certain parts of the fruit. Sub-dividing the latter into those cases in which the desiccation does not, and those cases in which it does, result in spiral torsion, we have three classes of sling-fruits. Of the first of these, that depending upon turgescence, the most celebrated example is that of the Squirting

Cucumber (*Ecballium Elaterium*), in which one layer of cells in the pericarp of the bristly fruit is in a state of tension; so that when the tissue round the apex of the fruit-stalk becomes disintegrated on ripening, the fruit is detached and its contents squirted out at the insertion of the peduncle. Some other cucurbitaceous species, such as *Cyclanthera explodens* and *Thladiantha dubia* exhibit very similar phenomena. Equally well known is the adaptation of the Balsams, which has given them the generic name of *Impatiens*, and our only British species the specific name *Noli-me-tangere*, Touch-me-not. In this case the turgescent tissue is the mesocarp; and when the five coherent carpels of the fleshy capsule separate on ripening, or when a touch interferes with the balance of forces within, they roll themselves up violently inwards, hurling the seeds forcibly to a distance of some yards. As one walks through the woods near Lucerne one is bombarded by the seeds of this species, whilst the efficacy of this means of dispersal is evidenced by the widespread occurrence as weeds in our gardens and shrubberies of the Siberian species, *I. parviflora*, D.C., and on our river-banks of the North American, *I. fulva*, Nutt. Very similar is the mechanism in the dry siliquas of various Crucifers of the genera *Dentaria* and *Cardamine*, especially *C. impatiens*, L., only that the valves of the siliqua roll outwards, and not, as in the Balsams, inwards. I have already alluded to the case of *Acanthus* and other members of the order *Acanthaceæ*, in which explosive capsules occur; whilst the presence or shape of the "jaculators," or hook-like processes on the placenta which aid in the expulsion of the seeds, is sufficiently general to be used as a sub-ordinal character by the systematist. Another but very distinct case, in which a means of seed-dispersal seems certainly most efficacious, is that of the Wood-sorrels (*Oxalis*) and the allied genus *Biophytum*. Here the turgescent tissue is one of the inner layers of the seed-coat itself. The outer coat splits and is turned inside out, and the body of the seed is shot off to some distance.

Omitting other interesting examples, if we pass to the second class of sling-fruits, those which act mainly by the drying up of certain layers of tissue, two well-known genera demand our attention from the slightly varied adaptations which they possess, the Crane's-bills (*Geranium*) and the Violets. In Herb Robert (*Geranium Robertianum*, L.) the outer tissue of the five awns or styles, the rod-like extremities of the five slightly coherent carpels, dries up and detaches the awn with a jerk from the central column or carpophore, throwing the seeds, according to Sir John Lubbock, sometimes more than twenty feet. In our British *G. dissectum*, L., in the Continental *G. palustre*, L., and other species, however, the carpels split along their under surfaces and the awns bend outwards from below upward, so as to eject the seeds from inverted carpels, but do not themselves separate from the carpophore at their apices. Among Violets those species which have aërial stems, such as *V. canina*, *V. tricolor*, and *V. elatior*, have capsules which split into three boat-shaped valves, each containing two rows of small polished seeds. The gradual drying up of the walls of these three valves squeezes out each seed in succession, one valve emptying itself before the second begins to do so. This pretty contrivance does not occur in the lower-

growing *V. odorata* and *V. hirta*; but an arrangement somewhat similar obtains in the Box (*Buxus*).

The third class of sling-fruits, that in which the valves of the drying fruit become spirally twisted, though represented by the genus *Alstrœmeria* among Liliaceæ and in other natural orders, is characteristic especially of the Leguminosæ and Euphorbiaceæ. Most of us have noticed on a hot summer's day the explosion of the dry pods of Broom or Furze, often accelerated by contact with us as we walk past, and a similar spiral coiling of the two halves of the legume occurs in *Vicia*, *Orobus*, *Lathyrus*, *Lupinus*, *Wistaria*, *Indigofera*, *Bauhinia*, and others. *Bauhinia purpurea*, for example, is recorded as throwing seeds weighing 2·5 grammes to a distance of 15 metres. This remarkable torsion is the result of the drying of a layer of thick-walled elongated cells which lies diagonally across each valve. In the Euphorbiaceæ, such as *Mercurialis*, *Euphorbia*, and *Ricinus*, the valves being shorter, the spiral torsion is less obvious; but we have in this group another of the best known instances of explosive seed-dispersal, that of the Sandbox-tree, or Monkey's Dinner Bell of Tropical America (*Hura crepitans*, L.). Certain layers in this large fruit contract with such force in drying as to shatter the entire fruit, bursting violently even through strong enclosing substances, and throwing the light seeds to a considerable distance.

We come next to the third main division of our subject—the adaptation of fruits and seeds to dispersal by wind. This may be roughly divided under three categories: 1st, lightness, whether of the seed, fruit, or entire plant; 2nd, wings; 3rd, plumes or parachutes. It is undoubtedly significant that it is especially among parasites and saprophytes—plants that more urgently require a wide dispersal of their abundantly produced seed—that we meet with some of the most striking instances of extremely light seeds. *Orobanche*, *Monotropa*, *Pyrola*, and many Orchids are cases in point, *Goodyera repens*, for example, having seeds which weigh only ·000002 gramme each. Small light seeds are also often combined with the somewhat simple adaptation known as censer action, as in many Caryophyllaceæ, Poppies, &c. The inflated pods of the Bladder Senna (*Colutea arborescens*, L.) may merely catch the wind while still on the plant, so as to jerk out the seeds separately as they sway in the breeze, or they may break off and be carried balloon-like to somewhat greater distances. As we might expect, it is especially among the plants of those wide-stretching level tracts of arid ground, the Steppes of Eastern Europe and of Asia, where plants have often so great a difficulty in sustaining life at all that we meet with instances of this class of adaptation. The fruit of *Cachrys alpina*, MB., one of the Umbelliferæ of these regions, for example, measures 13 mm. by 10 mm., but weighs only ·07 gramme, whilst another species of the same genus, from Shiraz, measuring 15 mm. by 10 mm. weighs only ·06 gramme. The spirally coiled legumes of some species of *Medicago* may also be cited in this connection; but more interesting still are those cases in which various subsidiary structures become detached, or even the whole plant is rolled away by the wind. In *Trifolium subterraneum*, L., and allied species, for example, the calyx-teeth of the abortive flowers form a loose globular cage round the head of legumes, and the whole of the ball thus formed breaks off and is rolled along by

wind. In the Wig tree (*Rhus Cotinus*, L.), a familiar garden shrub, most of the branches of the inflorescence are barren, forming merely reddish feathery arms, one branch which bears a drupe becoming detached together with all this "wig," and being in consequence readily blown about. Similarly in the Australian grass *Spinifex squarrosus* the entire head, the bracts of which are long and spiny, breaks off when the fruits are ripe, and is blown about in the sand. The Rose of Jericho (*Anastatica hierochuntica*, L.), one of the Cruciferæ, which is now commonly sold as a curiosity in London, is a type of those Steppe plants which become detached whole from the ground during the arid fruiting season, when the soil is cracked by heat. Its branches, bare of leaves but still carrying the fruits, bend inwards, forming a dry ball of wicker-work. This inward bending may help to uproot the tap-root, as does the outward bending of the branches in the case of a physiologically similar plant, *Plantago cretica*, described by Kerner. The whole plant is then blown along until it reaches moisture, when both branches and fruit-valves open out hygroscopically. It has been suggested that this plant is the "Galgal" of Psalm lxxxviii. 13, translated "wheel" in our English Bibles. There are also a considerable variety of herbaceous plants on the Russian steppes, of which *Alhagi camelorum*, *Salsola Kali*, and *Centaurea diffusa*—plants belonging to very divers families—may be mentioned as examples, in which the base of the aërial stem decays, so that all the rest of the plant is liberated. These dry, rigid, branching plants are rolled together by wind until they accumulate in the huge balls known as steppe-witches or wind-witches.*

We come next to the great series of plants in which wind-dispersal is facilitated by wing-like structures attached either to fruit or seed. Among these we shall find representatives of a very large number of natural orders and a great variety in the anatomical or structural origin of the "wing" itself, showing that this mode of seed-dispersal has originated independently in many different groups, and has been evolved along many independent lines. Nevertheless, as Sir John Lubbock has pointed out, they agree in many physiological or adaptational characters; as, for instance, in occurring almost always on trees or climbing shrubs well exposed to wind, and in having the seed generally in an eccentric position.

Beginning with those wings which are attached to fruits, we find that we may further subdivide them into three or four groups. In some the wing is in origin a bract, as in the Hop (*Humulus Lupulus*, L.), the Hop-hornbeams (*Ostrya*), the Spinach (*Spinacia*), and in such members of the order Nyctagineæ as *Bougainvillea*, where the bract has previously served to attract fertilising insect-visitors, and *Mirabilis*. Here, too, we must class the numerous Grasses, such as species of *Briza* and *Melica*, in which glumes adhere to the fruit and serve more or less as wings. Here, too, belongs that beautiful structure, the adherent leafy bract in the Lindens (*Tilia*), to which the weight of several fruits is so eccentrically attached as to give it in falling the same screw-propeller action that we have in the wings of Maples—an action which enables a very slight breeze to carry it beyond the over-shadowing of the parent tree.

Next we have a variety of instances of wings originating in the

* Kerner, *Natural History of Plants*, English edition, vol. ii p. 850.

perianth, generally the calyx. Such are the three leafy wings in *Triplaris surinamensis*, Cham., one of the Polygonaceæ, the allied but dissimilar wings in the Docks (*Rumex*), and the similar but not allied wings in the Dipterocarpaceæ. *Froelichia*, one of the Amaranthaceæ, has a two-winged perianth; and Thrift (*Armeria maritima*, Willd.) has a parachute-like membranous outgrowth of the accrescent calyx-limb.

Lastly, there is an even greater variety of wings formed from the pericarp itself, though here we ought undoubtedly, in anatomical strictness, to distinguish between "inferior" ovaries, such as the three-winged fruits of *Begonia*, where the wing is perhaps rather of perianth origin, and such "superior" ovaries as the "samaras" of the Maples, Elms, and Ashes. On the one hand there are also the Combretaceæ, such as *Terminalia* and *Quisqualis*, and the well-known *Ailantus glandulosa*, Desf.; on the other, such Leguminosæ as *Pterocarpus* and *Centrolobium*, and one of the two sub-orders of Malpighiaceæ, including the Maple-like fruits of *Banisteria*, Triopteris, Tetrapteris, and others.

Though performing an absolutely identical function to that of the wings of fruits, those of seeds are obviously of entirely different origin. It is interesting to notice here what appear like the first stages of such an adaptation, where, for instance, in the genus *Pinus* we have every gradation between no wing at all and one of considerable size; or where, as in *Lilium*, *Fritillaria*, *Tulipa*, *Agapanthus*, *Funkia*, and other members of the order Liliaceæ, or in *Rhinanthus*, *Veronica*, and other Scrophulariaceæ, we find seeds for the most part only slightly flattened, or with a comparatively narrow and thick wing. On the other hand, a large proportion of the Bignoniaceæ, such as *Bignonia*, *Tecoma*, *Eccremocarpus*, *Catalpa*, *Millingtonia*, or *Spathodea*, the genus *Deutzia* in Saxifragaceæ, and *Zanonia macrocarpa*, Blume, a cucurbitaceous plant in the Sunda Archipelago, exhibit this character in its highest perfection, having broad and delicate wings of feathery lightness.

Under the name of "parachutes" we might include such membranous expansions of the border of the calyx as we have mentioned in the Thrift, and as occur in some Labiatæ and Scabiouses; but we will speak now only of hairy or feather-like appendages. Like wings, these must structurally be sharply divided into two main groups according as they are attached to the fruit or to the seed. The former of these groups again presents great variety of structural origin, the feathery process being developed from style, corolla, calyx, pedicel, or glume. In the Old Man's Beard of our hedgerows (*Clematis Vitalba*, L.), in some, but not all, species of the allied genus *Anemone*, notably in the beautiful Pasque-flower, *A. Pulsatilla*, and, by one of those interesting parallelisms between the orders Rosaceæ and Ranunculaceæ, in *Dryas*, and some species of *Geum*, the style persists as a feathery awn. In the myrtaceous *Verticordia oculata* the fruit is crowned by five persistent petals, each consisting of a fan of ten palmately arranged but pinnately divided feathery lobes, a most beautiful, exceptional, and highly specialised adaptation. The labiate *Micromeria* has the five teeth of its calyx fringed with hairs: the long simple hairs of the Cotton-sedge (*Eriophorum*), now known, I believe, in commerce as "arctic wool," represent a perianth; whilst all the varieties of "pappus" among the Com-

positæ are developments from the margin of the calyx-tube. In connection with these last-mentioned plants, I would remind you that we have some Compositæ with a trace of a limb to the calyx and many without any pappus; whilst, when present, the pappus may be sessile at the apex of the fruitlet, as in the Thistles, or carried up on a long, slender stalk-like tube, or "stipes," as in the Dandelion; and its hairs may be simple (*pilose*) or feather-like (*plumose*). The hygroscopic character of these hairs gives them some effect in levering the fruitlets off the common receptacle, in connection with which action I would also remind you of the remarkable change of form of the common receptacle in the Dandelion (*Taraxacum*) from concave in the flowering stage to a taut convexity when in fruit. The tufts of hair in the Reed-mace (*Typha*) proceed from the pedicels; whilst the well-known long tale-like plumes of the Feather-grass (*Stipa pennata*, L.), one function of which, as Dr. Francis Darwin has demonstrated, is to bury the fruit in the ground, are awns proceeding from the apices of glumes.

Among seeds the presence of a "coma" is sometimes general in large groups of plants, as in Salicinæ, Apocynaceæ, and Asclepiadaceæ. It may spring from the base of the seed, as in *Populus* and *Salix*; from its apex, as in *Epilobium*, *Tamarix*, and *Strophanthus*; from both ends, as in another African Apocynad, *Adenium Hongel*, A. DC.; or from the whole surface, as in the Cottons (*Gossypium*). It is interesting to note that the long beak to the seed of the South African *Strophanthus hispidus*, crowned with a delicate plume of hairs, is reproduced in some of the epiphytic *Tillandsias* (Bromeliaceæ) of Tropical America; and Sir John Lubbock calls attention to species of the asclepiadaceous *Æschynanthus* in which there are only three hairs on each seed—one at one end and two at the other—but these being very flexible are capable of wrapping round the wool of an animal, so aiding dispersal otherwise than by wind.

This brings me to the last main division of dispersal mechanisms, those dependent upon animal agency. These fall mainly into two groups, those adapted for outside carriage—viz. burrs and hooked structures and those adapted for inside carriage, most of which are succulent, and many of them brightly coloured. To the former of these two groups it has been stated that ten per cent. of our flowering plants belong. In the first group it is noteworthy that no burrs occur on aquatics or on plants over four feet in height, such species being obviously out of the way of woolly or hairy animals. Seeds are seldom furnished with hooks, but such appendages may occur on bracts, calyx, style, or pericarp. The nyctaginaceous genus *Pisonia* is not bristly, but its persistent bracts, or "anthocarp," are so glandular as to cling to bird's feathers. Mr. H. O. Forbes relates that on Keeling Island the fruits adhere in this way to the feathers of herons in such quantities as to cripple or even kill the birds. In the North American Grass *Cenchrus tribuloides*, L., the fruit is enclosed in a hard, prickly involucre of sterile spikelets which renders this species a troublesome pest in wool-growing districts. Still more striking is the case of the composite *Xanthium spinosum*, in which the fruits are enclosed in a hard woody involucre covered with prickles. A native of Russia, it was introduced in 1828 into Wallachia in the manes and tails of Cossack horses. Similarly it travelled with cattle and wool by way of

Hungary and Bavaria to Hamburg, and more recently became so serious a pest in South Africa that strenuous laws have had to be enforced for its extirpation. In our own common Burdock (*Arctium Lappa*, L.) the involucral bracts become hooked and woody in the fruiting stage, so as to adhere to the fur of animals or the clothes of man; but such is their strength that they generally tear themselves free, so that the plant springs back and the fruits are jerked away. The calyx of the Bur-marigold (*Bidens tripartita*, L.), one of our British Compositæ, is represented by from two to six strongly barbed bristles: the calyx of some species of *Myosotis* is covered with hooks: and that of the rosaceous genera *Agrimonia* and *Acæna* has a circlet of stiff recurved bristles at the apex of the fruit. A most interesting form of burr is that of the British Herb Benet (*Geum urbanum*, L.). In the flower stage each carpel ends in a style which, at first straight, develops a double kink. In the fruit the apical portion breaks away, leaving the kink as a sharp, hard hook. By far the greater number of cases of hook-bearing fruits are those in which the hooks are on the pericarp. The achenes of the Corn Crowfoot (*Ranunculus arvensis*, L.), the four nutlets of the boraginaceous Houndstongue (*Cynoglossum*), the bicarpellate fruits of the Woodruff (*Asperula*), Bedstraws, such as Cleavers (*Galium Aparine*, L.) and Madder (*Rubia peregrina*, L.) among Rubiaceæ, and the siliqua of the crucifer *Bunias* are examples from widely different orders. Prickly fruits are not very numerous among Leguminosæ: but *Mimosa asperata*, L., and several species of *Medicago*, such as *M. truncatula*, Gærtn., and *M. rigidula*, Desr., are cases in point. Among Umbelliferæ such structures are common, as the popular name Bur-parsley witnesses. The genera *Caucalis*, *Sanicula*, and *Daucus* may be specially cited as examples. In the Carrot (*Daucus Carota*, L.) the secondary peduncles all bend inwards after fertilisation until the fruits are ripe, when they bend out again, so that the burred fruits may come in contact with passing animals. No order, however, is so remarkable in the production of hooks as that small, mainly African, group the Pedaliaceæ. *Pedalium murex*, L., has a calthrops-like fruit with rigid, straight spines, which would attach themselves only too cruelly to the soles of the feet of any animal treading on them. The formidable curved hooks, one at the apex of each of the two carpels, resembling mammoth tusks in the American genus *Martynia*, fasten themselves firmly, as we can well imagine, in the fleece of any passing animal. But the most ferocious in appearance of the whole group is the Grapple Plant (*Harpagophytum procumbens*, DC.). This fruit, a native of South Africa, is surrounded by twelve or more radiating arms, each ending in two strong recurved hooks, and having several similar hooks along its sides. It is blown about over the dry veldt of the Transvaal and the Orange Free State, and buries itself firmly into the hoof of any antelope that may tread upon it, driving the animal mad with the pain. It is even said to sometimes prove fatal to the lion, the animal, in endeavouring to tear the instrument of torture out of its skin, only making matters worse by getting it into its mouth.

As has been already said, the chief cases of adaptation for carriage within the bodies of animals are succulent structures. It is, as might

be anticipated, not very usual for the seed itself to be fleshy, as it is in *Iris fœtidissima*, though it is frequently bright-coloured and variously marked, so as to attract birds, in which case every seed will not probably be crushed in the gizzard. It must be remembered that fruit-eating birds have not the same muscular gizzards that characterise the seed-eaters, whilst one of the most general characteristics of seed—I hesitate to term it an adaptation—is the imperviousness of the bitter leathery testa to the action of the gastric juices. It is worthy of mention that gaily coloured seeds, such as those of many Leguminosæ, are confined to dehiscent fruits; and that fleshy, brightly coloured "arils," such as the mace of the Nutmegs (*Myristica*), the cup of the Yew berry, and the scarlet coat of the Spindle-tree, Tennyson's

> Fruit that in our autumn woodlands looks a flower,

are more frequent than fleshy seeds. In *Acacia homalophylla* a long red funicle, or seed-stalk, serves as the attraction, and in the Juniper the "berry" is strictly a simplified cone with fleshy scales. Far more numerous, however, and more varied, are the instances of succulent fruits. Though what is technically known as a "berry" or a "nuculane" occurs in a number of unrelated orders (as, for example, the Gooseberry, the Prickly-pear, and the Banana in the former case, and the Grape and the Tomato in the latter), it is important to note that some other succulent types of fruit, such as the "drupe" and the "pome" are characteristic of extensive, varied, widespread, and, therefore, geologically ancient sub-orders. I need not, I am sure, point out to you that here again, as in the cases of wings, parachutes, or hooks, structures which are so far physiologically similar as to be alike succulent, are of very different origins. Most of the flesh of a Gooseberry, for instance, is the testa of the seeds; that of a Cherry is mesocarp, *i.e.* the mesophyll of the carpellary leaf; that of the Apple is receptacular in origin; and that of an Orange an outgrowth from the endocarp, or inner layer of the ovary. Succulence, therefore, has originated along various independent lines.

In addition to those succulent structures, there are, however, a few imperfectly understood cases of what seem to be adaptations for what I have termed inside carriage by animals. These are cases in which seeds or fruits resemble insects or allied animals. The seeds of *Abrus*, *Adenanthera*, *Jatropha*, and *Ricinus* resemble beetles, the suggested explanation of the use of this resemblance being that birds may carry off these seeds by mistake, and so aid in their dispersal. The seeds of the Cow-wheat (*Melampyrum*) resemble the cocoons of ants so closely that, as Lundström has observed, ants do actually carry them to their nests, where presumably the plant benefits by being able to germinate in the fine tilth of an ant-hill. The pod of the leguminous *Scorpiurus subvillosa* closely resembles a centipede, and that of *S. vermiculata* is equally like a caterpillar; but perhaps the most remarkable of these cases is that of the common Marigold (*Calendula officinalis*, L.), in which —sometimes apparently in one flower-head—three types of fruit occur, viz. one with longitudinal flanges or wings that might aid its dispersal by wind, another in which these flanges consist mainly of somewhat hooked projections which would catch in the hides of passing animals, and a third which remarkably resembles a green caterpillar.

This last instance of adaptation to dispersal by animals which I have to mention well illustrates one of the leading conclusions drawn from such facts as those which I have put before you, viz. the probable specialising of such adaptations from more primitive and more indifferent adaptations.

We have seen that, though reducible to a comparatively small number of types, there are many very different mechanisms to secure seed-dispersal. Most types of mechanism are represented by members of widely separated orders: few of them are characteristic of whole sub-orders, hardly any of whole orders. Such genera as *Geranium*, *Viola*, and *Trifolium*, and such orders as the Compositæ, Cruciferæ, and Umbelliferæ, exemplify the occurrence of a variety of mechanisms in allied plants. Considerable as is the variety of dispersal mechanisms as a whole, it is not as great as the variety of pollination mechanisms in the flower. These conclusions lead to the further inference that these dispersal mechanisms are on the whole of more recent acquisition in the vegetable kingdom, geologically speaking, than at least the more common of the floral adaptations. Kerner has argued convincingly that many adaptations are either still of an indifferent character or may at least easily be imagined to have had an indifferent origin. Small seeds, for example, as in Orchids, may at first have been the result of late development, or of mere economy of nutrition, and lend themselves as readily to simple "censer action" as to dispersal by wind. Hooks and bristles, again, may be partly the result of purely nutritional causes, and may certainly serve, or have served, as protections against "unbidden guests," such as leaf-eating or honey-stealing insects, as well as, or before, serving to aid in dispersal by animals. Dispersal mechanisms afford, I think, some examples of progressive development in elaboration as instructive as Darwin's illustration of the possible origin of leaf-tendrils by the twining petioles of *Clematis*. Sir John Lubbock cites the case of the North American genus *Thysanocarpus*, belonging to the order Cruciferæ, one living species of which, *T. laciniatus*, has a winged or margined siliqua; whilst another, *T. curvipes*, has considerably larger wings; a third, *T. radians*, has them broader; and a fourth, *T. elegans*, has them so thin as to have become perforated. I have already alluded to the gradations presented by the wings of the seeds of different species of the genus *Pinus*, and I would only further remark on the contrast afforded by the comparatively thick, heavy, and unformed wings of the samara of our common hedge Maple (*Acer campestre*) and the beautifully curved and delicately thin vanes of other species, such as that familiar exotic the Sycamore (*Acer Pseudo-platanus*). Between these extremes there is a large series of intermediate forms. Considerations of time have caused me to intentionally say little on the present occasion as to the results of the seed-dispersal with which I have been dealing; but there is one interesting point to which, in conclusion, I wish to direct your attention. The epiphytic habit, whether it be exhibited by the Ferns, Gooseberry bushes, or various trees which may be found growing in the tops of our English pollard Willows, or by the multitudinous Orchids, Aroids, Tillandsias, &c., of the tropical forest, must be entirely dependent upon dispersal by wind or animal agency.

PRUNING: WHAT FOR, HOW, AND WHEN.

By Mr. R. P. Brotherston.

[Read August 15, 1899.]

Let me first of all say that your Secretary is responsible for the comprehensive title that heads this paper, and that after having made a few preliminary notes as guides to those parts of the subject calling for the greatest prominence, I was compelled to give up attempting anything beyond a discussion of the broad facts connected with pruning, along with such illustrations as, it is hoped, may tend to enhanced lucidity.

Pruning, it need hardly be said, is a practice of very ancient date, and though we may hesitate to believe with Milton that it formed one of the accomplishments of Eve, there is yet good reason to think it must have been a common detail in Grape cultivation in antediluvian times, because wherever the Grape vine is cultivated pruning is a necessary concomitant. It was practised by the ancient Jews, Greeks, and Romans, and we may be pretty certain it was also known in ancient Britain, though it was not until printed books became a necessity, and the conveniences of living began through their medium to be discussed, that anything much can be discovered of our ancestors' ideas on the subject.

As early as Elizabeth's time a few writers treated of the matter; but, so far as I am aware, no definition of the practice, that in any sense can be termed scientific, was made till towards the end of the seventeenth century, when De la Quintiney's "Compleat Gardner" appeared. Quintiney gave his reasons for pruning thus: "First, To take away all Branches that are naught, or might be prejudicial to the Abundance or Goodness of Fruit, as also to the Beauty of the Tree. Second, To preserve those of good use to those Trees. And Third, Prudently to clip those that are too long, and not to cut anything off those that have not too much length." In the succeeding century, Switzer, whom M'Intosh declared to have been the father of modern fruit-culture, formulated the following reasons:—"First, that the tree may last longer. Secondly, that it may have a handsomer shape. And thirdly, that it may bear better." A hundred or more years before this Lawson strongly advocated pruning as conducive to the longevity of hardy fruit trees. The theory was adopted by Evelyn, who, it may be noted, briefly defined pruning as follows: "Pruning, I call all purgation of trees from what is superfluous."

Coming down to the present century, we find Forsyth silent as to general reasons. Loudon, however, in the "Encyclopædia of Gardening," with that lucidity of statement for which he is remarkable among writers on horticulture, says that "the objects of pruning are various, such as promoting growth and bulk, the renewal of decayed plants and trees, modifying the form, enlarging the fruit, promoting the formation of fruit buds, lessening the bulk of trees, adjusting the branches to the roots, and the removal or cure of disease." M'Intosh, as well as other writers on fruit culture and forestry, was so pleased with these reasons that he and they transferred them bodily to their own works, forgetting, however, to make acknowledgment of their origin.

The author last named has very clearly defined the *rationale* of root-

pruning. This practice is mentioned in a French work of the sixteenth century, and "The New Orchard" contains proof that Lawson possessed a sense of the necessity of pruning roots as well as top-growth. At that early period, however, and long after, the common method of treating roots was by "ablaquation." This consisted in laying bare the main roots on the approach of winter, and leaving them exposed to weather of all kinds till the spring following, when they were again covered with soil. Another practice of these early days consisted in splitting the larger roots at a point near their junction with the bole of the tree, and by means of wedges inserted in the cleavage the split portion was prevented from again closing. But although very little is said of root-pruning by the mass of the earlier writers, there is yet reason to conclude that it was practised more or less continuously. In this connection the "Dictionnarium Rusticum," "printed in the year 1668," thus interprets: "To *Prune*—To trim trees by cutting off the superfluous branches or roots." The Rev. John Laurence, who was contemporary with Switzer, practised root-pruning, and recommends the practice in one of his little manuals. Its value as a factor to success in cultivation, though thus recognised, has nevertheless been fully realised only during our own times, when attention to the condition of the roots is considered as important as the care of the branches and shoots.

Without stopping to examine to what extent the early gardeners were right or wrong in their conceptions of what constitutes beneficial pruning, I shall at once proceed to the discussion of the first part of the subject: What pruning is for, or the reasons why we prune.

Pruning as an important item in fruit culture is a means towards obtaining an annual crop of fruit, limited to a quantity commensurate with proper size and fine quality in the individual fruits. Its immediate effect is to modify the habit of the tree's growth, and to bring it to the particular form desired by the operator, and, as a secondary effect, to produce in it a bias to grow in the future on the lines thus laid down for it in its infancy. The procedure is the same for all kinds of hardy fruit trees. If for a dwarf, for an espalier, or for training to a wall, it is imperative that the growth of the first year be shortened to form a foundation. The older race of gardeners were, if anything, more particular in this matter than those of the present day, who, being more anxious to secure a few fine fruits at the earliest possible moment, devote less attention to early pruning than they did of old. On the whole, it is by no means improbable that were the three or four earliest years of the tree's existence set apart solely to the securing a regular set of branches upon which to build up the fruit-bearing portions, the loss of a few large fruits sacrificed in the process would in the future be amply compensated for. These remarks apply to robust young trees, but in the case of those that are less strong, and perhaps even weakly, the earliest pruning must be of a nature that shall produce a stronger tree, and this may generally be secured by cutting well back in order to provide one strong shoot, which in its turn will come to be manipulated in the same manner as those already referred to. In this instance, pruning is not performed directly either to produce fruit or to lay the foundation of a tree, but solely to produce a vigorous plant. This phase of pruning is of very wide appli-

cation, and is perhaps less valued than its importance as an undoubted means of producing a strong young plant entitles it to be. Stunted young forest trees, such as the Oak and the Ash, if cut hard back, at once respond by producing a vigorous shoot; evergreen shrubs, as the Holly, are equally responsive. The Rose is particularly good as an example of flowering shrubs. At the same time the method is not of universal application. I should, for example, hesitate to treat the Beech or the Yew in so drastic a manner, and many examples will occur of other trees and shrubs to which this practice cannot be safely extended.

Having by means of pruning laid the foundation of a vigorous tree, I proceed to show that pruning is equally necessary as a means toward the production of an extended and fruitful growth. Extension and fruitfulness no doubt follow without pruning. That is the method of Nature, and it is at once rapid and uncertain. Extension is rapid, but fruit production always uncertain. Growth is extended by pruning in two ways and by two methods. A strong, well-ripened shoot relieved of one-third of its length will, according to the nature of the season and the vigour of the tree, add at least as much to the length of the shoot cut as if it had been left to Nature, and it will also produce a greater or less number of side growths, which in a state of nature would not have appeared. At the same time there has also been a promotion of fruit buds. This method must be very closely followed wherever symmetrical training is aimed at, as, for example, in the case of wall-trees. Other good results that follow are seen in foliage of larger size and fruit improved in the same way.

The other method of promoting growth extension is applicable to forestry, shrub culture, and some phases of gardening. It is based on the fact that all weakly growths, more particularly those which are in the centre of plants, and on that account debarred from light, are not only of no use to healthy plant life, but are really inimical to it. There are certain trees, of which the Poplar is a familiar instance, which naturally shoot up very rapidly; but the form most generally assumed by all unpruned trees is one of close growth with suppressed extension of the stem and main branches. By the simple method of cutting clean away a certain number of shoots, determined always by the judgment of the operator, a more rapid extension of the stem at once ensues, and if the same system is adopted in the case of the main branches as well, the bulk of the tree will by that means be still further increased. The effect, both immediate and ultimate, is to alter the habit of growth of the subject operated on so that given attention during the earlier years of the tree's existence, during which it assumes a habit of growth that it afterwards maintains, scarcely any pruning will be required in the future. In the case of shrubs we secure exactly the same results. By pruning only the weakly shoots from the centre of the Portugal Laurel or Yew, and allowing a certain number of shoots to obtain the lead, the habit of growth thus induced continues. Examples of a most interesting nature exhibiting how the whole future of a shrub may be altered by pruning at an early stage of growth exist at Tyninghame. A few years ago the main stem of a dead Holly was cut down, which, after having been reduced to short lengths, was split up for firewood. Blocks from the lower part of the tree were

found each to contain in its centre a portion of another Holly, bearing marks of having been pruned close to the stem. At first it was puzzling to understand how the stem of a young Holly could have got inside that of another, which from its bulk and height was certainly of great age. The solution was found in a little book written in 1633 by the sixth Earl of Haddington as a letter to his grandson on the management of woods, in which it is stated that the Earl had lost all pleasure in clipped shrubs, and that his pyramid Hollies had been in consequence pruned to clean stems in order to make trees of them. The dead Holly just referred to was one of these. Many large Hollies are still standing (though in a condition of decrepit age) which no doubt contain, like the above, undoubted evidence of the possibility of transforming, by means of judicious pruning, closely clipped shrubs into large trees.

Flowering shrubs, such as hardy Azaleas, by the simple method of cutting out weakly shoots, increase in size more quickly. Shoots of Weigelas, Flowering Plums, Apples, Thorns, Spiræas and others, are lengthened by the same process, no cutting back being required, but merely the removal of weakly and worn-out growths. This phase of pruning is practised in horticulture by all successful gardeners, and extends not only to the removal of shoots but likewise to foliage, to flower-stems, to flower-buds, and to fruits, the results in every instance being apparent in an extended growth, or an increase of size or of bulk.

Pruning as a means tending to restriction of growth is most commonly practised in the case of hedges, clipped shrubs, and in fruit culture, though in the last the system of restricting growth is in some degree counterbalanced by increasing the extent of leaf surface and by allowing the most perfect shoots only to remain on the tree. Root-pruning, properly pursued, exerts a very pronounced influence for good wherever there is a restricted top-growth, and it may be applied with advantage, not only to fruit-bearing trees, but also to closely cut hedges. The effect of root pruning when performed on young trees lasts over a period as extended as in the case of branch pruning.

The last reason for pruning that I shall name is the influence it exerts in restoring diseased plants to health, and worn-out ones to renewed vigour. In neither case, unfortunately, is pruning a universal remedy, and the extent to which it may be advantageously employed is limited. Nor is its operation or its effect so well understood as are some other aspects of pruning. It is possible sometimes, for instance, to stay the progress of canker in an Apple tree by cutting the portions attacked clean out, or by heading down, to induce a clean, healthy growth. But both of these methods occasionally fail in producing the good results expected. As a rule, nevertheless, the practice of excising all diseased growth, whether of foliage or of wood, is one to be commended. Pear trees, large Hollies, Grape vines, Rhododendrons, and Roses are a few examples of plants that are invigorated to a wonderful extent by close cutting when they are in an exhausted condition.

Dead or dying wood should be cut clean out, back to the living portion. Its influence on living vegetation is invariably inimical, and its removal is always followed by an increase of vigour.

Root-pruning is chiefly employed in gardening as a means of

promoting fruitfulness, and its further effect is to improve the size, quality, and appearance of the fruit. Fruit trees of all kinds should be subjected while young to annual or biennial root-pruning, say up to the eighth year. Growth will be in no wise retarded, and the after treatment of the roots will be simplified to a very great degree. Shrubs also are greatly benefited by root-pruning when young, and there is no better method of transporting a large shrub or young tree than first to prepare it twelve months previous to removal by cutting back the roots.

How shall I prune is the next question that asks for an answer.

Heading down young trees as a means (1) of imparting vigour to weaklings and (2) of laying a foundation for the future, has already been referred to. With regard to the first, it is imperative that in worked trees the cut be made just above the junction with the stock, or if seedlings are the subjects of manipulation, close to their base; and if they are in vigorous condition, and it is wished to form them into dwarf or trained trees, they may be cut 12 to 18 inches from the ground. Of the growths resulting from this pruning, the strongest shoots, to the number of three or four, should alone be allowed to grow, any weakly ones being rubbed off or cut close to the stem at an early stage. After-pruning consists in shortening these shoots to the buds which it is intended should produce other shoots to form the frame-work of the tree. Provided the trees are examined as soon as growth has well started, and the "snags," or "cockspurs," as they are called, removed, it is a matter of no great importance whether the cut is made slanting to or from the bud, or straight across. The cut will be covered with new bark the same year, and in passing I may say that the removal of these unsightly points, whether on plants, shrubs, or trees, is a little item in gardening that it is always advantageous to effect.

Single cordons, when suitable varieties, short in growth, and prolific of fruit-buds are employed, do not, in my experience, require to be headed down, and the main stem need not be shortened until the limit of extension has been reached. Side growths will, of course, require to be regulated, pinched, and in winter, pruned if necessary.

The manner of pruning fruit-trees after they have attained a size to bear a fair crop must always remain a matter for individual determination. Some there are whose idea of the proper method to pursue is that of "spur-pruning" pure and simple. Others favour a slight modification of this, permitting a growth somewhat more free, while yet others delight in a growth quite unrestricted, save by a due thinning of the shoots where they are too closely disposed. With the exception of the Peach and the Fig, any of these methods of pruning may be pursued with success. The really important point is to carry none of them to an unreasonable extent. Without going into details, it may be said that this occurs when the health of the tree is interfered with or its fruitfulness lessened or destroyed. But as long as an annual supply of good fruit is obtained, the pruning cannot be far amiss. Whichever system is favoured, in order to reap the benefit last named it is imperative that an abundance of light is secured to the leafage. Hence it is incumbent that shoots and branches should be thinly disposed and spurs and buds constantly regulated to a sufficient distance apart. In the case of

trees, whether dwarfs or standards, it is important that the centre be kept more or less open, and if spur-pruning be not the system adopted, not only the weakly growths, but, in the case of standards, those also which are to any extent exhausted must be removed, cutting them back to other young shoots, which will occupy their places. In the case of very large trees this system is, perhaps, of all others the best to pursue.

Flowering and decorative trees and shrubs call for a passing notice. It is not the rule to alter to any great extent the natural habit of these by pruning, though hedges and objects of topiary art must necessarily be excepted. The operator has generally two points to bear in mind: either to prune in order to induce a rapid though normal growth, or to keep the plant within limited bounds without, at the same time, reducing its natural vigour. We may select, as an illustration, the common Hawthorn. If it is wished to make it grow quickly to large dimensions all the pruning required after a proper foundation has been laid is the elision of the weaker shoots, leaving only the stronger. If, on the other hand, it is wanted to form a bush, it is necessary to make an annual examination, and with a knife to cut away a few of the stronger growing and outward tending branches, leaving others untouched to fill the places of those removed. Bushes perfectly neat in appearance will be the result, and altogether without, what many people think, the ugly primness of those pruned with shears. Spiræa Bella provides a good example of a shrub that succeeds best when the whole or nearly the whole of the shoots which have flowered are cut clean away, leaving for the succeeding year's flowering only the strongest of the yearling growths. Hydrangea paniculata succeeds best when spur-pruned, and Caryopteris mastacanthus when the growths are moderately thinned, and those left cut back.

As an example of a large tree, we may select a Copper Beech. It must be decided first of all whether it is intended that the branches should clothe the tree down to the ground, or whether a long, clean trunk is desired. In either case the central leading shoot must be favoured by removing, during the first ten or twelve years, most of the twiggy side growths which hinder its progress. The main branches having been selected, they must be treated in a like manner; and when once the tree has fairly "gone away," the leading stem and main branches will all but take care of themselves. In the case of a tree intended to produce a long and stately trunk, no branch should be allowed to predominate over others until the desired height has been attained. All useless spray, however, should be removed from the branches, which again are best when rather widely disposed, and as growth progresses these also must be removed, cutting back close to the main stem in the operation.

Careful pruning is helpful also to Conifers while they are still in a young state; but nothing should be attempted beyond cutting back to the main stem those side branches which have been over-grown by a later tier, and it is only while the trees are yet small that even so much is required. I have induced the difficult *Abies Veitchiana* to produce a leader in place of a dead one by cutting back to healthy wood. Conifers readily lend themselves to clipping, but it is a practice

not to be commended, though, no doubt, variegated forms are greatly brightened by means of an annual trimming.

With regard to the manner of cutting, we must bear in mind that young trees possess the power of quickly covering clean cuts with new bark, and therefore whenever a shoot or branch is removed it ought to be cut smooth, and even with the part of the tree from which it springs. The question of removing branches from old trees is more complicated. The vine provides an example of vegetation that takes kindly to the removal of its branches at any age. The Peach and the Apricot, on the other hand, when but a few years old resent the loss of a branch. Forest trees exhibit similar differences, and no branch should be taken from a tree if there is a doubt as to its power to overcome its loss.

A paragraph relating to the method of root-pruning may fitly terminate this section. Shortening roots at the time of transplantation is an old practice, and its method and rationale are well described by Reid, who in 1683 wrote "The Scots Gardner." French gardeners, when transplanting young trees, cut back the roots almost close to the stem: a practice which in a modified form still obtains in the West of England. It is, of course, not always convenient to lift a tree out of the ground in order to shorten its roots, which no doubt is the ideal method if it were always practicable to carry out. An almost equally effective way is to cut a narrow trench with a sharp spade round the tree to be root-pruned, which is effected, as far as side roots are concerned, in cutting the trench; and the roots passing downwards may be cut through by passing a shallow tunnel under the tree at about a couple of feet from the surface. It is a commendable practice to root-prune all kinds of fruit trees during the earlier years of their existence; and though there is a prejudice against the practice being applied in the case of the Apricot and of the Peach, I have discovered no harm to follow. As a matter of fact the annual chopping away of an inch all round the ball of trees cultivated in pots affords proof conclusive of its beneficial effect.

With respect to old trees that have been neglected, caution is necessary not to shorten too many roots in one year or at one pruning. Those that are shortened may, however, be cut to within a few feet of the main roots from which they branch. Incautious root-pruning has proved fatal to many a full-grown tree.

In the case of shrubs it is intended to transplant, the chief value of cutting the roots hard—twelve months or so beforehand—is that the bulk to be moved is lightened to a very considerable extent, and the risk of losing the plant is avoided. Deciduous trees and shrubs require less care than evergreen ones.

A brief consideration of the question when to prune remains now to be noticed. It has already been sufficiently indicated that, as applied to the age of the trees, pruning in very many cases is best performed while the tree is yet young. This rule, however, is a general one, and the exceptions to it are numerous. Without going into that I shall devote what remains to be said to a brief review of the season of the year when pruning is most advantageously performed; and this brings us to the recognition of two broad principles which underlie its performance. We prune either (1) to increase bulk or (2) to repress growth within stated

bounds. If for the former reason, the greatest extent of growth will follow when the operation is completed during that period of the year when growth is at a standstill—that is, in winter. Familiar examples occur in all kinds of deciduous trees and evergreens, which grow most rapidly if cut back or their stems or shoots shortened during the winter. But if we prune to repress excessive growth, then the best season is that which finds the portions to be pruned near to but not arrived at the hardening process. The season when this occurs is in most cases confined to the last week in July and the first week in August; and therefore it is that shrubs pruned at this season (or evergreen hedges trimmed) make less growth during the next twelve months than those pruned six or seven months later. But like all general principles in which Nature is concerned, the result cannot be absolutely foreshadowed within any hard-and-fast lines such as those above enunciated might lead one to suppose. The rule, however, is worth consideration because it leads one to expect an early pruned vine to break more strongly than one left till nearly the last moment; and in the opposite direction it points to late pruning as preferable for those trees which bear best on medium growths. Forsyth, for example, refrained till unhealthy Plums, Apples, and Pears were in full leaf before he cut them down, and this in order to secure a medium growth. It also helps us to determine the best time for pruning the summer growths of hardy fruit-trees, which is just before the sappy growths harden into wood. It serves also as a warning that Roses may be left too late in the season unpruned, so that in trying to escape the evil of early frosts we may quite as effectually arrive at the same result by weakening the young growths through pruning too late. It indicates the season fittest to lop trees as that shortly after the foliage has fallen, while branches it is intended to remove altogether are best cut off just after growth has commenced.

A few additional remarks of a more particular nature may be made. Variegated shrubs which are subjected to trimming assume a brighter foliage if clipped in spring rather than in August. Many shrubs must be pruned at the time of year that suits their flowering. Thus Lonicera Standishi must be left till April. Forsythias are best thinned in May, Spiræa Bella treated in like manner in July. Climbing Roses of the Ayrshire group can be kept in first-class condition only by removing the flowered-out growths in July or August, and filling in with shoots of the current year. Most Roses indeed are grateful for pruning after the bloom is over, when exhausted or misplaced growths are removed. In the same way hardy fruit trees appreciate the judicious excision of useless shoots, spurs, or branches when the season is past.

Then with regard to root-pruning one finds in practice that it may be performed at any season. The ideal time would, however, appear to be previous to the fall of the leaf in the case of deciduous plants, when wounds heal quickly, and a mysterious process of change is going on in the internal economy of plant-life, and, therefore, the time when the fruit has just been gathered is the best for root-pruning. In the case of ornamental shrubs I have performed the operation at all seasons, it being in their case largely a question of circumstance and opportunity.

LESSONS FROM THE GREAT DROUGHT OF 1898.

By Mr. Ed. Mawley, Past President Royal Meteorological Society.

[Read September 12, 1899.]

I think you will allow, after I have given you a few particulars as to the position of my own garden and the character of its soil and subsoil, that it is not naturally calculated to withstand successfully anything like a prolonged drought. In the first place, it is situated on the side of a hill facing south, and about 60 feet above the bottom of the Berkhamsted valley, the rise in the ground being an unbroken gradient of 1 in 8. The soil is composed of disintegrated clay and numerous flints to the depth of about 9 inches, then comes yellow clay and flints to the depth of about another 9 inches, and beneath this a hard pan resting on chalk of an unusually firm and close texture. It should be further stated, in order to show the complete nature of the drainage of this garden, that at a few yards beyond the bottom of it is a deep railway cutting. The flints in the soil vary greatly in size, and are so plentiful as to almost hide the surface of the beds if left exposed for any length of time.

In cultivating such a garden a spade can seldom be used, while a hoe is of no service whatever. Consequently, all the digging and loosening of the soil has to be done with a fork. Although so stony, the surface soon becomes caked after rain. I mention these particulars at the outset, in order to show that although I may not be able to suggest any new methods of contending against dry seasons, I at all events have had good cause in recent years to put in practice most of those that have been already recommended.

The climate of England is generally regarded as a rainy and humid one, and so it may be, even from a horticultural point of view, during the winter half of the year, when evaporation is languid. But I fancy most gardeners will agree with me that, even under average conditions, there is none too much rain for the requirements of the majority of the plants under their care during the summer half of the year. Of course, deep and retentive soils suffer much less than light and porous ones when the rainfall during the latter period happens to be to any extent deficient; but, taking the country as a whole, there are comparatively few localities where garden produce does not begin to suffer to a greater or less extent, unless special cultural precautions be taken to prevent it, after a few weeks of unusually dry weather. It may be interesting if I state here what may be regarded as a seasonable quantity of rain in different parts of the British Isles for each week in the growing or summer half of the year. Such quantities are usually given in inches or parts of an inch, or in tons or gallons per acre; but for gardening purposes my meaning will, I think, be more readily understood if throughout this lecture I substitute for such measurements as these the average number of gallons of rain deposited on each square yard of surface per week. It should, however, be clearly understood that as I have only given the quantities to the nearest quarter of a gallon, and

the area to which these have reference is but one square yard, they can only be regarded as sufficiently close approximations for horticultural purposes. Taking a number of years, the average rainfall for each square yard per week during the six months ending with September, in the different districts into which the Meteorological Office divides the British Isles, is as follows :—

Scot. W.	Scot. N.	Ire. N.	Ire. S.	Eng. S.W.	Eng. N.W.	Scot. E.	Eng. Mid.	Eng. N.E.	Eng. E.	Eng. S.	Britis Isles
gals.	gals.	gals.	gals.	gals.	gals.	gals.	gals.	gals.	gals.	gals.	gals.
$3\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{4}$	$3\frac{1}{4}$	3	3	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	3

I must here express my indebtedness to my friend, Mr. R. H. Curtis, of the Meteorological Office, for kindly compiling for me a table giving the mean monthly rainfall for each district, which has greatly facilitated the preparation of the above and other tables of a similar character.

It will be noticed that the different districts have been here arranged according to their rainfall, beginning with the district which is usually the wettest, and ending with the driest (Fig. 48).

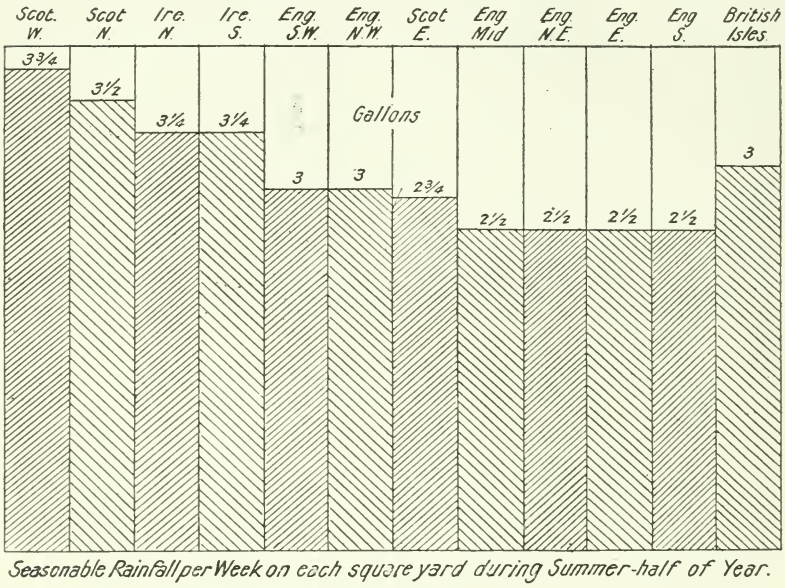


FIG. 48.

Now, taking the same six months for the year under discussion (1898), the average weekly quantity of rain which fell on each square yard comes out in the following manner, and shows a deficiency in all but three districts as compared with the seasonable amounts previously given :—

Scot. N.	Scot. W.	Ire. S.	Ire. N.	Eng. N.W.	Eng. S.W.	Scot. E.	Eng. Mid.	Eng. N.E.	Eng. E.	Eng. S.	British Isles
$4\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	3	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{4}$	2	$1\frac{3}{4}$	$1\frac{1}{2}$	$2\frac{3}{4}$
Variation from average :—											
$+\frac{3}{4}$	$-\frac{1}{4}$	$+\frac{1}{4}$	$+\frac{1}{4}$	av.	$-\frac{1}{2}$	$-\frac{1}{4}$	$-\frac{1}{4}$	$-\frac{1}{2}$	$-\frac{3}{4}$	-1	$-\frac{1}{4}$

(Fig. 49.) The mean weekly amount for the United Kingdom regarded as a whole, and taking one year with another, during this, the

warmest and least humid half of the year, is approximately three gallons for each square yard, which cannot, I think, be regarded as in any way excessive.* When, however, as in the same six months the supply is reduced throughout nearly the whole of England, as it was last year, to about two gallons a square yard per week, little wonder will be felt if

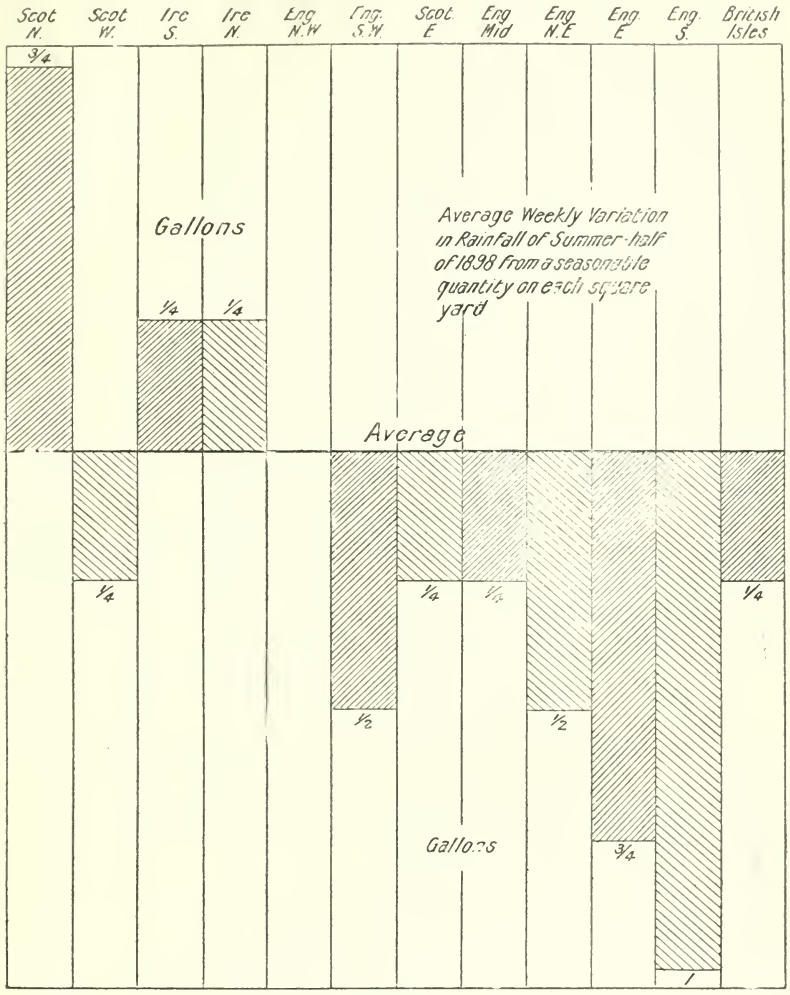


FIG. 49.

vegetation generally in the districts affected strongly resented such niggardly treatment.

On examining the rainfall records for these districts a little more closely, it soon became evident that in most of them, during two of the six months in question, the fall of rain was rather in excess of the average than otherwise. Indeed, it is only when the great drought of that year is reduced to its true limits—from the beginning of June to the middle

* I calculate that a gallon of water would be required to saturate a layer of dry soil a yard square to the depth of about an inch.

of October (thus trespassing to the extent of a fortnight upon the winter half of the year)—that we begin at last to realise what a pitiful allowance of rain our plants had to content themselves with during those four and a half months, and particularly in those parts of the country where the drought was most keenly felt.

The mean weekly supply for each square yard during the period in

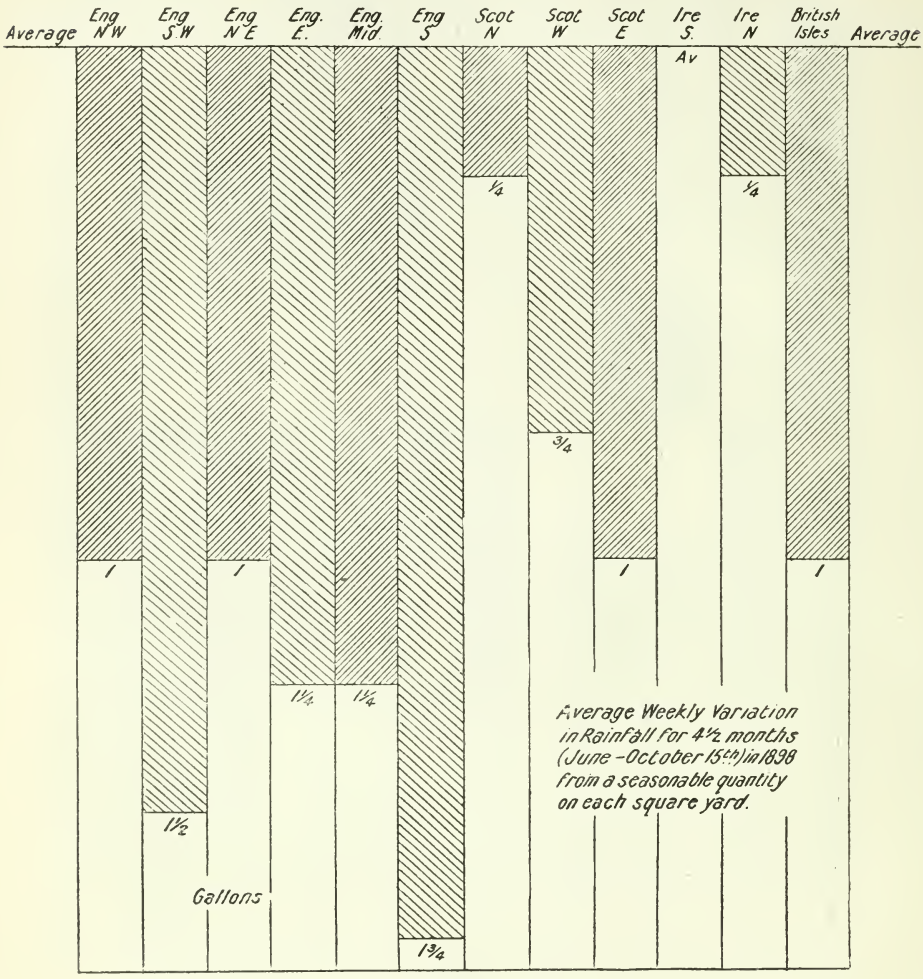


Fig. 50.

question, as compared with what may be considered as a seasonable quantity in the same four and a half months, was as follows :—

	England						Scotland			Ireland		British
	N.W. gals.	S.W. gals.	N.E. gals.	E. gals.	Mid. gals.	S. gals.	N. gals.	W. gals.	E. gals.	S. gals.	W. gals.	Isles
Average for 30 years	3½	3½	2½	2⅜	2⅜	2⅜	4¼	4¼	3	3½	3¼	3½
In 1898 . . .	2½	2	1½	1½	1½	1	4	3½	2	3½	3	2½
Variation from average.	−1	−1½	−1	−1¼	−1¼	−1⅜	−¼	−¾	−1	av.	−¼	−1

From these figures and the accompanying map and Fig. 50, we learn

that the drought was most severe in the south and south-west of England; that it was also keenly felt in the Midlands and eastern counties of England; that it was less pronounced in the north-west and north-east of England; while in most parts of Scotland and throughout Ireland the deficiency of rain was comparatively slight.

For comparative purposes, when dealing with large areas like the Meteorological Office districts, the distribution of the rainfall may perhaps

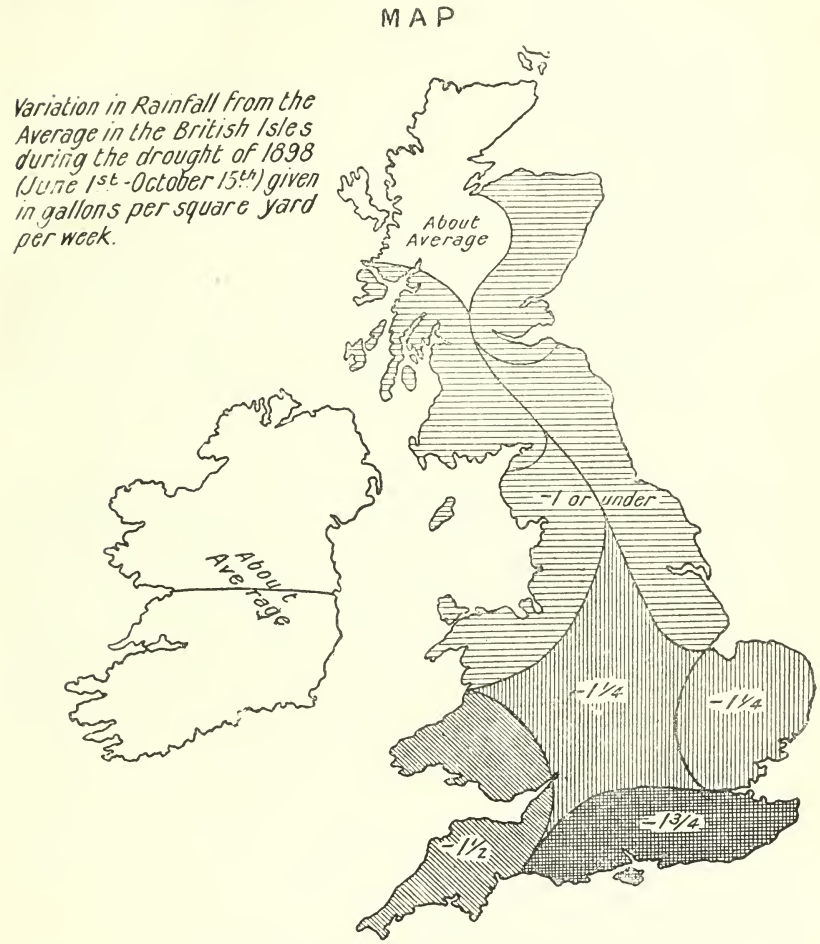


Fig. 51.

to a certain extent be ignored. Nevertheless it is a very important factor: and were it possible to include its influence in the foregoing tables, the drought we are now dealing with would no doubt be seen to have been in reality more trying than there represented. For example, a single drenching thunderstorm passing over any district might yield a large quantity of rain, and so raise the average weekly amount for that district, but this rain would be of comparatively little service to vegetation

as compared with several moderate rains equally distributed over the period under examination.

That prolonged droughts during the four months ending August, when vegetation is most active, are more serious in England than continued wet periods at the same time of year, is clearly shown by the following short tables :—

TABLE I.—Prolonged Droughts during the Spring and Summer at Greenwich since 1815 :—*

Year	Period	Length of drought	Rainy days	Rainfall	
				Total	In gallons per square yard per week
		Days		Inches	
1818	May 19 to September 1	106	13	1·36	Less than $\frac{1}{2}$ gal.
1825	May 29 to August 2	66	4	0·84	„ „ $\frac{1}{2}$ „
1834	April 3 to June 3	62	12	1·01	$\frac{1}{2}$ gal.
1844	March 15 to June 23	101	11	0·53	Less than $\frac{1}{4}$ „
1854	February 24 to April 27	63	9	0·69	„ „ $\frac{1}{2}$ „
1870	March 27 to June 30	96	15	1·14	„ „ $\frac{1}{2}$ „
1887	June 4 to August 15	73	11	1·37	„ „ $\frac{3}{4}$ „
1893	March 6 to July 3	120	24	1·59	„ „ $\frac{1}{2}$ „
1895	April 28 to July 16	80	19	1·08	„ „ $\frac{1}{2}$ „

The above may be regarded as the nine memorable spring and summer droughts that have occurred in the neighbourhood of London during the past eighty-four years. The average interval separating them has been about nine years, but the last two have taken place in the seven years ending 1899, and within two years of each other; while the first of these, that of 1893, was the longest of the series. Neither the drought of 1898 nor that of the present year was sufficiently severe at Greenwich during the spring and summer months to allow of its inclusion in this select table. The drought of 1898 was, however, a very exceptional one. Treated in the same way as the droughts in the table it lasted sixty-eight days (August 8 to October 14), during which rain fell on seventeen days to the total depth of 0·82 inches, or less than $\frac{1}{2}$ gall. per week on each square yard. The most remarkable feature of this drought, considering its severity, was the late period of the year at which it occurred.

During the present year, 1899, there have been at Greenwich three distinct droughts. The first of these lasted from February 20 to March 20, or for twenty-nine days, during which the rainfall amounted to less than $\frac{1}{4}$ gall. per week on each square yard of surface. The second from May 25 to June 17, or for twenty-four days, when no rain at all fell. The third from July 25 to August 27, or for thirty-four days, when the rate of fall was less than $\frac{1}{4}$ gall. for each square yard per week.

* *Quarterly Journal of the Royal Meteorological Society*, Vol. 24, page 70.

TABLE II.—Continued Wet Periods during the Spring and Summer at Greenwich since 1815:—

Year	Period	Length of wet period	Rainy days	Rainfall	
				Total	In gallons per square yard per week
		Days		Inches	
1828	July 4 to August 14	42	27	10·04	8 gals.
1830	May 21 to July 20	61	34	9·27	5 ,,
1838	May 28 to July 6	40	29	6·78	$5\frac{1}{2}$,,
1848	July 20 to August 13	43	38	6·10	$4\frac{1}{4}$,,
1860	July 16 to August 30	46	34	6·24	$4\frac{1}{2}$,,
1878	April 1 to June 30	91	51	13·17	$4\frac{3}{4}$,,
1879	May 23 to July 24	63	43	10·39	$5\frac{1}{2}$,,
1888	June 26 to August 6	42	34	10·76	$8\frac{1}{2}$,,

From a casual glance at the above tables it might be inferred that continued wet periods were about as frequent in England during the spring and summer months as prolonged droughts, but this is by no means the case. The fact is, when drawing up the foregoing tables I found that had I allowed anything like the same number of days for a wet period as I had done for a drought, there would have been scarcely any left to chronicle. On the other hand, had I reduced the number of days of drought to make them more closely agree with the wet periods, the table of droughts would have been considerably extended.

We here learn our first lesson in respect to dry periods in England. They are more frequent and of greater persistency than wet ones during that period of the year when plants are most in need of moisture at their roots.

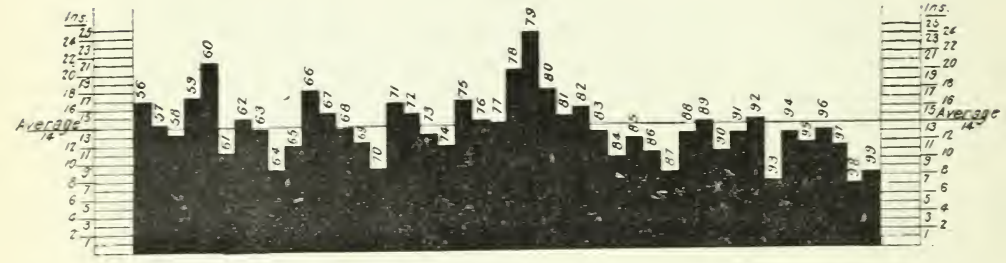
I scarcely know which to consider the more destructive agents in British gardens, severe winters or prolonged droughts. If the ultimate injuries as well as the immediate ones could be properly estimated, I am rather disposed to think that those placed to the credit of dry periods would outnumber those inflicted by severe winters. And for this reason dry summers frequently follow each other in rapid succession, whereas several severe winters in succession are comparatively rare, and after all it is the cumulative effects of either of these adverse influences that are most to be dreaded.

I may perhaps here explain how necessary it is for horticultural purposes to keep the rainfall of the summer and winter halves of the year distinct. I do not say that the winter rainfall is altogether unimportant; but as nearly the whole of it passes quickly below the subsoil, only a very small part can be regarded as of any direct service to vegetation. It is, however, very different with the rain which falls during the summer half of the year. For then, except when excessive, every drop is in one way or another helpful to the occupants of our gardens. I am often asked by horticulturists how much the rainfall of any year, calculated from the 1st of January, is in excess or defect of the average quantity. But estimated in this way the results must often prove very misleading. For instance, supposing the question be asked in July and the rainfall during the first four months of the year to have been very heavy, while scarcely any rain had fallen in May or June, the inference would be that the

total supply had been unusually bountiful, whereas a gardener would naturally describe the season as up to that time extremely dry. No; for all practical purposes it is the winter rainfall alone which goes to nourish the springs and maintain our supply of underground water, while the summer rainfall alone is of any substantial benefit to plant life. Let this, then, be our second lesson.

Regarded from this, the horticulturist's, point of view, I was surprised to find on tabulating the results what a number of dry summers (Apl.–Sept.) we have had in recent years. At Berkhamsted, and no doubt the same holds good for many other places in the home counties and elsewhere, in the last seventeen years there have been only two of these summers (those of 1889 and 1892) when the total rainfall for the six

FIG. 52.



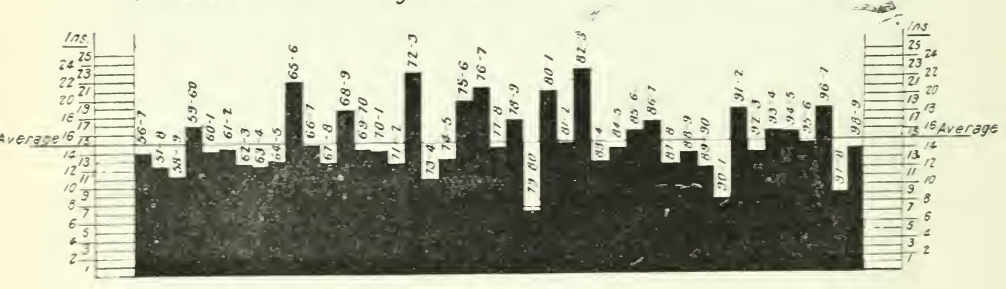


FIG. 53.

months ending September has been in excess of the average for that period, and even in those two years, as will be seen from Fig. 52, the difference was very slight. Taking these seventeen dry summers together, the total deficiency of rain on each square yard of surface in my garden has been 185 gallons, or an average deficiency of rather less than half a gallon a week.

TABLE to convert gallons per square yard into inches of rainfall.

¼ gallons	= ·05 ins.	5 gallons	= 1·07 ins.
½ „	= ·11 „	6 „	= 1·28 „
¾ „	= ·16 „	7 „	= 1·50 „
1 „	= ·21 „	8 „	= 1·71 „
2 „	= ·43 „	9 „	= 1·93 „
3 „	= ·64 „	10 „	= 2·14 „
4 „	= ·86 „		

It may be said that it is all very well to be told that a certain summer like that of last year was a singularly dry one in most parts of England, and that dry summers are by no means infrequent; but what we really want is a few practical hints as to how best those dry periods may be tided over. I am afraid that I have little that is new to impart in this connection, but a brief résumé of the methods that I have found of most service when contending against dry weather in my own garden may, I trust, prove useful, if only as a reminder of what should be done under such circumstances.

In the first place it may be well to consider what natural sources of moisture we have to depend upon during a long drought. They reduce themselves for all practical purposes to two :—

1. The scanty supplies of rain and dew under such conditions.
2. The moisture already stored up in the soil itself.

Trenching.—Forethought, as is well known, is one of the greatest essentials in successful gardening, and nowhere will this be found of more value that when trying to defend our gardens from the injurious effects of a long period of dry weather—one of their most dangerous and most frequent enemies. Hence it is that it is invariably found that on ground that has previously been well trenched plants suffer far less during a drought than on a similar soil which has not been deeply worked. This deep working of the ground, it will be found, not only renders the lower soil more capable of holding moisture, but also allows the roots of plants to descend deeper in search of it.

Manuring.—Another valuable aid to the retention of moisture in the soil in dry seasons is the addition of a liberal dressing of farmyard or other animal manure when the ground is being prepared for the reception of any crop. Half-rotten garden refuse, although of less manurial value, I have found still more helpful in its powers of keeping moisture in the soil, as it decays in the ground less rapidly.

Let our next lesson then be this: Deep working of the soil, together with the addition of animal and vegetable manure, serves more perhaps than any other means to collect and retain moisture in garden ground.

Hoeing.—The trenching previously recommended tends to keep the moisture in the soil instead of allowing it to pass downwards beneath the range of the roots of plants, while frequent hoeing of the surface, or loosening it to the depth of, say, a couple of inches, prevents this moisture rising to the surface and evaporating.

Mulching.—The previous operations of trenching, manuring, and hoeing having been carried out, the next precaution is that known as mulching—covering the surface of the ground with half-rotten animal manure, leaves, cocoa-nut fibre, spent tan, or other similar materials. All these are serviceable for the purpose, but in my opinion the first-named, half-rotten manure, is the best. The action of mulching, properly applied, is threefold: (1) it checks evaporation; (2) it keeps the surface soil open, and (3) at the same time equalises the temperature and moisture of the ground beneath it. Fresh manure is not to be recommended, as after rain it runs together and prevents the admission of light and air. For the same reason no mulching should be more than about 3 inches thick. If loosened with a fork after each heavy rain it will

continue effectual in its operation and with no injurious results throughout the whole summer. In 1884 I carried out at Croydon some experiments in regard to mulching, with the following results. The experiments were made by means of two percolation gauges, each a yard square and containing 2½ feet of garden soil. The surface of the soil in one gauge was unmulched, while that of the other received a mulching of half-rotten manure three inches thick. In every month of that year, with the exception of January, the evaporation from the mulched soil, as compared with the unmulched, was slight, while the temperature of the ground beneath the mulching remained considerably cooler than in the unmulched soil during the summer months, and particularly was this the case in the hottest part of the day. At night the ground under the mulching was as a rule slightly warmer than in the unmulched soil. Even at the depth of a foot the contrast in temperature was at times very striking—as clearly shown in the following table and in Fig. 54.

TABLE showing the effect of a Mulching of half-decayed manure, 3 inches thick, on Percolation, Evaporation, and Temperature :—*

1884	Temperature, &c., of soil with mulching, above or below that unmulched					Air temperature		Rainfall	
	Percolation per week	Evaporation per week	Earth temperature at 1 ft. 9 A.M.	Earth temperature at 1 ft. 3 P.M.	Earth temperature at 1 ft. 9 P.M.	Mean max.	Mean min.	Amt. per week	No. of days
	Gals.	Gals.	Deg.	Deg.	Deg.	Deg.	Deg.	Gals.	
January	−·12	+·12	+0·5	0	+0·1	48·1	39·4	2·80	16
February	+·44	−·44	+0·7	0	+0·1	47·9	37·4	2·01	13
March	+·33	−·33	+0·5	−0·5	−0·6	51·1	37·7	1·54	9
April	+·12	−·12	+0·6	+0·4	−0·7	52·4	37·1	1·40	13
May	+·07	−·07	−0·0	−1·6	−2·0	63·1	44·0	0·61	10
June	+·06	−·06	−0·2	−1·2	−1·9	66·1	48·8	2·05	9
July	+·18	−·18	+0·2	−1·2	−1·9	71·8	53·9	1·68	16
August	+·18	−·18	+0·3	−3·7	−2·2	75·5	52·9	1·12	8
September	+·02	−·02	+0·6	−0·6	−0·6	67·0	51·6	2·62	15
October	+·17	−·17	+1·1	+0·5	+0·3	56·0	41·9	1·26	12
November	+·10	−·10	+1·2	+0·7	+0·6	47·3	36·2	1·73	12
December	+·04	−·04	+0·7	+0·4	+0·1	45·5	37·0	2·38	16
Sums	+1·59	−1·59						21·20	149
Means			+0·5	−0·6	−0·7	57·6	43·2		

In these experiments the surface of the unmulched soil was kept constantly hoed, or the differences given in the table would, no doubt, have been greater than there shown. For, after all, a loose layer of surface soil forms in itself one of the most efficient of mulchings. It is inadvisable to put on any mulching, at all events, earlier than the latter half of May, as previous to this the warmth of the ground is a more important factor in a garden than the amount of moisture in it. There are only two objections to mulching. It is expensive where suitable material is not ready to hand, and it gives the garden an untidy appearance, particularly where wild birds are numerous.

Watering.—This should only be resorted to on a large scale, where it

* *Quarterly Journal of the Royal Meteorological Society*, Vol. 24, page 71.

has been found from experience that it is impossible otherwise to keep the majority of the plants in the garden in a satisfactory condition. On good holding soils, if the ground has been well and deeply cultivated, and the hoe has been kept constantly going, a drought must, indeed, be prolonged for any except moisture-loving plants to receive any serious check. On shallow or less retentive soils, the more important crops in the kitchen garden, and all the flower borders, should be mulched with short litter; for, with all its drawbacks, a mulching is one of the most efficient means with which I am acquainted of combating a long continuance of dry weather. Even on the driest soils, where frequent watering has to be resorted to whenever a drought has set in in earnest, the greater the proportion of mulched surface in a garden the less the labour in watering, and the more satisfactory the result. Watering is one of those things which, unless done thoroughly, is likely to do more harm than good. Let a good soaking be given to a plant or border, or no water at all. The object should be to moisten the ground in the neighbourhood of the roots of plants, and, if possible, beneath them. It has often been said that watering with water much below the temperature of the soil is injurious; but I cannot say that I have found this so in practice. It is thought to chill the ground. Twice during the recent hot weather I have driven two earth thermometers into the soil in the same bed to the depth of a foot with a view to test this point. One I treated like a flagging plant, and gave the ground immediately round it three gallons of water, the temperature of which had been lowered by means of ice much below that of the ground, while the other thermometer received no water at all, with the following results:—

	deg.
August 26, 1899.—Temp. of soil at 1 ft. deep before watering	71·5
Temp. of water	60·0
Water $11\frac{1}{2}$ deg. colder.	
Temp. of soil 20 minutes after saturating with water	71·4, or $\frac{1}{10}$ deg. colder.
An hour afterwards	71·6, or $\frac{1}{10}$ deg. warmer.
September 7.—Temp. of soil at 1 ft. deep before watering	67·4
Temp. of water	55·0
Water $12\frac{1}{2}$ deg. colder.	
Temp. of soil half an hour afterwards	67·3, or $\frac{1}{10}$ deg. colder.
,, ,, an hour afterwards	67·2 ,, $\frac{2}{10}$,, ,,
,, ,, three hours afterwards	66·8 ,, $\frac{4}{10}$,, ,,

In the last experiment the temperature of the soil, as shown by the thermometer not watered, did not vary at all during the three hours.

No doubt in all such cases the large mass of surrounding soil at a higher temperature warms the cold water as it enters the ground, or very shortly afterwards. It is the light waterings which do the harm, and chill the soil by the rapid manner in which the water evaporates from the surface. After every proper watering the soil should on the following day be either hoed or lightly forked over, or it will soon require repeating. When once the first few inches of soil have become dry and powdery, it is often impossible, without much patience, to get the water into the ground. In such cases the only plan is to gradually moisten this layer of dry soil, then, allowing a sufficient interval to elapse, to loosen it with

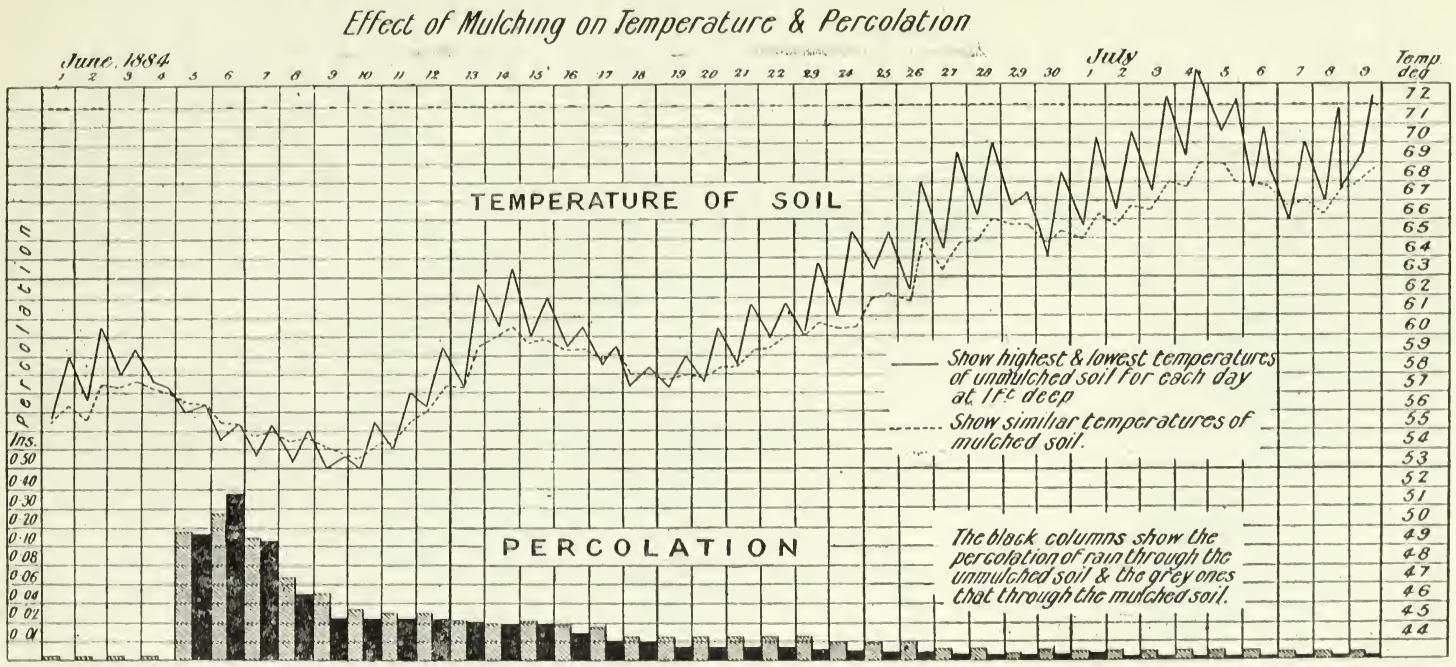

Effect of Mulching on Temperature & Percolation
June. 1884
July
Temp deg
TEMPERATURE OF SOIL
PERCOLATION
Percolation Ins.
Show highest & lowest temperatures of unmulched soil for each day at 1ft deep
Show similar temperatures of mulched soil.
The black columns show the percolation of rain through the unmulched soil & the grey ones that through the mulched soil.

Fig. 54.

a hoe or fork, and then to give the ground the soaking it requires. Of course much labour is saved by beginning to water sufficiently early, so that this obstinate layer of dusty soil may not have time to form. In watering fruit trees and shrubs it will be necessary to extend the watering for some distance away from the tree, according to its size, and not, as is often done, confine the watering to the roots near the main stem. When planting during dry weather it is of little use applying water after the plant is in position, but the hole made for its reception should be filled with water previously, so that the soil beneath its roots may become completely saturated. When this is done no further watering will in most cases be required. In sowing seeds the object should be the same, viz. to secure an ample supply of moisture in the ground beneath the seed bed.

Selection of Drought-resisting Plants.—In dry localities, the careful choice of varieties of plants which have been found by experience to be deeper-rooting and of more vigorous constitution than their fellows will be found of the greatest assistance, and especially will this hold good in the kitchen garden. I feel sure that our troubles during a dry season would be much reduced if only due attention was paid to this ; whereas most of us persist in growing, year after year, vegetables, flowers, shrubs, and fruit trees altogether unsuited to the soil and climate of the particular district in which our garden happens to be situated, and consequently suffer accordingly.

I have already trespassed too largely on your attention ; but there is one more question which I must just refer to in conclusion, and that is the importance of every garden being provided with an ample supply of water for all emergencies. There are now so many labour-saving appliances available in the way of raising, storing, and distributing water that there can be no good reason why this should not be done.

In addition to those already given, the lessons to be learnt from last year's drought are the following :—

In order to check evaporation from the ground, a loose layer of soil should be always kept on the surface by frequent hoeing.

Should this not prove sufficient for the purpose, a suitable mulching should be applied. Watering should never be resorted to unless absolutely necessary, but if undertaken, sufficient water should be given to saturate the soil to the depth of six or more inches.

In dry districts the most vigorous and deep-rooting varieties of each kind of plant should as far as possible be alone grown.

Lastly, every garden should be provided with an ample supply of water to meet the requirements of even the driest seasons.

ON PLANT COMPOSITION AND MANURIAL REQUIREMENTS.

By M. Georges Truffaut.

[Read August 29, 1899.]

If a plant be analysed, no matter from what part of the globe it may be derived, there are always found in it the same natural elements, although very diversely associated. These elements are carbon, oxygen, hydrogen, nitrogen, phosphorus, sulphur, chlorine, potassium, sodium, magnesium, silicon, calcium, iron, manganese; and more rarely zinc and copper, which appear only to be present in altogether special cases.

In a general way it is the components of atmospheric origin—carbon, hydrogen, oxygen, and a portion of the nitrogen—which mainly enter into the constitution of plants.

If, however, a plant be calcined in an open vessel, all the elements of gaseous origin disappear, and nothing is left but the mineral elements, which have certainly been furnished to the plants through the soil.

The mineral aliments of plant life are therefore chlorine, sulphur, phosphorus, silica, calcium, magnesium, iron, potassium, and sodium. In order to ascertain the form under which these different elements are susceptible of being absorbed by the roots of plants, it is well at the outset to define in a very general way the nature of vegetable soil and its original constitution.

At the time when the earth's crust first became solidified, it was solely constituted of various crystalline rocks in the act of solidification. These rocks contained all the mineral elements now distributed in nature, but the silicates, whether of lime or of potash, of soda or alumina combined with oxide of iron, were by far the most abundant. We can well imagine that the first external influences which were exercised upon these rocks were all chemical: the atmosphere, superheated at this period, being extremely rich in carbonic acid. And the continuous fall of rain charged therewith attacked these rocks little by little, and rendered soluble, under the form of bicarbonates, a part of the lime, of the potash, of the magnesium, and of the other bases.

The water, following the slopes, carried these bicarbonates away with it. Little by little the aërial pressure of the carbonic acid diminished, and these bicarbonates, losing the greater part of their carbonic acid, were transformed into insoluble carbonates. It is this phenomenon which permits of the explanation of the accumulation of enormous masses of either calcareous rock (carbonate of lime) or of dolomite (carbonate of magnesia).

There was effected, therefore, at this period a dissociation of the primitive rocks and a classification of their elements; the clay, resulting from the silicates of alumina and hydrated potash, remaining unattacked. The silica, which also was generally unattacked, was transported by water to a greater or less distance, according to the size of the grains. There was thus formed either the siliceous sands, the fine mixtures of sand and clay, or the gravels, the original material of conglomerates, the stones of which were subsequently cemented together either by a calcareous cement or a ferrugineous one. This gives a very general idea of the origin of the

three principal existing mineral constituents of our arable lands, the sandy or siliceous, the clay (complex silicates of alumina and potash), and the calcareous (carbonate of lime).

It is evident, therefore, that according to the nature of the primitive rocks the soils formed therefrom were more or less rich either in silica, in lime, or in clay.

It is thus that the different types of soil were formed which we see around us to-day. This process of soil formation is also continuous. The mechanical action of water, friction, the influence of frost, and, above all, that of the carbonic acid in solution, produce every day fresh quantities of silica, lime, and clay.

At an epoch, extremely remote, in the history of the earth, and which no branch of science can determine, there appeared upon it a cell of planetary or other derivation, which was, in any case, the origin of life. This organic cell, in order to adapt itself to the conditions of the environments in which it found itself, must have had the power to seize upon the carbon of the carbonates and to decompose water, in order to find the energy necessary for its development:—the life of the nitric ferment is now the only example of life possible under these conditions. In any case this cell differentiated and adapted itself to external conditions, and became the source of the organic world. Very soon the inferior plants developed themselves, and commenced to add their action to the other mechanical actions effecting the disintegration of the rocks. These plants perished on the soil which had nourished them. Their organs fell upon the soil and were decomposed. Thence was constituted in time an accumulation of substances, which, being rapidly oxidised, became principally composed of carbon, and gradually enriched also with nitrogen. This was the origin of humus, or leaf-mould. The association of this humus with the three other chief constituents gave birth to arable land, which thenceforth was capable of nourishing vegetation of a more exacting nature, and of a more and more complex organisation. In brief, arable soil is an association of sand, clay, lime, and humus in such proportions that the qualities and defects proper to each of these constituents are balanced, from the point of view of physical qualities, by their reciprocal influences. From the chemical point of view also this association is one of the happiest. The sand contributes silica, often mixed with a little oxide of iron; the clay, an abundance of alumina, potash, a little soda, and often much oxide of iron; and the calcareous portion, rarely pure, contains principally lime, but it also carries with it some magnesia, sulphuric acid, and phosphoric acid. The humus itself is a valuable composition, rich in carbon and associated nitrogen, which, from a mineral point of view, may be said to be the reflex of the composition of the soil on which it has been produced. In any case, it is this which is the principal source of nitrogen, the most useful element for vegetation.

Plant Requisites.

Before studying in detail the manner in which the soil affords to vegetation the requisite mineral food constituents, it will be as well to point out what are the alimentary needs of a certain number of plants used in horticulture. The first of the two accompanying tables, com-

TABLE I.

Composition of 1 Kilogramme of Plant Substance in a fresh condition.

Composition	Asparagus	Carrots	Brussels Sprouts	Cucumber	Spinach	Haricot Beans	Lettuce	Leeks	Tomatos	Radishes	Peas "Org. Marché"	Milan Cabbage	Beet culinary	White Beet	Potatos	Turnips	Onions	Garlic	Shallots
Water	919·000	850·000	864·000	958·000	911·000	803·000	936·480	880·000	873·000	770·000	803·400	906·000	852·000	846·000	778·000	905·150	903·170	683·000	734·500
Nitrogen	1·465	0·828	1·618	0·493	1·053	1·918	0·861	1·139	1·188	2·378	1·784	1·031	0·695	0·818	0·906	1·107	0·920	0·197	0·295
Mineral matter	8·180	11·250	23·540	5·610	23·000	26·200	19·680	15·000	33·430	30·960	18·280	11·180	10·440	25·530	42·400	15·330	6·950	44·760	39·840
Phosphoric acid	1·405	0·681	1·400	0·627	1·100	1·359	0·752	0·769	1·818	2·055	0·905	1·099	1·054	1·331	3·324	1·578	1·067	6·720	3·043
Potash	3·722	3·985	7·318	2·390	6·405	4·409	4·430	4·528	6·090	4·545	3·938	3·864	4·100	7·552	18·444	6·656	2·300	12·006	8·592
Soda	0·019	0·591	0·031	0·008	0·526	0·014	0·295	0·478	0·330	0·647	0·096	0·032	0·540	1·817	0·042	0·015	0·014	0·052	0·010
Lime	0·419	1·481	6·748	0·496	2·070	7·393	1·732	2·394	9·758	8·235	5·215	2·394	0·535	1·920	0·508	0·444	1·106	10·393	7·052
Magnesia	0·014	0·076	0·359	0·008	0·112	0·303	0·043	0·051	0·571	0·000	0·000	0·000	0·000	0·000	0·212	0·024	0·012	0·125	0·164

TABLE II.

Requisites for Crops of Fertilising Elements per Hectare.

	Carrots	Milan Cabbage	Haricot Beans	Lettuce	Leeks	Peas	"Eclipse" Beets	White Beets	Potatos	Turnips	Onions	Garlic	Shallots
	K	K	K	K	K	K	K	K	K	K	K	K	K
Yield	45,000·000	50,000·000	20,000·000	16,000·000	40,000·000	30,000·000	80,000·000	96,000·000	26,000·000	70,000·000	40,000·000	13,000·000	24,000·000
Water	38,250·000	45,300·000	16,060·000	14,983·680	35·200	24,102·000	68,160·000	81,216·000	20,228·000	63,640·500	36,126·800	8,879·000	17,638·000
Nitrogen	37·260	51·550	38·360	13·776	45·560	53·520	55·600	84·528	23·556	77·490	36·800	6·561	7·080
Mineral matters	506·250	559·000	524·000	314·880	600·000	548·400	835·200	2,450·880	1,102·400	107·310	278·000	581·880	860·160
Phosphoric acid	30·645	54·950	27·180	15·032	30·760	27·150	84·320	127·776	86·424	110·460	42·680	87·360	73·032
Potash	179·325	193·200	88·180	70·880	181·120	118·140	328·000	724·992	479·544	46·592	92·000	156·078	206·208
Soda	26·595	4·800	0·280	4·720	19·120	2·880	43·200	174·432	1·092	1·050	0·560	0·676	0·240
Lime	66·645	260·750	147·860	27·712	95·760	156·450	42·800	184·320	13·208	30·080	44·240	135·109	169·248
Magnesia	3·420	0·000	6·060	0·688	2·040	0·000	0·000	0·000	5·512	1·680	0·480	1·625	3·936

piled from my own analyses, which gives the actual composition of one kilogramme of each plant taken in its normal vegetative condition, enables us, after having confirmed the practical results under cultivation, to formulate the second table, which is a *résumé* of the practical alimentary requisites of a certain number of vegetables.

It will be noticed, at the first glance, that water is the most important factor in vegetable production. Without water no vegetation is possible.

Physiologists, and especially M. Déhérain, have calculated that to produce one kilogramme of dry vegetable matter it would be necessary that there should be in that vegetable a circulation of water of not less than 250 litres. To make the point clear, take the Milan Cabbage as an example. We find that a crop of 50,000 kilogrammes of Cabbage per hectare has necessitated the evaporation of a minimum of 1,175,000 litres of water; which represents a rainfall in one year of 80 centimetres. This brings into evidence the fact that in dry climates the crops are always proportionate to the quantity of rain, and shows also the enormous importance of the irrigation question in all horticultural operations.

We find that the various crops withdraw from the soil very varying quantities of the different useful elements. For example, whilst 26,000 kilos. of Potatos only take up 24 kilos. of nitrogen, we find that a heavy crop of Turnips absorbs nearly 78 kilos. of that element. If we consider the case of phosphoric acid and potash, we find differences which are often even more considerable still. This difference, from the point of view of the elementary needs of different plants, has given rise to the practice of rotation, which consists in growing in succession to a plant requiring much nitrogen a plant which requires less, and the same for other elements. This rule of rotation, established by judicious practice based on observation of cultural facts, is found to be fully justified by scientific study of the question. We know also now that the various mineral elements in the soil are in a condition of assimilation which varies with time. The analysis of a soil may at one time demonstrate it to be rich in all materials useful to plants, and yet after some crops have been taken off, the soil appears to be exhausted. This fact in former times led to the obligation of fallow periods: the land was left untilled, a part of the useful elements became, after some time, again capable of being assimilated, and a fresh crop could then be raised. We can now dispense with these costly practices, which rendered large areas useless, causing a dead loss; by means of soluble complementary manures it is easy for us either to facilitate the solution of certain mineral constituents of the soil, or even to furnish artificially these same elements to the roots of the plants.

The Soil the Source of Plant Aliment.

Nitrogen.—Plants find their nitrogenous food in the soil under the form either of ammoniacal salts, nitrates, or nitrogen combined with organic matter. We know that in the first two of these forms the nitrogen is eminently absorbable by plants. As for the third, we think with Sachs that plants can absorb a certain proportion of nitrogen combined with carbon in the components of humus. This seems to us justified by horticultural practice, wherein soils as rich as possible in humus are always selected for all cultures.

Humus invariably contains a considerable quantity of nitrogen derived from pre-existent combinations in the albuminoids of primitive vegetable tissues. Without microbic intervention the researches of M. Hébert have demonstrated that these albuminoid matters can play the part of amides; they can, in fact, give rise to ammoniacal carbonates and sulphydrates by simple fixation in water. We find, indeed, the presence of these salts in our peat soils, and especially in turfy peat.

There exists in soils which are rich in humus, and moist, a special ferment termed ammoniacal ferment, which appears to act like the analogous ferment which in a few days transforms the urates of urine into carbonate of ammonia. As the result of numerous experiments, it is established now that it is this ammoniacal ferment which commences the decomposition of proteic matters: this ferment still retains vitality at a temperature of 90° C., which suffices to kill the nitric ferment.

Fungoid growths intervene also in humid soils in the formation of ammoniacal salts; the bacillus micoïdes seems also to act in this way. The greater part of the nitrogen absorbed by plants in the soil is in the form of nitrates.* These nitrates are the result of the successive action in the soil of two ferments: the first, the nitromonad, transforms the ammonia produced by the ammoniacal ferment into nitrous acid, producing consequently soluble nitrites (almost always nitrites of lime). These nitrites are extremely unstable, and are rapidly oxidised under the influence of another ferment, the *micrococcus nitrificans*, which then produces either nitrate of lime, nitrate of magnesia, or nitrate of ammonia. The nitrates are extremely soluble and immediately absorbable by the roots of plants. In order that the nitrification may be rapid in a soil, it is essential that a certain number of favourable conditions be fulfilled. It is necessary, in the first place, that the circulation of air and of water be possible in the soil; when the soil contains less than 3 per cent. of water the nitrification becomes irregular. The intensity of the nitrification varies directly with the quantity of organic matter contained in the soil. When, however, a soil contains no lime an excess of organic matter retards or hinders the nitrification. In the case, however, of our horticultural soils, very rich in humus, such as leaf-mould and peat-mould, nitrification takes place, especially when the water used is slightly calcareous. The presence of a certain quantity of lime is of the greatest importance, the temperature also plays an important *rôle*. Nitrification, which attains its maximum at 37° (Centigrade), is almost nil at 5°. The pulverisation and frequent working of the soil have the greatest influence upon the intensity of the nitrification. To afford an idea of the amount of nitrogen placed at the disposal of plants by nitrification in the different soils most used in horticulture I give the following examples from my own investigations:—

Loam, or Surrey Turves, total nitrogen	4·67 per 1,000
Nitrification per day and per kilo. . . .	0·00387 gr.
Road Sand for Compost Trappes (S/Oise), total nitrogen	1·50 per 1,000
Nitrification per day and per kilo. . . .	0·00029 gr.
Maurepas Peat Mould (S/Oise), total nitrogen . .	5 per 1,000
Nitrification per day and per kilo. . . .	0·000199 gr.

* See "Des formes dans lesquelles l'azote est le plus avantageusement absorbé par les racines des plantes." Paris Horticultural Congress, 1899.

These quantities are far from being unimportant. A cubic metre of peat-mould, indeed, weighing 532 kilos., has produced in this special case, in 119 days, 12·4 gr. of soluble nitrogen for a total quantity of 2,620 gr. Maurepas leaf-mould. Total nitrogen 4·70 per 1,000.

Nitrification per day and per kilo. . . . . 0·00081.

1 cubic metre of this soil, weighing 660 kilos. and containing 3,102 gr. nitrogen, has produced in 117 days 62·50 gr. of nitrogen immediately utilisable by plants. Hot-bed soil of Versailles, total nitrogen 20 per 1,000.

Nitrification per day and per kilo. . . . . 0·00463.

This quantity corresponds to the solubilisation of 1·7 gr. of organic nitrogen per kilo. of soil per annum. It is seen, therefore, how the capacity for nitrification—that is to say, the production of utilisable nitrogen—varies in different soils. It should be remarked that in the majority of cases, horticultural soils being rich in leaf-mould and poor in lime, the nitrification decreases progressively until it becomes nil. When the lime-salts have disappeared, our leaf-mould soils acquire a particular appearance well known to gardeners. They become pasty, water penetrates with difficulty, aëration becomes a nullity, and then the plant-roots perish. The remedy is to mix with such soil a pretty large proportion of coarse sand and to aërate it as much as possible. We have also found, as the result of many experiments, that these soils can be again rendered fit for nitrification by watering them with weak solutions of carbonate of potash. Laboratory experiences have shown that the production of nitric nitrogen, which, without carbonate of potash, was for peat-mould 0·00012 gr. per day and per kilo., was raised to 0·0219 gr. by a solution of 4·5 per cent. of carbonate of potash. Beyond this limit the nitrification has, on the contrary, diminished. The solution giving the best results for leaf-mould soils is $1\frac{1}{2}$ per cent. It would not, however, in practice be safe for plants to reach these figures. We consider, even, that for watering plants in peat-soil it would not be prudent to employ solutions stronger than those of $\frac{1}{1000}$. The experiments of 1899 regarding the forms under which nitrogen is best absorbed by the roots of plants have shown us that it was nitrate of ammonia which was by far the most rapidly utilised; next followed sulphate of ammonia, then nitrate of soda, nitrate of magnesia, nitrate of potash, and nitrate of lime.

Potash.—Potash is generally less abundant than lime in deposits of arable soil: it is, however, found more abundantly than nitrogen or phosphoric acid. We have already seen that potash arises from the action of water charged with carbonic acid upon the bisilicates of alumina and potash, which are themselves formed by the disintegration of feldspathic rocks (orthose). The potash in the soil is therefore almost entirely locked up in insoluble compounds, some of a mineral nature, such as the silicates; and some in organic forms. Among these latter, some appear to be true salts, nearly insoluble, whilst others represent semi-soluble combinations, furnished by the association of a salt, mineral or organic, only soluble with a complex organic principle, often of colloid nature. At present no precise line of demarcation can be chemically determined between the amount of potash immediately utilisable by the

plant-roots and the total reserve of potash contained in the soil. On the other hand, the use of potash gives, on the whole, such wonderful results that it is difficult to gauge the advantage which may in many cases arise from the use of potassic manures. It is certain, however, that such are often indispensable. We have seen, indeed, that certain crops demand between 150 and 200 kilos. of potash per hectare per annum. On the other hand, experiments made with the drainage water have shown that 1,890 cubic metres of water having filtered through a clayey soil have in one year only carried away 9·374 kilos. of potash. I have adopted the conclusions of M. Schlœsing, who thinks that there may be considered as immediately useful that portion of potash which is set at liberty by treating the soil (cold) with a quantity of acetic acid just sufficient to coagulate the clay and decompose the humates. Here are some figures relating to the quantity of potash contained in a certain number of our horticultural soils :—

Soils.	Soluble Potash in aqua-regia at boiling point.	Soluble Potash in acetic acid cold.
Rambouillet Leaf-mould . .	3·50 per 1,000	... 0·780 per 1,000
Maurepas Soil	4·98 ,,	... 1·000 ,,
Ghent Soil	1·43 ,,	... 0·815 ,,
Peat-mould	3·06 ,,	... 1·390 ,,
,, Maurepas . . .	3·06 ,,	... 1·390 ,,
Trap Loam	4·76 ,,	... 2·090 ,,

which figures show that in the majority of cases potash is an element of which the manurial value is much less than that of nitrogen or phosphoric acid.

Lime.—Lime plays a part of the first importance from the point of view of vegetable alimentation. If in many cases lime may serve but an insignificant part purely as an aliment, it seems nevertheless necessary to have it present in sufficiently large proportions to saturate, and fix in the tissues, the organic acids which form the salts (such as the oxalate and citrate of lime), which crystallise; and which are found very frequently under microscopic research.

It may be observed that when lime is absent it is potash which takes its place. We have seen that lime arises from the decomposition of the silicates (disintegration of felspaths of the oligoclase type). Lime is sometimes, but rarely, found in the form of silicates. In this condition it is almost unutilisable by plants. Lime is chiefly met with in our soils in the form of carbonates, sulphates, and combinations with humic acid. When a soil contains much humus and little lime the greater part of this element is then found in the form of humate of lime. This complex mixture is extremely favourable to the development of the various micro-organisms. When a soil is found to contain humate and carbonate of lime in association, it is usually extremely fertile. It is not so when the lime is principally in the form of sulphate. Beyond a certain limit cultivation in a soil with an excess of sulphates becomes difficult. When the sulphate of lime is proportionately small, and especially in clayey soil, it plays a most important part in enhancing the solubility of the potash contained in the clay. The sulphate of lime in presence of silicate of potash and alumina gives rise to sulphate of potash and silicate of lime. The sulphate of potash is very soluble in the presence of carbonate of lime in the soil: it is again decomposed, and there is then produced

afresh a double decomposition which re-generates sulphate of lime, and forms carbonate of potash. Now, we have seen above what was the beneficial action of the carbonate of potash on nitrification, and also as a solvent of humus. The nitrification is an active agent in carrying away the lime in the effluent water. The nitrate of lime which is formed by the saturation of the carbonate is extremely soluble; by consulting the following table which shows the respective quantities of lime and of humus contained in our horticultural soils it will be remarked that the proportion of lime annually carried away by nitrification is a matter of the greatest importance. It is necessary, therefore, in the case of soils which cannot be renewed, to introduce from time to time a little marl to maintain their fertility :—

Soils.	Lime per 1,000.	Humus per 1,000.	Nitric nitrogen produced per annum per kilogramme Grammes.	Lime carried away per annum per kilogramme Grammes.
Hotbed Soil . .	66·95	405·0	1·689	1·182
English Loam . .	2·87	86·60	1·412	0·988
Leaf-mould . .	1·77	170·00	0·295	0·206
Trap Loam . .	1·40	31·02	0·105	0·073
Peat-mould . .	1·93	188·00	0·069	0·048

The physical condition of the lime in arable soil is of very great importance. It is always interesting when it is a question of a soil which contains a notable quantity of carbonate of lime to study the source, the nature, and the quality of the same. Analysis by the rapid process of M. Mondésir, that is to say, by attacking the soil with a weak organic acid, affords a very good indication regarding the useful portion of the lime contained in the soil.

Phosphoric Acid.—Phosphoric acid is certainly one of the principal elements of plant food. It often exists in very small proportions in our soils used in horticulture. The addition of small quantities of this element has the happiest results, especially as regards the formation of the reproductive organs, in which are found a mass of combinations of phosphoric acid with organic substances and magnesia. Its part is, therefore, a most important one from the point of view of fruit production. In the soil the phosphoric acid is met with either in the form of phosphates (some soluble in water, and others insoluble therein, but soluble in weak mineral acids), such as phosphate of lime, phosphate of sesquioxide of iron, alumina, and phosphate of magnesia, or under the form of ethereal compounds comparable to the glycerophosphates. Also under the form of very complex phosphorised organic compounds belonging to the order of phosphorised animal combinations, such as triethylphosphine. Plants can assimilate the phosphoric acid produced by the dissolution of various phosphates by water charged with carbonic acid, but a more important part is attributed to the portion of phosphoric acid derived from humic combinations. Following up the idea of M. Déhérain, I have considered the amount of phosphoric acid which is dissolved by cold acetic acid as the amount immediately assimilable by the plant roots. In the following table we give the total phosphoric acid, that is to say, that which is soluble in boiling aqua regia, and the amount which we consider as assimilable which is soluble in cold acetic acid. This table shows that in our soils the addition of phosphoric acid

would be generally advantageous, because the assimilable portions only represent about half the total quantity, itself already small:—

Soils.	Phosphoric Acid soluble in aqua regia.	Phosphoric Acid soluble in acetic acid.
Maurepas Peat-mould	0·64 per 1,000	0·32 per 1,000
Rambouillet Leaf-mould	1·16 ,,	0·40 ,,
Maurepas Leaf-mould	1·30 ,,	0·40 ,,
Ghent Leaf-mould	1·60 ,,	0·56 ,,
Trap Loam	0·62 ,,	0·36 ,,
Hotbed Soil	4·84 ,,	3·28 ,,

I consider that a soil is sufficiently well provided with phosphoric acid when it contains at least 0·600 gr. per kilo. of phosphoric acid soluble in acetic acid.

Sulphuric Acid.—Sulphur is an aliment absolutely indispensable to plant life: its importance is much greater than it is usually considered to be. Frequently the beneficial action of the superphosphates is erroneously attributed to the phosphoric acid, whilst often it is the free sulphuric acid and the sulphate of lime of the superphosphates which act as useful complementary aliments. Sulphur exists in the soil principally in the form of sulphates, sulphate of lime, sulphate of potash, and sometimes of magnesia. In some cases an excess of sulphuric acid is met with which may sometimes even become dangerous: this acid is formed by the oxidisation of sulphuret of iron in the form of pyrites brought to the surface of the soil by deep working. Exposed to the air this pyrite becomes oxidised, and gives rise to sulphate of iron, which, if very abundant, may become harmful.

Sulphur is also found in the soil in the form of organic compounds of an altogether special character. In a soil analysed by M. Berthelot which contained 2·356 gr. of nitrogen per kilo., thus approaching the nature of horticultural soil, he found a total of 0·352 gr. of sulphur, including 0·169 gr. of sulphur attributable to sulphates. The relation between the organic combinations of sulphur and its mineral combinations is therefore very near to equality. In another case analysed the soil was four times as rich in organic sulphur as in sulphur derived from sulphates. M. Berthelot has remarked that this question is one of the most important from the physiological point of view. The albuminoid principles contained sulphur as well as nitrogen. The proportion between the weights of these two elements, which is $\frac{1.0}{100}$ of the weight of nitrogen for the albumen, is $\frac{2.0}{100}$ for the horny matters. It is curious to remark that in the last case cited by M. Berthelot the increase in the sulphur contents is considerable. It is a question in this case of a formation of sulphur compounds of an altogether special character, perhaps comparable to acids, conjoined with sulphur (*acides sulfoconjugués*). This quite recent discovery will probably lead to a great advance in the knowledge of the physiological properties of sulphur. It has been remarked that the difference between the quantities of sulphur which are found under the two forms diminishes as we pass from common to hotbed soil, and thence to the plant itself.

Silica.—Silica, of all the mineral compounds, is that which is found most abundantly distributed in the soil, either in the form of pure silica or in that of silicates. In the tissues of plants there are found quantities

of fixed silica, which sometimes in the roots amounts to 78 per cent. of the weight of the ashes, and 50 per cent. of the weight of the leaves and stalks. Consequent, possibly, upon experiments too rapidly carried out, the assertion has been thought justified that silica, from the elementary point of view, played but an unimportant part. This assumption was probably a too hasty one. Silica is rendered soluble in the soil and enters into the plant, especially during the primary phase of development, a phase which may be termed the rooting period. At this time it represents in Wheat $\frac{1}{5}$ of the weight of the leaves, and already three-fourths of this silica have become insoluble. In proportion as the plant matures, the relative weight of the silica diminishes, although its total weight increases, and, curiously enough, the soluble portion of silica, that which appears to be combined with organic matter, increases. There is a certain relation between the assimilation of the hydrocarbonised and nitrogenised matters, and the fixation of the silica. Later experiments will determine this point, which can only have a scientific interest, silica being generally abundantly present in soils.

Magnesia.—The part played by magnesia in the alimentation of plants may be compared to that of lime; its action, however, is far less important. The examination of the tables of crop-requisites shows that for plants which are not grown exclusively for the production of fruits or seed the importance of the presence of magnesia is diminished. It is found in the soils used for horticultural purposes, associated either with lime or silica. The soils which are richest in magnesia are derived from the disintegration of dolomitic limestones (carbonate of magnesia). Precisely as with lime, it is only that portion of the magnesia which can be extracted from the soil by weak acids that can be regarded as useful.

Iron.—Oxide of iron is plentifully distributed in the majority of soils. This element, which is certainly indispensable to plant life, does not, however, play so important a part as has long been attributed to it. It was thought that iron took an altogether special part in the formation of chlorophyll. Recent research has demonstrated that frequently the chlorotic plants contain more iron than others, while previously the general idea was that in such plants iron was absent. The work of dissolution of the iron in the soil is effected by the action of dissolved carbonic acid. Soluble phosphate of lime forms with the humus, the alumina, and the oxide of iron, various organic phosphatic lacs, which very slowly furnish to the roots of plants the phosphorus and iron which they may need. Generally speaking, nine-tenths of the good results attributed to the sulphate of iron employed as manure occur in calcareous or clayey calcareous soils. The sulphate of iron, coming into contact with the carbonate of lime, forms sulphate of lime, which, finely divided, acts as a veritable plaster.

Chlorine and Sodium.—All plants contain chlorine; there is also found chloride of sodium and chloride of magnesium in almost all soils. The physiological property of chlorine does not seem to be clearly determined. It has, however, been ascertained that if the chlorine entered the plants in the form of chloride of sodium, the weight of soda recovered from the tissues was not equivalent to that indicated by the formula of chloride of sodium. There is a transformation there by double decomposi-

tion or probably precipitation subsequent to the entry into the vessels, the details of which operation escape us. Soda is always met with in plants, and may be derived from the decomposition of the felspath albite. In marine climates chloride of sodium is found in abundance, and it is estimated, for instance, that on the plain of Caen the contribution of marine salts by the rain water is not less than 50 kilos. per hectare per annum.

Alumina.—The existence of alumina in plants has been the subject of numerous discussions. M. Berthelot has been able to show that alumina exists in the ashes of annual plants with abundant roots. The alumina appears to become fixed in the tissues in the form of phosphate of alumina, and does not seem to pass beyond the stalks.

Manganese, zinc, and copper have been observed in vegetable tissues. I have myself found measurable quantities of manganese in Orchids of the genus Cattleya, and in the petals of Roses; but we have no indication of their utility, nor of their mode of entry into the plants.

Chemical analysis, such as can nowadays be made, affords us very precise and exact information regarding the total number of elements useful to plants contained in the soil. With the exception of nitrogen, of which we can study the nitrification, and perhaps of phosphoric acid and lime, of which the assimilable quantities may be determined by analysis only, we cannot form an idea of the actual condition of assimilability of the elements useful to plants, but, on the other hand, we can clearly determine whether the total quantity of each of the contained elements is insufficient, and so be enabled to assure cultural success by providing complementary manures. It suffices for that purpose to take the thickness of the cultivable soil, then the density of same, and finally multiply the weight of the arable deposit by the figures expressing the composition of the kilo. of soil in a fresh condition: the result then at once appears.

The greatest help to progress that agronomic science has given to modern horticulture is the determination of the composition of crops, permitting thereby the composition of the soil being known, and the calculation and restitution of all the elements withdrawn by them. Such a restitution is indispensable in order to secure the maintenance of present fertility and the success of future cultivation.

INSTRUCTIONAL FRUIT STATIONS.

By Mr. Edward Luckhurst, F.R.H.S.

[Read September 26, 1899.]

It was some seven years ago, soon after horticulture was added to the list of subjects for technical education by the Special Committee of the County Council of Derbyshire, that the idea of bringing instructional fruit stations into the scheme took tangible form in the laying out and planting of the first County Council fruit plot at Duffield, near Derby. It came about in this way. From the very outset, during the preliminary pioneer lectures, requests for special advice and assistance in local difficulties with all kinds of hardy fruit were made wherever I went. At the lectures bushes, Raspberry canes, and branches, shoots, and trees were brought for object lessons in pruning, and during the first regular course of lectures one often had requests to go and see what could be done to render barren trees fruitful, sickly trees healthy, and so on. Several times have I given a lesson in pruning in some garden by lamplight before an evening lecture, or paid a special visit by daylight for a demonstration in a village garden.

Faulty practice generally and "wrong" trees and bushes everywhere prompted the thought of how much the right thing was wanted for object lessons. The suggestion of a fruit plot met with approval by the County Council, with the result of the planting of the first plot at Duffield in 1893; of the second plot at Matlock Bridge in 1895. A year later the local secretary of Whittington's offer of his new garden for demonstrations was accepted. These three stations are in and for Derbyshire. In November, 1897, a fruit plot was planted at the Midland Dairy Institute at Kingston, which is maintained by the combined counties of Derbyshire, Nottinghamshire, Leicestershire, and the Lindsey Division of Lincolnshire. It may be useful to mention that there might have been two more plots now in other parts of Derbyshire, land suitable for the purpose having been offered as a gift in both cases; but when I went to inspect the sites—one near a town, the other near a large mining village, both quite away from any house—I had to point out that it would be useless to lay out a station there without the provision of a caretaker's cottage or an unclimbable fence or wall. In neither case could the local authorities guarantee immunity from pilfering, or find funds for safeguarding the fruit, and so the matter fell through.

Ends and Aims.

At these stations instruction full and complete, by actual demonstration in every detail of hardy fruit cultivation, is our aim. Everything is made a lesson, so that students may have an opportunity of obtaining a fair practical knowledge of the work: of grasping its significance sufficiently to realise the importance of close attention to every detail as a means to the development of healthy, well-formed, profitable trees and bushes. It is not merely a knowledge of fruit that we desire to impart.

The scope of the teaching embraces the site, soil, subsoil tests for drainage, breaking up the land, its mechanical division, water filtration, drainage—either natural or artificial—air circulation in the soil, liming and manuring.

Then come the best time and right method of planting; the selection of the trees; the treatment of trees when received from the nursery; the scheme of arrangement; economy of space; the combination of "top" and "bottom" fruit, or otherwise; distance apart; the special value and use of pyramid, cordon, standard, and bush. In the planting attention is called to the risk of harm from an undue exposure of the roots; to pruning the bruised ends of roots; to the proper depth to plant; to packing the roots in fine soil; to the importance of soil pressure about the roots, and of staking when necessary.

The only thing that was at all vague or speculative about such planting lessons in a county where so little attention had been given to fruit culture was in the selection of varieties. Preference was given to well-known hardy, free-cropping varieties, to which were added as many other good ones as space could be found for. Two trees of each variety were planted in order that the trial should be a fair one, most of them being Apples, with a fair quantity of Plums and a few Pears.

In the first two plots there were about fifty varieties of Strawberries, also some dozen of Rhubarb. The later plots have only a selection of the best of these. Of bush fruits there are the best varieties of Currants, Field and Garden Raspberries, and Blackberries. Gooseberry bushes were selected for some special feature, such as market value for ripe fruit, or early green fruit for flavour, and for early or late ripe fruit; and cordons were planted for a comparison of varieties and to exemplify economy of space. At Kingston we have the Logan Berry and Wineberry.

Evolution.

In size the stations range from a quarter to half an acre, and I may say, after seven years' experience, that half an acre is ample for an instructional fruit plot. Each station is under the charge of the local secretary. I do the whole of the pruning myself; and as I allow no digging among the trees or bushes, feeding the roots by surface dressings of chemical manure, the annual cost for labour and manure is not heavy.

At the Duffield Station the trees and bushes are fast filling the allotted space. Most of the Apple pyramids are about twelve feet high and eight feet in diameter at the base. By the exercise of due care in pruning and training, they have developed into perfectly symmetrical specimens, objects of beauty and utility—especially the latter. The guiding principle is fruit—not merely on the ends of the branches, but on every part of them. To secure this, air and light around every tree, branch, and spur is an inflexible rule, and fifteen inches is the minimum distance from branch to branch, ten feet from tree to tree.

All Apple trees at all the stations are on the broad-leaved Paradise stock: their vigorous growth, healthy condition, early and abundant production of blossom—buds, and fruit, leave nothing to desire. Take,

for example, a half-standard Bramley's seedling Apple tree in this plot: its head is now fifteen or sixteen feet in diameter, the centre being well open. Certainly this fine tree is about the best of this form, but the others follow it more or less closely, and are now profitable trees.

Another feature in this plot worthy of special mention is the two rows of Parsley-leaved Blackberry. They are twenty feet long, six feet apart, and the plants are three feet apart in the rows. For the first two years they were left to grow wild, being pruned back to a few buds at the end of the second year. In the third year they made growth from twelve to fourteen feet long, which in the autumn was slightly shortened, and tied along—not up—the supports. Next autumn there was a full crop of ripe fruit. Last year most of the fruit, though late, ripened, and now again there is an abundant crop of the large black glossy fruit. Judging from the yield of these two rows, I may say that the annual yield of fruit of a row fifty feet long in full bearing is fully 1 cwt.

The teaching consists of meetings for pruning demonstrations in May, September, and November, and for Strawberry and Gooseberry meetings when the fruit is ripe. At all the meetings much general information is imparted, questions are answered, and there is always a discussion of cultural points of interest. In addition to this I frequently meet parties or individuals from local centres, and give them special lessons. Enough fruit is collected and stored for winter lectures, a basket of specimens being about the best notes one can desire for a lecture.

I have ample proof that good work is being done, and could quote many examples—the latest may suffice. Only a fortnight ago I took with me to a meeting fair examples of Lady Sudeley and Chelmsford Wonder Apples, Pond's Seedling, Emperor, and Kentish Bush Plum, telling my hearers of the excellence of Lady Sudeley as an early dessert Apple, and how it answers best as a half-standard, from its habit of fruiting near to and at the ends of the branches; that the specimen of Chelmsford Wonder weighed 15 oz., and of its free fruiting under close pruning; that the Pond's Seedling weighed 4 oz., and the trees were almost as vigorous and free-cropping as Victoria; and of the special value as late Plums of the other two varieties, and what fine half-standards we had of them at Duffield. I believe everyone present took the names; all looked as if they meant business.

The Kingston Plot.

Each of the plots has distinctive features, but it will suffice if I give a brief sketch of one of them, giving preference to that at Kingston as being the most important.

This is intended primarily for the instruction of the students at the Midland Dairy Institute, to whom I give a lecture every week. It is about half an acre in size, and is divided by paths into four squares, the whole being enclosed by a hedge of Myrobalan Plum. One square has pyramidal Apples ten feet apart, one variety to a row—the first row being a Codlin, the last a late variety, with intermediate ones between. There is a row of Strawberries between each two rows of Apples to remain till the Apples require the space.

The second square has the fifteen-foot arrangement, which I regard as the best of all for the growth of top and bottom fruit in a plantation. The half-standard Apple trees are fifteen feet apart each way, with two bushes between each two trees in the tree rows, and two rows of bushes between each two tree rows, so that there are five-foot spaces between the bushes everywhere, and the bushes are five feet from the trees. This is the most economical arrangement of bush and tree possible. The bushes come into bearing quickly, and soon afford a return upon outlay. The tree branches eventually cover very nearly a square rod of land: having only four-foot stems they are easily managed, and are very little affected by wind—in point of fact, when the hedge gets up no wind can harm them.

The third square has Plums and Damsons—half-standards—fifteen feet apart, with Strawberry beds between them and two rows of Rhubarb on one side.

The fourth square has a row of pyramidal Pears, another of Plums, with Raspberries, Blackberries, Wineberry, and Logan Berry. The Raspberry canes are like field Raspberries kept to a yard in height, and have no supports. There is a row of double-cordon Apples—trained diamond-fashion—on each side of the path from the entrance gate, with cordon Gooseberries alongside other paths.

The Myrobalan Plum hedge will be about twelve feet high—perhaps a foot or two more. It should reach this height in about four more years, as in this, the second year from the planting, much of it is over seven feet in height: it will be cut back after the leaf falls this autumn to about four feet six inches. I regard this as the best hedge plant we have. When planted a foot apart in November, 1897, they were cut down to nine inches: they put forth growth of marvellous vigour last year. This year many of the shoots are from five to six feet in length and wonderfully robust. By the time the trees require it this hedge will afford them shelter, and become a perfect wind screen.

I have thus briefly endeavoured to show something of these adjuncts to a branch of technical education the aim of which is fine fruit and plenty of it everywhere. Though intended primarily for the labourer, it appeals to the wants and sympathy of all classes, evidence of which is afforded in the mixed audiences at the demonstrations, in the eager critical attention to the teaching, in the keen inquiries, and, above all, the earnest endeavour to turn it to practical account. Mistakes and failures there are undoubtedly—this was inevitable and unavoidable in such a movement. But the degree of success that has been achieved by many an earnest worker shows that in due course the work will have its reward in the planting and rightful management of hardy fruit generally; that good trees, good varieties, and fine fruit will be the rule, bad trees and inferior fruit the exception.

VINES IN THE OPEN AIR.

By Mr. H. M. Tod, F.R.H.S.

In complying with our Secretary's desire that I should write a note on the cultivation of open-air Vines, I must premise that, although this subject is my hobby, I cannot claim to be a scientific instructor in this branch of fruit-growing, but only to have studied the matter, collecting and comparing facts, and growing as many varieties as possible, but with only odds and ends of time to devote to this most interesting subject.

I first took notice of open-air Vines in the London district in the hot summer of 1868, and the two following years gave me opportunities of further observing that in country districts as well as in the metropolis open-air Grapes could be ripened, and thoroughly good and handsome bunches produced.

On changing houses in 1872 I selected one with the back almost due south, and instructed a gardener to plant two Vines there, preparing the border specially for them, as the soil was clay. These Vines were Black Hamburgh and Buckland Sweetwater. They grew apace, and I took some good black Grapes off the Black Hamburgh in 1874. A friend advised me to procure Clement Hoare's work on the Growth of Vines on Open Walls, and soon I knew all that writer's rules by heart, and found I had made a bad beginning by allowing Vines on walls to fruit before their fifth year, although by this time the Black Hamburgh had attained to the necessary 2½ inches in circumference.

In 1877 I had the first opportunity of observing Vines in different parts of France, and very soon formed the opinion that we could grow as good in England in some seasons, and at all times nearly as good. I also exchanged English Vines for French ones with friends in the celebrated wine-growing departments; and so for some years I had 'Pineau Noir' from Champagne and the Clos de Vougeot, 'Carbinet Sauvignon' from Château Lafite, and sundry others.

I had good Grapes in 1878 on my Black Hamburgh and Buckland Sweetwater, and according to Hoare's rule I pruned these two Vines in October. Had I not done so I have no doubt they would have flowered and tried to fruit a second time that year, as many others did, as I will notice later on.

Early in 1876 I heard of Lord Bute's new vineyard in South Wales* and went to see it, taking good note of everything about it, and described it in a letter published in the *Times*. The slope of this vineyard on the south face of the hill of Castel Coch is very beautiful, sheltered by plenty of timber above the old castle, and by other hills all round, except due south, where the view extends to the Bristol Channel, five or six miles off. Lord Bute made the same mistake as I had done: he made his first wine in 1878, before the Vines were fit for it. I saw the two small casks in the fermenting stage.

* See *R.H.S. Journal*, vol. xvii.

At this point I must refer to the flowering of open-air Vines in October 1878. I saw it in several counties and I saw 'Castel Coch' on November 9. The Vines were all in flower, and many had passed that stage and had well-formed Grapes. The explanation of this phenomenon is that with a long warm summer we had a warm and abnormally wet August, succeeded by a fine warm September. And this precocity or special fruiting was followed by the only year that in twenty-seven years of Vine-growing I can call really bad. 1879 was bad. The year 1888 came, I think, next nearest to a failure of any of these other years as far as my observation is extended; July 1888 was cold and wet following on a cold June, and August only improved on the 58°·0 average temperature for July by 1°·2, including the hottest day of the year, the 10th of the month, the maximum being 87°·7.

To those who never tire of depreciating our climate, and who say that we cannot ripen Grapes in England, I beg to reply by calling their attention to a simple fact. I cut my Grapes in 1888, about October 10, and immediately went to France, and about forty-eight hours after cutting my own I went into the market at Rheims and closely examined those on sale there. *They were no better, scarcely so good as mine.* No doubt the Rheims market Grapes were taken for the most part either from vineyards or gardens in which the Vines were grown as bushes or espaliers, with a few from cottage walls, and my Grapes were grown on a south wall in a suburb of London. But whatever disadvantage the Rheims Grapes laboured under by being grown in the open was, I think, not unfairly matched by my Grapes at that time not getting the sun until after 12 o'clock. I may here remark that in such years as 1879 and 1888, besides the low temperature and absence of sunshine, there is excessive moisture and also a more smoky atmosphere, house fires being maintained almost continuously throughout the season.

If the clerk of the weather would only predict the main characteristics of the weather of such years, we might make good use of them by making them "Sabbatical years." The idea of a "Sabbatical year" has very much to recommend it, especially in the case of Vines. I include it in the calculations I have made with regard to the cost of planting and management of vineyards when consulted about whether they will pay in this country.

Leaving the theory on one side, let anyone, whether connected with the wine trade or not, consider this:—The great 1893 vintage in France severely taxed the Vines, which not only during the 110 days that it takes to make a vintage, but for a month besides, had no more than half an inch of rain, and in some places none at all. The truth is, the Vines were crippled. Both the fruiting canes and the new ones should have been pruned right out and a "Sabbatical" year's recuperation allowed to them. If this had been done there would have been none of the Vine diseases which were rampant in 1894, and the great expense of chemically cleansing and stimulating the Vines to produce a vintage which when produced was in my opinion, in the first place, not wanted, and, in the second place, very inferior—would have been saved. Without the wines of that year those of 1893 would have fetched—as they deserved—better prices, and the wines of the following year, though generally good,

would have been far better, more abundant, and more remunerative to the growers.

I should very much like my readers to consider this matter fairly and without prejudice. Whatever may be done under glass in the management of Vines, I claim for them in the open every reasonable consideration. If the quality of Grapes and the wine made from Grapes off old Vines is better than that from young plants, then this is a special reason for respecting the strength and health of the Vine. I also submit that strong manures, or those of a suddenly quick and stimulating action, like blood, should be forbidden. It should always be remembered that the best wines grow in poor soil, calcareous, chalky, gravelly, slaty schist, &c. If it be true, as Clement Hoare says, that the Vine outlives every other "tree," surely that is a natural instruction to us how to treat it. If, as it advances in age, a large part of its roots rise towards the surface, should not the spade and the plough be rigorously excluded from their neighbourhood, and only the hoe and the fork admitted?

There is also a serious objection to the use of chemical applications to cure diseases, which are to at least some extent the result of a greedy system of cultivation. It was not greedy for the viticulturist to take all that Nature provided so richly in 1893, but he ought to have guessed (if he did not know) that then his Vines needed rest. Only seven years had passed since the disappearance of mildew in an epidemic form, and the renovation of the vineyards by grafting French varieties on American roots had almost entirely got rid of the damage done by the Phylloxera vestatrix. An enormous increase took place in the quantity of wine grown—50 per cent. did not cover the increase in the production of some of the best known claret vineyards. Commercially the mildew years did very serious harm to the claret trade. If 1886 had been eliminated, it would have been better for everybody concerned. If it had been a "Sabbatical" year, then 1887 would have had the immense advantage of being not only a very good, but also a very abundant year—cheaper no doubt, but far more profitable.

It may here be usefully remarked that the application, not of one—for that seldom succeeds—but of repeated washings of the bouillie Bordelaise is risky, as was shown in one of Messrs. W. & A. Gilbey's circulars. A vineyard in the Médoc was named by them, in which the effect of counteracting the mildew in this way had an undesired and untoward effect. The Vines were so stimulated by these dressings that they made an unhealthy and precocious autumnal growth, did not shed their leaves as usual, but were caught and, to a very serious extent, destroyed by severe frost in November.

The mention of this circumstance brings me naturally to the question of when Vines should be pruned. Unhesitatingly I say prune in October.

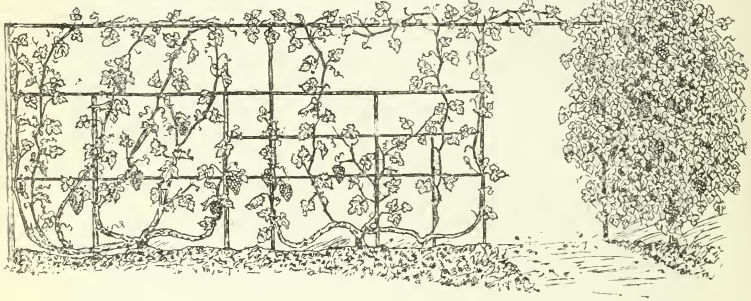
Along with the question of how to prune, which I shall go into separately, it is primarily a consideration of what is best for the plant both presently and in the long run. The growth of a healthy Vine is so great that it both invites and demands suitable management and control, and we must adopt the plan that will best preserve its health and strength—in other words, its fruit-bearing powers. Autumn pruning causes the least shock to its system and the least loss of sap—which we

call bleeding—indeed, generally there is none at all in October, and the wounds caused by pruning dry naturally before the advent of frost severe enough to hurt the plants.

On the other hand, the alternative of spring pruning causes certain loss of strength by bleeding, and this often continues to a serious extent. I am at this moment thinking both of French and English Vines. Admitting for a moment that the recuperative power of the French Vines, with more sunshine than ours have, is greater than ours, they also have more risks to encounter, *e.g.*, their earlier bud-pushing and flowering exposes them (two years out of three) to dangerous spring frosts that ours escape. In either case the Vine wants its whole strength, uncrippled by bleeding, to go on and accomplish its annual task. To my mind there is something more than adopting an opinion and practising a

FIG. 55.—CLEMENT HOARE'S LONG ROD TRAINING.

Except the immense bunch noted below on No. 1, all the fruit of these two Clement Hoare model-trained Vines are about half a pound.



'SYRIAN.' 15 years old. 3 bunches—own. 6 black—grafted. One very large bunch 30 to 40 ozs.

There are 6 bunches on this graft.

'TREBBIANO.' 16 years old. 6 bunches.

'BRANDT.' Standard 9 ft. high. Over 40 bunches ripe mid. Sept.

Two long canes of this 'Syrian' on left, mixed with a climbing Rose crossing garden walk. Two long canes of 'Brandt' cross boundary wall, and mix with neighbour's apples and pears.

system in this matter, for, unless I am greatly mistaken, it will be difficult, if not impossible, to name any other plant the equal of the Vine in the open air in repaying intelligent care bestowed liberally and regularly upon it.

Judging from my own garden and from others, I think this must be called a good Grape year. The best row of Vines in the middle of my garden is the subject of a sketch I made in the middle of this month of September, just as the standard 'Brandt' with over forty small black bunches (seen on the right of fig. 55) attained maturity. This Vine is nine years old, very strong and wild: it resents control, and is the earliest ripener within my knowledge. Its foliage is rapidly assuming splendid scarlet and purple tints. I mean to graft some more valuable variety upon it. The 'Brandt' is about 9 ft. high, and the top rail of the sup-

ports reaching to it is about 7 ft. from the ground. The middle plant is 'Trebbiano,' sixteen years old, with only half a dozen small bunches. This also I intend to graft with better open-air varieties. The Vine on the left is a 'Syrian,' thirteen years old, with very strong stout wood. It has three bunches of its own, only one of which is of the usual immense size. The fate of these is to go under pie-crust, as if they were Gooseberries. One year I put them in with all the others to make wine. There is a graft on the right arm of this Vine with six bunches of red Grapes, but these have got mildew this year. I am not sorry for having tried and studied the 'Syrian.' I have four of them, but shall clear them out in favour of Moore's Early, Chasselas Rosé, and some others more suitable to our climate.

The shape of these two Vines I take to be the best either on a wall

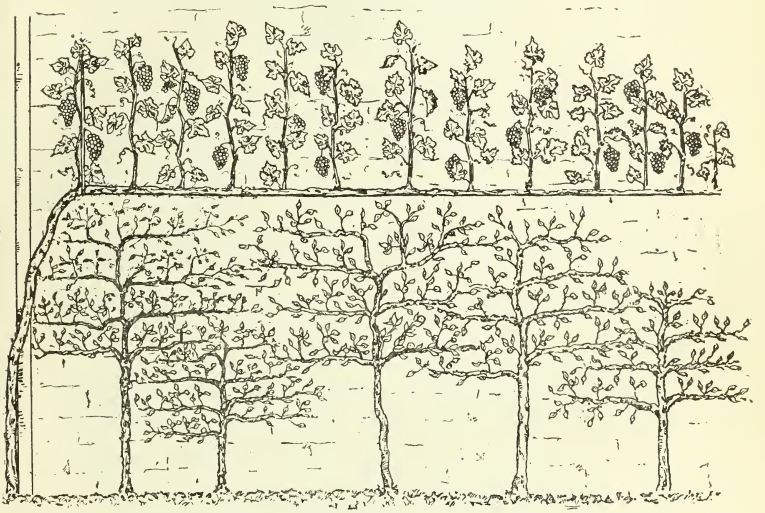


Fig. 56.—Gable of Mr. Will Tayler's House, showing 'Chasselas' Vine, Southern Exposure. Peaches and Nectarines on same Wall under the Vine. A Pipe carrying off Rain Water from the Roof ends the Wall on the left.

or in vineyard rows. It is Clement Hoare's long rod system produced according to his rules.

Another sketch shows the best open-air Grapes I have seen this year. The Vine is a 'Chasselas Rosé,' on the south gable of Mr. Will Tayler's house at Hampton. It is higher on the wall than I should grow it, and involves considerable ladder work to train and develop it (fig. 56). Most possessors of such a Vine would get little or nothing from it. It is the common neglect or mismanagement of wall Vines that keeps back the general and profitable cultivation of them. This one of Mr. Tayler's is a great advance on ordinary methods, and the result is most encouraging. Mr. Tayler received this Vine from Germany under the name of 'Reine Olga.'

REPORT ON DWARF FRENCH BEANS AT CHISWICK, 1899.

Fifty-seven stocks of Dwarf French Beans were received for trial, all of which were sown on a warm border on May 5, the rows being 3 ft. apart and two rows of each stock. The seeds were arranged according to their colours before sowing, and each colour, the black-seeded, the white-seeded, and so on, were sown in groups together. With one or two exceptions, the seeds germinated well, and the plants cropped freely. The Committee examined the collection on July 24.

Awards Recommended:—

F.C.C.=First Class Certificate.
A.M.=Award of Merit.
× × ×=Highly Commended.

Seeds Dark Dun.

1, 2, 3, 4, 5, 6. Ne Plus Ultra. × × × July 24, 1899, as a garden variety, also A.M. April 27, 1897, as a forcing variety (Hurst, J. Veitch, Cooling, Dean, Dicksons, Watkins & Simpson).—Growth moderately dwarf; foliage large; pods long and straight; very heavy crop. Ready for use July 17.

7. New Golden Queen (Toogood).—Growth dwarf; foliage moderate; pods long and slightly curved; very heavy crop. Ready for use July 18.

8. Sir Joseph Paxton (Hurst).—Growth rather tall; foliage large; pods moderately long and straight; very heavy crop. Ready for use July 15.

9. Superb Forcing (J. Veitch).—Did not germinate well.

10. Sutton's Forcing (Hurst).—Growth dwarf; foliage small; pods moderately long and slightly curved; very heavy crop. Ready for use July 15.

11. Stringless, × × × July 24, 1899 (Watkins & Simpson).—Growth moderately dwarf; foliage large; pods long, round, and very fleshy, without strings until quite old; heavy crop. Ready for use July 18.

Seeds Pale Dun.

12. Aigburth Wonder (Ker).—Growth moderately dwarf; foliage large; pods very long and straight; very heavy crop. Ready for use July 20.

13. Improved Perfection (Toogood).—Growth dwarf; foliage small; pods short and straight; heavy crop. Ready for use July 24. This variety continues flowering and cropping for a long time.

14. New Bountiful (Henderson).—Same as No. 12.

15, 16. Newington Wonder (Watkins & Simpson, Hurst).—Growth dwarf; foliage moderate; pods long and straight; heavy bearer. Ready for use July 17.

17. Pole Dun (J. Veitch).—Growth dwarf; foliage small; pods long and straight; very heavy crop. Ready for use July 15.

Seeds Speckled.

18. Butter Bean (Dean).—Growth dwarf; foliage small; pods long and slightly curved; moderate crop. Ready for use July 22. 'Dwarf Butter' received a **F.C.C.** in 1873, and 'Golden Butter' an **A.M.** in 1895, one or both of which are probably synonymous with the above.

19. Early Dwarf Prolific (Dicksons).—Growth tall; foliage moderate; pods long and straight; very heavy crop. Ready for use July 21. Not an early variety.

20. Early Wonder (J. Veitch).—Growth dwarf; foliage small; pods moderately long and straight; heavy crop. Ready for use July 17. One of the dwarfest varieties.

21. Fulmer's Forcing (J. Veitch).—Growth tall; foliage large; pods long and straight; heavy crop. Ready for use July 24.

22, 23. Magnum Bonum (Hurst, Dean).—Growth rather tall; foliage large; pods long and straight; very heavy crop. Ready for use July 20.

24. Mohawk (Dean).—Growth tall; foliage rather large; pods long and straight; heavy crop. Ready for use July 17.

25. Osborne's Forcing, **F.C.C.** 1873 (Watkins & Simpson).—Growth very dwarf; foliage small; pods moderate length, straight; good crop. Ready for use July 17.

26. Perfection, × × × July 24, 1899 (Dean).—A very superior form of No. 13. Ready for use July 17.

27. Progress, × × × July 24, 1899 (J. Veitch).—Growth moderate; foliage large; pods long and straight; very heavy crop. Ready for use July 17.

28. Superb Forcing (Toogood).—Growth dwarf; foliage small; pods long and straight; heavy crop. Ready for use July 18.

29. Syon House (J. Veitch).—Growth dwarf; foliage moderate; pods long and nearly straight; heavy crop. Ready for use July 18.

30. Veitch's Dwarf Hybrid (J. Veitch).—Growth tall; foliage large; pods long and straight; heavy crop. Ready for use July 29. A very distinct variety that should prove valuable for its lateness and vigour.

31. Williams's Prolific (Hurst).—Growth dwarf; foliage small; pods moderately long and spotted with purple; moderate crop. Ready for use July 20.

Seeds Black.

32. Covent Garden Early Negro, × × × July 24, 1899 (Watkins & Simpson).—Growth moderate; foliage large; pods long and straight; very heavy crop. Ready for use July 18.

33. Covent Garden Late Negro (Watkins & Simpson).—Same as No. 38.

34. Corrie's Rust-proof (Hurst).—Growth dwarf; foliage small; pods long, straight, yellow; poor crop. Ready for use July 18.

35. Goliath Hybrid (J. Veitch).—Growth moderate, also the foliage; pods long and straight; heavy crop. Ready for use July 24.

36. King of the Blacks (Toogood).—Growth tall; foliage large;

pods moderately long and slightly curved; good crop. Ready for use July 22.

37. Monster Negro Longpod (Dobbie).—Same as No. 38.

38, 39, 40, 41, 42. Negro Longpod, or Early Negro (J. Veitch, Hurst, Dean, Dicksons).—Growth tall; foliage large; pods long and straight; good crop. Ready for use July 21.

43. Smythe's Hybrid (J. Veitch).—Growth dwarf; foliage small; pods moderately long, straight; good crop. Ready for use July 18.

Seeds Purple.

44, 45, 46. Canadian Wonder (J. Veitch, Dobbie, Watkins & Simpson).—Growth tall; foliage large; pods long and straight; heavy crop. Ready for use July 20.

Seeds White.

47. Canadian Wonder (Watkins & Simpson).—A white-seeded and later form of No. 44.

48, 49, 50. Everbearing, × × × July 24, 1899 (Dean, Hurst, Dicksons).—Growth and foliage moderate; pods short and produced in great trusses thrown above the foliage; very heavy crop. Ready for use July 19.

51. Early Green Haricot (J. Veitch).—Growth tall; foliage large; pods long and curved; moderate crop. Ready for use July 24.

52. Green Haricot (J. Veitch).—Not a success.

53. King of the Earlies (Toogood).—Growth and foliage small; pods short and slightly curved; heavy crop. Ready for use July 18.

54. Longsword (J. Veitch).—Growth tall; foliage large; pods long and straight; good crop. Ready for use July 24.

55. Parkwood Prolific (Searing).—Similar to No. 54.

56. Miniature Haricot (J. Veitch).—A climbing form of No. 51.

57. Rhode Island (Hurst).—Growth moderate; foliage large; pod long, straight, and broad; heavy crop. Ready for use July 20.

REPORT ON PEAS AT CHISWICK, 1899.

Forty-six stocks of Peas were received for trial in the Gardens, and nine old and good varieties were grown with them for comparison. Thirty-three stocks were sown on March 10, and thirteen other stocks were sown later, the seeds being received late, and consequently did not have the same advantages as those seeds received earlier. The whole collection was sown on ground that had been trenched and well manured with cow manure, and with one exception the whole grew well and cropped freely. Two meetings were held by the Committee to examine them: on June 29 for the early varieties, and on July 11 for the later ones.

F.C.C.=First-class Certificate.
A.M.=Award of Merit.
× × ×=Highly Commended.
× ×=Commended.

1. Alderman Selected, **A.M.** July 11, 1899 (Deal).—Height 5½ feet; pods long, straight, in pairs, averaging nine large deep green and sweet peas in a pod; haulm and pods deep green; growth robust; very heavy crop. Ready for use June 29. Seeds wrinkled.

2. Beatrice (Harrison).—Height 2½ feet; pods long, slightly curved, in pairs, averaging seven large pale green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use July 4. Seeds wrinkled; stock slightly mixed.

3. Bertrand (Deal).—Height 1½ feet; pods moderately long, straight, usually in pairs, averaging five large deep green peas in a pod; haulm and pods deep green; growth robust; heavy crop. Ready for use June 29. Seeds wrinkled.

4. Continuity, **A.M.** July 26, 1898 (R. Veitch).—Height 3 feet; pods moderately long, straight, and broad, averaging five large deep green sweet peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use July 10. Seeds wrinkled.

5. Dalby's Prolific, **A.M.** July 11, 1899 (J. Veitch). Height 4 feet; pods long, slightly curved, in pairs, averaging eight large deep green sweet peas in a pod; haulm and pods dark green; growth robust; very heavy crop. Ready for use July 10. Seeds wrinkled.

6. Duke of Cornwall, **A.M.** July 11, 1899 (Toogood).—Height 5 feet; pods long, straight, in pairs, averaging nine large deep green sweet peas in a pod; haulm and pods dark green; growth robust; very heavy crop. Ready for use June 29. Seeds wrinkled.

7. Duke of York, **A.M.** June 6, 1893 (Toogood).—Height 5½ feet; pods long, straight, in pairs, averaging nine large deep green sweet peas in a pod; haulm and pods dark green; growth very robust; heavy crop. Ready for use June 29. Seeds wrinkled.

8. Dwarf Triumph, × × × July 11, 1899 (Toogood). Height 2 feet; pods long, straight, single, averaging seven large sweet peas in a pod; haulm and pods dark green; growth robust; very heavy crop. Ready for use July 5. Seeds wrinkled.

9. Dwarf Hardy Marrowfat (Hurst).—Height 2 feet; pods long, straight, in pairs, averaging six large deep green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use June 29. Seeds wrinkled.

10. Doris Harrison (Harrison).—Height 1 foot; pods moderate length, slightly curved, in pairs, averaging six large pale green peas in a pod; haulm and pods dark green; robust growth; heavy crop. Ready for use June 20. Seeds wrinkled.

11. Early Pearl (Harrison).—Height 3 feet; pods long, straight, usually single, averaging six large pale peas in a pod; haulm dark green, pods pale green; growth robust; heavy crop. Ready for use June 21. Seeds round.

12. Emperor of Japan (Harrison).—Height 2 feet; pods long, curved, in pairs, averaging six large deep green peas in a pod; haulm and pods dark green; growth robust; moderate crop. Ready for use July 4. Seeds wrinkled.

13. Excelsior (R. Veitch).—Height 15 inches; pods moderate length, in pairs, averaging seven large pale green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use June 24. Seeds wrinkled.

14. Fascination (Harrison).—Height 4 feet; pods long, slightly curved, in pairs, averaging eight large deep green peas in a pod; haulm and pods dark green; growth robust, very heavy crop. Ready for use July 4. Seeds slightly wrinkled. The stock was a little mixed, but when further selected this should prove a valuable market pea.

15. Glory of Devon, **A.M.** July 11, 1899 (R. Veitch).—Height 3½ feet; pods long, straight and broad, in pairs, averaging eight large pale green sweet peas in a pod; haulm and pods bright green; growth robust; very heavy crop. Ready for use July 11. Seeds wrinkled.

16. Harbinger (R. Veitch).—Height 1 foot; pods moderate length, thick, single, averaging five large pale green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use June 21. Seeds wrinkled. This is distinct from the Harbinger that received a **F.C.C.** in 1872, and also from the Harbinger that received × × in 1897.

17. Lathom (Ashton).—A good selection of Ne Plus Ultra. Ready for use July 4.

18. Lord Granby (Harrison).—Height 4 feet; pods moderate length, straight, in pairs, averaging seven large bright green peas in a pod; haulm and pod a glaucous green; heavy crop. Ready for use June 29. Seeds wrinkled.

19. Magnificent (Hurst).—Height 4 feet; pods long, straight, in pairs, averaging six large pale green sweet peas in a pod; haulm and pods light green; growth robust; heavy crop. Ready for use June 29. Seeds wrinkled. A variety under this name was sent in 1884 by Mr. Eckford, and was awarded a **F.C.C.**

20. Nobleman, **A.M.** July 11, 1899 (Deal).—Height 2½ feet; pods slightly curved, in pairs, averaging seven large deep green sweet peas in a pod; haulm and pods dark green; growth robust; very heavy crop. Ready for use July 4. Seeds wrinkled.

21. Peerless Marrowfat (R. Veitch).—Height 3 feet; pods slightly

curved, in pairs, averaging seven very large deep green sweet peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use July 5. Seeds wrinkled.

22. Pierremont Gem (Hurst).—Height 1 foot; pods straight, broad, usually single, averaging seven large bright green sweet peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use June 24. Seeds wrinkled.

23. Prodigious (Bryson).—Height 3 feet; pods slightly curved, long, in pairs, averaging six large whitish peas in a pod; haulm and pods pale green; growth fairly robust; heavy crop. Ready for use July 3. Seeds wrinkled.

24. Prolific Marrow (R. Veitch).—Height 2½ feet; pods long, straight, in pairs, averaging six large deep green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use July 4. Seeds wrinkled.

25. Superior (Hurst).—Height 3 feet; pods long, straight, in pairs, averaging eight large deep green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use June 21. Seeds wrinkled. Stock slightly mixed.

26. Seedling Marrowfat (R. Veitch).—Height 15 inches; pods long, straight, and broad, single, averaging six large pale green peas in a pod; haulm and pods dark green; growth robust; good crop. Ready for use June 24. Seeds wrinkled.

27. The Major (Webber).—Height 5 feet; pods moderate length, straight, in pairs, and very similar in appearance to Ne Plus Ultra. Ready for use June 29. Seeds wrinkled.

28. Thousandfold (Toogood).—Height 3½ feet; pods long, straight, in pairs, averaging six large deep green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use July 5. Seeds wrinkled.

29. Tremendous (Toogood).—Height 3 feet; pods moderate length, straight, single, averaging six large bright green peas in a pod; haulm and pods deep green; growth weak; moderate crop. Ready for use June 22. Seeds wrinkled.

30. Unrivalled (Toogood).—The same as Boston Unrivalled, which received an **A.M.** July 14, 1896. (See Vol. XX. p. 67.)

31. Utility (Dicksons).—Height 5 feet; pods long, straight, single, averaging five large pale green peas in a pod; haulm and pods pale green; growth robust; heavy crop. Ready for use July 4. Seeds wrinkled.

32. Victoria (Toogood).—Height 2½ feet; pods short, straight, single, averaging five large deep green peas in a pod; haulm and pods dark green; growth robust; moderate crop. Ready for use July 11. Seeds wrinkled.

33. Winifred, **A.M.** July 11, 1899 (Deal).—Height 2 feet; pods long, straight, in pairs, averaging eight large deep green sweet peas in a pod; haulm and pods dark green; growth robust; very heavy crop. Ready for use July 4. Seeds wrinkled.

All the following stocks were received late:—

34. Centenary (Eckford).—Height 2½ feet; pods long, straight, single,

averaging five large deep green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use July 11. Seeds wrinkled. Stock slightly mixed.

35. Daylight (Carter).—Height 2 feet; pods short, straight, averaging four small whitish peas in a pod; growth robust; heavy crop. Ready for use June 24. Seeds wrinkled.

36. Dwarf Marrowfat (Daniels).—Height 1½ foot; pods long, straight, single, averaging seven large deep green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use July 11. Seeds wrinkled.

37. Dwarf Monarch (Eckford).—Height 2½ feet; pods moderately long, straight, in pairs, averaging five large deep green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use July 11. Seeds wrinkled.

38. Holborn Glory (Carter).—A good form of Ne Plus Ultra.

39. Ideal (Eckford).—Height 6 feet; pods long, straight, in pairs, averaging six large pale green peas in a pod; haulm and pods pale green; growth robust; heavy crop. Ready for use June 29. Seeds wrinkled.

40. Idaho or Coffee Pea (Pearce, Canada).—Height 15 inches. This is more like a Vetch than a Pea in the foliage; the pods are small and freely produced, and the peas are stated to be excellent when cooked. If dried and ground it is said to be a good substitute for coffee. The seeds germinated well, but when the plants were forming their pods they seemed unable to stand the heat at Chiswick, and collapsed.

41. London Market (Carter).—Height 3 feet; pods short, in pairs, averaging four large green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use July 3. Seeds wrinkled.

42. Royalty (Eckford).—Very similar to No. 32.

43. The Carter (Carter).—Height 6 feet; pods long, straight, in pairs, averaging six large deep green peas in a pod; haulm and pods dark green; growth robust; heavy crop. Ready for use July 10. Seeds wrinkled.

44. The Howard (Barr).—A failure.

45. The Bruce, **A.M.** July 26, 1898 (Eckford).—Height 5 feet; pods long, straight, in pairs, averaging nine large bright green peas in a pod; haulm and pods a rather light green; growth robust; heavy crop. Ready for use July 4. Seeds wrinkled.

46. The Sirdar (Eckford).—Height 5½ feet; pods long, straight, in pairs, averaging six large pale green peas in a pod; haulm and pods pale green; growth robust; heavy crop. Ready for use July 4. Seeds wrinkled.

REPORT ON TOMATOS GROWN AT CHISWICK, 1899.

Twenty-five new varieties of Tomatos were sent for trial, and twenty-seven of the best older ones were grown for comparison. The seeds were all sown on March 21, and the plants grown on and fruited in 10-inch pots. The hot season suited the plants admirably, all making good growth, and being entirely free from any disease.

A.M.=Award of Merit.

1. Comet, **A.M.** July 25, 1899 (R.H.S.).—Medium size, round, smooth, of good form; deep scarlet; averaging six fruits in a cluster; solid, good flavour, and a great bearer. Seeds of this variety were sent to Chiswick, about five years ago, by Messrs. Wrench.

2. Champion (Dobbie).—Medium size, deep, round, smooth, good form; deep scarlet; averaging four fruits in a cluster; solid, and pleasing in flavour. Heavy bearer.

3. Cherry Ripe, **A.M.** July 25, 1899 (Dobbie).—Small, round, smooth, nice form; deep red; averaging seven fruits in a cluster; firm, and of excellent flavour for dessert. Heavy bearer.

4. Combination (Atlee Burpee).—Large, round, smooth, good form; deep crimson; averaging four fruits in a cluster; solid, fair flavour, and a heavy bearer.

5. Crimson King (Dicksons).—Large, round, smooth, fine form; deep crimson; averaging six fruits in a cluster; solid, and good flavour. Heavy bearer.

6. Early Marvel (Toogood).—Large, flattish-round, smooth; deep red; averaging three fruits in a cluster; firm, good flavour. Moderate crop.

7. Fordhook Fancy (Atlee Burpee).—Very large, flattish-round, smooth; purplish crimson; averaging four fruits in a cluster; solid, and fair flavour. Heavy crop. The foliage is very broad, and quite distinct.

8. Glenburn Model (Cuthbertson).—Large, deep, round, smooth, fine form; bright crimson; averaging five fruits in a cluster; solid, and good flavour. Heavy crop.

9. Golden Gem (Toogood).—Very similar to Golden Nugget.

10. Golden Prince (Cuthbertson).—A very good selection of Golden Nugget.

11. Golden Queen (Toogood).—Large, flattish, corrugated; averaging three fruits in a cluster; solid, fair flavour. Poor crop.

12. Golden Drop (Dobbie).—A fine stock of Golden Nugget.

13. Hillside Comet (Watkins & Simpson). Same as No. 1.

14. King of the Yellows (Cutbush).—Large, round, smooth; bright yellow; averaging four fruits in a cluster; solid, excellent flavour. Heavy crop.

15. Leicester Prolific (Harrison).—Large, round, smooth, fine form;

scarlet; averaging five fruits in a cluster; solid, good flavour. Heavy crop.

16. Paramount (Pearce).—Large, round, smooth, good form; deep scarlet; averaging four fruits in a cluster; solid, somewhat acid flavour. Moderate crop.

17. Polegate Improved (Cutbush).—Large, flattish-round, smooth; scarlet; averaging three fruits in a cluster; solid, fair flavour. Light crop.

18. Pointing's Trophy (Watkins & Simpson).—Very similar to Chemin Rouge.

19. Royal Sovereign, **A.M.** July 26, 1892 (Dicksons).—Large, deep, round, smooth, good form; pale yellow; averaging three fruits in a cluster; solid, excellent flavour. Moderate crop.

20. Scarlet Queen (Dicksons).—Large, deep, round, smooth, fine form; bright scarlet; averaging four fruits in a cluster; solid, good flavour. Heavy crop.

21. Semper Fidelis (R. Veitch).—Large, round, smooth; scarlet; averaging three fruits in a cluster; solid, good flavour. Moderate crop.

22. The Cropper (Cutbush).—Medium, deep, round, smooth; good form; bright scarlet; averaging five fruits in a cluster; solid, excellent flavour. Heavy crop.

23. The Champion (Cutbush).—Same as No. 2.

24. Tit-Bit (Watkins & Simpson).—Medium, deep, round, smooth, good form; scarlet; averaging six fruits in a cluster; firm, excellent flavour. Heavy crop.

25. Tip-Top (Toogood).—Large, flattish-round, slightly corrugated; dark red; averaging four fruits in a cluster; fair flavour. Moderate crop.

26. Wonderful (Toogood).—Large, deep, round, smooth, good form; bright red; averaging six fruits in a cluster; solid, and very similar to Chemin Rouge in appearance and flavour. Heavy crop.

The Rev. W. Wilks, M.A., sent Tomato plants raised from small bulb-like protuberances which appeared along the mid-ribs and subsidiary branch-ribs of the leaves. The plants grew and cropped well, exhibiting the same peculiarity as in their parents.

LETTUCE GROWN AT CHISWICK, 1899.

Seventeen stocks of Lettuce were received for trial, all of which were sown in boxes on February 27, and when large enough were transplanted on an open quarter. The whole of the stocks were remarkably true, and entirely free from any rogues, the growth in almost every instance being good. The Committee examined them on two occasions, viz. June 29 and July 11.

F.C.C. = First-class Certificate.
A.M. = Award of Merit.

Cabbage Varieties.

1. Canaday (R. Dean).—Foliage large and spreading, green shaded with purple; hearts large, firm, crisp, and of good flavour. Did not stand the drought well.

2. Crimson Beauty (Watkins & Simpson).—Foliage large and spreading; very handsome; heavily shaded with rich crimson. This variety does not form good hearts, but stands well without running to seed.

3. Crystal Cabbage, **F.C.C.** July 26, 1898 (Watkins & Simpson).—This fine variety well maintained its reputation of 1898. See Vol. XXII. page 226.

4. Continuity (Daniels).—See Vol. XXII. page 226.

5. Early Market All-heart (Watkins & Simpson).—A darker green form of No. 9.

6. Genezzau (R. Dean).—Same as No. 4.

7. Green-fringed (Carter).—See Vol. XXII. page 226.

8. Ice, or Iceleaf, **A.M.** August 13, 1895 (R. Dean).—Foliage large and spreading, deep shining green; hearts large and firm, crisp, and of good flavour, standing the drought well.

9. Improved All the Year Round (Watkins & Simpson).—Foliage of medium size, very compact, pale green; hearts rather large, firm, crisp, of good flavour, and standing well without running to seed.

10. Leyden White Dutch (R. Dean).—Foliage of medium size, compact, deep green; hearts large, firm, and of good flavour, standing the drought well.

11. New Fern-leaved (Carter).—Foliage small, deep green, crimped, compact; hearts small, and quickly ran to seed.

12. Royal Malta, **A.M.** August 13, 1895 (Harrison).—Foliage large, green, and spreading; hearts very large and firm, standing the drought well, and of good flavour.

13. Syon Maincrop (Wythes).—Ran to seed without hearting.

14. Stanstead Park (Watkins & Simpson).—An excellent variety for autumn sowing.

Cos Varieties.

15. Hicks's Hardy White (J. Veitch).—See Vol. XXII. page 226.

16. Prince of Wales (Watkins & Simpson).—Similar to Paris White.

17. Sugarloaf Bath (J. Veitch).—See Vol. XXII. page 226.

REPORT ON POTATOS AT CHISWICK, 1899.

Forty-six varieties of Potatos were sent for trial, and twenty-five of the older popular varieties were grown for comparison. The ground had been specially prepared for the crop, and in spite of the drought the majority of the varieties grew well, and produced good crops. The Fruit and Vegetable Committee examined the collection on two occasions, viz. July 24 and August 31. The following varieties, by reason of their heavy crops and good appearance, were selected for cooking to test their quality, viz. :—

Caradoc Seedling.	Norbury Park.
Devonian.	Prolific.
Early Peter.	Queen of July.
Ellington's Seedling.	Ridgewell Invincible.
Hibberd's Seedling.	St. Lawrence.
Laxton's No. 3.	The Sirdar.

F.C.C.=First-class Certificate.
A.M.=Award of Merit.

1. Achievement (Briggs).—Round, variable in shape, white; eyes shallow; small; poor crop, slightly diseased; moderate haulm. Mid-season.

2. Britannia (Dobbie).—Round, white; eyes shallow; medium size; heavy crop, free from disease; moderate haulm. Late.

3. British Queen (Dobbie).—Round, white; eyes shallow; medium size; heavy crop, free from disease, but slightly grown out; tall strong haulm. Late.

4. Camm's Early (J. Veitch).—Kidney, white; eyes full; large; light crop, slightly diseased; short haulm. Very early.

5. Caradoc Seedling, **A.M.** July 25, 1899 (Caddick).—Round, white; eyes shallow; medium size; very heavy crop, free from disease; tall haulm. Late. Excellent quality when cooked.

6. Challenge, **A.M.** September 6, 1898 (Sydenham).—See Vol. XXII. page 222.

7. Collier's Glory (Compton).—Round, white; eyes full; large; light crop, free from disease; tall haulm. Late. Tubers of this variety were not received for trial until May 24.

8. Devonian, **A.M.** September 6, 1898 (R. Veitch).—See Vol. XXII. page 222.

9. Early Queen (Dicksons).—Kidney, white; eyes full; large; heavy crop, free from disease; moderate haulm. Very early.

10. Early Victor (Hurst).—Kidney, white; eyes full; very small; light crop, free from disease; short haulm. Early.

11. Early Peter, **A.M.** July 25, 1899 (Bradley).—Flattish kidney, white, with russety skin; eyes full; medium size; very heavy crop, free from disease; moderate haulm. Early or mid-season.

12. Ellington's Seedling, **A.M.** September 26, 1899 (Ellington).—

Round, white, with shallow pink eyes; medium size; heavy crop, free from disease; moderate haulm. Mid-season.

13. Eynsford Castle Kennedy (Eves).—Round, white; eyes shallow; small; light crop, free from disease; short haulm. Early.

14. Fidler's Fame (Fidler).—Long kidney, white; eyes shallow; large; moderate crop, slightly grown out, free from disease; strong tall haulm. Mid-season or late.

15. Green's Favourite (Green).—Kidney, white; eyes full; medium size; heavy crop, much grown out, free from disease; tall strong haulm. Late.

16. Grand Chancellor (Toogood).—Same as Chancellor, which received a **F.C.C.** August 20, 1885, when exhibited by Mr. Dean.

17. Hibberd's Seedling, **A.M.** July 25, 1899 (Hibberd).—Kidney, white; eyes full; medium size; moderate crop, free from disease; short haulm. Early.

18. Huey's Seedling (Huey).—Kidney, white; eyes full; large; uneven in form; heavy crop, free from disease; tall haulm. Late.

19. Kimes's Seedling (Kimes).—Round, white; eyes shallow; very large; heavy crop, free from disease; tall haulm. Late.

20. Knight's Seedling (Knight).—Round, white; eyes shallow; medium size; heavy crop, much diseased; tall haulm. Late.

21. Laxton's No. 1 (Laxton).—Round, white; eyes full; medium size; light crop, free from disease; moderate haulm. Mid-season.

22. Laxton's No. 2 (Laxton).—Round, white; eyes shallow; large; light crop, much grown out; free from disease; tall haulm. Late.

23. Laxton's No. 3 (Laxton).—Flattish round, white; eyes full; medium size; moderate crop, free from disease; short haulm. Early.

24. Leicester Prolific (Harrison).—Round, white, handsome; eyes full; medium size; good crop; free from disease; tall strong haulm. Late.

25. Maid of Coil (Dobbie).—Round, white; eyes shallow; rather small; heavy crop, much grown out, free from disease; very strong haulm. Late.

26. Morris's Seedling (Morris).—Kidney, white; eyes full; medium to small; light crop, free from disease; short haulm. Early.

27. Netley Seedling (Morris).—Kidney, white; eyes shallow; medium size; good crop, slightly diseased; short haulm. Early.

28. New Seedling No. 20 (Fidler).—Round, white; deep eyes; bad shape, large; heavy crop, slightly grown out; tall strong haulm. Late.

29. Norbury Park, **A.M.** July 25, 1899 (Solomons).—Very similar in haulm and tubers to No. 17, but a heavier crop. Early.

30. Pride of Chester (Dicksons).—Kidney, white; eyes full; large; heavy crop, slightly grown out, free from disease; tall haulm. Late.

31. Prolific, **A.M.** July 25, 1899 (Johnson).—Round, white; eyes shallow; large; heavy crop, free from disease; moderate haulm. Mid-season.

32. Purple Beauty (Lye).—Round, purple; eyes full; handsome, medium size; moderate crop, much grown out; free from disease; tall haulm. Late.

32A. Queen of July (Toogood).—Kidney, white; eyes shallow; medium size; heavy crop, free from disease; moderate haulm. Early.

33. Ratcliffe Seedling (Briggs).—Kidney, white, russety; eyes full; uneven in size; good crop, free from disease; moderate haulm. Mid-season.

34. Red Perfection (R. Veitch).—Round, red; eyes deep; medium size; large; good crop, free from disease; tall haulm. Late.

35. Satisfaction, **A.M.** September 10, 1895 (Toogood).—Rounded oval; eyes full; white, handsome, large; heavy crop, free from disease; tall haulm. Late.

36. Seedling Maincrop (Wythes).—Round, white; eyes shallow; large; good crop, free from disease; tall strong haulm. Late.

37. Snowdrop, **F.C.C.** August 30, 1883 (Toogood).—Kidney, white; eyes full; medium size; moderate crop, much diseased; tall strong haulm. Mid-season.

38. St. Lawrence (Heaton).—Flat kidney, white; eyes full; large; good crop, much diseased; moderate haulm. Early.

39. The Sirdar, **A.M.** September 26, 1899 (Hurst).—Round, white; eyes shallow; large; very heavy crop, free from disease; tall haulm. Mid-season or late.

40. The Sirdar (Cutbush).—Kidney, white; eyes full; small; poor crop, free from disease. Early. Quite distinct from and inferior to No. 39.

41. Tamworth Mercury (Sydenham).—Round, pale red; eyes shallow; large; heavy crop, free from disease; tall haulm. Late.

42. The Noble (Ranger).—Round white; eyes full; rather small; very heavy crop, free from disease; tall haulm. Mid-season.

43. The Crofter (Dobbie).—Round, white, russety; eyes shallow; medium size; heavy crop, free from disease; tall strong haulm. Late.

44. Triumph, **F.C.C.** September 12, 1893 (Toogood).—Kidney, variable in shape, white; eyes shallow; good crop, free from disease; moderate haulm. Late.

45. Up to Date (Toogood).—Flat round, white; eyes shallow; medium size; very heavy crop, much grown out, free from disease; tall strong haulm. Mid-season or late.

MISCELLANEOUS VEGETABLES.

At Chiswick, 1899.

Cauliflowers.

A large collection of Cauliflowers were sown in gentle heat. The whole germinated well, and when large enough to handle they were pricked out in cold frames, and from thence planted out on rich and deeply worked ground. For a time the plants grew well, but when the drought set in they all "buttoned" prematurely, in spite of constant supplies of water, the whole collection thus proving a failure.

Onions.

1. Barnet Hero (Cutbush).—Large, firm, heavy, flattish round, with a bronzy yellow skin.

2. Cestrian (Dicksons).—Medium size, firm, heavy, globular, with a deep coppery brown skin.

3. Cranston's Excelsior (Watkins & Simpson).—See Vol. XXII. page 229.

4. Empson's Champion Globe (Wingfield).—Large, heavy, deep globe shape, with a pale brown skin.

All the above stocks were remarkably true and good.

5. The Wildsmith (R. Veitch).—See Vol. XXII. page 231.

Parsley.

1. Moss Curled (Watkins & Simpson).—An excellent strain of the ordinary type.

2. Fern-leaved (Watkins & Simpson).—Foliage much cut and divided, almost feathery. Very pretty in the green state, shading off with age to a beautiful crimson and brown, which should make it useful for decoration.

Chicory.

Fringed Perpetual (Carter).—Foliage deeply fringed. It was said that the stems were very palatable when cooked in the same manner as Asparagus.

Beetroot.

1. Crimson Willow-leaved (Watkins & Simpson).—Very similar to the Dracæna-leaved, and, like it, very handsome for bedding purposes, but the roots are too small to be useful.

2. Brazilian (Watkins & Simpson).—A very fine selection of this bedding plant.

3. Cutbush's Crimson (Cutbush).—Roots pyriform, with a deep crimson flesh; foliage dwarf, and very dark.

Parsnip.

1. Elcombes (Watkins & Simpson).—Roots of medium length, thick and tapering, handsome; hollow crown, small top.

2. Improved Marrow (Watkins & Simpson).—See Vol. XXII. page 399.

3. Lisbonnais (Watkins & Simpson).—See Vol. XXII. page 400.

Salsafy.

1. Mammoth (Watkins & Simpson).—A much stronger and superior form of No. 2, with large and more shapely roots.

2. Ordinary (Watkins & Simpson).—A good selection of the usual type.

Gourd.

Potiron Gris de Boulogne (Bonavia).—Stock slightly mixed, the majority of the fruits being very similar to "Boulogne Grey," which is a popular edible variety in France.

Runner Beans.

1. Everbearing (J. Veitch).—Scarlet Runner × dwarf French Bean. Seeds deep purple; pods long, straight, thick and fleshy, produced in abundance; height 5 feet. A strong and continuous grower.

2. Invincible Scarlet Runner (Upstone).—A good selection of the ordinary form.

3. Premier (J. Veitch).—Scarlet Runner × dwarf French Bean. Seeds grey, marked with stripes of purple. In other points similar to No. 1.

4. The Wonder (Deal).—Pods long, straight, broad and handsome; a free bearer.

Broad Bean.

Robin Hood Green Longpod (Harrison).—A very fine selection of this type of Bean.

Aubergine.

Maroo Baingan, syn. Narrow Aubergine of Delhi (Bonavia).—Fruits very large and of various colours; excellent for cooking. Plants of sturdy habit and very prolific.

Cucumber.

Western Wonder (R. Veitch).—A handsome prolific variety somewhat resembling Lockie's Perfection.

Pumpkin.

1. Squash, Warted Hubbard (Pearce).—This proved to be very similar to a large green Vegetable Marrow.

2. Pumpkin, The Enormous (Pearce).—A large variety, with the fruits of a grey colour and rather oval in form, one end being a little thicker than the other.

REPORT ON POMPON DAHLIAS, 1899.

A COLLECTION of 127 stocks of Pompon Dahlias was planted in well-worked and liberally manured ground between June 5 and June 22 as received from the donors, the distance between the plants being 3 feet 6 inches each way. The season proved unprecedentedly hot and dry; but notwithstanding this serious drawback the plants grew well, and many of them flowered abundantly. The Floral Committee examined the collection on three occasions, and Highly Commended fifteen varieties.

F.C.C.=First-class Certificate.
A.M.=Award of Merit.
× × ×=Highly Commended.

I.—FLOWERS WHITE.

1. Camellæflora (as a bedding variety), × × × September 8, 1899 (Cannell).—Height 3 feet; sturdy habit; exceptionally free flowering; flowers rather flat, borne well above the foliage.

2. Dolly Keith (Cannell, Veitch).—Height 4 feet; erect, rather slender habit; free flowering; flowers with quilled petals, blush white, borne well above the foliage.

3. Eli Millard (Cannell).—Height 3 feet 6 inches; vigorous habit; moderately free flowering; flowers of good form, with fimbriated petals, white with a delicate blush suffusion, borne well above the foliage.

4. George Brinckman, × × × August 25, 1899 (Cannell, Turner).—Height 4 feet; bushy habit; very free flowering; flowers of excellent form, borne well above the foliage.

5. Lady Blanche, × × × September 23, 1890 (Cannell).—Height 4 feet; erect, sturdy habit; moderately free flowering; flowers with regularly quilled petals, borne well above the foliage.

6. La Petite Barbier, **F.C.C.** August 14, 1884 (Dobbie, Cannell).—Height 3 feet; bushy habit; moderately free flowering; flowers with quilled petals, borne well above the foliage.

7. Little Lady (Turner).—Height 3 feet 6 inches; compact, sturdy habit; moderately free flowering; flowers rather large, blush or cream-white heavily edged with rosy purple, borne well above the foliage.

8. Purity, **A.M.** August 27, 1895 (Cannell, Turner).—Height 3 feet 6 inches; rather close habit; moderately free flowering; flowers of good shape, white touched with cream, white in the centre, borne well above the foliage.

9. White Aster (syn. Guiding Star), × × × September 23, 1890 (Dobbie, Cannell).—Height 4 feet; compact, erect habit; very free flowering; flowers with fimbriated petals, borne on stout stems well above the foliage.

II.—FLOWERS LEMON OR PRIMROSE YELLOW.

10. Ceres, **A.M.** September 26, 1893 (Dobbie).—Height 4 feet; vigorous, compact habit; moderately free flowering; flowers large with quilled petals, pale primrose-yellow, borne well above the foliage.

11. Clarissa, **A.M.** October 13, 1896 (Dobbie, Turner).—Height 4 feet; bushy, compact habit; very free flowering; flowers of exquisite form, soft primrose, borne well above the foliage.

12. Dora (Cannell, Veitch).—Height 4 feet 6 inches; sturdy habit; free flowering; flowers pale primrose, partly hidden by the foliage.

13. E. F. Jungker (Dobbie, Cannell).—Height 3 feet; bushy habit; very free flowering; flowers primrose-yellow touched with pale salmon, borne well above the foliage.

14. Fairy Tales, ××× September 23, 1890 (Forbes, Cannell, Veitch).—Height 3 feet 6 inches; vigorous, bushy habit; very free flowering; flowers large, well formed, rich primrose-yellow, thrown well above the foliage.

15. Hypatia, **A.M.** August 24, 1897 (Dobbie, Turner).—Height 3 feet; bushy, compact habit; very free flowering; flowers small, lemon-yellow suffused with salmon.

16. Jewel (Dobbie).—Height 4 feet; vigorous, spreading habit; moderately free flowering; flowers variable in colour, in some the petals are marked with white and others almost wholly white.

17. Madeline, **A.M.** September 10, 1895 (Turner).—Height 3 feet; compact, bushy habit; very free flowering; flowers with quilled petals, primrose-yellow heavily tipped with rosy purple.

18. Opal, ××× August 25, 1899 (Dobbie, Veitch).—Height 3 feet; compact, bushy habit; very free flowering; flowers variable, but usually bright yellow, tipped with white, and thrown well above the foliage.

19. Pomponei (Cannell).—Height 3 feet 6 inches; bushy habit; moderately free flowering; flowers pale primrose suffused with rose-pink, borne well above the foliage.

20. Zoe (Turner).—Height 3 feet; compact, bushy habit; moderately free flowering; flowers of good form, primrose-yellow tipped with white, borne well above the foliage.

III.—Flowers Yellow.

21. Boule d'Or (Cannell).—Height 2 feet 6 inches; rather slender habit; moderately free flowering; flowers deep yellow.

22. Chrystabelle (Cannell, Turner).—Height 4 feet; very bushy habit; exceptionally free flowering; flowers yellow, tipped and suffused with red.

23. Countess von Sternberg (Forbes).—Height 3 feet 6 inches; sturdy habit; moderately free flowering; flowers with quilled petals, yellow occasionally tipped with white.

24. Deegen (Cannell).—Height 4 feet; compact habit; moderately free flowering; flowers with quilled petals, deep yellow, borne well above the foliage.

25. Elegant (Dobbie, Cannell, Veitch).—Height 2 feet 6 inches; bushy, compact habit; very free flowering; flowers large with broad petals, soft yellow, heavily tipped and shaded with rosy crimson.

26. Emily Hopper, **A.M.** October 10, 1893 (Dobbie, Cannell).—Height 4 feet; erect, bushy habit; free flowering; flowers clear yellow, borne well above the foliage.

27. Flora (Dobbie, Forbes).—Height 3 feet; bushy habit; very free flowering; flowers rich yellow, borne well above the foliage.

28. Florence Woodland, **A.M.** September 26, 1893 (Dobbie, Cannell).—Height 4 feet; bushy, compact habit; very free flowering; flowers of good form, pale yellow edged with purplish crimson, borne well above the foliage.

29. Ganymede, **A.M.** September 10, 1895 (Turner).—Height 3 feet 6 inches; bushy habit; very free flowering; flowers amber yellow suffused with pale lilac, borne well above the foliage.

30. Golden Gem (Cannell).—Height 4 feet; rather loose habit; free flowering; flowers with quilled petals, canary yellow, borne well above the foliage.

31. Goldfinch (Turner).—Height 4 feet; sturdy habit; moderately free flowering; flowers golden yellow, not borne very high above the foliage.

32. Iona (Dobbie).—Height 3 feet; very sturdy habit; moderately free flowering; flowers large, rich yellow, borne well above the foliage.

33. Iris, **A.M.** September 20, 1898 (Turner).—Height 4 feet, rather loose, spreading habit; free flowering; flowers with quilled petals, yellow suffused with salmon, borne well above the foliage.

34. Iseult, × × × August 25, 1899 (Forbes, Cannell, Veitch).—Height 3 feet 6 inches; rather slender habit; very free flowering; flowers with quilled petals, deep golden yellow, borne well above the foliage.

35. Jessica (Dobbie, Forbes, Cannell, Turner).—Height 3 feet 6 inches; sturdy habit; free flowering; flowers amber yellow, slightly tipped and shaded with orange red.

36. Little Frank (Dobbie, Forbes, Cannell).—Height 3 feet 6 inches; very bushy habit; very free flowering; flowers canary yellow with a faint suspicion of salmon, tipped and suffused with rose-purple.

37. Marion (Cannell).—Height 2 feet 6 inches; bushy, compact habit; very free flowering; flowers neat, deep yellow, borne well above the foliage.

38. Nancy, × × × August 25, 1899 (Turner).—Height 3 feet 6 inches; bushy habit; free flowering; flowers deep yellow, heavily edged and shaded with scarlet, borne well above the foliage.

39. Norah (Dobbie, Turner).—Height 4 feet; erect habit; very free flowering; flowers rich yellow tipped with scarlet, borne well above the foliage.

40. Orpheus (Turner).—Height 4 feet 6 inches; erect habit; moderately free flowering; flowers bright yellow with a raised centre, thrown well above the foliage.

41. Psyche (Turner).—Height 3 feet 6 inches; sturdy habit; very free flowering; flowers rich yellow, heavily tipped and shaded with orange-scarlet, borne well above the foliage.

42. Rosalie (Cannell).—Height 3 feet 6 inches; compact, bushy habit; free flowering; flowers of excellent shape, pale yellow touched with pink towards the edges of the petals.

43. Rosalind (Forbes).—Height 2 feet 6 inches; bushy habit; free flowering; flowers with quilled petals, pale yellow tipped with white, borne well above the foliage.

44. Rosy Gem (Veitch).—Height 4 feet; bushy habit; moderately free flowering; flowers yellow shaded with rose.

45. Rowena, **A.M.** August 29, 1893 (Dobbie, Cannell).—Height 3 feet 6 inches; compact, bushy habit; wonderfully free flowering; flowers of good form, rich yellow edged and suffused with scarlet, borne well above the foliage.

46. Royalty (Forbes, Cannell).—Height 3 feet; bushy habit; very free flowering; flowers with quilled petals, rather large, yellow, heavily tipped with crimson-scarlet, borne well above the foliage.

47. Salamander (Forbes).—Height 3 feet; sturdy habit; free flowering; flowers of good form, yellow, very heavily tipped and shaded with scarlet.

48. Sovereign, **A.M.** September 26, 1893 (Forbes, Cannell).—Height 3 feet 6 inches; vigorous habit; moderately free flowering; flowers deep yellow, the greater portion of which are hidden by the foliage.

49. Sunny Daybreak, × × × August 25, 1899 (Dobbie, Forbes).—Height 3 feet 6 inches; very bushy habit; exceptionally free flowering; flowers of good form, rich apricot yellow, edged and suffused with red, borne on long stalks well above the foliage.

50. Whisper, **F.C.C.** September 25, 1888 (Cannell, Turner).—Height 3 feet 6 inches; compact habit; very free flowering; flowers of excellent form, yellow, heavily tipped and shaded with orange-scarlet, borne well above the foliage.

IV.—Flowers Orange.

51. Cicero (Turner).—Height 3 feet 6 inches; bushy habit, moderately free flowering; flowers pale orange, borne well above the foliage.

52. Dr. Rauch, **F.C.C.** August 24, 1876 (Cannell).—Height 3 feet 6 inches, bushy habit; very free flowering; flowers small with quilled petals, orange-red, borne well above the foliage.

53. Fabio, **A.M.** August 27, 1895 (Cannell).—Height 3 feet; diffuse habit; very free flowering; flowers of good shape, orange-yellow, heavily edged with orange-scarlet, borne well above the foliage.

54. Fashion, × × × September 23, 1890 (Dobbie, Veitch, Cannell).—Height 3 feet 6 inches; compact habit; exceptionally free flowering; flowers with quilled petals, well formed, light orange, borne on stout stems well above the foliage.

55. Favourite (Forbes).—Height 3 feet 6 inches; very sturdy, compact habit; moderately free flowering; flowers large with quilled petals, orange, heavily shaded and tipped with crimson, borne on short stems and partly hidden by the foliage.

56. Hedwig (Cannell).—See No. 58.

57. H. E. Searle (Forbes).—Height 3 feet 6 inches; sturdy habit; moderately free flowering; flowers large, light orange, borne well above the foliage.

58. Iolanthe, **F.C.C.** September 21, 1886 (Cannell, Turner).—Height 3 feet 6 inches; rather diffuse habit; moderately free flowering; flowers with quilled petals, orange, borne well above the foliage.

59. Janet (Cannell).—Height 4 feet 6 inches; erect, vigorous habit; moderately free flowering; flowers light orange, borne well above the foliage.

60. John Lucaks (Cannell).—Height 3 feet; compact habit; free flowering; flowers variable, with quilled petals, deep orange touched with white, borne well above the foliage.

61. Leila (Dobbie).—Height 3 feet; sturdy habit; very free flowering; flowers variable, but mostly orange-scarlet, tipped with blush-white.

62. Phœbe, × × × August 25, 1899 (Dobbie, Turner).—Height 3 feet 6 inches; sturdy, bushy habit; very free flowering; flowers bright orange-scarlet, borne well above the foliage.

63. Ringdove (Cannell).—Height 3 feet 6 inches; vigorous, bushy habit; free flowering; flowers large, deep orange or terra cotta, borne well above the foliage.

64. Surprise (Cannell).—Height 3 feet; rather slender habit; very free flowering; flowers with quilled petals, yellow, splashed and shaded with red.

V.—Flowers Pink, Rose-Pink, and Salmon.

65. Alwine (Cannell).—Height 4 feet; erect, bushy habit; very free flowering; flowers large with quilled petals, pink faintly suffused with lilac, borne well above the foliage.

66. Claribel, **A.M.** September 10, 1895 (Turner).—Height 3 feet; bushy habit; free flowering; flowers of good form, delicate pink heavily tipped and shaded with rosy purple, borne well above the foliage.

67. Gruss an Wien (Cannell).—Height 3 feet 6 inches; sturdy habit; moderately free flowering; flowers large, pale salmon, borne well above the foliage.

68. Katie (Dobbie).—Height 2 feet; compact, bushy habit; free flowering; flowers salmon-buff flushed with rose, borne well above the foliage.

69. Lilian (Dobbie, Cannell, Turner).—Height 3 feet 6 inches; erect, sturdy habit; moderately free flowering; flowers neat, pale pink, the basal portion of the petals yellow, borne well above the foliage.

70. Minnie (Cannell).—Height 4 feet; vigorous habit; moderately free flowering; flowers large with quilled petals, buff tipped and shaded with purplish rose, borne well above the foliage.

71. Model (Dobbie, Forbes).—Height 3 feet; compact, sturdy habit; exceptionally free flowering; flowers variable, but mostly pale pink shaded and tipped with deep pink, borne well above the foliage.

VI.—Flowers Lilac.

72. Achilles (Cannell).—Height 4 feet; vigorous habit; rather shy flowering; flowers somewhat flat, rosy lilac, borne well above the foliage.

73. Hector (Dobbie).—Height 3 feet 6 inches; vigorous habit; free flowering; flowers rosy lilac, borne well above the foliage.

74. Pauline (Cannell).—Height 2 feet 6 inches; bushy habit; very free flowering; flowers with quilled petals, deep lilac, borne well above the foliage.

VII.—Flowers Rose.

75. Eurydice, **F.C.C.** September 25, 1888 (Cannell, Turner, Veitch).—Height 4 feet; bushy habit; very free flowering; flowers of good form, blush white, heavily tipped with rosy purple.

76. Hermione (Forbes).—Height 4 feet; erect, sturdy habit; free flowering; flowers of good form, rose tipped with crimson-purple.

77. Irene. × × × (as a border flower) August 25, 1899 (Dobbie, Turner, Cannell).—Height 2 feet 6 inches: bushy habit; very free flowering: flowers large, rosy-purple, heavily tipped and shaded with blush-white, borne well above the foliage.

78. Little Dear (Cannell).—Height 3 feet 6 inches: very bushy habit; moderately free flowering; flowers with quilled petals, very pale rose, heavily tipped and suffused with purple, and partly hidden by the foliage.

79. Locket (Cannell).—Height 3 feet 6 inches; compact habit: moderately free flowering: flowers rose touched with purple, the lower portion of petals blush-white.

80. Mdlle. Valentine Faconet. × × × September 23, 1890.—Height 4 feet: sturdy habit: moderately free flowering: flowers with quilled petals, very pale rose, the basal portion blush-white.

81. Nerissa. **A.M.** August 27, 1895 (Dobbie, Cannell).—Height 4 feet; erect habit: free flowering; flowers pale rose touched with white, borne well above the foliage.

82. Rosebud. **A.M.** September 10, 1895 (Dobbie, Cannell).—Height 3 feet 6 inches; sturdy habit: moderately free flowering: flowers pale rose tipped with clear rose-pink, partly hidden by the foliage.

VIII.—Flowers Rosy Carmine.

83. Eva (Cannell).—Height 3 feet 6 inches; bushy habit: very free flowering; flowers rosy carmine, borne well above the foliage.

84. Leonard Kelway (Forbes).—Height 4 feet: very bushy habit: free flowering: flowers with quilled petals, borne well above the foliage.

IX.—Flowers Purple and Rose-Purple.

85. Dandy (Veitch).—Height 4 feet 6 inches; erect habit; moderately free flowering; flowers purple, borne well above the foliage.

86. Dr. Jim (Dobbie).—Height 4 feet: bushy, spreading habit; very free flowering; flowers neat, pale purple, heavily tipped with rosy purple.

87. Hercules (Cannell).—Height 4 feet: bushy habit; moderately free flowering; flowers with quilled petals, rosy purple, not thrown well above the foliage.

88. Hilda. × × ×August 25, 1899 (Dobbie, Cannell).—Height 3 feet; rather slender habit; free flowering; flowers variable, but mostly rosy purple tipped with cream-white, borne well above the foliage.

89. Ixion (Turner).—Height 3 feet 6 inches; sturdy habit; moderately free flowering; flowers purple tipped with white, not borne very high above the foliage.

90. Katie Parnham (Dobbie).—Height 3 feet 6 inches; erect, bushy habit; very free flowering; flowers pale purple, heavily tipped and shaded with rosy purple.

91. Little Bobby (Cannell).—Height 3 feet 6 inches; bushy, spreading habit; very free flowering; flowers neat, purplish crimson, borne well above the foliage.

92. Little Darkie (Cannell).—Very similar to No. 91.

93. Revenge (Cannell).—Height 3 feet 6 inches; sturdy habit; free flowering; flowers large, rosy purple tipped with pale purple, borne well above the foliage.

94. Ruy Blas (Cannell, Turner).—Height 3 feet 6 inches; bushy habit; moderately free flowering; flowers purplish crimson tipped with white, the basal portion of petals shaded yellow, borne well above the foliage.

X.—Flowers Scarlet.

95. Bacchus, × × × August 25, 1899 (Dobbie, Cannell, Veitch).—Height 3 feet 6 inches; bushy habit; very free flowering; flowers of good form, bright scarlet, borne well above the foliage.

96. Cecil, **A.M.** September 22, 1891 (Cannell, Turner).—Height 3 feet 6 inches; compact habit; moderately free flowering; flowers scarlet tipped with cream-white.

97. Ernest (Cannell).—Height 3 feet 6 inches; very bushy habit; moderately free flowering; flowers scarlet, borne well above the foliage.

98. Ernest Harper (Veitch).—Height 3 feet 6 inches; sturdy habit; moderately free flowering; flowers scarlet shaded with orange, not borne very high above the foliage.

99. Firefly (Veitch).—Height 4 feet; bushy habit; free flowering; flowers of good form, clear scarlet suffused with pale orange, thrown well above the foliage.

100. Gem, **F.C.C.** July 25, 1892 (Cannell).—Height 4 feet; vigorous habit; moderately free flowering; flowers rich scarlet, borne well above the foliage.

101. Little Sweetheart, × × × August 25, 1899 (Dobbie).—Height 2 feet; very bushy habit; exceptionally free flowering; flowers of good form, bright red or scarlet tipped with white, borne well above the foliage.

102. Madge (Dobbie, Cannell, Turner).—Height 2 feet 6 inches; sturdy habit; free flowering; flowers scarlet heavily tipped with blush-white, borne well above the foliage.

103. Mars, **A.M.** September 22, 1891 (Dobbie, Turner, Veitch).—Height 3 feet; sturdy habit; exceptionally free flowering; flowers of good shape, bright scarlet, borne on stout stems well above the foliage.

104. Mrs. Ireland (Dobbie).—Height 2 feet 6 inches; bushy habit; free flowering; flowers scarlet edged with white.

105. Red Indian, × × × September 23, 1890 (Cannell, Veitch).—Height 4 feet; vigorous habit; very free flowering; flowers scarlet, borne well above the foliage.

106. Vivid, **F.C.C.** September 25, 1888 (Forbes, Cannell).—Height 4 feet 6 inches; erect habit; moderately free flowering; flowers large, bright orange-scarlet, borne well above the foliage.

XI.—Flowers Red.

107. Grace, × × × August 25, 1899 (Dobbie, Cannell).—Height 2 feet 6 inches; bushy habit; very free flowering; flowers of excellent form, cerise shaded with orange at the tips of the petals.

108. Rosea (Dobbie).—Height 3 feet; very bushy habit; free flower-

ing; flowers rosy cerise tipped with light purple, not borne very high above the foliage.

XII.—Flowers Crimson.

109. Admiration, **F.C.C.** September 25, 1888 (Forbes, Cannell, Veitch).—Height 4 feet; vigorous habit; free flowering; flowers very showy, crimson tipped with white, borne well above the foliage.

110. Annie Holton, × × × August 25, 1899 (Cannell).—Height 3 feet 6 inches; vigorous habit; very free flowering; flowers large, of good form, crimson-scarlet tipped with white, borne well above the foliage.

111. Arthur West, **A.M.** September 20, 1892 (Dobbie, Cannell, Turner).—Height 4 feet; bushy habit; very free flowering; flowers large, of good form, deep crimson, borne on stout stems well above the foliage.

112. Crimson Beauty, **A.M.** September 9, 1890 (Cannell.)—Height 4 feet; erect habit; very free flowering; flowers rich crimson, borne well above the foliage.

113. Little Jack (Dobbie, Cannell).—Height 3 feet 6 inches; sturdy habit; moderately free flowering; flowers of good form, crimson-maroon, borne well above the foliage.

114. Martial (Cannell).—Height 4 feet; vigorous habit; rather shy flowering; flowers small, flat, crimson-scarlet, borne on short stems and partly hidden by the foliage.

115. Midnight Sun (Cannell).—Height 4 feet; erect habit; very free flowering; flowers rich crimson touched with maroon, borne well above the foliage.

116. Mignon (Forbes).—Height 4 feet 6 inches; rather sparsely branched; flowers crimson-scarlet, borne well above the foliage.

117. Othello (Dobbie).—Height 4 feet; vigorous habit; moderately free flowering; flowers rich crimson, borne on stiff stalks and partly hidden by the foliage.

118. Tommy Keith, **A.M.** September 20, 1892 (Turner).—Height 3 feet; bushy habit; free flowering; flowers neat, crimson, tipped with white, borne well above the foliage.

119. Vulcan, × × × August 25, 1899 (Dobbie, Turner).—Height 4 feet; compact habit; very free flowering; flowers of good form, rich crimson, borne on stiff stems well above the foliage.

Flowers Maroon.

120. Captain Boyton, **A.M.** September 26, 1893 (Dobbie, Cannell, Turner).—Height 4 feet; diffuse habit; moderately free flowering; flowers with quilled petals, deep maroon tipped with crimson, borne on stiff stems well above the foliage.

121. Dagmar, **A.M.** September 8, 1896 (Turner).—Height 3 feet 6 inches; very free flowering; flowers with quilled petals, maroon shaded with crimson, borne well above the foliage.

122. Darkness, × × × September 23, 1890 (Cannell).—Height 3 feet 6 inches; rather close habit; moderately free flowering; flowers maroon, not borne very high above the foliage.

123. Don Juan, **F.C.C.** September 21, 1886 (Turner).—Height 2 feet

6 inches; compact, bushy habit; free flowering; flowers small, maroon, shaded with purple, borne well above the foliage.

124. Douglas, A.M. August 27, 1895 (Turner).—Height 3 feet; erect habit; very free flowering; flowers maroon, tipped with crimson, borne well above the foliage.

125. Little Dorrit (Dobbie).—Height 3 feet; vigorous habit; free flowering; flowers maroon, suffused and edged with purple, barely borne above the foliage.

126. Nemesis (Cannell).—Height 3 feet; erect habit; very free flowering; flowers neat, some with fimbriated petals, rich maroon, occasionally tipped with blush-white.

127. Raphael (Cannell).—Height 4 feet; vigorous habit; very free flowering; flowers with quilled petals, crimson maroon, borne on long stems well above the foliage.

NOTES.

IV.

In our Society's Journal, Volume XI. at page 13, will be found a very interesting account of Mr. Barron's experiments with different stocks on which to graft Apples.

In 1897 it was found that all the trees on the 'French Paradise' stock had died. The others were all taken up and their roots very carefully examined, but not the slightest difference whatever in the form or character of the roots could be detected—all the roots were practically the same, whatever the stock may have been.

There are now at Chiswick sets of from six to twelve different (or so-called different) stocks, each set of stocks being worked with one and the same variety of Apple; but, with the single exception of those on the 'French Paradise' stock, there is no apparent difference in the habit, vigour, or fruitfulness of the trees, each tree being almost exactly similar to its fellows. The 'French Paradise,' however, has in all cases had the result of dwarfing and stunting the tree.

V.

Fellow suffering breeds fellow feeling. We Horticulturists on this side of the Channel have recently had great and grievous losses from our ranks; to name none others,—Girdlestone, Rivers, Courtauld, Martin, Dunn—how can we hand down to posterity any sufficient idea of the magnitude of the loss to English Horticulture suggested by these names? or who will fill their places?

Full, then, as our own hearts are of sorrow, we can yet find place for very real sympathy with our French gardening friends in the irreparable loss they have sustained by the sudden and untimely death of Monsieur Henry Lévêque de Vilmorin, Premier Vice-Président de la Société Nationale d'Horticulture de France. Our sorrow for him is very real; our love of him was very great. He was a man of world-wide sympathies —a Fellow of our own Society—and 'Henry Vilmorin' always seemed to us in England quite an Englishman, only that he spoke French so well. It will be very, very long before we meet his like!

France and England weep together! All Horticulture mourns!!

ROYAL COMMISSION, PARIS EXHIBITION, 1900.

Horticulture. Group VIII.

Regulations and Programme of Permanent and Periodical Shows.

Competitions in the Group of Horticulture will be divided into two sections:—

A.—Permanent Show. B.—Periodical Shows.

A.—Permanent Show.

The Permanent Show will remain during the whole time the Exhibition is open, from April 15, 1900, to November 5, 1900.

It will include all trees, shrubs, fruit-bearing and ornamental plants planted in the open grounds, which will remain during the whole of the Exhibition; horticultural and arboricultural implements, garden ornaments; plans, models, and designs relating to landscape-gardening; works and literature referring to horticulture.

Fruit trees and ornamental vegetables entered for permanent exhibition must be, if possible, planted in 1899, in any case before March 15, 1900. They must not be taken away before the close of the Exhibition. Should they die or decay they must be replaced. The Administration will provide exhibitors taking part in the Permanent Show with the vegetable mould, peat, compost, manure, and water for irrigation which they may require, all free of charge; application must be made before August 1, 1899, stating approximately at what time the planting is to take place.

In accordance with Articles 35 and 50 of the General Regulations, the Committees of Installation are responsible for the proper superintendence of their several classes.. The Administration are under no circumstances responsible for damages which may arise, even should they be caused by an exceptionally large attendance of visitors at the Exhibition. Any plant or article damaged must be at once replaced by the exhibitor.

B.—Periodical Shows.

The Periodical Shows will take place on the following dates in 1900:—April 17, May 8, May 22, June 12, June 26, July 17, August 7, August 21, September 11, September 25, October 9, October 23. Each Periodical Show will extend over a period of five days, commencing on Wednesdays and concluding on Sundays. In exceptional cases the duration of the shows may exceed five days, of which due notice would be given.

To these shows collective exhibits will be admitted, as well as those of amateurs, horticulturists, and public institutions, &c. They will compete separately in each show.

The reception and arrangement of exhibits will take place during the two days preceding each show, and must be completed, *without fail*, by 5 P.M. on the day before the opening. Cut flowers will be admitted on the day of the show, and must be arranged by 8 A.M. *at the latest*. Exhibitors must remove their goods before 9 on the next morning after the show, failing which the Administration will have them removed at the exhibitors' expense.

Every exhibitor taking part in a competition must leave his exhibits on show during the whole time of that exhibition, and must see that they are properly looked after.

Exhibitors of plants are authorised to negotiate with exhibitors of glasshouses for the use of one or more of the latter; they will have to enter into an engagement in this case to keep them filled during such time as the Committee of Installation may determine. They will only qualify for awards in competitions falling within the programme, and in which they have duly taken part.

The Administration may, under special circumstances, authorise the removal of plants which it would be particularly inconvenient to leave in the Exhibition till the end of a Periodical Show.

Plants, flowers, fruit, or vegetables which are faded or spoilt must be removed and replaced by exhibitors, failing which, this removal will be summarily carried out by the Administration without the exhibitors having any right to object.

Exhibitors must bear all expenses of packing, carrying, handling, unpacking, arranging, maintenance, and looking after their exhibits.

Each plant exhibited must bear a label showing legibly and correctly both its common and its scientific name (species or variety).

New plants, vegetables, flowers, &c. must be provided with a label showing, besides their common and their scientific name, their place of origin, the date of their production, and of their introduction or importation.

The same specimen or exhibit cannot compete in more than one class at the same show.

An *exhibit* may consist of several examples of the same species or variety; this, however, will not apply in the case of a *collection*, where only one example of the same species or variety can be exhibited. In competitions merely differing in the number of specimens of a plant shown, the same variety may only appear in one of the competitions. New varieties of plants may be represented by several examples.

Only such plants as have not been sent out will be considered as new, whether they are home-raised, introduced, or imported from abroad.

Foreign exhibitors in the Periodical Shows must send in their applications, at least six weeks before the shows take place, to the offices of the French Administration [*Commissariat Général* (*Direction générale de l'Exploitation, Sections étrangères*), 97 *Quai d'Orsay, Paris*] through their respective Commissioners. Exhibitors will receive notice of their admission at least three weeks before the show opens.

The application forms must specify the name and abode of the applicant, the number, species, and variety of the products he wishes to show, the manner in which these exhibits are to be shown, the space they will occupy, and must state the particular show they are entered for; the applications must likewise state if the exhibits are to be shown in pots, in boxes, in baskets, or if they will be planted in the ground.

Note.—Further details regarding regulations for exhibitors and particulars of the shows, of which only an abbreviated account is given in the tabular statement, can be obtained on application at the offices of the Royal Commission, Paris Exhibition, 1900, St. Stephen's House, Westminster, London, S.W.

JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

VOL. XXIII. 1900.

PART III.

SIXTH GREAT ANNUAL EXHIBITION OF BRITISH-GROWN FRUIT.

HELD AT THE CRYSTAL PALACE, SEPTEMBER 28, 29, AND 30, 1899.

ALTHOUGH the Fruit Season of 1899 was by no means an exceptionally bad one, it was certainly not a good one, the crop of almost every description of hardy fruit being below the average both in quantity and in size; the frosts thinned the crops severely, the early drought made them an easy prey to insect pests, and the exceptionally hot dry summer did not, in the south-eastern districts at least, afford opportunity for the proper development of what there was left. In certain localities noted for fruit-production the almost unexampled hailstorms of midsummer rendered apples and pears absolutely unfitted for exhibition purposes. Notwithstanding these drawbacks the Show was an excellent one, and full of instruction for fruit lovers and growers.

As an object-lesson in British Fruit cultivation this Annual Show stands unrivalled, and is of national importance. Those who have visited it from year to year cannot fail to have been impressed by the wonderful advance which has been made in the quality of the hardy fruits exhibited. And as the importance of fruit-growing in this country cannot well be over-estimated, the Council invite Fellows and their friends to support them in their efforts to maintain and improve this Exhibition by visiting it, and by subscribing to its funds. For it cannot be too widely known that the continuance of the Show is absolutely dependent

on at least £100 being raised by subscription each year towards the Prize Fund. The Show involves the Society in a very large expenditure without the possibility of any financial return. The Council have therefore established the rule that they will not continue it unless sufficient interest in it is taken by Fellows and their friends to provide £100 towards the Prize Fund. And this will in the coming year 1900 be even more important than heretofore, as the Directors of the Palace have signified to the Council that they feel compelled to decrease their contribution by £50. A glance at the list of subscribers will show how small has been the interest taken by the bulk of the Fellows. The Council would point out that this is not a local show with a few large prizes, but that a multitude of small prizes have been arranged in order to secure the best fruits in each section, special prizes have been allotted to market growers, and Counties have been grouped in such a way that growers should not have to compete with exhibitors from localities more favoured by climatic conditions. These points will be still further extended should sufficient financial support be forthcoming. Subscriptions should be sent at once to the Secretary, 117 Victoria Street, Westminster.

LIST OF SUBSCRIBERS TO THE PRIZE FUND, 1899.

Donations to this Fund for 1900 are earnestly requested, and will be acknowledged in the R.H.S. *Journal*.

	£	s.	d.
Apthorpe, W. H., Hills Road, Cambridge	0	10	6
Balderson, H., Hemel Hempstead	1	1	0
Bartrum, Rev. Dr., Wakes Colne, Earls Colne, Essex	0	10	6
Basham, John, Bassaleg, Newport, Mon.	0	10	6
Becker, H., Jersey	1	0	0
Beebe, A. G., Palace Road, Streatham Hill	0	10	6
Blaker, Dr., East Grinstead	0	10	6
Blenkinsop, B., J.P., Kenley	0	10	0
Blinco, C. F., Hucknall Torkard	0	5	0
Boyd, Mrs., 154 South Norwood Hill, S.E.	0	5	0
Brocklehurst, G., Sydenham Hill, S.E.	1	1	0
Browne, Colvile, Swanley	0	10	6
Bunyard, George, & Co., The Royal Nurseries, Maidstone	10	10	0
Burdett-Coutts, Baroness, Holly Lodge, Highgate	3	3	0
Caddy, John, Ruskinville, Dalton-in-Furness	1	1	0
Carter, A. J., Billingshurst	0	5	0
Cheal, J., & Sons, Lowfield Nurseries, Crawley	2	2	0
Clinch, T., Key St., Sittingbourne	0	2	0
Clout, R., Broome House, West Malling	3	1	0
Colman, Jeremiah, Gatton, Reigate	2	2	0
Coode, R. C., J.P., Polapit Tamar, Launceston	1	1	0
Courtauld, S. (the late), Bocking Place, Braintree	1	1	0
Cundey, Mrs., 2 Hyde Park Square, W.	2	2	0
Day, James, Galloway House, Garliestown	0	7	6
Dixon, Jas., Dover Street, Hull	0	1	0
Edwards, H., Mile Ash, Derby	0	10	0
Edwards, Mrs., 26 Golden Square, W.	1	0	0
Edwards, R., Beechy Lees, Otford, Sevenoaks	0	10	0
Fennell, G., Fairlawn Gardens, Tonbridge	0	5	0
Fletcher, Chas. E., Kenward, Yalding, Kent	0	5	0
Foster, W. K. (the late), The Grove, Horley	2	2	0
Fowke, Miss, Wellington, Salop	0	10	6
Fowler, Gurney, Glebelands, Woodford	2	2	0
Gabriel, John T., Palace Road, Streatham Hill	1	1	0

	£	s.	d.
Galpin, W., Norwood, Wincanton	0	5	0
Gaymer, Wm., & Son, Attleboro', Norfolk	2	2	0
Greaves, Ben., Broome Hall Gardens, Dorking	0	5	0
Green, Herbert, The Godlands, Maidstone	1	1	0
Hart, J., Lochinver, Reigate	0	5	0
Haywood, T. B. (the late), Woodhatch, Reigate	2	2	0
Hill, D., Herga, Watford	0	10	0
Horne, Wm., Cliffe, Rochester	2	2	0
Kay, Peter E., Church End, Finchley, N.	1	1	0
Kemp, A., Coolhurst Gardens, Horsham	0	5	0
Kershaw, Hy., Wellfield Road, Streatham	1	1	0
King, E. P., Lymington	0	10	0
King, Miss, Burghfield, Reading	1	1	0
Kirkman, W. W., Timperley, Altrincham	0	10	6
Knight, John, Ruskinville, Dalton-in-Furness	0	5	0
Lloyd, Fred. G., Langley House, Bucks	2	2	0
McIndoe, J., Hutton Hall Gardens, Guisboro', Yorks	1	0	0
McKenzie, J., Linton Park Gardens, Maidstone	0	10	6
McLaren, Mrs., 56 Ashley Gardens, S.W.	1	1	0
Merryweather, H., Southwell	2	15	0
Michael, W. A., The Hermitage, East Liss, Hants	0	5	0
Monro, Geo., Covent Garden Market	2	2	0
Paulin, Wm. Thomas, Winchmore Hill	2	2	0
Pearson, J. R., & Sons, Lowdham Nurseries, Notts	5	12	0
Peed, John, & Son, West Norwood, S.E.	2	2	0
Planck, Surgeon-General, J.P., Edenbridge	1	0	0
Reid, J. W., Holly Walk, Leamington Spa	0	10	6
Richards, A., Dukes Avenue, Chiswick	0	5	0
Rivers & Son, T., Sawbridgeworth	5	5	0
Ross, Chas., Welford Park Gardens, Newbury	0	10	6
Rothschild, Leopold de, New Court, St. Swithin's Lane, E.C.	3	3	0
Sandys-Lumsdaine, E., Blanerne, Edrom, N.B.	1	0	0
Savory, Rev. E., Binfield Rectory, Bracknell	1	0	0
Schröder, Baron, The Dell, Staines	5	0	0
Shea, C. E., The Elms, Foots Cray, Kent	1	1	0
Sherwood, N., Dunedin, Streatham Hill	1	1	0
Slogrove, William, Gatton Cottage Gardens, Reigate	0	5	0
Smith, Edwin, Ingleside, Chatham	1	1	0
Smith, Martin R., Warren House, Hayes, Kent	2	2	0
Sneyd, Miss, Holland Park Avenue, W.	0	5	0
Somes, Mrs., Annery House, Bideford	1	1	0
Southby, P., Bampton, Oxford	0	5	0
Spooner & Sons, Hounslow Nurseries, Middlesex	1	1	0
Sutton & Sons, Reading	5	0	0
Sydenham, R., Birmingham	1	1	0
Taylor, Thomas, 55 Trafalgar Road, Old Kent Road	0	10	6
Thomas, Owen, Royal Gardens, Windsor	1	1	0
Tidy, W., Stanmore Hall Gardens, Middlesex	0	5	0
Turton, T., Castle Gardens, Sherborne, Dorset	0	10	6
Veitch & Sons, J., King's Road, Chelsea	5	0	0
Walker, Jas., Ham Common, Surrey	1	1	0
Wallace, L. A., Sanderstead Court, Croydon	5	0	0
Wastenobie-Clipston, Market Harboro'	3	0	0
Wellington, Duke of, Mortimer, Berks	1	0	0
Wells, H. C., Broomfield, Chelmsford	1	1	0
White, Mrs., Walton Hall, Kelso, N.B.	1	0	0
Wigan, James, Cromwell House, Mortlake	0	10	0
Willard, Jesse, Holly Lodge Gardens, Highgate	0	10	6
Williams, H. H., Pencalenick, Truro	1	0	0
Wingfield, A. H., Ampthill House, Ampthill	1	1	0
Woodward, Geo., Barham Court Gardens, Maidstone	1	0	0
Wyatt, A., Hatton, Middlesex	1	0	0
Wythes, Geo., Syon House Gardens, Brentford	1	1	0

The following table may be interesting as comparing the number of dishes of each fruit exhibited in each of the six years during which the Show has been held. Only the exhibits under the Schedule have been

included, it having been found impossible to enumerate everything shown in classes not for competition.

Dishes of	1894	1895	1896	1897	1898	1899
Apples	1,027	1,938	1,083	1,485	1,494	2,203
Apricots	2	1	1	1	1	—
Bananas	—	1	—	—	—	—
Blackberries	—	—	—	—	1	—
Bullaces	5	3	1	3	1	—
Cherries	7	12	6	1	1	2
Crabs	—	—	—	—	—	6
Currants	—	—	—	—	2	1
Damsons	6	18	4	5	15	13
Figs	4	9	7	26	10	9
Gooseberries	1	—	—	—	2	—
Grapes	105	97	135	120	115	83
Medlars	—	2	3	5	4	5
Melons	—	10	7	8	5	4
Mulberries	—	—	—	—	—	2
Nectarines	15	18	4	11	29	19
Nuts	—	26	19	10	14	10
Passiflora	—	—	1	1	—	—
Peaches	51	80	24	77	96	67
Pears	829	779	795	677	694	842
Pines	—	—	5	3	1	2
Plums	90	101	38	115	214	79
Quinces	6	14	17	1	2	5
Raspberries	—	—	—	—	2	1
Strawberries	—	—	—	—	2	—
Tomatos	—	67	2	3	6	5
Total	2,148	3,176	2,152	2,552	2,711	3,358
Entries for competition	1,301	1,783	1,234	1,329	1,332	1,297
Visitors	23,680	36,293	26,499	27,242	29,281	30,150

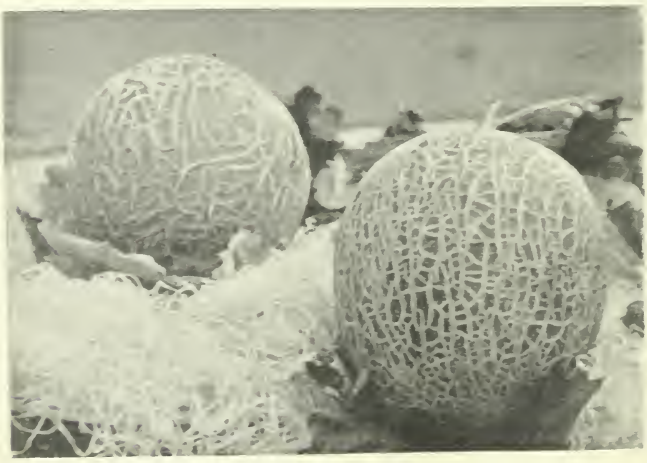


FIG. 84. – MELONS GROWN IN THE OPEN AIR BY MR. F. W. THOMAS, POLEGATE. (*Gardeners' Magazine.*)

THE JUDGES.

The following gentlemen kindly acted as judges, and deserve the best thanks of the Society for their oftentimes very difficult work, viz. :—

Basham, J., Bassaleg, Newport, Mon.
Bates, W., Poulett Lodge Gardens, Twickenham.
Becker, H., Imperial Nursery, Jersey.
Beckett, E., Aldenham House Gardens, Elstree.
Blick, Chas., The Warren, Hayes Common, Beckenham.
Bunyard, G., V.M.H., Royal Nurseries, Maidstone.
Camp, W., c/o T. Rivers & Son, Sawbridgeworth.
Challis, F., Wilton House Gardens, near Salisbury.
Cheal, Jos., Crawley, Sussex.
Crump, W., V.M.H., Madresfield Court Gardens, Malvern.
Dean, A., 62 Richmond Road, Kingston.
Divers, W. H., The Gardens, Belvoir Castle, Grantham.
Douglas, J., Edenside, Great Bookham, Surrey.
Empson, W. J., Ampthill House Gardens, Ampthill.
Farr, Wm., Spring Grove House Gardens, Isleworth.
Gleeson, M., Warren House Gardens, Stanmore.
Herrin, C., Lydhurst Gardens, Haywards Heath.
Hudson, J., Gunnersbury House Gardens, Acton, W.
Jarman, W., Preston Hall, Aylesford, Maidstone.
Kay, Peter, V.M.H., Church Road, Finchley, N.
Kemp, A., Coolhurst Gardens, Horsham.
King, W., Gatton Park Gardens, Reigate.
Markham, H., Northdown House Gardens, Margate.
McIndoe, J., V.M.H., Hutton Hall Gardens, Guisboro'.
Norman, G., Hatfield House Gardens, Hatfield.
Parker, R., Goodwood, Chichester.
Pearson, A. H., The Gables, Pelham Road, Sherwood Rise, Nottingham.
Pope, W., Highclere Gardens, Newbury.
Poupart, W., Marsh Farm, Twickenham.
Reynolds, G., The Gardens, Gunnersbury Park, Acton, W.
Rides, H., Covent Garden, W.C.
Salter, C. J., Woodhatch Gardens, Reigate.
Smith, J., V.M.H., Mentmore Gardens, Leighton Buzzard.
Tillman, H. E., Covent Garden, W.C.
Walker, J., Ham Common, Surrey.
Ward, A., Stoke Edith Park, Hereford.
Woodward, G., Barham Court, Teston, Maidstone.

THE REFEREES.

The following gentlemen very kindly held themselves ready at the disposal of the Society to act as referees if required, viz. :—

Balderson, H., Hemel Hempstead, Herts.
Barron, A. F., V.M.H., 13 Sutton Court Road, Chiswick, W.

Crowley, P., Waddon House, Croydon.
Monro, G., V.M.H., Covent Garden, W.C.
Wright, J., V.M.H., 8 Rose Hill Road, Wandsworth, S.W.
Wythes, G., V.M.H., The Gardens, Syon House, Brentford.

For the following table we are indebted to the kindness of the Editor of the *Gardeners' Magazine*:—

APPLES.

Varieties	Dishes 1897	1898	1899
Cox's Orange Pippin	66	89	121
Ribston Pippin	73	73	95
Worcester Pearmain	42	51	75
Warner's King	56	70	66
Peasgood's Nonesuch	39	63	59
Blenheim Orange	43	39	55
King of the Pippins	52	38	48
Bramley's Seedling	33	34	46
Lane's Prince Albert	32	34	45
Emperor Alexander	27	19	39
Stirling Castle	20	25	39
Dumelow's Seedling	25	22	37
Bismarck	21	32	36
New Hawthornden	10	29	36
Lord Derby	34	40	35
Gascoyne's Scarlet	22	29	34
Golden Noble	20	15	34
Cellini	23	16	32
The Queen	27	33	32
Lord Suffield	25	28	31
Fearn's Pippin	20	11	30
Mère de Ménage	20	29	29
Sandringham	16	13	28
Stone's, or Loddington	21	24	27
Baumann's Red Winter Reinette	22	27	26
Margil	16	15	23
Potts' Seedling	22	14	23
Cox's Pomona	38	30	22
Ecklinville	30	35	22
Newton Wonder	10	22	22
Tower of Glamis	18	16	21
Adam's Pearmain	8	10	20
Beauty of Kent	22	27	20
Alfriston	19	20	19
Lady Henniker	13	16	19
Washington	14	13	19
Egremont Russet	5	9	18
American Mother	19	20	18
Tyler's Kernel	8	11	17
Annie Elizabeth	8	5	16
Rosemary Russet	0	0	16
Wealthy	11	16	16
Grenadier	6	12	15
Gloria Mundi	8	8	14
Royal Jubilee	5	11	14
Allington Pippin	4	11	13
King of Tompkins County	8	8	13
Duke of Devonshire	1	7	12
Golden Spire	9	7	12
Hormead Pearmain	4	4	12
Court Pendu Plât	16	7	11
Lord Grosvenor	10	5	11
Sturmer Pippin	2	7	11
Belle de Pontoise	2	4	10
Frogmore Prolific	11	14	10
Hoary Morning	3	1	10
Lady Sudeley	7	12	10
Mabbott's Pearmain	5	5	10
Striped Beefing	7	3	10
Waltham Abbey Seedling	6	5	10
Brownlee's Russet	9	7	9
Claygate Pearmain	7	8	9
Gravenstein	5	4	9
Mannington's Pearmain	7	9	9
Northern Greening	1	2	9
Queen Caroline	0	0	9
Yellow Ingestrie	3	3	9
Yorkshire Beauty	7	6	9
Belle Dubois	5	7	8
Cockle's Pippin	1	6	8
Cornish Aromatic	1	2	8
Keswick Codlin	3	1	8
Reinette du Canada	5	7	8
Schoolmaster	0	0	8
Colonel Vaughan	0	0	7
Duchess of Gloucester	4	1	7
Hollandbury	0	2	7
Jefferson's	0	0	7
Roundway Magnum Bonum	2	2	7
Royal Russet	3	1	7
Scarlet Pearmain	0	0	7
Betty Geeson	2	1	6
Duchess of Oldenburg	0	1	6
James Grieve	2	1	6
Red Beitigheimer	1	3	6
Tibbett's Pearmain	2	4	6
Manks Codlin	0	2	6
Bedfordshire Foundling	2	2	5
Calville Malingre	0	0	5
Chelmsford Wonder	0	1	5
Cornish Gillyflower	0	2	5
Dutch Mignonne	0	1	5
Evagil	1	1	5
Flanders Pippin	1	1	5
Galloway Pippin	0	0	5
Golden Reinette	0	0	5
Golden Russet	0	0	5
Hawthornden (Old)	5	1	5
Herefordshire Pearmain	0	0	5
Mrs. Barron	3	7	5
New Northern Greening	5	6	5
Devonshire Quarrenden	0	0	5
Scarlet Nonpareil	2	7	5
September Beauty	0	0	5
Twenty Ounce	3	4	5
Okera	0	2	4
Autumn Pearmain	4	3	4
Bess Pool	0	0	4
Brabant Bellefleur	0	0	4

Varieties	Dishes 1897	1898	1899
Gold Medal	3	4	4
Hanwell Souring	0	0	4
Hereford Beefing	0	0	4
Kentish Fillbasket	0	0	4
Lewis's Incomparable	0	0	4
Lemon Pippin	0	1	4
Melon Apple	0	2	4
Nelson Codlin	0	3	4
Norfolk Beefing	0	1	4
Ross Nonpareil	0	0	4
Tom Putt	2	1	4
Vicar of Beighton	3	2	4
Wadhurst Pippin	4	1	4
Baxter's Pearmain	0	0	3
Braddick's Nonpareil	2	1	3
Castle Major	2	1	3
Emily Childs	0	0	3
Foster's Seedling	2	2	3
Golden Pippin	0	0	3
Gospatrick	1	1	3
Jolly Miller	0	0	3
Landsberger Reinette	0	0	3
Lord Burghley	0	0	3
Murfitt's Seedling	0	0	3
Old Nonsuch	0	0	3
Rymer	0	0	3
Scotch Bridget	0	0	3
Seaton House	2	2	3
Small's Admirable	2	3	3
Winter Peach	0	0	3
Allen's Everlasting	3	5	2
Atalanta	0	0	2
Barnack Beauty	0	0	2
Beauty of Stoke	0	1	2
Bielo Borodawka	0	0	2
Boston Russet	0	0	2
Calville Garibaldi	0	0	2
Catshead	1	1	2
Crimson Quoining	0	2	2
Dredge's Fame	0	0	2
Flower of Kent	0	0	2
Hubbard's Pearmain	0	0	2
Jolly Beggar	0	1	2
London Pippin	0	0	2
Lord Clyde	0	0	2
Nanny	0	0	2
Northern Dumpling	0	2	2
Old Leathercoat Russet	0	0	2
Professor	0	0	2
Ringer	0	0	2
Sanspareil	0	0	2
St. Edmund's Pippin	1	1	2
Swedish Reinette	0	0	2
Wareham Russet	0	0	2
Winter Pearmain	0	0	2
Winter Quoining	1	1	2
Winter Hawthornden	0	1	2
Withington Fillbasket	0	1	2
Yorkshire Greening	1	2	2

Varieties	Dishes 1897	1898	1899
Armorel	0	0	1
Autumn Bergamot	0	0	1
Beauty of Moray	0	0	1
Blue Pearmain	0	0	1
Bow Hill Pippin	0	1	1
Carlisle Castle	0	0	1
Christmas Pearmain	0	0	1
Counsellor	0	0	1
Court of Wick	0	0	1
Crown Apple	0	0	1
Cumberland Favourite	0	0	1
Curltail	0	0	1
Domino	0	0	1
Dutch Codlin	2	3	1
French Crab	0	0	1
Forge	0	0	1
Gipsy King	0	0	1
Grand Duke	0	0	1
Greenup's Pippin	2	1	1
Hambledon's Deux Ans	0	0	1
Histon Favourite	0	0	1
Imperial Ribston	0	0	1
Jessie Pippin	0	0	1
Kerry Pippin	0	0	1
King Harry	0	0	1
Lamb Abbey Pearmain	0	0	1
Malcolm Dunn	0	0	1
Mark Marshall	0	0	1
May Queen	0	0	1
Monstrous Pippin	0	0	1
Morgan's Sweet	0	0	1
Nancy Jackson	0	0	1
Niton House	0	0	1
Nonpareil	0	0	1
Northern Spy	0	0	1
Ottershaw Pippin	0	0	1
Pigeonnet	0	0	1
Pineapple Pippin	0	0	1
Pitmaston Golden Pippin	0	0	1
Prince Arthur	0	0	1
Rambour Papelon	0	0	1
Red Ingestre	0	0	1
Reinette de Granville	0	0	1
Rivers' Codlin	0	0	1
Royal Winter Nonsuch	0	0	1
Sam Young	0	0	1
St. Lawrence	0	0	1
Silver Russet	0	0	1
Sops in Wine	0	0	1
Spencer's Favourite	14	12	1
Spring Grove Codlin	0	0	1
Strawberry	0	0	1
Summer Orange	0	0	1
Thomas Rivers	0	1	1
Warner's Seedling	0	0	1
White Melrose	0	0	1
Wiltshire Defiance	0	0	1
Woodstock Pippin	0	0	1
Wormsley Pippin	0	0	1

Pears.

Pitmaston Duchess	46	71	81
Doyenne du Comice	35	34	39
Louise Bonne de Jersey	36	29	39
Durondeau	26	30	38
Marie Louise	23	23	34
Williams's Bon Chrétien	2	42	32
Souvenir du Congrès	9	29	31
Beurré Diel	32	30	31
Doyenne Boussoch	15	19	25
Beurré Hardy	18	23	24

Varieties	Dishes 1897	1898	1899
Beurré Bosc	14	4	21
Beurré Superfin	31	18	21
Catillac	16	10	18
Conseiller de la Cour	0	0	18
Duchesse d'Angoulême	18	16	16
Fondante d'Automne	10	10	13
Madame Treyve	8	10	13
Uvedale's St. Germain	10	7	13
Beurré Bachelier	17	11	11
Conference	8	12	11
Emile d'Heyst	6	12	11
Josephine de Malines	17	7	11
Easter Beurré	11	6	10
Glou Morceau	15	6	10
Marie Louise d'Uccle	20	12	10
Thompson's	9	9	10
Triomphe de Vienne	1	9	10
Gansel's Bergamot	10	3	9
General Todleben	10	11	9
Marguerite Marrillat	6	13	9
Vicar of Winkfield	4	5	9
Beurré Fouqueray	2	7	8
Grosse Calebasse	4	3	8
Marie Benoist	7	4	8
Seckle	3	4	8
Winter Nelis	14	8	8
Beurré Clairgeau	9	5	7
Brockworth Park	7	3	7
Fertility	1	1	7
Jersey Gratioli	4	9	7
Beurré d'Amanlis	9	12	6
Beurré d'Anjou	1	7	6
Comte de Lamy	3	5	6
Flemish Beauty	0	2	6
Nouveau Poiteau	4	1	6
Princess	5	3	6
Bergamotte d'Esperen	0	0	5
Beurré Brown	0	1	5
Chaumontel	3	4	5
Nouvelle Fulvie	6	3	5
Van Mons. Léon Leclerc	0	1	5
Beurré Baltet Père	5	4	4
Beurré Capiaumont	4	3	4
Beurré Rance	2	3	4

Varieties	Dishes 1897	1898	1899
Hacon's Incomparable	2	5	4
Triomphe de Jodoigne	3	3	4
Baronne de Mello	0	1	3
Bellisime d'Hiver	0	1	3
Beurré Sterckmans	4	2	3
Fondante de Cuerne	2	6	3
Olivier de Serres	4	2	3
Parrot	0	0	3
Bergamotte Collette	0	0	2
Beurré de Jonghe	2	1	2
Dr. Hogg	0	0	2
Dr. Joubert	1	1	2
King Edward	0	1	2
Knight's Monarch	0	1	2
Le Lecteur	1	3	2
President d'Ormanville	2	2	2
Prince Consort	0	0	2
Prince of Wales	0	1	2
Urbaniste	0	0	2
Alexander Lambre	0	0	1
Belle de Bruxelles	1	1	1
Beurré Alexander Lucas	0	0	1
Bergamotte Reinette	0	0	1
Beurré d'Aremberg	0	0	1
Beurré d'Avalon	0	0	1
British Queen	0	0	1
Charles Ernest	0	0	1
Clapp's Favourite	0	4	1
Althorp Crassane	0	0	1
Directeur Alphand	1	1	1
Dr. Jules Guyot	0	3	1
Duc d'Hiver	0	0	1
Duchesse de Bordeaux	0	0	1
Eyewood	0	0	1
Fondante de Thirriott	5	3	1
Forelle	1	1	1
Jargonelle	2	1	1
Madame André Leroy	0	0	1
Madame Chaudry	0	0	1
Magnate	0	0	1
Notcutt's Winter Orange	0	0	1
Passe Crassane	0	0	1
Summer Compote	0	0	1
Welbeck Bergamot	0	0	1

Plums.

Coe's Golden Drop	34	37	16
Monarch	9	22	9
Pond's Seedling	9	22	9
Transparent Gage	2	5	6
Reine Claude de Bavay	7	7	5
Bryanston Gage	5	6	4
Grand Duke	5	7	4
Archduke	2	2	3
Late Transparent	2	5	3
Washington	2	1	3
Belle de Septembre	1	2	2
Orleans Late	0	0	2
Autumn Compote	1	1	1
Cloth of Gold	0	0	1
Diamond	0	5	1
Goliath	1	1	1
Impératrice	0	1	1
Late Prolific	0	0	1
Golden Transparent	0	0	1
White Magnum Bonum	3	10	1
Orleans	0	1	1
Prince Engelbert	0	2	1
Prince of Wales	2	1	1
Purple Gage	0	1	1
Victoria	3	14	1

Peaches.

Sea Eagle	21	18	14
Princess of Wales	9	21	13
Walburton Admirable	7	6	10
Nectarine	4	9	8
Lady Palmerston	5	1	3
Late Admirable	5	4	3

Varieties	Dishes 1897	1898	1899	Varieties	Dishes 1897	1898	1899
Lord Palmerston	3	2	3	Golden Eagle	4	2	1
Mr. Gladstone	2	4	3	Osprey	0	0	1
Barrington	2	13	3	Royal Ascot	0	0	1
Prince of Wales	3	3	2	Violette Hâtive	0	2	1
Albatross	0	0	1				

Nectarines.

Spenser	0	0	5	Humboldt	0	5	2
Victoria	3	6	4	Pitmaston Orange	0	4	2
Prince of Wales	0	0	3	Balgowan	0	0	1
Albert Victor	2	1	2				

Grapes.

Muscat of Alexandria	24	24	17	Cooper's Black	0	0	3
Alicante	14	16	14	Madresfield Court	8	6	3
Gros Maroc	14	17	11	Dr. Hogg	0	0	2
Black Hamburgh	11	13	7	Gros Colmar	9	6	2
Lady Downes	5	5	6	Buckland Sweetwater	3	1	2
Mrs. Pince's Muscat	5	1	5	Alnwick Seedling	4	7	1
Foster's Seedling	6	5	4	Appley Towers	0	3	1
Mrs. Pearson	3	4	4	Barbarossa	0	0	1

Damsons.

King of Damsons	0	1	4	Prune	1	5	2
Bullace, Shepherd's	0	0	3	Farleigh	0	3	1
Cluster	0	0	3				

Cherries.

Morello	1	2	2

Currants.

Red Dutch	0	0	1

Crab Apples.

Dartmouth	0	0	4	Siberian	0	0	2

Figs.

Brown Turkey	14	8	4	Rond Noir	0	0	1
Negro Largo	3	2	4				

Raspberries.

October Red	0	1	1

Melons.

Countess	0	1	1	Scarlet Premier	0	0	1
Frogmore Scarlet	0	0	1	Sutton's Best of All	0	0	1

Pineapples.

Queen	1	1	2

Tomatos.

Conference	2	1	2	Polegate	0	0	1
Duke of York	0	0	2				

MEDLARS.

Varieties	Dishes 1897	1898	1899	Varieties	Dishes 1897	1898	1899
Dutch	2	1	5				

QUINCES.

Champion	0	0	3	Pear-shaped	1	2	2

MULBERRIES.

Black	0	0	2

WALNUTS.

Thin-shelled	0	0	1

COBS AND FILBERTS.

Kent Cobs	0	0	3	Pearson's Prolific	0	0	2
Red	0	0	2	True Kentish	0	0	2

OFFICIAL PRIZE LIST.

(The address and the Gardener's name are entered on the first occurrence, but afterwards only the Owner's name is recorded.)

DIVISION I.

Fruits grown under Glass or otherwise.

Open to Gardeners and Amateurs only.

NOTE.—Exhibitors can compete in one Class only of Classes 1, 2; and of Classes 3, 4.

Class **1.**—Collection of 9 dishes of Ripe Dessert Fruit:—6 kinds at least; only 1 Pine, 1 Melon, 1 Black and 1 White Grape allowed; not more than 2 varieties of any other kind, and no two dishes of the same variety.

First Prize, £6; Second, £4; Third, £2.

1. Lady H. Somerset, Ledbury (gr. G. Mullins).
2. Sir J. W. Pease, Bart., Guisboro' (gr. J. McIndoe, V.M.H.).
3. Earl of Harrington, Derby (gr. J. H. Goodacre).

Class **2.**—Collection of 6 dishes of Ripe Dessert Fruit:—4 kinds at least; only 1 Melon, 1 Black and 1 White Grape allowed; not more than 2 varieties of any other kind, and no two dishes of the same variety. Pines excluded.

First Prize, £3. 15*s.*; Second, £2. 10*s.*; Third, £1. 5*s.*

1. Col. H. Walpole, Winchfield (gr. A. Maxim).
2. M. Biddulph, Esq., M.P., Ledbury (gr. J. Dawes).
3. W. K. D'Arcy, Esq., Stanmore (gr. W. Tidy).

Class **3.**—Grapes, 6 distinct varieties, 2 bunches of each, both Black and White must be represented.

First Prize, Silver Challenge Cup, value Fifty Guineas, and £3;
Second, £3; Third £2.

The Challenge Cup was presented to the Society by Messrs. Wm. Wood, of Wood Green, in celebration of the Jubilee Year of their Firm. The Winner will hold the Cup for 12 months only, when it will be again offered for competition, until it eventually becomes the property of the Exhibitor who shall have won it three years in succession.

1. Earl of Harrington.
2. C. Bayer, Esq., Forest Hill (gr. W. Taylor).
3. Sir C. Russell, Reading (gr. F. Cole).

Class **4.**—Grapes, 3 distinct varieties, 2 bunches of each.
First Prize, £2. 10*s.*; Second, £1. 10*s.*; Third, £1.

1. M. Biddulph, Esq., M.P.
2. No award.
3. ,,

Class **5.**—Grapes, Black Hamburgh, 3 bunches.
First Prize, £1. 10*s.*; Second, £1; Third, 10*s.*

1. J. W. Fleming, Esq., Romsey (gr. W. Mitchell).
2. Sir C. Russell.
3. Earl of Harrington.

Class **6.**—Grapes, Madresfield Court, 3 bunches.
First Prize, £1. 10*s.*; Second, £1.

1. J. W. Fleming, Esq.
2. C. Bayer, Esq.

Class **7.**—Grapes, Mrs. Pince, 3 bunches.
First Prize, £1. 10*s.*; Second, £1.

1. J. W. Fleming, Esq.
2. C. Bayer, Esq.

Class **8.**—Grapes, Muscat Hamburgh, 3 bunches.
First Prize, £1. 10*s.*; Second, £1.

1. Earl of Harrington.
2. No award.

Class **9.**—Grapes, Alicante, 3 bunches.
First Prize, £1. 10*s.*; Second, £1.; Third, 10*s.*

1. Lord Suffield, Norwich (gr. W. Allan).
2. Sir C. Russell.
3. J. W. Fleming, Esq.

Class **10.**—Grapes, Lady Downes (Black), 3 bunches.
First Prize, £1. 10*s.*; Second, £1.

1. J. W. Fleming, Esq.
2. C. Bayer, Esq.

Class **11.**—Grapes, any other Black Grape, 3 bunches.
First Prize, £1. 10*s.*; Second, £1.

1. Lord Suffield.
2. Mrs. Tulk, Chertsey (gr. A. Sadler).
3. Col. H. Walpole.

Class **12.**—Grapes, Muscat of Alexandria, 3 bunches.
First Prize, £2. 10*s.*; Second, £1. 10*s.*: Third, £1.
1. C. J. Lucas, Esq., Horsham (gr. G. Duncan).
2. J. Barker, Esq., Bishop's Stortford (gr. E. Skelton).
3. Col. H. Walpole.

Class **13.**—Grapes, Mrs. Pearson.
First Prize, £2; Second, £1. 10*s.*
1. L. J. Baker, Esq., Chertsey (gr. T. Osman).
2. Mrs. Wingfield, Ampthill (gr. W. J. Empson).

Class **14.**—Grapes, any other White Grape, 3 bunches.
First Prize, £1. 10*s.*; Second, £1.
1. L. J. Baker, Esq.
2. Sir C. Russell.

Class **15.**—Peaches, from under glass, 1 dish of one variety.
First Prize, 10*s.*; Second, 7*s.*
1. Col. H. Walpole.
2. J. W. Fleming, Esq.

Class **16.**—Nectarines, from under glass, 1 dish of one variety.
First Prize, 10*s.*; Second, 7*s.*
1. F. W. Thomas, Esq., Polegate.
2. Sir Marcus Samuel, Maidstone (gr. W. H. Bacon).

Class **17.**—Dessert Plums or Gages, from under glass, 3 dishes distinct.
First Prize, 15*s.*; Second, 10*s.*
1. Leopold de Rothschild, Esq., Gunnersbury (gr. J. Hudson, V.M.H.).
2. Sir J. W. Pease, Bart.

Class **18.**—Figs, 1 dish of one variety.
First Prize, 10*s.*; Second, 7*s.*
1. No award.
2. Leopold de Rothschild, Esq.
3. Mrs. Wingfield.

Class **19.**—Collection of Hardy Fruit, 36 dishes distinct, grown entirely in the open.
First Prize, £3; Second, £2; Third, £1.
1. Sir Mark W. Collet, Bart., Sevenoaks (gr. R. Potter).
2. M. Biddulph, Esq., M.P.
3. No award.

Class **20.**—Collection of Hardy Fruit, 24 dishes distinct, grown partly or entirely under glass, to illustrate Orchard House Culture; Grapes excluded.
First Prize, £3; Second, £2.
1. Sir Mark W. Collet, Bart.
2. No award.

Division II.

Open to Nurserymen only.

Allotment of table-space will be made to Nurserymen on the three following scales:—

Class.
21.—48 feet run of 6-feet tabling
22.—32 „ „ „ „
23.—16 „ „ „ „ } For Fruit grown entirely out of doors.
24.—32 „ „ „ „ For Orchard House Fruit and Trees.

Nurserymen desiring to exhibit at this Show must make application for either Class 21, 22, or 23, and also for 24 if they wish to show fruit grown under glass. No other spaces but the above can be allotted to Nurserymen wishing to show Fruit. Exhibitors can only enter in one of Classes 21, 22, 23.

Nurserymen may adopt any method of staging they desire, subject to the following reservations: (*a*) The number of Fruits is not limited, but the Baskets or Dishes must not exceed 15 inches in diameter if circular, or 19 × 15 if rectangular; (*b*) Duplicate Trees are permitted, but not duplicate Baskets or Dishes of Fruit; (*c*) Trees are not admissible in 21, 22, 23; (*d*) As in all other Divisions so also here all the Exhibits must have been actually grown by the Exhibitor.

Medals or other Awards will be made to Nurserymen's Exhibits at the discretion of the Council, but no Awards of any sort will be made to Nurserymen who do not conform to the above regulations.

Class **21.**—48 feet run of 6-feet tabling.

1. Gold Medal, Messrs. G. Bunyard, Maidstone.
2. Silver-gilt Knightian, Messrs. James Veitch, Chelsea.
3. Silver-gilt Banksian, Mr. H. Berwick, Sidmouth.

Class **22.**— 32 feet run of 6-feet tabling.

1. Silver-gilt Knightian, Royal Jersey Agri-Hort. Society.
2. Silver-gilt Banksian, Mr. J. B. Colwell, Sidmouth.
3. Silver Knightian, Mr. J. Watkins, Hereford.
4. Silver Banksian, Messrs. Paul & Son, Cheshunt.
5. Silver Banksian, Messrs. J. Cheal, Crawley.
6. Silver Banksian, Mr. G. Mount, Canterbury.

Class **23.**—16 feet run of 6-feet tabling.

1. Silver-gilt Banksian, Mr. J. Basham, Newport.
2. Silver Knightian, Messrs. T. Rivers, Sawbridgeworth.
3. Silver Knightian, Messrs. J. Peed, Norwood.
4. Silver Banksian, Messrs. Pewtress, Hereford.
5. Bronze Knightian, Messrs. J. Spooner, Hounslow.
6. Bronze Knightian, Messrs. W. & J. Brown, Stamford.
7. Bronze Knightian, Messrs. Notcutt, Woodbridge.

Class **24.**—32 feet run of 6-feet tabling.

1. Hogg Medal, Messrs. T. Rivers.
2. Silver-gilt Knightian, Messrs. G. Bunyard.

Division III.

Open to Market Growers only.

Gentlemen's Gardeners or Amateurs who sell surplus fruit, and Nurserymen are excluded from this Division.

All the Fruit exhibited must have been grown by Exhibitor or his Employer, and (with the exception of Class 36) must be shown "as packed for travelling to Market," except that all lids, covering paper, and other surface packings are to be turned back

(not removed), so as to display contents. Boxes or Baskets piled up above the edge or rim will be considered "unsuitable for travelling."

Other things being equal, a sieve or bushel of Apples or Pears will be considered to weigh about 42 lb. and a half-sieve or half-bushel 20 lb., or of Plums 28 lb.

The Judges will be men thoroughly conversant with the market, and in awarding the Prizes they will be instructed to consider, not only the quality of the Fruit, but also the Packing, the Grading, and the Suitability for Travelling and for Market purposes of the box, basket, or other receptacle in which the fruit is shown.

The Winner of any Prize will have the option of a Medal of kindred value instead of money if he prefer it.

Class **25.**—Grapes, Hamburgh, a single layer, weighing not less than 12 lb., in a baby basket.

First Prize, £2; Second, £1. 10*s*.

No award.

Fig. 85.—Baby Basket enclosed in Shallow Hamper, Frome Fruit Co. (*Gardeners' Magazine.*)

Class **26.**—Grapes, White, any variety, a single layer, weighing not less than 12 lb., in a baby basket.

First Prize, £2; Second, £1. 10*s*.

1. Frome Fruit Company, Somerset. (Fig. 85.)
2. Mr. W. Green, Harold Wood.

Class **27.**—Grapes, any variety, in any other package than a baby basket, for market.

No Prize to be awarded unless the Judges consider the box, basket, or other receptacle *superior* for transit by rail to baby baskets in flats.

First Prize, £2; Second, £1. 10*s*.

1. Mr. W. Green. (Fig. 86.)
2. Frome Fruit Company.

Class **28**.—Apples, Cooking, 4 varieties, about 42 lb. net of each, in baskets or boxes.

First Prize, £1. 10*s*.; Second, £1.

1. Messrs. W. J. Poupart, Twickenham.
2. Mr. E. Basham, Bassaleg.

Class **29**.—Apples, Dessert, 4 varieties, about 20 lb. net of each, in baskets or boxes.

First Prize, £1. 10*s*.; Second, £1.

1. Messrs. W. J. Poupart.
2. Mr. A. Wyatt, Hounslow.

Class **30**.—Apples, Cooking, any one variety, about 42 lb. net, in a basket or box.

First Prize, 15*s*.; Second, 10*s*.

1. Mr. G. Tebbutt, Isleworth.
2. Mr. A. Wyatt.

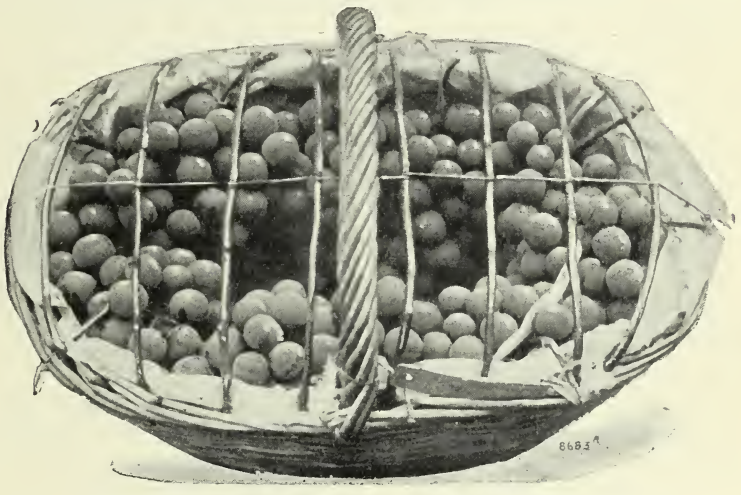


Fig. 86.—Grapes for Market. (*Gardeners' Magazine*.)

Class **31**.—Apples, Dessert, any one variety, about 20 lb. net, in a basket or box.

First Prize, 15*s*.; Second, 10*s*.

1. Messrs. W. J. Poupart.
2. Mr. C. A. Marchant, Maidstone.

Class **32**.—Apples, about 42 lb. net of any one variety, in any Improved Form of Package for Market.

No Prize will be awarded unless the Judges consider the box, basket, or other receptacle *superior* to those in ordinary use.

First Prize, £1; Second, 15*s*.

1. Mr. E. Basham.
2. No award.

Class 33.—Apples, about 42 lb. net of any one variety, showing any Improved System of Packing.

First Prize, £1; Second, 15*s*.

1. Mr. E. Basham.
2. No award.

Class 34.—Pears, 2 varieties in 2 Packages of about 20 lb. capacity each.

First Prize, £1; Second, 15*s*.

1. Messrs. W. J. Poupart.
2. Mr. A. Wyatt.

Class 35.—Pears, from 24 to 48 Fruits, according to size, of any one Choice Dessert variety, suitably packed in one Package for Market.

First Prize, 15*s*.; Second, 10*s*.

1. Mr. A. Wyatt.
2. Mr. C. A. Marchant.

Class 36.—Collection of 12 varieties of Apples and 6 of Pears, distinct. 18 Fruits of each, to be laid flat on the table without dishes or baskets.

First Prize, £4. 10*s*.; Second, £3.

1. Messrs. W. J. Poupart.
2. Mr. A. Wyatt.

Class 37.—Plums, Cooking, a Basket or Box of about 28 lb. capacity of any one variety.

First Prize, 15*s*.; Second, 10*s*.

1. Messrs. W. J. Poupart.
2. Mr. G. S. Tebbutt.

Class 38.—Plums, from 24 to 48 Fruits of any Choice Dessert Variety, suitably packed in one Package for Market.

First Prize, 15*s*.; Second, 10*s*.

No award.

Class 39.—Peaches, 24 Fruits of one or more varieties, packed in a suitable Box.

First Prize, £1. 10*s*.; Second, £1.

1. Mr. J. Gore, Polegate.
2. Messrs. W. J. Poupart.

Class 40.—Tomatos, a Basket or Box of about 12 lb. capacity suitably packed.

First Prize, 15*s*.; Second, 10*s*.

1. Mr. J. Gore.
2. Messrs. W. J. Poupart.

Division IV.

Fruits grown in the Open Air.

Open to Gardeners and Amateurs only.

Nurserymen and Market Growers excluded.

Note.—Exhibitors can compete in one Class only of the Classes 41, 42, 43; of 44, 45; of 46, 47; of 48, 49, 50, 51; of 52, 53; of 54, 55; of 56, 57; of 58, 59; of 61, 62. In distinguishing Dessert and Cooking Varieties, see Official List, p. 34.

Class **41.**—Apples, 24 Dishes, distinct, 16 Cooking, 8 Dessert. The latter to be placed in the front row.

First Prize, £4 ; Second, £2 ; Third, £1. 10*s*.

1. F. S. W. Cornwallis, Esq., M.P., Maidstone (gr. J. McKenzie).
2. Duke of Richmond, Chichester (gr. R. Parker).
3. J. Colman, Esq., Reigate (gr. W. King).

Class **42.**—Apples, 12 dishes, distinct, 8 Cooking, 4 Dessert. The latter to be placed in the front row.

First Prize, £2 ; Second, £1 ; Third, 15*s*.

1. Col. H. Walpole.
2. Lady H. Somerset.
3. Agricultural College, Wye, Ashford, Kent.

Class **43.**—Apples, 9 dishes, distinct, 6 Cooking, 3 Dessert. The latter to be placed in the front row.

First Prize, £1. 10*s*. ; Second, 15*s*. ; Third, 10*s*.

1. M. Biddulph, Esq., M.P.
2. J. R. Brougham, Esq., Carshalton (gr. W. Jones).
3. H. Colin Smith, Esq., Roehampton (gr. W. Wallace).

Class **44.**—Cooking Apples, 6 dishes, distinct.

First Prize, £1 ; Second, 15*s*.

1. Mr. H. H. Hurnard, Hingham, Norfolk.
2. Mr. R. M. Whiting, Hereford.

Class **45.**—Cooking Apples, 3 dishes, distinct.

First Prize, 10*s*. ; Second, 7*s*.

1. W. M. Cazalet, Esq., Tonbridge (gr. G. Fennell).
2. M. Biddulph, Esq., M.P.

Class **46.**—Dessert Apples, 6 dishes, distinct.

First Prize, £1 ; Second, 15*s*.

1. J. Colman, Esq.
2. Mr. H. Cook, Sidmouth.

Class **47.**—Dessert Apples, 3 dishes, distinct.

First Prize, 10*s*. ; Second, 7*s*.

1. Marquis Camden, Lamberhurst (gr. G. H. Sage).
2. F. W. Buxton, Esq., Sawbridgeworth (gr. W. H. Godden).

Class **48.**—Dessert Pears, 12 dishes, distinct.

First Prize, £2. 15*s*. ; Second, £1. 15*s*. ; Third, £1.

1. Sir Marcus Samuel.
2. A. H. Smee, Esq., Hackbridge (gr. W. E. Humphreys).

Class **49.**—Dessert Pears, 9 dishes, distinct.

First Prize, £2 ; Second, £1 ; Third, 15*s*.

1. J. R. Brougham, Esq.
2. Mr. H. Cook.
3. No award.

Class 50.—Dessert Pears, 6 dishes, distinct.
First Prize, £1. 10*s.*; Second, 15*s.*
1. Marquis Camden.
2. Major Heneage, Compton Basset (gr. W. A. Cook).

Class 51.—Dessert Pears, 3 dishes, distinct.
First Prize, 15*s.*; Second, 10*s.*
1. G. H. Field, Esq., Sevenoaks (gr. R. Edwards).
2. G. H. Hadfield, Esq., Ross (gr. J. Rick).

Class 52.—Cooking Pears, 3 dishes, distinct.
First Prize, 15*s.*; Second, 10*s.*
1. A. H. Smee, Esq.
2. Mr. H. Cook.

Class 53.—Cooking Pears, 1 dish of 1 variety.
First Prize, 7*s.*; Second, 5*s.*
1. Sir Mark W. Collet, Bart.
2. Captain Carstairs, Newbury (gr. C. Ross).

Class 54.—Peaches, grown entirely out of doors, 3 dishes, distinct.
First Prize, £1. 10*s.*; Second, £1; Third, 10*s.*
1. Col. H. Walpole.
2. Mr. J. Sparks, Putney.
3. Duke of Fife, East Sheen (gr. S. Osborn).

Class 55.—Peaches, grown entirely out of doors, 1 dish of 1 variety.
First Prize, 10*s.*; Second, 7*s.*
1. Duke of Northumberland, Brentford (gr. G. Wythes, V.M.H.).
2. Lord Poltimore, Exeter (gr. J. H. Slade).

Class 56.—Nectarines, grown entirely out of doors, 3 dishes, distinct.
First Prize, £1. 10*s.*; Second, £1; Third, 10*s.*
No award.

Class 57.—Nectarines, grown entirely out of doors, 1 dish of 1 variety.
First Prize, 10*s.*; Second, 7*s.*
1. Mr. T. J. Sparks.
2. O. E. A. Goldsmid, Esq., Tonbridge (gr. C. Earl).

Class 58.—Plums, 4 dishes, of Dessert, distinct.
First Prize, £1; Second, 15*s.*
1. C. E. Strachan, Esq., Hemel Hempstead (gr. H. Folkes).
2. F. M. Lonergan, Esq., Reading (gr. R. Chamberlain).

Class 59.—Plums, 1 dish of Dessert, of 1 variety, not Gages.
First Prize, 7*s.*; Second, 5*s.*
1. H. C. Moffatt, Esq., Ross (gr. F. Spencer).
2. J. G. Dearden, Esq., Stamford (gr. A. Wright).

Class **60.**—Gage Plums, 1 dish.
First Prize, 7*s.*; Second, 5*s.*
1. C. J. Lucas, Esq.
2. G. H. Hadfield, Esq.

Class **61.**—Plums, 4 dishes of Cooking, distinct.
First Prize, £1; Second, 15*s.*
1. Sir J. W. Pease, Bart.
2. C. E. Strachan, Esq.

Class **62.**—Plums, 1 dish of Cooking of one variety.
First Prize, 7*s.*; Second, 5*s.*
1. T. L. Boyd, Esq., Tonbridge (gr. E. Coleman).
2. Mr. H. H. Hurnard.

Class **63.**—Damsons, Prunes, and Bullaces, 4 dishes, distinct.
First Prize, 15*s.*; Second, 10*s.*
1. Mr. T. Clinch, Sittingbourne.
2. Wm. Cazalet, Esq.

Division V.

Special District County Prizes.

Open to Gardeners and Amateurs only.

(In this Division all fruit must have been grown in the open).

N.B.—Exhibitors in Division V. must not compete in Divisions II. and III., or in Classes 1, 2, 3, 4, 41, 42, 43, 46, 48, 49

Class **AA.**—Apples, six dishes, distinct, 4 Cooking, 2 Dessert.
1st Prize, £1 and 3rd class Single Fare from Exhibitor's nearest railway station to London; 2nd Prize, 15*s.* and Railway Fare as above.

Class **BB.**—Dessert Pears, 6 dishes, distinct.
1st Prize, £1. 10*s.* and Railway Fare as above; 2nd Prize, £1 and Railway Fare as above.

The two above Classes Nos. AA and BB are repeated ten times as follows; and Exhibitors must enter for them thus: "Class AA 64" or "BB 65" and so on, to make it quite clear whether they mean Apples or Pears.

Class **64.**—Open only to Kent Growers.

AA.—Apples.
1. G. H. Dean, Esq., Sittingbourne (gr. W. T. Stowers).
2. Marquis Camden.

BB.—Pears.
1. Marquis Camden.
2. G. H. Field, Esq.

Class **65.**—Open only to Growers in Surrey, Sussex, Hants, Dorset, Somerset, Devon, and Cornwall.

AA.—Apples.
1. Duchess of Cleveland, Battle (gr. W. Camm).
2. J. Colman, Esq.

BB.—Pears.
1. A. Benson, Esq., Merstham (gr. W. Hancy).
2. J. Colman, Esq.

Class 66.—Open only to Growers in Wilts, Gloucester, Oxford, Bucks, Berks, Beds, Herts, and Middlesex.

AA.—Apples. { 1. Col. Vivian, Trowbridge (gr. W. Strugnell).
2. F. M. Lonergan, Esq.

BB.—Pears. { 1. Major Heneage.
2. F. M. Lonergan, Esq.

Class 67.—Open only to Growers in Essex, Suffolk, Norfolk, Cambridge, Hunts, and Rutland.

AA.—Apples. { 1. Mr. H. H. Hurnard. [Andrews).
2. Hon. W. Lowther, Wickham Market (gr. A.

BB.—Pears. { 1. Lord Suffield.
2. Hon. W. Lowther.

Class 68.—Open only to Growers in Lincoln, Northampton, Warwick, Leicester, Notts, Derby, Staffs, Shropshire, and Cheshire.

AA.—Apples. { 1. J. G. Dearden, Esq.
2. Duke of Rutland, Grantham (gr. W. H. Divers).

BB.—Pears. { 1. J. G. Dearden, Esq.
2. Duke of Rutland.

Class 69.—Open only to Growers in Worcester, Hereford, Monmouth, Glamorgan, Carmarthen, and Pembroke.

AA.—Apples. { 1. Mrs. Blashill, Hereford.
2. R. M. Whiting, Esq., Hereford.

BB.—Pears. { 1. G. H. Hadfield, Esq.
2. H. C. Moffatt, Esq.

Class 70.—Open only to Growers in the other Counties of Wales.

AA.—Apples. { 1. R. D. Hughes, Esq., Denbigh (gr. R. T. Jones).
2. S. T. Pugh, Esq., Aberystwith (gr. H. Austin).

BB.—Pears. No award.

Class 71.—Open only to Growers in the Six Northern Counties of England, and in the Isle of Man.

AA.—Apples. { 1. Mr. J. Garside, Garstang.
2. No award.

BB.—Pears. No award.

Class 72.—Open only to Growers in Scotland.

AA.—Apples. { 1. Earl of Galloway, Garlieston (gr. J. Day).
2. No award.

BB.—Pears. { 1. Earl of Galloway.
2. No award.

Class 73.—Open only to Growers in Ireland.

No entries.

Division VI.

Single Dishes of Fruit Grown in the Open Air.

Open to Gardeners and Amateurs only. Nurserymen and Market Growers excluded.

Prizes in each Class (except 105, 112, and 126A): First, 7*s.*; Second, 5*s.*

Dessert Apples.

Class **74.**—Adams' Pearmain.
1. Mr. H. H. Williams, Truro.
2. Duchess of Cleveland.

Class **75.**—Allen's Everlasting.
1. J. W. Buxton, Esq.
2. No award.

Class **76.**—Allington Pippin.
1. Captain Carstairs.
2. R. M. Whiting, Esq.

Class **77.**—Baumann's Red Winter Reinette.
1. Captain Carstairs.
2. H. H. Hurnard, Esq.

Class **78.**—Blenheim Orange.
1. F. M. Lonergan, Esq.
2. O. E. D. Goldsmid, Esq.

Class **79.**—Brownlee's Russet.
1. T. H. Boyd, Esq.
2. Marquis Camden.

Class **80.**—Claygate Pearmain.
1. R. M. Whiting, Esq.
2. F. W. Buxton, Esq.

Class **81.**—Cockle's Pippin.
1. Mr. A. J. Carter, Billinghurst.
2. W. A. Sandford, Esq., Wellington (gr. S. Kidley).

Class **82.**—Court Pendu Plât.
1. W. Greenwell, Esq., Marden Park (gr. W. Lintoll).
2. F. M. Lonergan, Esq.

Class **83.**—Cox's Orange Pippin.
1. J. Colman, Esq.
2. Lord Poltimore.

Class **84.**—D'Arcy Spice, *syn.* Baddow Pippin.
No entries.

Class **85.**—Duke of Devonshire.
1. G. H. Hadfield, Esq.
2. Marquis Camden.

Class **86.**—Egremont Russet.
1. R. M. Whiting, Esq.
2. H. C. Moffatt, Esq.

Class **87.**—Fearn's Pippin.
1. G. H. Dean, Esq.
2. F. S. W. Cornwallis, Esq., M.P.

Class **88.**—Gascoigne's Scarlet.
1. Mr. J. Clinch.
2. Lord Poltimore.

Class **89.**—Golden Reinette.
No entries.

Class **90.**—Gravenstein.
1. Duchess of Cleveland.
2. T. J. Charlesworth, Esq., Redhill (gr. T. W. Herbert).

Class **91.**—James Grieve.
1. Earl of Galloway.
2. O. E. D. Goldsmid, Esq.

Class **92.**—King of the Pippins.
1. F. S. W. Cornwallis, Esq., M.P.
2. G. H. Dean, Esq.

Class **93.**—King of Tompkins County.
1. Colonel H. Walpole.
2. Surgeon-General C. Planck, J.P., Edenbridge (gr. J. Treadwell).

Class **94.**—Lord Hindlip.
No entries.

Class **95.**—Mabbot's Pearmain.
1. O. E. D. Goldsmid, Esq.
2. C. P. Wykham Martin, Esq., Maidstone (gr. D. McAinsh).

Class **96.**—Mannington's Pearmain.
1. F. S. W. Cornwallis, Esq., M.P.
2. Sir Mark Collet, Bart.

Class **97.**—Margil.
1. F. S. W. Cornwallis, Esq., M.P.
2. Vincent Ames, Esq., Bristol (gr. Mr. Bannister).

Class **98.**—Mother (American).
1. Mr. R. M. Whiting.
2. Surgeon-General C. Planck, J.P.

Class **99.**—Ribston Pippin.
1. J. Colman, Esq.
2. Marquis Camden.

Class **100.**—Rosemary Russet.
1. Duchess of Cleveland.
2. Mr. H. Cook.

Class **101.**—Ross Nonpareil.
1. F. S. W. Cornwallis, Esq., M.P.
2. Marquis Camden.

Class **102.**—Scarlet Nonpareil.
1. Leopold de Rothschild, Esq.
2. No award.

Class **103.**—Sturmer Pippin.
1. F. M. Lonergan, Esq.
2. Captain Carstairs.

Class **104.**—Wealthy.
1. Mr. R. M. Whiting.
2. G. H. Field, Esq., Tunbridge Wells (gr. J. Allan).

Class **105.**—Winter Quarrenden.
No entries.

Class **105a.**—Winter Quarrenden.
No entries.

Class **106.**—Worcester Pearmain.
1. J. Colman.
2. C. J. Lucas.

Class **107.**—Any other variety.
1. Captain Carstairs:—'Thomas Andrew Knight.'
2. Duke of Northumberland, V.M.H.:—'Golden Russet.'

Cooking Apples.

Class **108.**—Alfriston.
1. H. C. Moffatt, Esq.
2. G. H. Field, Esq.

Class **109.**—Beauty of Kent.
1. F. M. Lonergan, Esq.
2. Mr. R. M. Whiting.

Class **110.**—Belle de Pontoise.
1. F. S. W. Cornwallis, Esq., M.P.
2. Col. H. Walpole.

Class **111.**—Bismarck.
1. Mr. S. W. Sweet, Ipswich.
2. G. H. Dean, Esq.

Class **112.**—Bramley's Seedling.
First Prize, 20*s.*; Second, 10*s.*; Third, 5*s.*
Prizes given by Messrs. H. Merryweather, The Nurseries, Southwell.
1. Mr. H. Cook.
2. Captain Carstairs.
3. A. H. Smee, Esq.

Class **113.**—Cellini.
1. Lord Poltimore.
2. H. Colin Smith, Esq.

Class **114.**—Cox's Pomona.
1. G. H. Dean, Esq.
2. J. Colman, Esq.

Class **115.**—Dumelow's Seedling, *syn.* Wellington and Normanton Wonder.
1. Duchess of Cleveland.
2. J. Colman, Esq.

Class **116.**—Ecklinville Seedling.
1. G. H. Dean, Esq.
2. Hon. W. Lowther.

Class **117.**—Emperor Alexander.
1. F. S. W. Cornwallis, Esq., M.P.
2. G. H. Dean, Esq.

Class **118.**—Golden Noble.
1. F. S. W. Cornwallis, Esq., M.P.
2. G. H. Dean, Esq.

Class **119.**—Golden Spire.
1. F. S. W. Cornwallis, Esq., M.P.
2. No award.

Class **120.**—Grenadier.
1. F. S. W. Cornwallis, Esq., M.P.
2. Colonel H. Walpole.

Class **121.**—Hawthornden (New).
1. J. T. Charlesworth, Esq.
2. O. E. D. Goldsmid, Esq.

Class **122.**—Lane's Prince Albert.
1. G. H. Dean, Esq.
2. Captain Carstairs.

Class **123.**—Lord Derby.
1. G. H. Dean, Esq.
2. Mr. R. M. Whiting.

Class **124.**—Lord Grosvenor.
1. Mr. R. M. Whiting.
2. J. B. Fortescue, Esq., Maidenhead (gr. C. Herrin).

Class **125.**—Lord Suffield.
1. Surgeon-General C. Planck, J.P.
2. J. J. Dearden, Esq.

Class **126.**—Mère de Ménage.
1. Captain Carstairs.
2. F. S. W. Cornwallis, Esq., M.P.

Class **126a.**—Newton Wonder.
First Prize, 20*s.*; Second, 10*s.*; Third, 5*s.*

Prizes presented by Messrs. J. R. Pearson & Sons, Chilwell, Notts.
Open only to Exhibitors living in Cardigan, Radnor, Shropshire, Stafford, Warwick, Northampton, Bedford, Cambridge, Essex, or Counties further north.
1. Mr. H. H. Hurnard.
2. Duke of Rutland.

Class **126b.**—Newton Wonder.
Open only to Exhibitors living south of the before-named Counties.
1. Mr. H. Cook.
2. Sir Mark Collet, Bart.

Class **127.**—Peasgood's Nonesuch.
1. F. S. W. Cornwallis, Esq., M.P.
2. G. H. Dean, Esq.

Class **128.**—Potts' Seedling.
1. F. S. W. Cornwallis, Esq., M.P.
2. F. M. Lonergan, Esq.

Class **129.**—Royal Jubilee.
1. Captain Carstairs.
No award.

Class **130.**—Sandringham.
1. F. S. W. Cornwallis, Esq., M.P.
2. H. C. Moffatt, Esq.

Class **131.**—Spencer's Favourite, *syn.* Queen Caroline.
1. Marquis Camden.
2. J. R. Brougham, Esq.

Class **132.**—Stirling Castle.
1. Mr. R. M. Whiting.
2. Captain Carstairs.

Class **133.**—Stone's, *syn.* Loddington Seedling.
1. Captain Carstairs.
2. F. S. W. Cornwallis, Esq., M.P.

Class **134.**—Striped Beefing.
No entries.

Class **135.**—The Queen.
1. G. H. Dean, Esq.
2. Colonel H. Walpole.

Class **136.**—Tower of Glamis.
1. E. A. Lee, Esq., Liphook (gr. G. Hagon).
2. F. S. W. Cornwallis, Esq., M.P.

Class **137.**—Waltham Abbey Seedling.
1. Captain Carstairs.
2. Duchess of Cleveland.

Class **138.**—Warner's King.
1. Philip Crowley, Esq., Croydon (gr. J. Harris).
2. A. W. Wright, Esq., Newent (gr. W. H. Davies).

Class **139.**—Any other variety.
1. M. Biddulph, Esq., M.P., Ledbury (gr. J. Dawes) :—'Tyler's Kernel.'
2. Captain Carstairs :—'Harvey's Wiltshire Defiance.'

Dessert Pears.

Class **140.**—Beurré Bosc.
1. Hon. P. C. Glyn, Godstone (gr. J. Friend).
2. Mrs. Stuart, Roehampton (gr. A. Smith).

Class **141.**—Beurré d'Anjou. (Fig. 87.)
1. F. M. Lonergan, Esq.
2. Marquis Camden.

Class **142.**—Beurré Diel.
1. Lord Suffield.
2. Duke of Northumberland.

Class **143.**—Beurré Dumont.
No entries.

Class **144.**—Beurré Fouqueray.
1. Marquis Camden.
2. Leopold de Rothschild, Esq.

Class **145.**—Beurré Hardy.
1. G. H. Field, Esq.
2. G. H. Dean, Esq.

Class **146.**—Beurré Mortillet.
No entries.

Class **147.**—Beurré Superfin.
1. Dowager Lady Freake, Twickenham (gr. A. H. Rickwood).
2. Lord Poltimore.

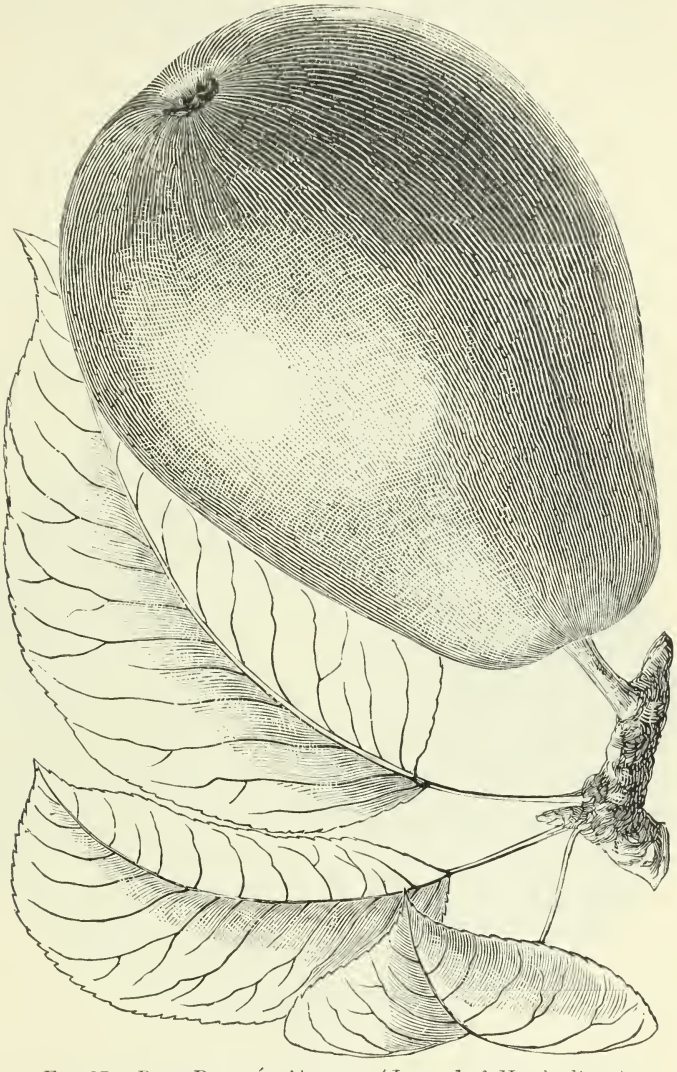


Fig. 87.—Pear Beurré d'Anjou. (*Journal of Horticulture.*)

Class **148.**—Comte de Lamy.
1. J. T. Charlesworth, Esq.
2. Lord Suffield.

Class **149.**—Conference.
1. Leopold de Rothschild, Esq.
2. Hon. P. C. Glyn.

Class 150.—Conseiller (or Maréchal) de la Cour.
1. F. M. Lonergan, Esq.
2. Captain Carstairs.

Class 151.—Doyenné du Comice.
1. Sir Marcus Samuel, Bart.
2. Col. Archer-Houblon, Bishop's Stortford (gr. W. Harrison).

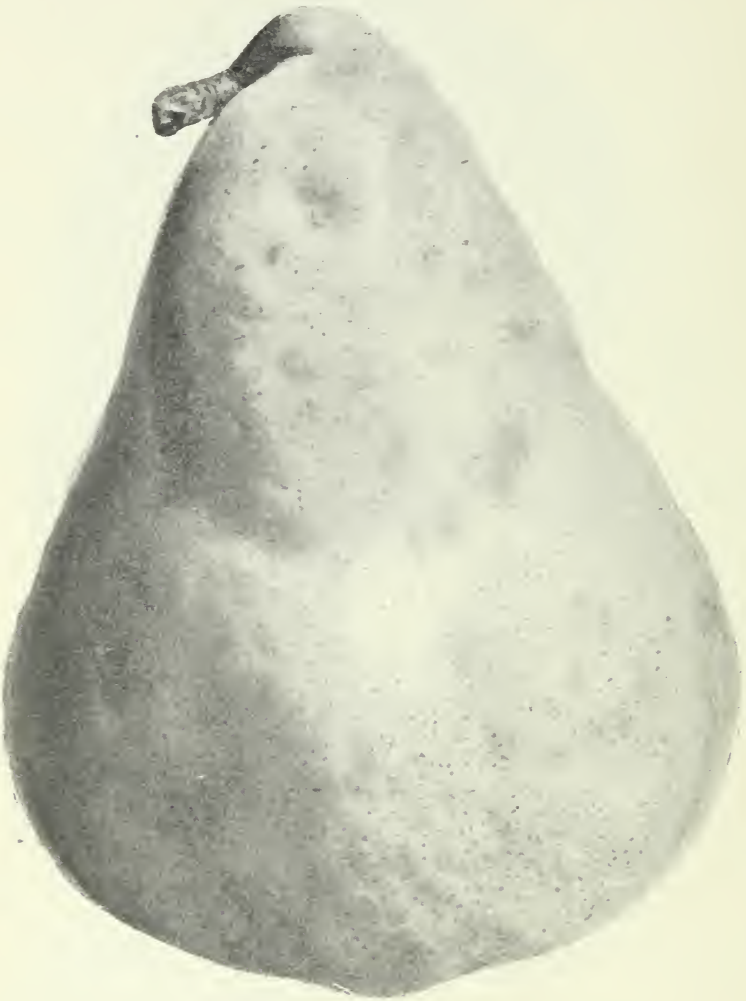


Fig. 88.—Pear Marguerite Marillat. (*Journal of Horticulture.*)

Class 152.—Duchesse de Bordeaux.
1. F. L. Boyd, Esq., Tonbridge (gr. E. Coleman).
2. No award.

Class 153.—Durondeau.
1. Sir Marcus Samuel.
2. H. C. Moffatt, Esq.

Class **154.**—Easter Beurré.
1. J. R. Brougham, Esq.
2. J. W. Melles, Esq., Chingford (gr. J. Nicholson).

Class **155.**—Emile d'Heyst.
1. Lord Suffield.
2. C. P. Wykeham-Martin, Esq.

Class **156.**—Fondante d'Automne.
1. F. W. Buxton, Esq.
2. Lord Brassey.

Class **157.**—Fondante de Thirriott.
No entries.

Class **158.**—Glou Morceau.
1. J. Sparks, Esq.
2. F. M. Lonergan, Esq.

Class **159.**—Josephine de Malines.
1. J. R. Brougham, Esq.
2. Captain Carstairs.

Class **160.**—Le Lectier.
1. J. R. Brougham, Esq.
2. No award.

Class **161.**—Louise Bonne of Jersey.
1. Duke of Northumberland.
2. Major Heneage.

Class **162.**—Marie Benoist.
1. F. W. Buxton, Esq.
2. J. W. Melles, Esq.

Class **163.**—Marie Louise.
1. Lord Suffield.
2. B. Moore, Esq., Bath.

Class **164.**—Marguerite Marillat. (Fig. 88.)
1. F. W. Thomas, Esq.
2. Lord Poltimore.

Class **165.**—Nouvelle Fulvie.
1. F. W. Thomas, Esq.
2. Duke of Northumberland.

Class **166.**—Olivier de Serres.
1. O. A. Smith, Esq., East Grinstead (gr. C. Harris).
2. T. L. Boyd, Esq.

Class **167.**—Pitmaston Duchess.
1. Du Crozy, Esq., Weybridge (gr. C. Morgan).
2. H. Padwick, Esq., Horsham (gr. J. Webb).

Class **168.**—President Barabé.
No award.

Class **169.**—Seckle.
1. Captain Carstairs.
2. J. Sparks, Esq.

FIG. 89.—DESSERT PEAR, TRIOMPHE DE VIENNE. (*Gardeners' Magazine.*)

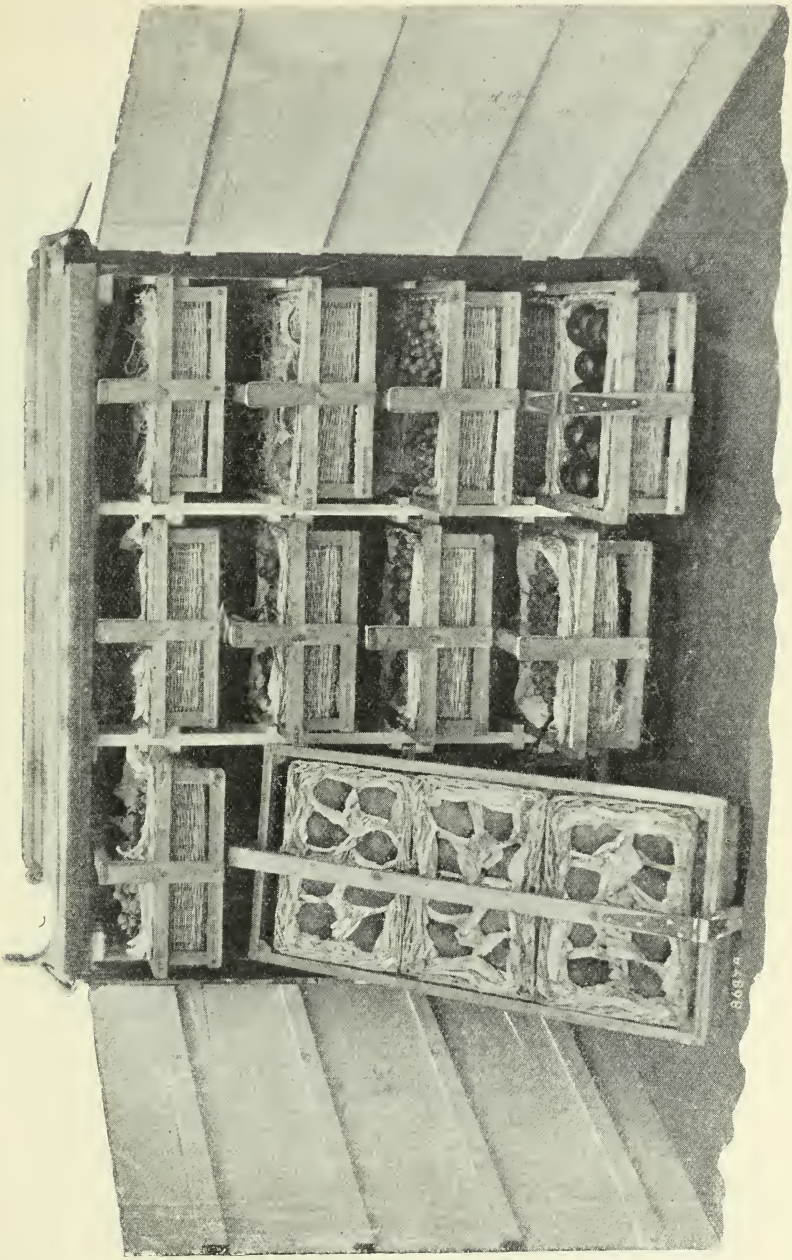


Fig. 90.—Mr. Bashford's Travelling Crate. (*Gardeners' Magazine.*)

Class **170.**—Souvenir du Congrès.
1. J. B. Fortescue, Esq.
2. Mr. F. W. Thomas.

Class **171.**—Thompson's.
1. Lord Suffield.
2. Leopold de Rothschild, Esq.

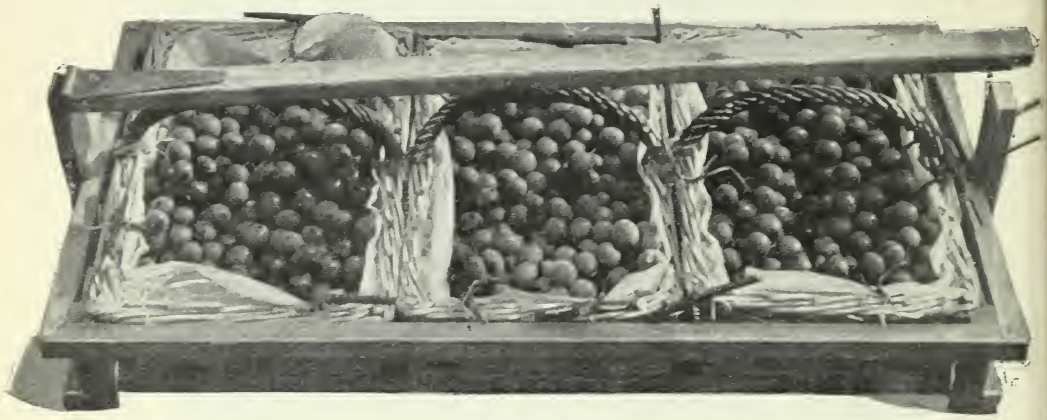


Fig. 91.—Single Tray from Crate. (*Gardeners' Magazine.*)

Class **172.**—Triomphe de Vienne. (Fig. 89.)
No entries.

Class **173.**—Winter Nelis.
1. F. M. Lonergan, Esq.
2. H. Padwick, Esq.

Fig. 92.—Single Basket from Tray. (*Gardeners' Magazine.*)

Class **174.**—Any other variety.
1. Lord Suffield :—Williams' Bon Chrétien.
2. G. H. Dean, Esq. :—Duchesse d'Angoulême.

MISCELLANEOUS AWARDS.

Highly Commended.—Swanley Horticultural College : Bottled Fruits.
Commended.—Mr. Bashford, Jersey; Travelling Crate. (Figs. 90, 91, 92.)

THE INJURIOUS SCALE INSECTS AND MEALY BUGS OF THE BRITISH ISLES.

By Mr. R. Newstead, F.E.S.,

Curator of the Grosvenor Museum, Chester.

[Read October 10, 1899.]

With Photographic Illustrations by the Writer.

The "scale insects" and "mealy bugs" are generally termed "coccids." They belong to the extensive order *Hemiptera*, which contains the two great sub-orders *Heteroptera* and *Homoptera*. The former contains, among other common insects, the "plant bugs," "bed bugs," water boatmen, and water scorpions, &c.; while the *Homoptera* includes the "plant lice," "frog hoppers" and "cuckoo spits," &c., and the destructive coccids (*Coccidæ*), which it is my pleasure to deal with in this paper.

The minute structural details will be briefly dealt with, and only such facts as may be considered essential or of economic importance will be given. The salient characteristics by which the *Coccidæ* may be known from all other insects are—

(1) The females are destitute of wings; legs and antennæ either present or absent; mouth, formed for *sucking* up the juices of the plant, is present in all but one remarkable exotic genus.

(2) Males possess one pair of wings; but not a few are apterous, or wingless. The most remarkable character is, they are absolutely without a mouth, its position being occupied by one or two pairs of eyes.

(3) Larva, a minute active six-legged insect, both sexes possessing mouths as in the female.

With the exception of two genera—*Exeretopus*, Newstead, and *Olifiella*, Cockerell, both males and females are also characterised by possessing a single-jointed foot (*tarsus*), furnished with a single claw, and usually two to four knobbed hairs. In the abnormal genera referred to above the front tarsi are double-jointed, while the other tarsi are normal.

As coccids usually occur in large colonies, they may be generally considered as injurious to plant life. Of course there are many novelties among them, which from their rarity can scarcely come under this heading; but the horticulturist may safely regard all of them with suspicion, and apparently harmless species should be given no quarter.

Three species are of interest as furnishing us with commercial products. "The lac insect" (*Tachardia lacca*) is of the first importance, as it furnishes us with the invaluable product known as "lac," which forms a basis for varnish, French polish, and many other equally important materials. It is usually imported into this country upon the twigs or small branches of the trees upon which the insects have secreted it, and is known commercially as "stick lac," which, after treatment, is made into "cake lac," and finally into "shell lac," a material known to

almost every schoolboy. Being of such value to us, I have ventured to give a photograph of examples of the "stick lac" (fig. 93), the history of which may be briefly described as follows :—

Like all other coccids, the young (*larvæ*) are active : they are at first very tiny creatures, resembling mites, and are generally spoken of by the horticulturist as "lice." These young arrange themselves in groups of various dimensions round the twigs of the food-plant, and, having settled matters satisfactorily as to space, insert their thread-like sucking tube (mouth) into the plant tissues, and pump up the sap of the tree. At the same time they commence covering their bodies with the peculiar "lac" which, by the time they are fully developed adult females, assumes the form and size shown in the illustration. (Fig. 93.) By taking a hot

Fig. 93.—Lac Insect (*Tachardia lacca*, Kerr).

Lac or covering material, actual size, on twigs of the food plant. The circular specimen shows the material in section, with large radiating chambers or cells once tenanted by the females, and hollow branch in centre.

knife a transverse section of the material may easily be made, when it will be seen that the covering material or "lac" is not a solid mass, but is honeycombed by large, somewhat ellipsoidal cells, each of which was once tenanted by a single female. It is not within the scope of this paper to consider the remarkable changes which take place during the life of the insects while they are building their castles of "lac"; but if we examine a female we find she is shaped somewhat like the cavity in which she lives, with the cephalic portion bearing the mouth parts touching the bark at the narrow end of the cavity, and the abdominal extremity at the opposite end having connection with the exterior by means of a minute perforation; and she is destitute of legs and antennæ, &c. Where she has lived she dies, leaving as a legacy the

wonderful product which she manufactured during life, and which all the world over is of so great importance in commerce. And this is not all; the bodies of the females also furnish an excellent dye, which in former times was of much value also.

The "cochineal insect" (*Coccus cacti*) is also a true coccid. Before the discovery of aniline dyes this species afforded us a most valuable dye product, which, although superseded to a very great extent, is still largely used for dyeing valuable fabrics such as silk, and it is, I believe, used exclusively as a crimson dye for colouring sweetmeats and confectionery. A species of *Kermes*, in shape remarkably resembling a large crimson holly berry, is also imported for the value of its dye, for which purpose it has been used from time immemorial. *Ericerus pe-la* is a coccid of some value to the Chinese. This insect, like many others (including British species) secretes a pure white wax, which in China is collected and made into candles for special use. In India similar use is made of a wax obtained from a species of Ceroplastes (*C. ceriferus*).

In Australia there is a remarkable family of gall-making coccids, which, strange to say, are peculiar to the various species of Eucalypti of that country. All galls are remarkable, but none could be more so than these, and the insects inhabiting them are among the largest of known coccids, some of them measuring over an inch in length. The sexes usually live apart, inhabiting separate leaves; but in a few instances the female gall often supports a number of males. The female galls are considerably larger than those of the males, and act as a sort of prison-house, from which they never escape. The male galls also remain intact until the insects are ready to escape, when a portion of the gall falls away, liberating the insects. Fertilisation is accomplished by the male inserting its long genetalia into a small opening in the gall which leads to the hidden female.

A very large proportion of the coccids possess the power of covering or protecting their bodies with a natural secretion, which assumes various forms in the different sub-families. We have already seen how this is accomplished in the "lac insect," and how the Australian Brachycelinæ protect theirs by making galls on their food-plants. When we come to consider the British species we shall find that the secreted coverings which many of the insects make form a very important item in their economy, and it may be well for practical purposes to consider them under different headings, according to the nature or absence of secretionary matter. Such a division as I propose is by no means scientific in its arrangement, but it may materially help the horticulturist in obtaining a clearer idea as to what he has to contend with in making applications of insecticides to these pests.

(1) Species protecting their bodies with a scale or shield completely covering the insect beneath. This may be hard and horny, tough and leathery, or thin and transparent. The adult females are without legs and antennæ, and include *Mytilaspis pomorum*, *Diaspis rosæ*, &c.

(2) Species in which the females are naked in all stages. The pupæ of the males are covered with a glassy scale, but these are in most cases exceedingly rare, and do not materially concern us. The Peach Scale

(*Lecanium persicæ*) and the Currant Cushion Scale (*Pulvinaria ribesiæ*) may be taken as examples.

(3) Species covering their bodies with a white mealy substance. This includes the "mealy bugs" (*Dactylopius*), which finally envelop themselves in a loose cottony material.

(4) Species completely enveloping their bodies in a cottony or felted material forming a complete sac. Typical examples are the Beech Coccus (*Cryptococcus fagi*) and the Ash Coccus (*Apterococcus fraxini*).

(5) Species covering their bodies with plates of white wax (*Orthesia insignis*, &c.).

DIVISION I.

Species protecting their bodies with a scale or shield, which com-

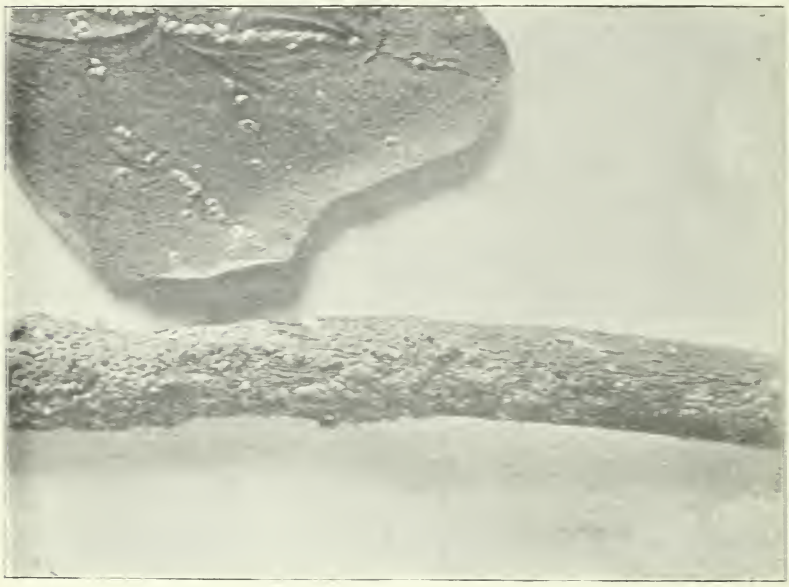


Fig. 94.—Small Straw-coloured Camellia or Fig Scale (*Aspidiotus camelliæ*) on leaf and branch of Fig (nat. size).

pletely covers the sublying insect. The females of this division are shaped more or less like a flattened peg-top, and are without legs or horns, and the eyes are often not traceable. (See Fig. 99. D.) There is also no division between the head, thorax, and body, the articulation of these parts being scarcely visible.

Small Straw-coloured Camellia or Fig Scale (*Aspidiotus camelliæ*, Boisduval). (Fig. 94.)

The scale or covering is shaped somewhat like a limpet, with the pointed portion a little to one side, and sometimes it is slightly turned over. The colour is dull yellow, ochreous, or straw-coloured. On removing the scale from the plant a white circular patch of secretion is

almost invariably left behind upon the plant. This character is common to many coccids, but it is so marked in this species that it may serve to identify the insect.

The female, like so many others of this family, is bright yellow, and when the ova mature they show as darker spots through the transparent integument.

Although this species has been under careful observation for many years, the male sex has never been discovered. The absence of males among coccids is a quite common occurrence, and there seems no difficulty on the part of the females to reproduce their species without the intervention of the male.

This insect only occurs under glass in this country, but lives in

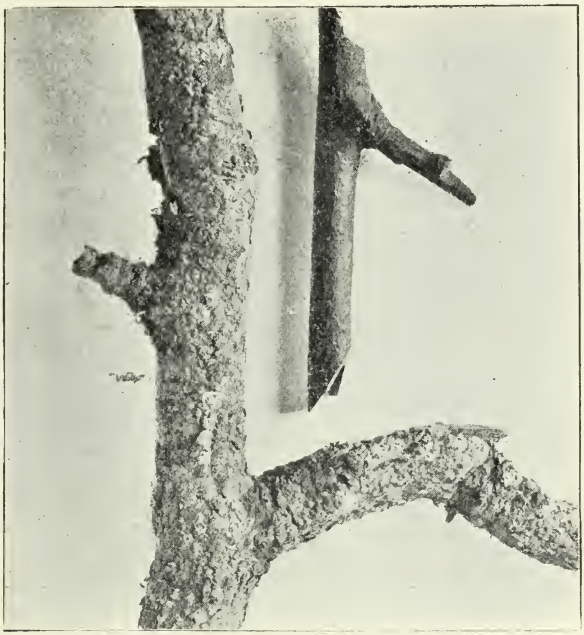


Fig. 95.—Oyster-shell Bark Louse or Scale (*Aspidiotus ostreæformis*) on Plum branch (nat. size). The small branch to the right is from a healthy tree, and is free from scale.

the open air in the south of Europe. I have also received it from North Africa, and it is met with in many other parts of the world. It increases most rapidly in a "stove," being less productive in cooler houses.

It is especially attached to the Camellia and Fig, but occurs on a number of other plants, including *Asparagus plumosus*, Myrtle, Euonymus, Begonia, &c.

Oyster-shell Bark Louse or Scale

(*Aspidiotus ostreæformis*, Curtis=*A. betulæ*, Barensprung). (Fig. 95.)

This insect takes its name from the scale covering, assuming somewhat the form of a miniature oyster shell, which character is most

noticeable on the under side. But so many insects belonging to this division bear the same resemblance that the name might, with all appropriateness, be applied to any of them. The covering scale of this species is much flatter than that of the preceding, and is almost circular. It is of a smooth texture, with a dark, almost black, centre, and a broad greyish margin. It is, however, given to much variation in colour, and sometimes the scale is almost covered beneath the epidermal layer of the plant. This latter character is particularly noticeable when the insect infests the branches of Peach trees.

The adult female is very short, ovate, and of a yellow or ochreous-yellow colour.

The males appear at the end of April and the beginning of May. They are of a bright yellow colour with a black band stretching across the thorax from the base of the wings.

Peaches, Nectarines, Plums, Apples, and Pears are usually attacked, but the species is also found upon the Currant and the common Heath. It does not, however, appear generally common, but, like other coccids, is usually very abundant where it occurs. The illustration (fig. 95) is from a photograph of a Plum branch, which, it will be seen, is completely covered with the "scale," forming an almost continuous scurfy layer. The specimen was cut from a wall-tree, which was so badly infested it was deemed advisable to burn it. As the species increases but slowly, I have little hesitation in saying it must have occupied the tree unmolested for many years.

Aspidiotus zonatus, L., which infests the Oak in this country and throughout Europe, is so very closely allied to *A. ostreæformis* that it is only by the highest power of the microscope the separation is possible, the salient characters lying chiefly in the number of knobbed hairs on the antennæ of the males.

British Aspidiotus

(*Aspidiotus britannicus*, Newstead).

This is a comparatively new insect, being for the first time described in 1896. It was first found by Mr. R. McLachlan, at Teddington, near London, where it had completely infested a holly fence. The leaves submitted to me were almost covered with scale. The insect seems partial to the leaves, but it also infests the wood, and in many instances had attacked the berries.

The colour of the covering scale is reddish-yellow in the younger examples, but the old specimens lose their bright tints and become more or less smoky brown.

The female is of a translucent yellow, and has the segmentation of the abdomen rather distinct, which latter character can only be seen under a good lens or a microscope.

When first described I thought the species might possibly prove peculiar to the British Isles, hence its specific name; but no such luck. And, I now learn from Prof. Cockerell, it has been recently discovered in the United States of America. Since receiving it from Teddington I have also received it from Mr. Nicholson, Curator of the Royal Gardens

Kew, where it was found infesting both Holly and *Ruscus hypoglossum*. It appears not to be confined to the Holly, and should therefore be regarded with suspicion, and not be allowed to establish itself on fruit trees. Coccids so often prove omnivorous, or nearly so, that it is advisable at all times to guard against possible attacks.

White Oleander Scale

(*Aspidiotus hedere*, Vallot=*A. nerii*, Bouché).

From its frequent occurrence upon the Oleander this insect has received the above appellation, and it was also scientifically named after that plant by Bouché. But it is a very general feeder; indeed, it may

Fig. 96.—San Jose Scale

(*Aspidiotus perniciosus*) on Peach branches (nat. size).

justly be said to be omnivorous. This habit and the varying character of the covering scale in a great measure created for it a list of synonyms. In his recent work on all the known species of the genus Dr. Gustavo Leonardi gives a list of twenty-six distinct names! Only those who have worked at the synonymy of plants and animals know what such a task means, and we welcome Dr. Leonardi's great work.

In the young adults the covering scale is pure white, but old scales generally become dull straw-coloured. The bright yellow spot usually seen towards the centre is the cast skin of the larva, which, although at first covered by secretion, eventually becomes exposed.

The female eggs and larvæ of this species are also of a yellow colour, while the pretty little male is yellow, thickly spotted and mottled with purple or red-brown spots.

In its distribution it occurs in almost every part of the world. In England it is only known as a stove and greenhouse pest, but in Southern Europe it is commonly met with outdoors, and is generally looked upon as a pest wherever it occurs.

In this country it infests Oleander, Palm, Agave, Erica, Passiflora, Dracæna, Azalea, &c.

Several other species of Aspidioti occur in the British Isles, but they are much more sparingly met with, and without entering into microscopical details it would be impossible to differentiate their specific characters from those already given. I may add for your interest that the very destructive "San José Scale" (*Aspidiotus perniciosus*, Comstock) (fig. 96), of which we heard so much in the years 1898–9, is closely allied, and bears a close superficial resemblance, to *A. ostreæformis*, as will be seen from the illustration. But it has not so far made its appearance in this country.

Pine-apple Scale

(*Diaspis bromeliæ*, Kerner).

The covering scale of this species is scarcely distinguishable from that of the common white "Rose Scale." It is, however, generally more or less circular, thin, almost flat, and pure white. Like other diaspids it has the power of burrowing beneath the epidermal layer of the plants, and when this happens the scale becomes almost hidden beneath the characteristic covering of the Pine-apple leaves.

The colour of the female varies from pale to bright yellow. That of the male is bright orange or orange-yellow, with the eyes and ocelli black.

Curtis first called attention to this insect in the *Gardeners' Chronicle* for 1841, and says he found it in considerable numbers. I have only once received it from cultivated Pine-apples in this country, but have repeatedly seen it on imported fruit, and have succeeded in rearing the pretty little males from such consignments.

This species has the habit of fixing itself near the base of the leaf-stalk, where it is difficult to get at without slight injury to the plant. When plants become badly infested the insects occur on all parts of them; even the fruit does not escape.

It is said to be generally common in other parts of Europe where the Pine-apple (*Ananassa sativa*) is cultivated. It has also been met with in the United States, and it probably occurs over a much wider area, as, owing to our speedy means of importing plants and fruits, such insects find their way into many new abodes.

Boisduval's Scale

(*Diaspis Boisduvalii*, Signoret). (Fig. 97.)

Without entering into very lengthy microscopic detail it is well-nigh impossible from superficial characters to determine this species from any other scale-bearing coccid. But some of my readers may recognise this greenhouse pest from the photograph. (Fig. 97.) The scale of the female is approximately circular, except when overcrowding takes place;

it is almost flat and semi-transparent, revealing the sublying insect and eggs, giving it a yellowish tinge and a waxy texture. The old scales become more opaque, are pale ochreous or straw-coloured, and have a much rougher texture. To the unaided eye the living examples appear like minute scales of yellow wax.

The male scale is very much smaller than the covering scale of the female, is pure white, very elongate, narrow, has three strong ridges arranged longitudinally, and is accompanied by a varying quantity of loose woolly filaments. Minus the latter character it is quite inseparable from many other species and genera (fig. 99, C, shows a typical male

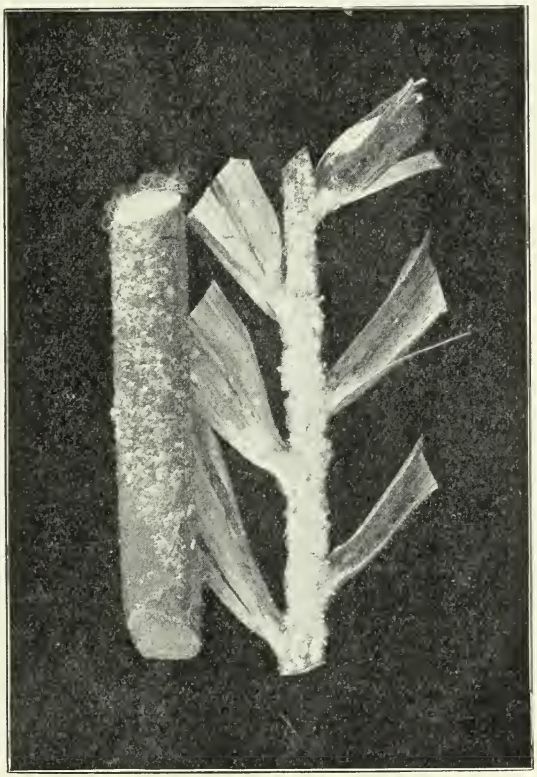


Fig. 97.—Boisduval's Scale
(*Diaspis Boisduvalii*) on portions of Palm leaf (nat. size).

scale of this genus). One interesting characteristic of this species is that the male scales arrange themselves in small groups or colonies; a very marked habit where the insects are not over-numerous; but when overcrowding takes place the somewhat isolated colonies unite and form a mass, often completely covering portions of the food-plant, which is clearly illustrated in the photograph. (Fig. 97, B.) Where such enormous colonies exist there is such an excess of woolly filaments as to almost obscure the form of the scale. The separation of the sexes is sometimes shown to a remarkable degree, although the distance is not usually very great. Thus on Palms the male scales are usually con-

gregated at the base on the under side of the leaves and the upper portions of the midrib, while the females scatter themselves over the more exposed parts of the leaves and the basal portion of the leaf-stalks. The specimens shown in the illustrations were taken from the same Palm leaf showing at fig. 97, A, the basal portion of the leaf with the females, and at B part of the upper portion of the same leaf with the hordes of male scales.

The pretty little bright orange-red male may often be seen struggling out of its woolly covering, which, to my mind, certainly does not facilitate but retards its escape. They enjoy a bright hot summer day, and often occur in considerable numbers at such times. But to the naked eye they appear only as minute orange-coloured specks.

This is certainly one of the commonest of our greenhouse pests, thriving best in heat. It is partial to monocotyledons, especially to young pot Palms, and is frequently troublesome to Calanthes and other Orchids.

It occurs in almost every part of the world on cultivated plants, and is found in the open air in the West Indies, Sandwich Islands, and elsewhere.

Small Scurfy Juniper Scale

(*Diaspis carueli*, Targioni-Tozzetti=*D. juniperi*, Bouché).

As a British insect this species has only recently been discovered. It is possible it may be indigenous to this country; but it is highly probable it has been introduced from other parts of Europe, where in the southern portions it is a very common insect, and Professor Comstock has found it in the United States.

My examples were forwarded to me from the London district, on branches of Juniper (*J. virginiana*), cut from a home-raised plant. Every branch and leaf were crowded with the scales, which gave the branches quite a scurfy appearance, and, judging from their numbers, must have weakened the constitution of the plant.

In form the covering scale of the female may be generally described as more or less irregular ovate, very thin, dirty white, and readily falls from the plant. Quantities of them placed together on a dark background exactly resemble scurf. The female is very minute, and of a greenish-yellow colour.

I am not in a position to state which of the insecticides would be best for application to this insect; very probably No. 1 would have the desired effect, and whatever is used can only satisfactorily be applied in the form of a spray. Seeing the extreme readiness with which the scales fall from the food-plant, one might very well remove large numbers with a brush. Such work, however, could only be carried out on plants which had not attained any great size.

Scurfy Rose Scale

(*Diaspis* [*Aulacaspis*] *rosæ*, Sandberg). (Fig. 98.)

This is an indigenous species, occurring freely on various Wild Roses in hedgerows and sheltered places in many parts of England. It is a

common pest on cultivated Roses, and for this reason is one of the best known coccids in the British Isles.

The covering scale of the female is pure white, and comparatively thick, the larval moult appearing towards the margin as a yellow speck. The male scale is also white, occurs as freely as those of the opposite sex, and resembles that shown of the next species. (Fig. 99, C.)

The adult female is deep orange-red, and in shape remarkably resembles certain Trilobites of the older geological deposits, and is the largest of all the British Diaspinæ.

Fig. 98.—Scurfy Rose Scale (*Diaspis rosæ*) on stem of Wild Rose (nat. size).

The male pupa, larva, and ova are of a similar colour to the female, varying only in the intensity of the orange-red or orange-crimson.

The habit of this species is to thoroughly infest the main stems of the Wild Rose (briars), only ascending to the smaller branches when overcrowding compels them. Under glass and in warmer countries they will take greater strides and also infest the leaves, which not infrequently proves fatal to them, as when the leaves fall they are naturally cut away from their food supply. It is owing to the persistent habit of infesting briars that these insects are brought into our nurseries; and although they may not at first be numerous, they will in time cover the "standard," much to the detriment of the plant.

The little bright males are usually very abundant in May and early June, but, like other male coccids, are very short-lived. In August the females lay their eggs, and later the young larvæ may be found swarming over the standards, giving them much the appearance of being attacked by a host of dull crimson micro-fungi.

This is probably a European insect, but it occurs in every country where the Rose is cultivated, and is often very destructive in sub-tropical countries.

Seeing that it confines itself chiefly to the "standards," the treatment for removing the pest is comparatively simple. A weak solution of No. 1 or the full strength of No. 4 should easily remove the insects. For my own part, I prefer to remove the scale with a brush, and afterwards apply a little soap and water. The early part of March is perhaps the best time to carry out the work.

Japanese Fruit Scale

(*Diaspis* [*Aulacaspis*] *amygdali*, Tryon). (Figs. 99, 100.)

This is the newest of all introduced coccids, and as such was fully described in the *Gardeners' Chronicle* for October 1, 1898. As no further information has come to hand concerning the various batches of infested Japanese Cherries which were known to be in the hands of several horticulturists, it is hoped the advice then offered was the means of a speedy extermination of the pest. I have therefore nothing further to add to my original remarks; and, as this paper is intended to deal with our injurious coccids in a collective form, I must ask your indulgence to be allowed to quote my paper *in extenso*. It may be well to state at the commencement that this pest is quite distinct from the San José Scale insect (*Aspidiotus perniciosus*, Comstock, fig. 96) of the American fruit-growers, which up to the present moment has engaged the attention of the whole fruit-growing industry of the world. But it belongs to the same destructive family of scale insects (Coccidæ), and being of Western Asiatic origin, inhabiting a region with a climate somewhat resembling our own, gives us far greater cause for alarm than did its sub-tropical relative, the San José Scale. We therefore beg to lay before the British public an account of its introduction into this country, together with a description of the insect, of its general distribution in other parts of the world, and of its destructive character, in the hopes that by such means we may not only assist the fruit-growers in identifying the insect, but gain by their united efforts in the speedy destruction of this newly introduced pest.

History of Introduction.

In January of the present year a consignment of several hundred Japanese Cherries (*Prunus pseudo-cerasus*) was imported into this country from Japan, which ultimately fell into many hands, and were disseminated over the British Isles without any knowledge that they were badly infested with scale. In the following April two of the plants from the consignment were submitted to the writer for the purpose of identifying the insects upon them, which proved to be the destructive scale insect

Diaspis amygdali of Tryon. On inquiry it was found that the greater number of the plants of this particular batch (100) had been planted outdoors since the time of their arrival; and, as the examination proved, the insects were not in any way affected by their change of climate, but appeared in a perfectly healthy condition. Information was at once forwarded to the correspondent as to the serious nature of the pest, with a request that the plants be at once destroyed. This, however, was not carried out; but measures were taken to destroy the insects by dipping the whole 100 plants in a hot paraffin emulsion, in the hope the insects would not survive such drastic treatment.

And so the matter rested until June 3, when the correspondent again informed the writer that a recent examination of the plants had been made, when it was found that the insects were still living, and it was thought another application of the insecticide would have completely destroyed them; but instead of temporising the plants were all burnt.

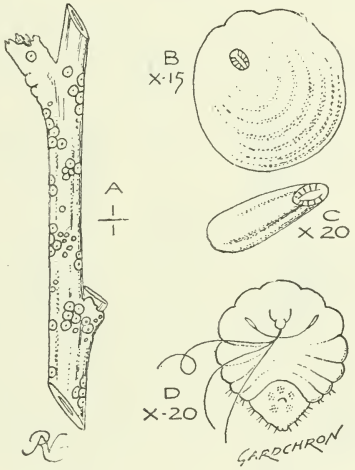


Fig. 99.—Japanese Fruit Scale

(*Diaspis amygdali*): A, Insects (nat. size). B, Scale of the female × 15. C, Scale of the male × 20. D, Adult female removed from under scale shown at B. (*Gardeners' Chronicle.*)

This was much the wiser plan, as we have the satisfaction of knowing that the insects on this particular batch of plants are completely destroyed, and this, too, before the young ones (larvæ) had time to hatch and migrate to other plants. Into whose hands the remaining plants have fallen has yet to be discovered, and we earnestly appeal to all those who purchased Japanese Cherries from the same consignment to at once communicate with us, at the same time sending examples of the insect for identification.

But numbers of foreign nurserymen import Japanese Cherries, &c., and, in order to prevent a repetition of this, the most stringent measures should be taken to prevent any further importations of infested plants into this country, which can only be done by an inspection of them on arrival, and before they have been dispersed throughout the country.

Description of the Insect.

To the unaided eye the scale or covering shield of the female (*puparium*) is more or less circular, and closely resembles the common Rose Scale (*D. rosæ*), but is of a dusky white, the old examples being smoky grey or ochreous, and harmonising with the colour of the bark. They are of the size of an ordinary pin's head, and measure from 1 to 2 mm. (Fig. 99, A, B.) Beneath this scale the wingless, legless, inert, fixed body of the female undergoes its transformations, lays its eggs, and dies. For the purpose of identification it will be necessary briefly to describe the salient characters of the female (fig. 99, D), which alone affords us the means by which we can separate it from the numerous allied species belonging to the same sub-family. It is necessary first of all to boil the insect in caustic potash, stain, and ultimately

Fig. 100.—Japanese Fruit Scale (*Diaspis amygdali*), Pygidium of the female × 250. (*Gardeners' Chronicle.*)

mount in Canada balsam, when we shall find the margin of the tail (*pygidium*, fig. 100), which is composed of several segments, to be curiously fringed with spines and lobe-shaped organs. In the central position above is the anal orifice, and a number of cylindrical tubes connected with the derm, and it is through these latter that the scale covering or shield is secreted. On the ventral surface is the vaginal opening, and surrounding it are five groups of circular spinnerets. As none but the expert student can discern the minute structural differences between species and species, it is useless here entering further into detail concerning them.

The covering scale of the male (fig. 99, C) is pure white, narrowly elongate, and much smaller than that of the female. Within this covering, which somewhat resembles the finger of a glove, the insect

undergoes its transformations, appearing in due season as a very tiny two-winged fly having an orange-coloured body.

Distribution.

It was originally discovered by Professor Tryon in Australia on the Peach. Mr. Green records it from Fiji, and says that in Ceylon it feeds on many species of plants, but that it is partial to the Pelargonium. Professor Cockerell found it injurious to a large number of plants in Jamaica, including the Grape and Peach. The same author also received it from Trinidad. It was in 1892 that it first attracted attention in the United States, where it is a serious pest to the Plum and the Peach. It was also found there on a dwarf flowering Almond and fifty Tea bushes imported from Japan; the latter were destroyed (*vide* "Psyche," March 1898, pp. 190, 191). Professor C. Sasaki, of the Agricultural College, Tokyo, describes it (under another name) as a pest to the Mulberry-trees in Japan. Seeing that the insect was originally discovered in Australia, it might be suspected to be indigenous to that country; but I agree with Dr. L. O. Howard and the late Dr. C. V. Riley ("Insect Life," vol. vi., pp. 287–295) that Japan is very probably the original home of the species, as we have now three authentic instances of its occurrence on freshly imported plants from that country.

Remedies.

As the examples found in this country withstood the severe treatment of hot paraffin emulsion, and as we are informed by the United States entomologists that it will survive anything but pure kerosene, our wisest course by far is to burn the infested plants. Undoubtedly the insect must be regarded as a dangerous species, which, if once established, would be difficult to eradicate, owing to the diversity of food-plants and its decidedly hardy nature. (*Gardeners' Chronicle*, Oct. 1, 1899, p. 245, 246.)

Croton Scale

(*Parlatoria pergandii*, var. *crotonis*, Cockerell).

The covering scales of the females of this genus are generally recognised from all others of the sub-family by the great size of the moulted skin of the second-stage insect, which usually occupies a considerable portion of the scale, a character strongly developed in the black *P. zizyphi*, which is so commonly met with on imported Oranges. The Croton Scale cannot be considered generally distributed in this country as a greenhouse pest, although I know it to be exceedingly troublesome in several localities.

In form the covering scale is somewhat ovate. At first it is of a yellowish colour and a somewhat waxy texture; but as it matures this colour generally disappears, and the scale presents a drier bran-like appearance. The under side of the scale is somewhat trough-shaped, one end of which is occupied by the female, and the remaining portion by the purple-coloured eggs, the latter being carefully placed transversely and arranged in two parallel rows.

I have only met with Mr. Cockerell's variety on our cultivated plants, but the type is common with us on imported Oranges.

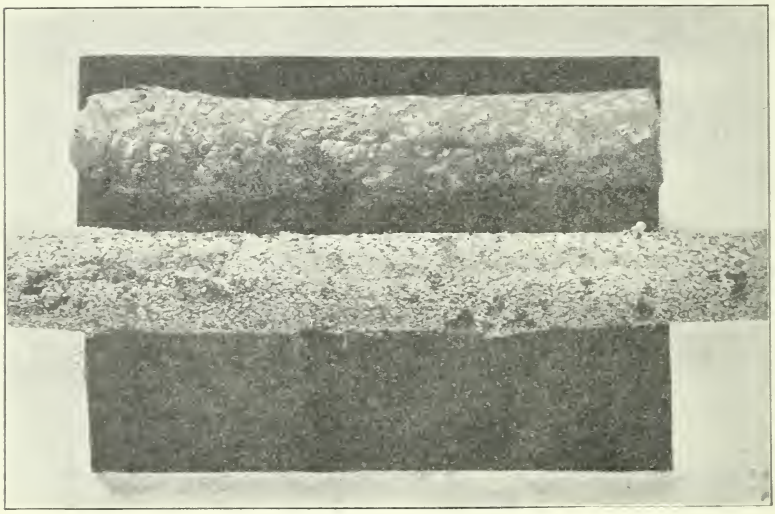
So early as 1843 Curtis called attention to *Parlatoria proteus*, which he then described for the first time. He says the insect was abundant on Aloes and Amaryllis, but I find it chiefly attached to Orchids. It differs from its Croton relative by its greater transparency, and certain important structural details.

Ash and Willow Scale

(*Chionaspis salicis*, Linnæus = *Ch. fraxini*, Signoret). (Fig. 101.)

Of the three British species of Chionaspis, *C. salicis* is the only indigenous one. It is a very abundant insect, occurring in every county yet investigated; and although commonly met with on the Willow and

A



B

Fig. 101.—Ash and Willow Scale (*Chionaspis salicis*) on branches of Ash (nat. size).

Ash, is found also on various other hard-wooded plants, such as Alder, Privet, Lilac, and many others. Willow or Osier beds are favourite resorts, and when such plants are attacked the twigs become "spolt" or brittle, and less valuable for basket-making.

The covering scale of the female is white or greyish, and pear-shaped in outline. (Fig. 101, A.) At the narrow end of the scale the pale yellow moulted larval skin is generally conspicuous, although of minute size. The female is of a dark crimson colour, and when crushed gives a blood-like stain to the bark. The eggs are also of the same colour, and when crushed produce the same effect.

The male scale is very much smaller than that of the female (as is always the case) and strongly ridged as in other genera. These often occur in such vast numbers as to completely cover the branches and the

more sombre-coloured scales of their partners. An example of this kind is shown in the photograph. (Fig. 101, B.) The males are bright orange-crimson, with long sabre-like genitalia. But the most interesting feature is that they occur in two forms, winged and apterous—a character which is unique among British coccids, and rarely met with in other countries.

The eggs are laid about August, but do not hatch till the following spring. In June or early July the perfect males appear, and die shortly afterwards; while the females live on until after laying their eggs, when, like other allied insects, they die, leaving their old desiccated bodies at the extremity of the little covering scale. This is a very hardy species of Palæarctic distribution, occurring as far as 63° north latitude.

Brown Fern Chionaspis

(*Chionaspis aspidistræ*, Signoret).

This species is generally met with in this country on Ferns, but it is by no means exclusively confined to such plants. It was first discovered by Signoret on Aspidistra, and it has been met with at Kew on Palms and *Heliconia metallica*.

The covering scale of the female is red-brown, and is much more mussel-shaped than the other British species, and superficially bears a strong resemblance to Mytilaspis. But the form of the male scale at once distinguishes it from that genus, it being a white felted structure, as described elsewhere (see fig. 99, C, of *Diaspis amygdali*).

It is probably a sub-tropical insect, as it occurs with us only in warm houses. Among other places it has been recorded from Ceylon and New Zealand.

As a novelty we have also *Chionaspis biclavis*, Comstock, a species remarkable for its burrowing properties, which are so strongly developed that it can completely bury itself beneath the epidermis of its food-plant, presenting minute swellings as the only indication of its presence. It is a rare species with us, and so far has not occurred in sufficient numbers to include it among the strictly injurious species.

Palm and Camellia Fiorinia Scale

(*Fiorinia fioriniæ*, Targioni-Tozzetti).

The covering scale of this species is elongate, with straight or slightly curved sides, and there is usually a strong ridge or keel running down its centre. It is usually of an orange-brown colour, and when very old presents a somewhat mealy appearance. Curiously, the covering scale is composed almost entirely of the moulted skin of the second-stage female, in which the adult insect lives and brings forth its young. With us it occurs chiefly upon Palms, and is often very injurious to seedling plants, causing the leaves to turn yellow and sickly. In other countries it has also been found on the Camellia, but I do not think it is likely to infest it in this country, as Camellias are grown in too cool an atmosphere for its welfare.

It is a difficult species to keep in check, and "dipping," as described in my instructions, has given the most satisfactory results. Where small

quantities of plants are grown, "sponging" would be a most effectual means of dealing with the pest.

I have recently received a new and undescribed species from the "Temperate House" in the Royal Gardens, Kew, for which I propose the specific name *kewensis*. It was infesting a species of Howea, and was very abundant. Superficially the covering scale resembles a white Chionaspis.

Common Mussel Scale

(*Mytilaspis pomorum*, Bouché). (Fig. 102.)

One of the best known of British coccid pests, occurring almost everywhere on Apple, Pear, Hawthorn, Cotoneaster, and a variety of other plants.

The covering scale is shaped like a mussel shell, and varies from a light red to a dark brown colour, with the yellowish larval skin

Fig. 102.—Mytilaspis pomorum ♂ (magnified).

attached to the narrow or anterior extremity. Under this covering the white or almost colourless female may be found fully developed towards the end of August. About that time and during September twenty-five to forty white eggs are laid, which remain within the scale until the following May (last week) and early in June. At this time the active little white larvæ ("lice") may be found disporting themselves over the tree trunks and branches. About six weeks later the perfect male appears, and thus the cycle is completed. The male, however, has proved so exceedingly rare that, until its discovery in England by the writer three years ago, it had remained unknown for 150 years. It is true the late Prof. Riley figured and described what he supposed was the male of this species, but his accurate description of the sex leaves no doubt in my own mind that he had the male of some other Diaspid before him. Dr. Gustavo Leonardi, of the Royal School of Agriculture, Portici, Italy, has also succeeded in rearing it. Not the least remarkable fact concerning its discovery is

that the examples were found upon Broom (*Cytisus*). I have never seen a trace of the sex on the Apple or other plants upon which it commonly feeds, which is truly remarkable, as its existence could easily be detected by the presence of its characteristic "scale," which is much smaller and narrower than that of the female, and is hinged towards the centre. The male is a tiny pale mauve-coloured creature, measuring about $\frac{1}{25}$ of an inch in length. I have given a magnified illustration of the male (fig. 102), which will give an idea of the general character of the insect as seen under the low power of the microscope.

Two facts in the economy of the insect are of importance from a practical point of view:—

(1) That in autumn and winter the female covering scales contain only the living eggs. The female lies with them at the narrow end of the scale, but is dead.

(2) That towards the end of May and the beginning of June the young larvæ hatch, and are then active and *unprotected*.

For winter application I should advise the emulsion No. 1, p. 258, which should be thoroughly brushed into the scale, bearing in mind the *eggs* have to be destroyed, and not the covering scales.

Decidedly the most effectual plan of dealing with this pest is to apply a dressing when the young have just hatched, for while their bodies are naked and unprotected they can be much more readily destroyed. The soap emulsion, if well applied, will be found thoroughly efficient and the safest remedy for the time of the year. The fact is, one can do without an insecticide altogether if the insects are located on the stems and main branches, as it is only necessary to give the affected parts a good brushing with a stiff brush to effectually destroy them. I suggested this plan to a friend who is an ardent fruit-grower, but instead of using a brush he rubbed the trunks of his young trees with the palm of his hand, and he assures me he is highly satisfied with the result.

It is obvious to a practical man that such a measure could not be adopted where the pest has ascended to the smaller branches, as is only too frequently the case on wall-trained trees; but young standard trees are *at first* almost invariably attacked about the stem and main branches; and it is for such trees I would advise the "brushing" process. I have heard that the Germans adopt similar methods of cleaning trees, and if so my treatment is not altogether a novelty.

Mytilaspis ficus infests the Fig, and has been met with abundantly in the London district. But it is so precisely like the preceding species that it can only be separated by the examination of the pygidium of the female under a high power of the microscope, when the arrangement of certain hairs and lobes gives the specific characters.

The Black Thread Scale

(*Ischnaspis filiformis*, Douglas).

In the early days of its discovery, when Mr. Douglas first described this insect, it was looked upon as comparatively rare. Now it is found in many parts of England as a plant pest. On the West Coast of Africa

it is destructive to cultivated coffee. It is also common in the West Indies, and probably occurs in many other parts of the world.

The covering scale, which Mr. Douglas aptly describes as "looking like little bits of black silk thread accidentally attached," is from $\frac{2}{16}$—$\frac{5}{16}$th of an inch long, and unlike any other known coccid. It is of an exceedingly hard texture, and, like horn or chitine, does not dissolve when treated in boiling potash. This character largely accounts for the difficulty experienced in keeping the insect in check. The surest remedy I have found is frequent "sponging" with "Gishurst's" or soft soap. In this country Palms are its special food-plants, but it occasionally attacks other plants.

Pit-making Oak Coccid

(*Asterodiaspis quercicola*, Bouché). (Fig. 103.)

My naturalist friends will tell me I have no right to class this insect

Fig. 103.—Pit-making Oak Coccid (*Asterodiaspis quercicola*) on Oak branches (nat. size).

with the Diaspinæ, but we are not strictly adhering to scientific principles, and only place this insect in this roughly arranged division in order to avoid confusion.

The adult females of this curious little insect are completely *enclosed* in a glassy test or covering, which is more or less transparent, or at least so much so as to admit the colour of its contents to show through. In the immature state it is pale yellowish-green, with a beautiful arrangement of glassy filaments all round the margin of the body; but this character entirely disappears in the old examples, and they are usually particoloured grey and brown, the line of demarcation being almost central. The species is easily recognised by the curious little circular pit or depression which it makes for itself on the terminal branches of the Oak.

and besides the pit there is also a considerable swelling of the surrounding tissues. Tits (Paridæ) are particularly fond of these insects, so much so that in winter one finds more untenanted "pits" than insects. This is clearly shown in the photographic reproductions of the oak twigs, upon which the insects and characteristic depressions are clearly traceable. (Fig. 103.)

I do not think the insect ever occurs in sufficient numbers to cause serious injury to the tree; but the malformations of the branches are often so numerous that they cause attraction, and foresters and even botanists may have wondered how the swellings were brought about. I trust, therefore, these few brief remarks may be a help towards the identification of the attack.

DIVISION II.

In this section are included the coccids or "scales" which are naked in all stages. Certain of them (*Pulvinaria*) secrete an enormous cushion of wax, but this is all placed beneath and behind the insect; nothing is placed over the body, as we have seen in the preceding species.

Brown Peach Scale

(*Lecanium persicæ*, Fab.).

I have unfortunately not been able to procure a satisfactory photograph of this common species, but it is a well-known insect, and is often a serious pest to Peaches and Nectarines under glass. In the open air it is much less prolific, and I have never known it to be injurious to the trees.

The young insects, like all other coccid larvæ, are very active for a few days, but they rapidly settle down and apparently pass the winter in an almost dormant and unchanged condition, appearing as minute brown specks on the branches, very much resembling the similar-coloured stomata characteristic of the plant. Growth takes place jointly with the tree, and by the end of May they have attained their full size. In the early stages of the young adults they are usually of a greenish-yellow, or even ochreous colour, with blackish transverse streaks, seen under a lens to be made up of a number of confluent spots. Shortly after this stage egg-laying commences; and as this takes place the interior of the body gradually shrivels, until eventually, when it has emptied itself of its eggs, it somewhat resembles an inverted boat without a keel with from 2,000 to 3,000 eggs in it. About the month of August the young escape from the egg, and make their way out from beneath the dead, dry, hard, reddish-brown body of their parent, which if not disturbed will remain for several months before finally falling away from the branch. Indeed they will sometimes remain for years if in a sheltered position. The male is unknown, and its discovery would be of much interest.

Two things should be remembered in connection with its life-history:—

(1) To bear in mind the minute size of the young larvæ, as it is these little wretches we have to contend with when applying remedies in the

winter months. The escape of one of these "mites" means an increase of from 2,000 to 3,000 larvæ in the following autumn. So that to be successful we must be careful to make the application very thorough.

(2) That when the scale (female) is brown and dry it affords shelter first to the eggs and subsequently to the young ones. At such periods it is dead and dry, and its removal tends only to scatter the eggs or prematurely the young ones.

Lime-wash is supposed to kill this insect, but it is only partial in its effect, and does not kill more than about 50 per cent. of the insects.

FIG. 104.—HAWTHORN AND APPLE SCALE

Lecanium genevense) on branch of Hawthorn partly destroyed by the insects (nat. size).

The [paraffin emulsion No. 1, p. 258, is more effectual and is much more pleasant to use. The caustic soda preparation (No. 7) during the last two or three years has met with much favour among horticulturists as a remedy for this pest, but its use causes much pain to the hands of the operator, and, moreover, gives little or no better results than the lime-wash. But whatever application is made, numbers of the insects escape, and it is always advisable to go over the trees in spring, and destroy any insects that may be found. Such work, however, should be carried out before egg-laying takes place, and before the insects have attained their brown colour and the hardened condition of the integument.

Hawthorn and Apple Lecanium

(*Lecanium genevense*, Targioni-Tozzetti). (Fig. 104.)

I have never met with this insect in sufficient numbers upon Apple to claim it as injurious to that plant. But its presence upon Hawthorn is very different. I have not infrequently found it in such vast colonies as to kill large patches of a Hawthorn hedgerow; and I am sure a glance at the photograph (fig. 104) will confirm my statement.

The number of eggs laid by a single female average between 2,000 and 3,000. Fortunately it is single-brooded, like all other indigenous species, otherwise it would, if unmolested, very soon cause ruin to everything it attacked.

The eggs are laid about August; the young, escaping shortly afterwards, pass the winter without changing. In spring they rapidly develop, and in May have attained their full size. The females are then large gravid insects, of various shades of mahogany red, and often possess transverse whitish zebra-like markings. At this stage the bright red males make their appearance from their little glassy-white scales, which may be found fixed to the branches alongside the females. The vast difference between the form and size of the sexes in coccids is a very marked feature; but it cannot well be more so than in this species, in which the female is from fifty to one hundred times the size and weight of her partner. This species is much subject to the attacks of internal parasitic larvæ of small Hymenopterous insects allied to the bees and wasps. They escape as perfect flies by cutting small circular perforations in the derm of their host, of which there is some trace in the illustration.

Another remarkable coccid belonging to this genus is also found upon the Hawthorn, but it is rare, and has only been met with in a few isolated localities. This is the *Lecanium bituberculatum*, also described by Professor Targioni-Tozzetti. It can generally be recognised from the preceding species by the possession of two conspicuous tubercles arising from the back of the insect; and it may also be distinguished by the permanency of the coloured bands or markings so characteristic of the species. As an example of protective resemblance it is very fine, and generally difficult to detect.

The Rose harbours a brown scale (*Lecanium rosæ*) which is frequently injurious; but it is so closely allied to the *L. persicæ* of the Peach that I am at present unable to separate them without entering into very minute detail.

Brown Currant Scale

(*Lecanium coryli*, Linnæus=*L. ribis*, Fitch).

This species very closely resembles the Peach Scale, but is much smaller and of a paler colour, and feeds upon a greater variety of plants, which include the Currant, Gooseberry, Raspberry, and Cotoneaster, and it has also been found on certain conifers.

Like *L. persicæ*, the males are also unknown—a most remarkable fact, since the species has been more or less under observation from the

time of Linnæus down to the present day. It will be a triumph, therefore, when the first individual of that sex is discovered. It is also a single-brooded species, and its habits differ in no appreciable way from that of its near ally.

Lecanium hesperidium, Linn.

A much smaller species than either of the foregoing, and in this country is known chiefly as a greenhouse pest, infesting various plants, but is very partial to cultivated Roses under glass. It also occurs in the open air upon Ivy and Myrtle, but is a comparatively rare species on such plants. It is somewhat oval in form, rather shiny, and is of a dull

Fig. 105.—Cottony Cushion Scale of the Currant (*Pulvinaria ribesiæ*) on branch of Currant (nat. size).

yellowish colour, having a network pattern of dark chestnut or black confluent spots.

Flat Black Lecanium

(*Lecanium perforatum*, Newstead).

A very common coccid infesting Caryota and other Palms and various cultivated plants. It can easily be recognised from other species found in this country by its pitchy-black colour and its very flat pyriform shape. It is probably indigenous to sub-tropical countries, and is common in the West Indies. Its specific name is derived from certain curious transparent places in the skin which can be seen only under the microscope.

Cottony Cushion Scale of the Currant

(*Pulvinaria ribesiæ*, Signoret). (Fig. 105.)

All the adult members of this genus are recognised at a glance by the remarkable cushion or pad of white wax which the female secretes behind

and beneath her body. In their early stages the insects of this genus are not separable from Lecanium, as both larvæ and the immature females of the two genera are identical. But at the period of parturition the females of the genus Pulvinaria protect their eggs with an enormous quantity of secretion which may take the form of that in *P. ribesiæ* (fig. 105) or th long narrow form of *P. floccosa* (fig. 106).

In winter the young are very small, and externally are exactly like the young of the Brown Peach Scale. In May the females attain their full size, and begin to lay their eggs in the curiously shaped pad of white cottony material. When all the eggs are laid the female dies and

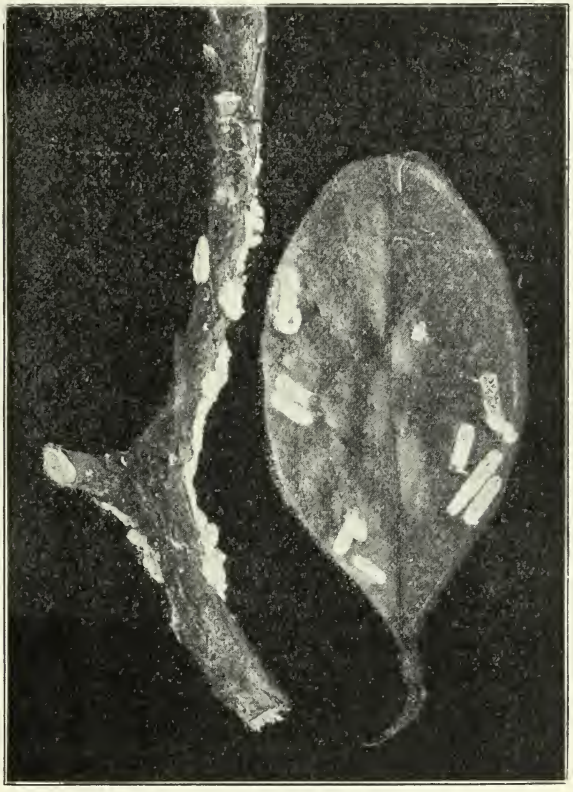


Fig. 106.—Camellia Coccus or Pulvinaria (*Pulvinaria floccosa*) on leaf and branch of Camellia (nat. size).

leaves her dark brown shrivelled body, tilted almost on end, at the anterior extremity of the pad or cushion (scientifically termed the *ovisac*). In August the young insects escape from their cottony home, and take up an independent existence on some other part of the plant.

I have only once met with the covering scale of the male, which exactly resembled those of the Lecania, but I have not been fortunate in rearing the perfect insect, which probably also bears a strong resemblance to the same genus.

The cottony pads or sacs often get ruptured by the wind, and particles are sometimes borne away, like collected patches of gossamer down, and

in this way the species may very probably be carried long distances to fresh localities, but its chances of accidentally stumbling against another Currant bush cannot be very great.

The Camellia Coccus or Pulvinaria

(*Pulvinaria floccosa*, Westwood). (Fig. 106.)

Common throughout the British Isles, living chiefly on the Camellia, but it also attacks Orchids and other tender plants. It is easily recognised by the extraordinary length of the egg sac, which is well shown in the photograph. (Fig. 106.) The females are of a pale yellowish colour, and in their early stages somewhat resemble the pale forms of *Lecanium hesperidium*. In cool conservatories very little trace is to be seen of the insects during winter, as they are then very minute; but as spring advances they rapidly attain their full size, and in summer are only too conspicuous by their white sacs on the branches and leaves of the food-plant.

Infested plants should receive a winter dressing of the soft soap emulsion or of Gishurst's compound, and in spring, immediately the white sacs appear, they should be sprayed or syringed with the same mixtures. Or, better still, if time can be given, the plants (Camellias) should be carefully brushed to remove and destroy the eggs before the young escape.

Cottony Cushion Scale of the Vine

(*Pulvinaria vitis*, Linnæus).

Superficially this insect is indistinguishable from the species infesting the Currant (see fig. 105). The illustration of the one admirably serves for the other.

As soon as the white pads begin to show, the insects should be brushed away, using a little methylated spirit with the brush. This method will naturally lessen their numbers. In winter the vines should be carefully "stripped" and painted with a soap emulsion or with Gishurst's compound.

Cottony Cushion Scale of the Peach

(*Pulvinaria persicæ*, Newstead).

I am inclined to think this will prove nothing more than a variety of the former. It has practically the same habits, and requires the same treatment as the Peach Scale (*P. persicæ*).

DIVISION III.

In this division are included the species which protect their bodies with a thin white mealy substance, of which the "mealy bugs" are excellent examples. Of these we have three species, viz. *Dactylopius*

citri, Boisduval; *D. longispina*, Targ.-Tozz; and *D. Walkeri*, Newstead. This latter is the only known indigenous species, and lives upon various grasses, but chiefly upon *Dactylus glomeratus*. The adult female is more elongate than our common greenhouse species, and has much thicker waxen appendages at the margin of the body. When full fed it descends to the base of the plants, where it makes long curling cottony egg-sacs, in which it completely envelops itself. A photograph of the sacs of this insect is shown at fig. 107. It may be interesting to add that this insect

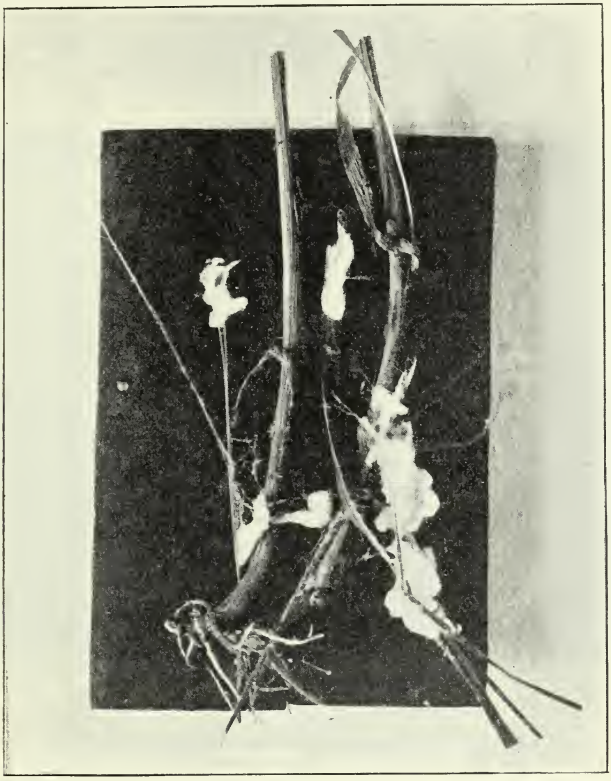


Fig. 107.—Walker's Mealy Bug
(*Dactylopius Walkeri*) on *Dactylus glomeratus* (nat. size).

is named after Mr. Alfred Ostend Walker, F.L.S., whose excellent collection of herbaceous plants is known to many horticulturists.

Common Mealy Bug

(*Dactylopius citri*, Boisduval = *D. destructor*, Comstock). (Fig. 108.)

Everywhere destructive, almost omnivorous, and of world-wide distribution. It may be recognised from its less common relative (*D. longispinus*) by the short white marginal appendages which fringe the body of the female, and by certain minute structural details which can only be seen by the aid of the microscope.

The female may be briefly described as short ovate, covered with a white mealy substance, and having at the margin a fringe of short white appendages which lengthen towards the posterior extremity. They are active until egg-laying takes place, when they secrete a quantity of loose cottony material to protect their eggs, and then die.

The male is very much smaller than the female, is of a dull reddish-brown colour, and is furnished with two long white filaments at the end of its body. The wings are of a beautiful dark iridescent blue, and when at rest overlap, and completely hide the abdomen. They are much more common than is generally supposed, but they are so unlike their partners there is no wonder they are frequently overlooked. If undisturbed they will remain in one position for a long time, which is rather

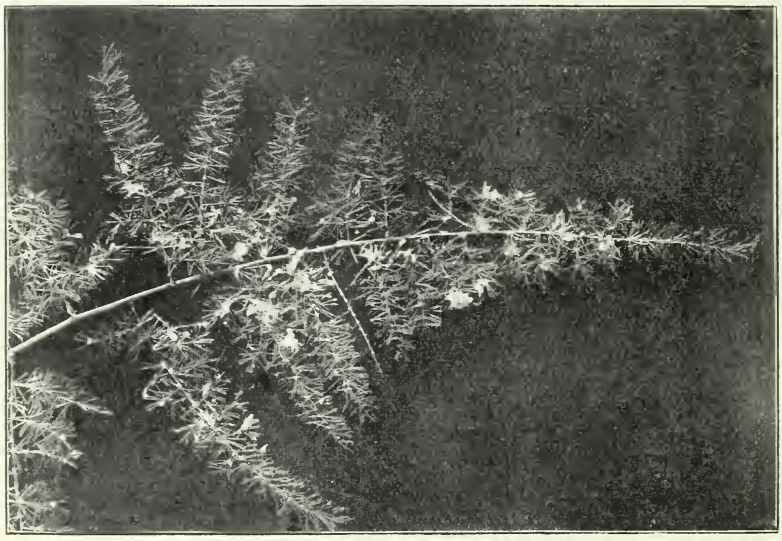


Fig. 108.—Common Mealy Bug (*Dactylopius citri*) on *Asparagus plumosus* (nat. size).

remarkable, as all male coccids with which I am acquainted appear always on the move when the day is well advanced and the sun hot.

The pupa undergoes its transformation within a small elongate white sac, which can easily be detected among the hordes of females.

Like other insects, they increase more rapidly in summer, when there is a succession of broods. In winter they are much less productive, but there is no season of the year when they are absolutely dormant. Again, they are much more productive in the stove or Cucumber house than in the conservatory, which points to a sub-tropical origin. But they are exceedingly hardy, and can even withstand exposure to severe frosts. In fact I have twice met with the species outdoors on an Ivy-clad wall of a Pine stove, where, I have no doubt, they were well sheltered.

I have often heard it said that the fumes of "XL All" will destroy "mealy bug," but I have found it of little avail against these pests. Soap or alkali solutions are the best remedies. And, when the nature of the

plants will admit, the paraffin emulsion gives excellent results. When the fruit of the vine becomes infested, the "bugs" should be removed with a camel's-hair brush, and a small quantity of methylated spirits applied to the egg-sacs. All plants subjected to the attacks of the pest should be thoroughly overhauled during the winter months. For pot plants such as Gardenias I have found it an excellent plan to remove them from the pit or house, lay them on their sides, and thoroughly "cut" the water into the under sides of the leaves with a syringe. In this way I have kept such plants in a thoroughly healthy condition, and almost free from bug. Palms are best sponged with the soft soap No. 4, or Gishurst's compound. Some prefer fir-tree oil, but the former give excellent results. Fig. 108 shows the characteristic cottony egg-sacs made by this species.

Long-fringed Mealy Bug

(*Dactylopius longispinus*, Targioni-Tozzetti). (Fig. 109.)

This is a less common insect than *D. citri*, but it is equally destructive

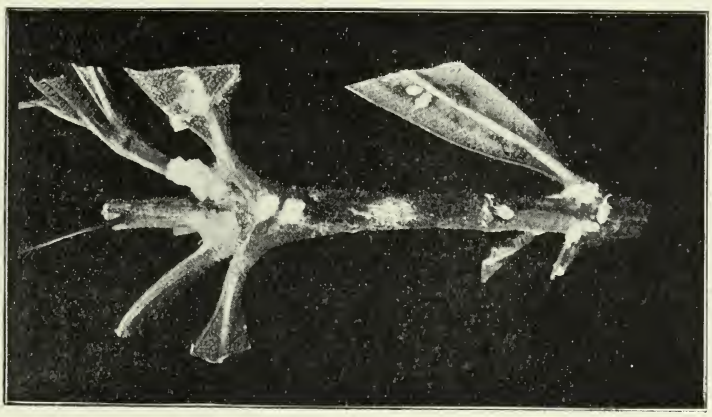


Fig. 109.—Long-fringed Mealy Bug (*Dactylopius longispinus*) on Oleander (nat. size).

and difficult to keep in check. When perfect it may be easily recognised by the great length of the marginal appendages, which, at the anal extremity, sometimes exceed the length of the body. When the appendages get broken away—and this often happens—the insect cannot be distinguished from the preceding species except by microscopic examination.

Laburnum and Gorse Mealy Bug

(*Pseudococcus ulicis*, Douglas). (Fig. 110.)

Externally the females of this genus differ very little from the true "mealy bugs" of the genus Dactylopius. They are a little larger, but present the same mealy appearance, and also possess small marginal appendages. The only real difference lies in the number of joints to the antennæ. In Dactylopius there are eight, and in Pseudococcus nine.

These insects occur on a number of plants—the Oak, Elm, Hawthorn, Gorse, and Laburnum. The species inhabiting these plants are separated by such slight characters that I fear they will not stand. Thus the species infesting Gorse and Laburnum appear identical, and the description which follows applies to both. In winter the young females may be found in a torpid condition in the sheltered nooks among the small branches of the Laburnum, while the pupæ of the males are comfortably wrapped in their white cottony sacs in the nooks and crannies of the tree-trunk. Early in March, after a "spell" of warm days, the females descend from the branches to the tree trunk, where they await the emergence of their partners. After copulation the females return to their original home among the branches, where they spend the rest of their lives. Like the true "mealy bugs" they are active up to the time of egg-laying.

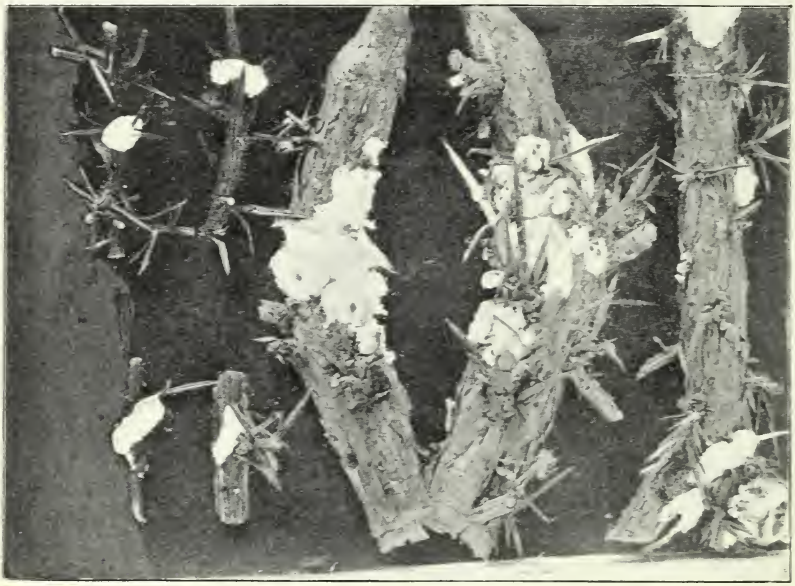


Fig. 110.—Laburnum and Gorse Mealy Bug (*Pseudococcus ulicis*) on Gorse (nat. size).

The female then constructs a long closely felted ovisac, in which she completely envelops herself. When the whole structure is completed it very closely resembles bird droppings, which may, in a certain measure, protect it against the internal parasites which so freely attack this species. Curiously enough, the isolated sacs, which are almost the perfection of mimicry, *are* less attacked than those which horde together in vast numbers round the thicker branches. This is very clearly shown in the photograph (fig. 110), where the holes through which the parasites have escaped appear as black spots among the collective mass of ovisacs.

I find the insect common on Laburnum in this district, and have met with it freely on Gorse in several places. The illustrations are from examples obtained in Norfolk (Ringstead Down). The species can scarcely be said to be injurious, but it is unsightly when it occurs in

large colonies on the trunks of the Laburnum. It is easily removed, however, by brushing, and if done when the young females are seen on the tree trunks in March the method will be found most effectual.

Subterranean or Root Coccus

(*Ripersia terrestris*, Newstead).

Ripersia is also an offset from Dactylopius, and separable only by possessing five to six joints to the antennæ, six joints being the normal number.

The species in question is a subterranean insect, and was discovered by Mr. Chas. O. Waterhouse, of the British Museum of Natural History, on Palm roots in London. It much resembles a minute "mealy bug,' and when full fed constructs a similar cottony ovisac. The antennæ are placed rather closely together, and bent suddenly downwards at the second joint. The mouth organs are placed between the first and second pairs of legs, projecting slightly beyond the latter: they consist of a double-jointed rostrum, from which the filamentous sucking tube extends in the form of a looped hair.

SECTION IV.

I have included in this section those species which pass nearly the whole of their existence completely enveloped in a white felted or cottony sac, in which the eggs are laid and the larvæ hatch.

Felted Beech Coccus

(*Cryptococcus fagi*, Barensprung). (Fig. 111.)

This coccid feeds exclusively upon the Beech, selecting the tree trunk, and occasionally ascends to the main branches. Owing to the whiteness of the ovisacs and their exposed position upon the tree trunks, it is at all times a conspicuous species, and more especially so when, as is often the case, the sacs unite and form one homogeneous mass of felted wax. It is a common species, and when abundant renders the tree unsightly, if it does not materially injure it.* But I have heard foresters say it will in time cause the bark to peel off in patches and the tree to decay and die. It is probably common throughout Europe wherever the Beech occurs. Dr. Karel Sulc informs me it is common near Prague, in Bohemia. It is very abundant in Cheshire, and I have received it from the Forest of Dean. But, strange to say, the Beech woods on the Witcombe Park Estate, between Birdlip and Painswick, near Gloucester, are almost free from its attacks, and I found it altogether absent in the grounds of Powis Castle, Welshpool.

The young larvæ hatch about September, and although active many never see daylight, but work their way under the old felted sacs and the

* This Coccus is doing much damage to the magnificent Beech trees in the eastern districts of Surrey. Many of the finest trees have been destroyed, the bark peeling off as described. The foresters tell me that a dressing of sulphur and spirits of tar is effective, but I have no experience of it as yet.—Ed.

dead bodies of their parents, and there set up an independent existence. They envelop themselves in the white secretion, and after a while cast their skins, throwing away their antennæ and legs, which are never again developed.

The adult female is a very tiny, yellow, egg-shaped, and legless creature, furnished with a well-developed rostrum and filaments. These latter are inserted into the hard bark of the Beech sufficiently far to enable the insect to suck up the juices of the tree.

The male is unknown in any stage.

When specimen or ornamental trees are attacked by this pest the tree trunk should be thoroughly *scrubbed* with soap and water of the proportions given in No. 4, p. 259. I have found this an excellent remedy, but

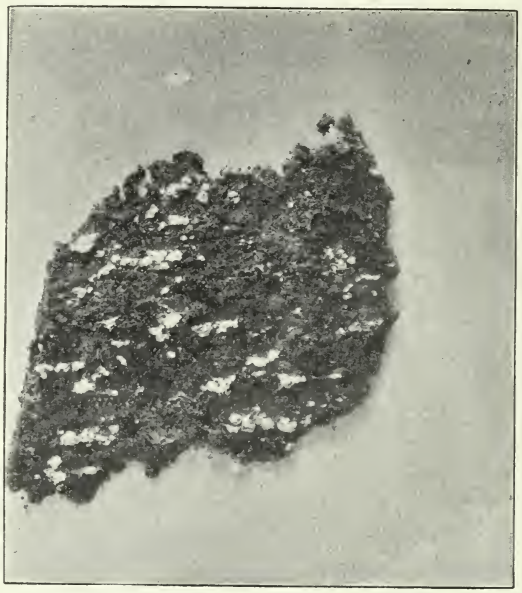


Fig. 111.—Felted Beech Coccus (*Cryptococcus fagi*) on Beech bark (nat. size).

the secret to success lies in the method of application. Scrub hard and rout them out of every cranny and crack is the surest way to success.

Felted Ash Coccus

(*Apterococcus fraxini*, Newstead). (Fig. 112.)

The sacs of this species closely resemble those of the preceding, but, as will be seen from the photograph (fig. 112), they remain more isolated, and do not form large homogeneous patches as in the case of *C. fagi*. It feeds exclusively upon the Ash, preferring trees of from ten to fifteen years old, upon which it sometimes swarms, filling almost every available crevice in the bark. It is also common on old trees, but I have never met with it in such numbers as upon young and comparatively

smooth trees. Like *C. fagi*, when the tree trunk becomes overcrowded, the insects travel up to the main branches.

The adult female is of a bright red or orange-red colour, almost globular, has six jointed antennæ, and retains its legs, although it apparently never uses them. Thus it will be seen to differ very materially from *C. fagi*.

The male is a very abnormal-looking creature without wings and without any distinct articulation between the head, thorax, and abdomen, and is altogether of a different character to any other male coccid with which I am acquainted.

This species is very common in Cheshire, but is much less so in certain parts of Gloucestershire and Hertfordshire. Infested trees in

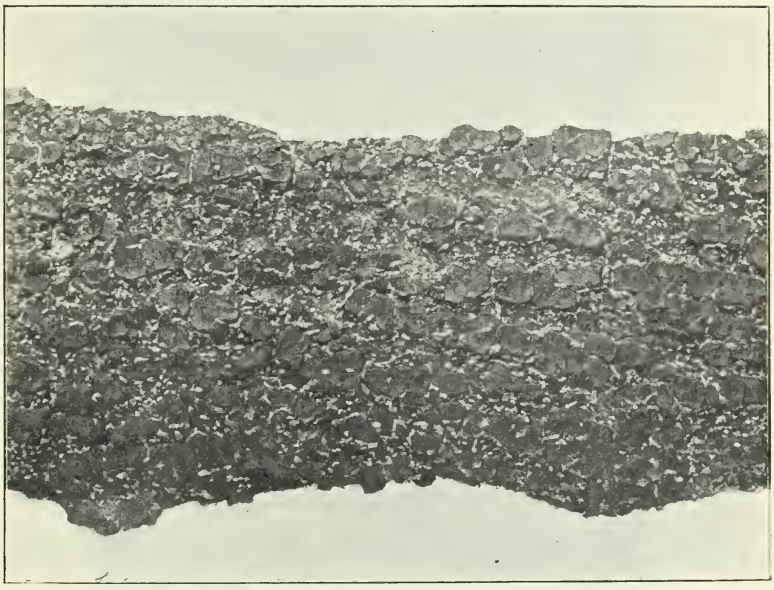


Fig. 112.—Felted Ash Coccus
(*Apterococcus fraxini*) on Ash bark (nat. size).

ornamental and pleasure grounds may be treated in the same way as recommended for the Beech coccus.

Two species of coccids found on grass in this country construct much more perfect sacs than either of the preceding species. The most interesting of these are those made by *Eriopeltis festucæ*, Fonsc. The other species referred to is the *Eriococcus insignis*, Newst. It is much rarer, but more generally distributed.

DIVISION V.

Species which are active throughout life, and carry their young in a sac behind them. This includes the genus *Orthesia*, of which we have three indigenous species, and the greenhouse species described below. I have also included the Egyptian Icerya, although it is by no means so active as the preceding insects.

Greenhouse Orthesia or Lantana Bug

(*Orthesia insignis*, Douglas). (Figs. 113, 114.)

Few forms there are among the Coccidæ that can in any way claim the title of beauty; for, like other sub-families of the Homoptera, it is the curious and grotesque rather than the beautiful which are to be found among these pernicious insects. But the members of the genus Orthesia are exceptions, and are the most beautiful of all coccids, and of these *O. insignis* stands in the first rank. All the beauty is due to the wonderful symmetrical arrangement of a number of glistening white waxen plates which cover the body. An ordinary pocket lens reveals, in a small way,

Fig. 113.—Greenhouse Orthesia or Lantana Bug (*Orthesia insignis*) on Strobilanthes (nat. size).

the striking features of the insect, but under a low power of the microscope it may be seen to perfection, and forms a pleasing object even to the casual observer. In its early stages it is of a more or less rounded form, with two dorsal rows of white plates, and a darker series of them at the margin. When half-grown, longer plates are seen extending from behind, giving the insect a more elongated form. (Fig. 114, A.) In the old adults (fig. 114, B) the anal plates lengthen out enormously, extending to about three-times the length of the insect's body. These anal plates are formed of two series, an upper and a lower; the former fluted, the latter smooth, outwardly convex, and reflexed. In the comparatively large space between

the plates the eggs are laid, and subsequently the young are hatched. Egg-laying extends over a period of several weeks, or during the formation and completion of the anal plates. "In Ceylon," Mr. E. E. Green says, "three weeks elapse before the emergence of the first larva, after which the young insects hatch out at the rate of about five a day for a period of six weeks or more, by which time the parent is exhausted and dies, and the earliest hatched larvæ are mature and commence ovipositing on their own account." Mr. Green also puts the length of life of a single insect at about fifteen weeks, and adds: "There may be five generations in the course of a year." In England the number of broods would be regulated by the temperature of the house, and judging from their numbers I should imagine two or three broods are produced in a year.

The species was first described by Mr. J. W. Douglas in the year

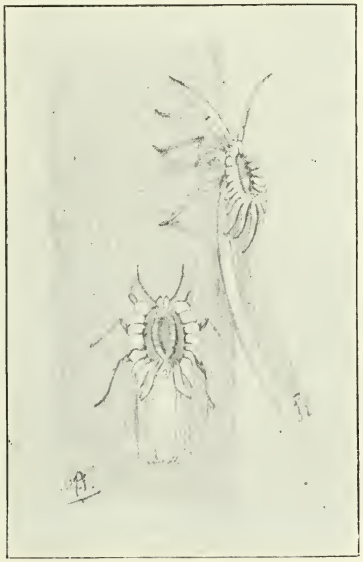


Fig. 114.—Orthesia insignis ♀ (magnified).

1888, and appears to have been unknown in this country prior to that date. Since then it has well established itself, and is likely to prove a very troublesome pest. I am not certain of its original home, but it is found in the United States as a greenhouse pest, is abundant in the West Indies, and has been recorded from British Guiana. "In Ceylon," Mr. Green says, "the pest has been steadily increasing in strength and extending its range," and I believe, quite recently, or within the last two years, it has been found in South Africa. In England it has been found on Strobilanthes and Colias, but elsewhere it is a very general feeder.

This is probably the hardest of all coccids to destroy, and Mr. Green, who has had considerable experience with the pest, says the only remedy is to fumigate with hydrocyanic gas. Failing this treatment, spray with No. 1, and repeat if necessary.

The Egyptian Icerya

(*Icerya ægyptiacum*, Douglas).

This insect was first discovered by Rear-Admiral Bloomfield, who described it to me as "the eleventh Egyptian plague." He found it so very destructive that he took steps and had a quantity of Vedalia beetles imported, which I believe did excellent work. It has only once occurred in England, and this was a few years since, when, acting on my advice, the infested plant upon which it was imported was wisely destroyed, and nothing further has been heard of it.

Natural Enemies of the Coccidæ.

Coccids all the world over are subjected to the attacks of internal parasites, which are the larvæ of minute hymenopterous insects. Certain coccids are more subject to the attacks of these parasitic insects than others. Thus, for example, *Lecanium genevense* is much subject to them, while *Mytilaspis pomorum* is almost immune.

Birds play an important part in checking certain species, as I have proved by post-mortem examinations. All the Paridæ (Tits) are useful in this respect, but the Blue Tit (*P. cæruleus*) feeds more extensively upon them than any other species. The coccids are chiefly attacked in winter, and the birds show a decided preference for *Mytilaspis pomorum*, *Aspidiotus zonatus*, and *Asterodiaspis quercicola*. I have found as many as fifty specimens of the first-named species in the stomach of the Blue Tit, which places the usefulness of this bird beyond all doubt. It is most regrettable, however, that the Tits should have acquired the habit of pecking ripe Pears, which makes them a worse pest than the coccids. But fortunately the habit is not by any means universal, and we may generally look upon them as beneficial in clearing off insects of all kinds.

Methods of Prevention and Remedies.

I have little to offer in regard to remedies that can be considered new, and I have no doubt that not a few of the formulas given will be familiar to many horticulturists; at the same time they, for the most part, are well-tried receipts, and such as have proved of the most reliable and effective character.

The Americans and some of our colonists have long been to the forefront in the subject of economic entomology, and have rendered great service to fruit-growers all the world over by the excellent and valuable information which they have given; where information has been taken from such sources full acknowledgment has been made to the authors.

In this country there is no recognised systematic method of prevention against scale insects or any other kind of pest, which, to say the least of it, is a very unsatisfactory state of affairs, resulting only too frequently in the introduction of new coccid pests from all quarters of

the globe. As instances of such introductions I may name the following species :—

Ischnaspis filiformis, Douglas.
Diaspis amygdali, Tryon.
Gymnaspis æchmeæ, Newstead.
Fiorinia fioriniæ, Targ.-Tozz.
F. kewensis, Newst. (n. sp.)
Pinnaspis pandani, Comstock.
Orthesia insignis, Douglas.
Icerya ægyptiacum, Douglas.

Thus within the last ten or twelve years we have seen the introduction of at least eight species of coccids, of which *Orthesia insignis* may prove as universally injurious as our common "mealy bugs" (Dactylopius spp.). It needs, therefore, no further words of mine to show how important it is we should take every precaution, each and all of us concerned, to guard ourselves against such introduction. This can only be accomplished by systematic investigation and treatment of imported plants immediately on arrival in this country. As already stated, we have no recognised system of dealing with the wholesale consignments of infested plants, so that it may be well to consider how such work is carried out in other countries. In his admirable work on the coccidæ of Ceylon, Mr. E. E. Green enters fully into the subject, describing the treatment as adopted by himself from information supplied by Mr. C. P. Lounsbury, official entomologist at Cape Town. As I do not possess Mr. Lounsbury's official work, I have taken the liberty of extracting from Mr. Green, who says (p. xv): "For wholesale fumigation of plants and fruits there is nothing to equal hydrocyanic acid gas, generated by mixing cyanide of potassium, water, and sulphuric acid in certain proportions. This treatment is cheap and effectual. The gas is of the most deadly nature, and will penetrate every crack and crevice, and do its work thoroughly. The application is quite simple. All that is required is a close-filling chamber, provided with a flue for the escape of the gas after the operation. The more air-tight the chamber, the more complete will be the work. It should be fitted with racks to receive movable trays, upon which fruit may be spread. The objects to be fumigated are placed into position; the chemicals are mixed in a leaden or earthenware pan and placed on the floor, the door shut, and the room kept closed for from half to three-quarters of an hour. The flue is then opened, and, after a sufficient time (about half an hour) has been allowed for ventilation, the door is unlocked and the plants, &c., removed. It is not advisable to take the subjected plants directly into the open air if the sun is shining. They should be kept for a few hours under shade, which will greatly lessen any danger of damage.

"Mr. C. P. Lounsbury, official entomologist at Cape Town, has kindly supplied me with full particulars of the work of the Fumigatorium at that place. From his letters and reports I have extracted the following directions and suggestions: 'For each 300 cubic feet of space enclosed (and in proportion for greater and smaller spaces) 1 oz. of 98 per cent. potassium cyanide, 1 oz. of sulphuric acid, and 2 oz. of water

will be required to generate gas of sufficient strength to kill the insects. Double this strength, or the same amount of materials to 150 cubic feet enclosed, may be used upon woody plants without danger of seriously injuring them. The greater strength should be employed whenever practicable, as it will ensure the death of the eggs as well as the active insects.'

"Imported plants are usually in a more or less dormant condition, which lessens danger of injury. Mr. Lounsbury writes, in his Report of June, 1897: 'Injury to the tips of new growth generally results. This injury is in no wise serious, and is quickly outgrown. The operators consider it a favourable indication, as when such injury results it is quite certain that the gas has been present in sufficient strength to destroy all the insects.'

"With respect to fruit, I again quote from Mr. Lounsbury's letter: 'I had had Lemons and Oranges analysed after treatment, and found that after a few hours not more than a trace of the gas remained in the rind. There is much more natural cyanogen in a single seed (so the analyst told me) than what remains in the fruit from fumigation. We have no complaints of any effect on the keeping qualities of the fruit.'

"To generate the gas, 'the required quantities of cyanide and water are first placed in the generating vessel, the cyanide being broken into small pieces about the size of lump sugar. The operator then adds the acid, pouring it slowly into the vessel to avoid splashing, and immediately withdraws.'

"The above treatment is suitable for fruit and hardy plants. Tender garden plants are usually imported in Wardian cases, and may be treated separately. We have in the Wardian case an air-tight chamber ready to hand, in which the plants can be fumigated before their removal. After a large series of experiments with various fumigating media, I find that hydrocyanic acid gas remains by far the most efficient insecticide and the least injurious to the plants. But with delicate succulent plants I find it has to be applied rather differently. A more concentrated dose of the gas applied for a shorter period is most satisfactory in its results. In a Wardian case containing about 16 cubic feet I find a dose of $\frac{1}{2}$ oz. cyanide, $\frac{1}{2}$ oz. acid, and 1 oz. water, with an exposure of half an hour, will kill every individual of a colony of Orthesia (the most resistant of all coccids) without in the least affecting the plants. The treatment should be carried out only after sunset. According to Mr. Lounsbury's tables, these proportions of chemicals should be sufficient for a space of 140 cubic feet with a longer exposure."

Mr. Green further describes the treatment of orchard trees on a large scale, quoting again from Mr. Lounsbury's method:—

"*Generation of the Gas.*—Hydrocyanic acid gas is generated by the action of sulphuric acid on potassium cyanide in the presence of water. The required quantities of the cyanide and water are first placed in the generating vessel, the cyanide being broken into small pieces, not above the size of lump sugar. The tree is then covered with the tent or sheet, and the vessel slipped under almost to the base of the tree; reaching in, the operator then adds the acid, pouring it slowly into the vessel so as to avoid its splashing and thus burning his hand or the

cloth. He immediately withdraws, and the men shovel a little soil on the edges of the cloth all around, to more thoroughly prevent the escape of the gas.

"The rapidity of the evolution of the gas depends largely upon the size of the pieces of cyanide. If these are like powder, the reaction is violent and immediate; but if in lumps, the reaction takes place more slowly and continues for a minute or longer. The slow reaction is desired, partly because less injury results to the foliage immediately above the vessel. But the lumps must not be too large, for then the reaction is liable to be imperfect owing to a black coating (carbon ?) forming over the lumps and preventing further decomposition by the acid. The water should not be added too soon, or part of the cyanide becomes dissolved and gives a violent reaction. The residue which remains in the dishes is buried, and the dishes are washed in clean water before being again used.

"*Time Necessary for Treatment.*—The cover is left over the tree for thirty minutes in the case of small trees, and forty-five in the case of those over twelve feet in height. At the expiration of this period the generating vessel is removed and the residue buried in the soil.

"A number of trees are fumigated together, the endeavour being to treat as many at a time as can be covered and uncovered during the period of exposure. In this way the men are kept continuously busy, the time for the removal of the first tent arriving by the time that the last tree is covered.

"*Absence of Sunlight Necessary.*—The originators of the fumigation process observed that the gas was most efficacious, and that less injury resulted to the foliage, when the operations were performed at night than when they were carried on in sunlight. It is said that chemical changes are produced in the gas by the action of sunlight, and that the resulting gases are more injurious to the plant life and less to animal than hydrocyanic acid gas. Whether or not these theories are correct is of small practical importance, for the foliage of a tree will suffer serious injury if the tree is left covered with an air-tight oiled tent for half an hour in sunlight without the gas being present. Having ascertained this fact by experience, the foreman in charge of the Board's outfit refrained from covering trees until the sun had sunk from sight on any but cool, dull days. The great majority of the trees treated have been fumigated after sunset. The ideal night for fumigating is quiet, cool, and moonlight, and without dew."

From such valuable and trustworthy evidence as the foregoing, we may safely take action with consignments of hard-wooded plants. But for such tender things as Orchids or other rare and costly plants, the process is likely to end in serious injury to them, and cannot therefore be expected to find *universal* favour amongst English horticulturists. There is this to be added, however, that all other fumigating compounds have been found by Mr. Green less effectual to coccids and more injurious to plant life than the hydrocyanic acid gas.

In the absence of fumigation or of the application of insecticides which, owing to the nature and condition of the plant, may be deemed advisable, a thorough sponging with clean water should invariably be made. All

foreign substances should be removed, and the plant or plants afterwards watched for any signs of the development of scale or bug.

Coccids are also freely imported into this country on Oranges and Lemons, including the troublesome and destructive *Aspidiotus aurantii*. Care should therefore be taken not to place infested fruit near to growing plants, and the rinds of all infested fruit should be destroyed.

The encouragement of the various species of Tits, the Tree-creeper, and other insectivorous birds in our gardens is also a sure means of checking the increase of certain coccids, and their presence in our gardens during winter should never be denied: their services at such times cannot be overrated, and more especially so that of the true Blue Tit. I am fully aware of the injury caused by these feathered acrobats to Apples and Pears, but, in view of their excellent services, give them all the encouragement you can afford. In winter encourage their presence by throwing out an occasional handful of maize: this will attract them, and will generally keep them within the bounds of your garden. When they have finished the food which has been given them, which need not be too plentiful, they will fill in the hours by incessantly searching for insects, and where "Mussel Scale" abounds they freely eat it. (See also chapter on "Natural Enemies of Coccids.")

Insecticides.

No. 1.—*Paraffin and Soap, or "Kerosene Emulsion."*

This is one of the most effective insecticides, and may be used as a remedy against various insect pests. Under varying proportions of the ingredients it has been in use for a number of years, and has found much favour among horticulturists. The only difficulty with this preparation is to obtain a perfect emulsion, which, for obvious reasons, must be made, and to ensure this use the following proportions:—

Soap	...	...	½ lb.
Kerosene (paraffin)		...	2 gals.
Soft water	...	...	1 gal.

Boil the soap in the water, and when thoroughly dissolved and still hot add the paraffin and churn with a syringe until a white creamy mixture has been obtained. If the instructions are properly carried out the ingredients will not separate. The mixture may be set aside for future use in corked bottles, or, as I prefer, used at once. For bark applications add to this nine times the quantity of hot soft water, and again churn with a syringe until the ingredients have again amalgamated.

The application should be made in the winter months with a stiff brush, taking care to rub it well into the old rough bark, and to thoroughly soak any shreds which may of necessity have to be left as supports to the branches of wall trees. Some prefer to use the mixture while hot, say at a temperature of 130° F., but for outdoor work I have found it quite impossible to maintain any given temperature. The secret of success lies chiefly in a perfect emulsion, and thorough application of it.

From recent experiments conducted in a large Peach house I find

this the most effectual remedy for the Brown Peach Scale (*Lecanium persicæ*), killing about 80 per cent. of the larvæ.

This emulsion may also be used for spraying foliage for other as well as scale insects. For tender plants and unripe wood and foliage, about double the quantity of water should be added, but even then the mixture is apt to scorch. It is advisable, therefore, to test the effect of the emulsion on the foliage before making wholesale applications of it; as it may be found necessary to considerably weaken it by the application of water. It should be borne in mind that a certain percentage of soap, paraffin, and water is more deadly in its effects upon plants than pure paraffin; a fact abundantly proved in the experiments conducted at Woburn on the Currant Phytoptus. And, what is more, certain plants can withstand the application more than others, and it will be necessary to vary the strength of the emulsion to suit them.

Whale oil and hard white laundry soap have been recommended for use in the preparation of this insecticide, but as soft soap finds greatest favour among English horticulturists, I see no valid reason why it should not be used. It mixes thoroughly well with paraffin, and does not solidify.

No. 2.—*Smith's "Swift and Sure."*

This is a very effective insecticide for soft-bodied and unprotected scale and "mealy bug"; but its effects upon the small shield-covered scales (Diaspinæ) are of very little service. For hard-wooded plants without leaves it has been found most effectual when applied at a temperature of from 130° to 140° Fahr., and, for plants with leaves, heated to not more than 100° Fahr.

No. 3.—*Fir-tree Oil.*

An old and well-tried remedy; but like paraffin is apt to scorch or burn the foliage if applied in bright sunlight. If applied to foliage, the plants should receive a good syringing shortly after its application. But this need not be done when the application has been made on plants or trees without leaves.

No. 4.—*Soft Soap.*

For "sponging" greenhouse plants this is a most efficacious remedy. For this purpose it is used in varying strengths of from 1 to 3 oz. per gallon of water. The weaker solution should be used for such tender plants as Eucharis, &c.

For *bark* application *only* it may be used at a strength of 8 oz. to the gallon of water. For "Mussel Scale" infesting the trunk and main branches of Apple and Pear, as also for *Cryptococcus fagi* infesting Beech trunks, it has proved a complete success.

In all cases it is best to dissolve the soap by boiling it in a quart of water, afterwards adding the full quantity.

No. 5.—"*Gishurst's Compound.*"

This is an excellent compound, and for "sponging" plants I have never found it excelled. I have also used it with excellent results on

"buggy" vines. But like other patent insecticides it is much too costly to use on a large scale.

No. 6.—*Lime-wash or Lime-water.*

This should be made of good fresh lime. I have twice seen this applied to Peach and Nectarine for destroying the Brown Scale (*Lecanium persicæ*). In both instances less than 50 per cent. of the insects were destroyed. In applying this to the trees the operator should wear gloves, as the caustic properties of the lime burn the hands terribly.

No. 7.—*Caustic Soda Wash.*

This consists of the following ingredients:—

1 lb. ground caustic soda.
¾ lb. pearl ash.
10 oz. soft soap.
10 gallons of water.

Apply at a temperature of 130° Fahrenheit.

This has been frequently recommended for dressing Peach and other trees infested with scale. Having personally witnessed both the mixing and application of this mixture, I can speak with certainty as to its effect upon the Brown Peach Scale. In the winter of 1899 this mixture was applied to a number of Peach trees (under glass) with an ordinary paint brush. The result was fairly satisfactory, and, judging from the number of females which appeared in the spring, I should estimate that about 60 per cent. of the insects were killed. The application certainly did not appear to injure the trees; in fact one of the largest and best crops of fruit was grown. Seeing the enormous percentage of various alkalies the preparation contains, it would certainly be unsafe to make an annual application of this mixture, as it must in time prove fatal to the health of the trees. Moreover it is a painful experience applying it, and for these reasons I certainly do not approve of its general use.

No. 8.—*Clay and Sulphur, or Cow Dung and Sulphur.*

Such mixtures are absolutely useless against "scale insects," and clay or cow dung in any form I have found most objectionable. I have so frequently seen them used against the Brown Peach Scale that I am quite confident of the results obtained, and from practical experience I cannot too strongly condemn their use against insects of any kind.

Methods of Applying the Insecticides.

In this country the application of insecticides against coccids is usually performed with a brush or sponge, which is the most effectual plan, as it gives decidedly the best results. But where large quantities of trees and plants have to be dealt with, which is often the case, the applications should be made with a syringe, or, as in the case of small plants, such as Palms and Crotons, &c., they can be expeditiously treated by dipping them in the mixture, care being taken to remove all the visible scale or

bug with the fingers. The plants should then be carefully shaken and laid on their sides to drain. This process is frequently adopted by large growers of plants for table decoration, such, for instance, as Palms and Crotons. I have seen the process carried out by a competent and experienced plant foreman, in whose hands the work was a complete success, the insecticide used being a weak form of the "Kerosene Emulsion No. 1," but not exactly of the same proportions of soap and paraffin, the exact proportions being as follows :—

¼ pint paraffin.
½ lb. soft soap.
3 gallons of soft water.

The method of mixing is also different, and is done as follows : Place the paraffin and soap together in a vessel, and with the hands or a stick very thoroughly mix them together until there is no liquid paraffin left, after which the bulk of water is added hot.

Sponging.

"Gishurst's Compound" or soft soap is generally used for this purpose, but the process can only be carried out on comparatively large, smooth-leaved plants, such as Eucharis, Crotons, Palms, Camellias, &c. It is a favourite and at the same time thorough method, and is very generally adopted by horticulturists.

Brush Application.—For all wall-trained trees, such as Peaches, Nectarines, Apples, Pears, &c., it is impossible to thoroughly apply a dressing by any other means than a brush. It is truly a laborious process, and entails a vast amount of time and patience, but with a good insecticide the results are satisfactory. It is obvious the branches should be unwalled in order that they may be painted all round, taking special care to get behind (*i.e.* between the branches and the wall), as it is there the greatest number of scale accumulates. Where supporting shreds are of necessity left, these should receive careful attention.

Spraying.—When a large number of trees have to be treated, which, fortunately, is rarely the case in England, or, as in large conservatories, where tall Palms, Creepers, &c., are out of reach, the only chance of applying an insecticide is with a spraying apparatus, such as a "Stott" syringe or sprayer.

Dipping.—All that is necessary for this purpose is to provide a large wooden vessel or tub capable of holding from 3 to 6 gallons of the wash. The whole plant, *minus the pot*, is then plunged into the mixture.

In the foregoing remarks it will be seen I have referred only to three patent insecticides, and, fearing it may be thought I might have selected others of equal value, I may say I have not done so for the simple reason that I have for the last few years had little or no opportunities for doing so. But during the coming season I anticipate conducting a number of experiments with all the leading insecticides, the results of which will be laid before the Royal Horticultural Society on the occasion of my next

paper. If in the meantime the proprietors of any of the various compounds would care to forward samples for testing purposes I should be glad to receive them.

Both outdoor and greenhouse and conservatory work is usually carried out in the winter months when other work is slack, and while plants are more or less in a resting condition and can better resist the action of the insecticides. But certain "bug" and other coccids increase so rapidly as summer advances that plants require frequent attention, which must necessarily be given wherever there is available help.

In spring and summer time dull or cloudy days should be selected for the treatment of plants. Applications made in bright sunlight "scorch" and otherwise injure the foliage. Failing dull days, apply the insecticide in the evening after the sun has gone down. And when *tender plants* have been treated, follow the application a few hours later or the following morning with a thorough syringing with cold water.

General Remarks.

Unless you are thoroughly acquainted with the insecticide intended for use, test it upon a part of the plant or plants to be treated, and watch the result.

GROWTH OF THE FRUIT TRADE.

By Mr. George Monro, V.M.H.

[Read October 24, 1899.]

I have been asked by the Council to read a paper on the Growth of the Fruit Trade in England, and I do not think I should be far wrong in calling it the birth as well as growth, as up to recent years there has not been anything worth calling a trade, apart from oranges, which I may consider began to come to this country in quantity in 1860, when the import duty was taken off. For some years there was little else in any quantity, except our own orchard fruit, coming in as it ripened; the remainder were what might be termed fancy articles, coming at irregular times in small quantities, and there was nothing like a regular supply of fruit all the year round until about twenty years ago, but from that time it has steadily increased. As the supply was uncertain and intermittent, it was of course very difficult to keep anything resembling a retail trade going, and fruit shops were very few. When I came into the trade in 1871 there were only three fruiterers in the city, although several others used to take shops for two or three months only, commencing at the end of June, to sell strawberries, and keeping open as long as they could get anything to sell. The West End was much the same, the greengrocer of that time only buying choice fruit as he received orders, the mass of the trade being done in the Centre Avenue, Covent Garden. There were only one or two firms who attempted to do a fruit trade in the West End apart from greengrocery, and one of these was Messrs. Mart & Co., Oxford Street, and they did it in conjunction with their wine trade.

As oranges were followed by American apples, and, later on, by bananas and pine-apples, so retail firms increased, and about 1880 the Haymarket Stores started a fruit department, and others quickly followed on, until at the present time there are fruit shops in every street, and it has become so regular an article of food that all first-class grocers find it necessary to have a green fruit department to keep pace with the times.

After this hasty review I will give some idea of the increase in certain fruits.

Oranges, I have already stated, began to come in quantity in 1860, and were sold in Pudding Lane on arrival from St. Michael's, Azores, Lisbon, and Valencia, all places within easy reach of England. The St. Michael's were the best, but at the present time they have nearly died out, and their place has been taken by pine-apples; but oranges now come from almost every part of the world, following each other all the year round.

I have not many figures to bother you with, but, to indicate the proportion of fruit exported from Spain to England compared with other parts of the world, I find that in the winter of 1886–7, out of just over one and a half million boxes of fruit, principally oranges, shipped from Valencia, over one and a quarter million came to England; and last winter, although now it is but one of many ports shipping fruit to this

country, the total was about four million packages, out of which England took nearly three and a half million, making our consumption very large compared with other countries, and coming now from Brazil, Florida, California, West Indies, Australia, Canary Islands, North Africa, Italy, Malta, &c., and even from India.

Apples one may consider the next largest supply. Thirty years ago there were very few beyond those grown in England, except some fancy varieties from France and some of very inferior quality from Holland and Germany. But soon after that time New York began to send New Town Pippins, followed by other varieties; a few years afterwards Canada followed, and then Nova Scotia, until the supply from those sources last winter was 1,217,767 barrels.

With the advent of cool chambers Apples are now successfully brought from California, Tasmania, and South Australia, so that we are never without a full supply of fresh ripe fruit. The Australian, ripening as they do at Christmas time, are very acceptable here, as other supplies get short; the quantity from these three centres, all coming in cool chambers, now exceeds 300,000 cases.

Our own growth has at the same time considerably increased, and shows signs of still doing so; but although on the whole English apples are better than they used to be, there is still a large proportion only fit for the jam pot or cider. In a very carefully written article on Pomology in last week's *Gardeners' Chronicle* the editor states that "our growers produce at once the finest and the worst samples." I quite endorse that.

Pears have also increased tremendously, not so much from home supply as imported. At one time they were only to be obtained in the autumn, but France has found a ready market here for an ever-increasing quantity, while California sends very large supplies in cool chambers, commencing in August and keeping on till March. A few have commenced to come from Cape Colony and Australia, and, as these arrive during March and April, there is room for a trade to be done in them.

There are also many acres of English, and doubtless some of the hardier varieties can be grown to pay, but I am of opinion that England cannot compete with either France or California in growing the better-class varieties.

Bananas are quite a recent addition, and it is marvellous how the public generally have caught on to them. Twenty-five years ago the only ones coming were imported from Madeira by Messrs. Mart & Company, and ripened in their wine cellars, and when asked if I could sell them I was very doubtful about it; but eventually I gave them a trial, and as they went all right imports were increased, other firms stepped in, until at the present time they are quite a staple article in the fruit trade. The bulk now come from the Canary Islands, the inhabitants there being induced to take up the growth of bananas, tomatos, and potatos, owing to the previous staple industry in cochineal for dyeing purposes failing, through mineral dyes being introduced much cheaper. At the present time the islands are simply market gardens, and the bulk of the produce comes to England. During the year ending June last the number of bananas imported from there was 783,418 bunches, while the total ten years ago was 29,903 bunches.

There is also a company being formed to bring bananas in large quantities from the West Indies; if that succeeds we shall soon increase the supply enormously.

Pine-apples.—Up till 1870 all those marketed fit for dessert were English forced, mostly grown in private gardens, and, the quantity being small, were very dear; but the orange trees in the Azores getting worn out the growers turned their attention to the cultivation of pines, until they have become plentiful and cheap nearly all the year round. Those coming from the East Indies are used for preserving, as they do not arrive in fresh enough condition to adorn a dinner table. The numbers now coming from the Azores run into hundreds of thousands, as many as 20,000 coming at a time. It is very probable that they may soon come from other sources. Growers in Florida and some other countries are very anxious to find a market here for them, and, as cool chamber treatment develops, it may be easily done, where now it is almost impossible.

Grapes have always been a favourite fruit, and trade in them has been revolutionised by the enormous increase in the home-grown. Thirty years ago we had very few except the surplus of private places, and had to depend principally on the Dutch Hamburghs coming in round baskets, and the Lisbon Sweetwater through the autumn, and through the winter those coming from Almeria in barrels. The Dutch are never seen now, being quite superseded by Channel Island and English; the Sweetwater from Lisbon and the Almeria come in much larger quantities; and of late years many tons also come from Malaga, Denia, and Mercia, all packed in cork dust, while cool chambers bring a fair quantity from Cape Colony and a few from Australia. But with all the increase in imported ones, the quantity of home-grown has gone up by leaps and bounds. Thirty years ago there were none forced in Guernsey, and at only one place in Jersey (Mr. Pond's), but soon after that, one or two other people built for early work in Jersey, and a great many in Guernsey put up lean-to's at the side of their dwelling-houses, but did not heat them. It was soon found that the climate and soil suited the vine, and the growth has developed marvellously in early and greenhouse grapes, but the air being so charged with moisture in winter prevents growers keeping them late. The next place to go into them largely for market was Worthing. Twenty-five years ago there were only two or three small places; now there are considerably over a hundred, the climate and soil there being also found suitable, especially for early ones. Also about that time came the great increase from Scotland, principally late varieties, as some six or eight followed in the steps of Mr. Thomson, of Cloverford, and for many years these all came to London and sold well; but the quantity grown near here was steadily increasing, and, prices falling, caused all those grown in Scotland to be sold locally, and at present more are sent there from London than used to come from there. The quantity now grown under glass in the Channel Islands and home counties runs into thousands of tons, and covers the whole of the year. Of course the price has had to suffer, until the margin of profit is very small, even on the best-managed places, and with unsuitable houses or old vines they cannot possibly be grown to pay. Another thing has to be studied, and that is, to take into account the natural advantage of the different situations, and grow

early or late ones accordingly. Besides this great increase, there are some hundreds of tons grown in Belgium, originally for the Paris market, but, by being shut out of there by a prohibitive tariff, nearly all come to London. To give some idea of the trade done in winter grapes, over thirty-four tons were sold by my firm in the week preceding last Christmas; this does not include any coming from the Channel Islands or Belgium, or any sold by other salesmen. In addition to these we sold about six tons in Manchester—roughly, forty tons of hothouse grapes in one week by one firm. That this should be possible reflects great credit on those enterprising growers who, in face of a constantly falling market, still kept on producing good quality grapes at prices which everyone connected with the trade said were impossible. It appears to be the opinion of a great many horticulturists that growers for market do not study quality, but grow for weight only. In the last issue of a gardening paper a well-known writer stated this as an accepted fact; but I venture to call your attention to the samples exhibited here to-day, which, I think, for quality and finish will compare favourably with any grown in private places. Of course, the market growers must study weight, but to get weight and quality too is where science slips in.

Outdoor-grown Soft Fruits have also increased very much, the main supply being grown in the home counties, strawberries, raspberries, gooseberries, and currants covering thousands of acres, only a small portion comparatively being used for dessert, the bulk going to the jam maker, and this has led to many thousands of hands being employed in an industry which scarcely existed twenty years ago.

The same can be said of stone fruit, principally plums, besides which there are thousands of tons imported from France, Holland, Germany, Spain, and Italy, as many as 20,000 packages of foreign greengages being sold on our market alone in one day; beginning as they do from Italy and Southern Europe and gradually working north, they cover some months. A considerable quantity of very fine quality plums also comes from California in cool chambers, while the Cape sent some very fine samples of Japanese varieties, which, arriving in February last, made long prices, and lead me to think we shall hear more of these in the future.

Peaches, Nectarines, Melons, and Figs are still a small trade compared with many other fruits, but the quantity grown is larger every year, and the time covered longer. We have peaches from the Cape in February, and home-grown from March till November.

Figs commence to arrive from Guernsey in March, and last till the end of October, while a good many fresh ones come from Italy through September, October, and November.

Melons, home-grown, commence in March and continue till December, the imported ones principally coming during the autumn.

There are many other fruits coming from abroad in small quantities, such as mangos, custard apples, Avocado pears, grenadillos, and Chinese lychee nuts, but except the latter there is very little demand, and the trade does not show any signs of increase.

Forced strawberries are one of the fruits in which we need not fear foreign competition, and a larger quantity is grown each year from February to June as a first crop in houses devoted afterwards to

cucumbers and tomatos. Throughout May the quantity on our market would average quite a ton daily, all morning-gathered, and put up in half-pound or pound punnets.

Tomatos, from being quite a novelty twenty-five years ago, have become a greater trade than any, and in nothing have our home growers succeeded better in keeping pace with the foreigners than in these, the quantity grown under glass alone being many thousands of tons, while in suitable autumns a great many are ripened out of doors. We have almost killed the tin trade in them, and those imported fresh have to be the best varieties, well graded and packed, to sell at all. The only time imported ones are likely to pay is from November till April, and as this fits in with the season in the Canary Islands, they come during that time by the shipload.

Tomatos, being a quick crop, have always been grown for a year or two in houses planted with vines, and it is a recognised fact that giving as they do a quick return, they have contributed largely to the increase in the growth of grapes.

To show the increase of those coming from the Canary Islands : in the year ending June 1889 the total number of packages was 5,617 ; the year ending last June was 492,075, or about half a million bushels.

Distribution.—It will readily be seen that with all kinds of produce crowding on us in such large quantities, it has not been an easy matter to cope with it, especially the more perishable kinds ; and it has been, I might say, my sole aim to find outlets. I have never had to trouble in the least about supply, as I soon found that while a salesman could find customers he would always be supplied with goods, and I am rather proud of a fact which is almost unique, and that is, never having had to ask a grower to send to me. It has taken me all my time and energy to keep pace with the supply, and it would not have been possible to have done this without the constant increase of imported goods, which enabled fresh shops to be opened and gave them something to sell all the year round, and so establish themselves and form channels for home-grown supplies when ready. Beyond these we have been able, by the reduced prices and more constant supply, to push the trade amongst grocers and stores in all parts of the kingdom.

Packing.—Another great help to the development of trade is care used in grading and packing, and great credit is due to our growers of hothouse produce for success in that direction. I cannot say as much for growers of orchard fruit generally. It seems almost impossible to make them realise the necessity of pleasing the eye. Quality is of course an important feature, but it stands second in the fruit trade to appearance. If a good fruit looks well the public will buy it and ask for it again ; but if it does not look well they will not buy it at all. Foreigners have realised this, and take no end of trouble to put fruit not only on the market, but on the consumer's table, in as perfect a condition as possible. They also grade well, knowing that some customers have a demand for best and largest fruit, while others can do best with medium. By suiting both they put more money in their own pockets and help to consolidate a trade.

Transit.—Another great help to the growth of a trade in such

perishable articles is the improvement in all directions of the means of transit. Not only can fruit be brought here from all parts of the world in good condition, but the communication at home is totally different from what it was. We are now in touch with all parts of the kingdom within a few hours, although railway rates still leave something to be desired.

The outlet is widening every year. At the present time we are sending hothouse grapes daily to all parts of Scotland and Ireland, and weekly to America and Sweden, while Germany, besides grapes and other fruits, takes large quantities of hothouse cucumbers.

At one time our main supplies of these came from the Continent, but we now have almost stopped those, and are able to serve all the better-class cities on the Continent with much better ones than they can grow.

But one great blot on international trade still remains, and that is the prohibitive tariffs maintained by the French Government. We take in millions of pounds' worth of fruit from them duty free, and they charge at the rate of 2*s*. per lb. on hothouse grapes, and other fruit in proportion.

In conclusion I will draw your attention to the value of this trade as a national industry, employing directly an immense number of hands, and benefiting directly and indirectly many other trades. Scarcely an industry can be mentioned that does not benefit in some way from this enormous development. As an instance, one place in which nothing but grapes, tomatos, and cucumbers are grown has 25½ miles of hot-water piping, besides boilers and fittings; many large growers have to build cottages by the row to accommodate their employees, and one of the most enterprising has found it worth his while to build an Institute, with mess-room and cubicles attached, to accommodate some scores of single young men.

If we look at the imports it is the same: those sending us goods from the Canary Islands and the Cape have to get the wood for boxes from Sweden and America, wood, wool, and paper from Germany, and nails from France, so that it is not only a national but a successful international industry which has sprung up in so short a time. Beyond this, it is a trade which no one need be ashamed to be connected with, as it is the means of bringing Nature's gifts within the reach of all, and all such distribution of wholesome and health-giving food must be for the benefit of the community at large.

OBSERVATIONS ON SOME OF THE PLANTS EXHIBITED.

By the Rev. Prof. G. Henslow, M.A., V.M.H., &c.

[November 7, 1899.]

Virescent Anemone.—Specimens of *A. coronaria*, flore pleno and green, were sent by Miss Edmunds, of Wiscombe Park, Colyton. They afforded an opportunity of explaining the foliaceous origin of flowers and the tendency to revert to it, a phenomenon not infrequent during the autumn, when vitality is lowered.

White-flowered Begonia.—The first exhibition of a white variety of ' Gloire de Lorraine ' was made by Mr. Forbes. Like the normal form it was male; but like that, too, it may possibly bear female fruit as the flowering declines.

Pear Within Pear.—Mr. Henslow explained this monstrous condition of Pears, as several examples had been sent to the Society this year. The flower was wanting, but a leaf-bud replaced it; and as internodes and leaves were formed these acquired the fleshy structure of Pears, so that each internode resembled a Pear. Nothing but branching fibro-vascular cords traversed the interior. He pointed out the difference between a Pear and an Apple, in that the core being just at the end of the stalk in the latter, the flesh of the Apple consisted of the basal parts of the calyx; but in the Pear the stalk for some distance below the core was swollen as well, thereby imparting the elongated form to it.

Statice.—A fine group of Statices, exhibited by Mr. Low, illustrated the removal of colour from the corolla—which was only occasionally present, very small and white—to the calyx, which thus becomes the attractive organ.

Cirrhopetalum refractum, a small Orchid with green sepals, was interesting in having two sepals coherent, a feature also seen in Cypripedium; but in the former case the labellum was rudimentary, and the elongated coherent sepals appeared to take its place, as providing a resting-place for insects.

Chrysanthemum, Quilled Form.—A remarkably fine variety of this type furnished material for observations on the origin of the different forms of flowers in this genus, and of the origin of sports. Mr. Henslow called attention to the theory of M. Ghys, that, while multiplying individuals by parting the roots never gave rise to sports, he had observed they frequently arise when cuttings are taken from a plant in full vigour. His interpretation is that this disturbs the equilibrium in the plant, as between absorption and evaporation, &c. It also explains why certain kinds are much more sportive than others, because, being in great demand, more cuttings are taken from them. Mr. Henslow hoped that Chrysanthemum growers of this country would test the theory and record

their observations to see if they agreed with M. Ghys' supposition. As an illustration of the effect of cutting a plant, he showed a specimen of an Acacia, usually bearing phyllodes only, without compound blades, except when as a seedling; but in the case in question a cutting had been made and struck, when it suddenly bore complete compound leaves without the usual flattened leaf-stalks or phyllodes.

Colewort × Cabbage.—Mr. Wythes, of Sion House, exhibited a new cross between Coleworts and the Cabbage, the object being to produce a late and more compact form. For the Colewort, having its leaves exposed, is liable to be cut by the frost; but by crossing it with the Cabbage it acquires the cabbage form, is late in season, and so becomes protected from being frozen. The varieties of Coleworts employed in the cross were 'Rosette' and 'Early Green.'

Fig. 115.—Odontoglossum crispum Daphne. (*Journal of Horticulture.*)

FRUIT IN MONMOUTHSHIRE AND SOUTH WALES.

By Mr. John Basham, F.R.H.S.

[Read November 21, 1899.]

South Wales, including Monmouthshire, is bounded on the north by Montgomeryshire, on the west by St. George's Channel, on the south by the Bristol Channel, whilst its eastern boundary follows to a large extent the course of the river Wye, the adjacent English counties being Gloucestershire and Herefordshire. It is divided into seven counties, with a total acreage of 3,058,632. The principal seaport towns are Cardiff, Newport, and Swansea, from which a very large quantity of coal and iron is annually exported. In the counties of Monmouthshire and Glamorganshire we have what is known as the Great South Wales Coalfield: this is fringed by a belt of limes one rock, and much of the land occupied by this formation is characterised by bare rocks or crags, but the soil that is formed by the decomposition of the rock is well known to support good pasturage for sheep. The Coal Measures, which occupy so large an area in South Wales, form an elevated tract intersected by deep valleys, and from an agricultural point of view the soil in these mountainous districts is poor. Red sandstone and marls with layers of magnesian limestone are to be found to a very large extent in Monmouthshire and Glamorganshire, whilst over the greater part of the Vale of Glamorgan the Lias limestone extends, as it does also on the banks of the Ebbw and at Liswerry, near Newport. Much of the soil in these districts is of a strong loam, and very heavy crops of corn have been grown upon it. Between Cardiff on the west and Chepstow on the east, bordering on the Bristol Channel, and along the rivers Usk and Wye, there are very extensive alluvial flats, or what is known locally as the Moors, which furnish very rich tracts of pasture land.

The climate of South Wales differs materially from that of many parts of England, and varies in itself considerably. In the mountainous districts it is bleak; moderately mild in the vales and on the southern coast, particularly in the far-famed Vale of Glamorgan. The average rainfall is considerably higher than in England, the wet season not being confined to the winter months, for rains are frequent at all times of the year.

The total area of orchards in Great Britain, according to the returns issued by the Board of Agriculture for the present year, is 228,603 acres, out of which only 6,515 are situated in Monmouthshire and South Wales, but this does not include "small fruits." Of this acreage 4,035 are to be found in the county of Monmouth; the remaining 2,480 acres are distributed as follows: Breconshire 1,191, Radnorshire 689, Glamorganshire 321, Carmarthenshire 158, Pembrokeshire 78, and Cardiganshire 43. There is an increase on the year of 29 acres, 26 of which are put to the credit of Monmouthshire. To those who are more intimately acquainted with the larger fruit-growing districts of Great Britain, such as Kent

Herefordshire, Worcestershire, and the western counties of England, it may appear somewhat presumptuous on my part to describe fruit-growing as an industry in South Wales, especially when you remember that until very recently little or nothing has been heard of fruit from this (shall I say remote?) part of Great Britain.

In September 1894 a very interesting paper was read by Mr. Pettigrew on the Marquess of Bute's vineyards at Castle Coch, in South Wales, the only experiment of the kind which has been made in Great Britain during the present century. You will also remember that in the year 1896 one of the finest collections of Fruit ever sent to a R.H.S. show at the Crystal Palace came from Llanelly, Carmarthenshire, and was grown by Major Bythway, to which the Gold Medal of the Fruiterers' Company was awarded, and only very recently the Society has had a grand collection of Apples and Pears, exhibited at the Drill Hall, from The Hendre, near Monmouth, the seat of the Right Hon. Lord Llangattock, to which the Society's Gold Medal was awarded. I shall not refer to the collections exhibited by myself on different occasions at the Society's shows at the Crystal Palace and at the Drill Hall, except that later on I may, if time permit, describe the conditions, soil, &c., under which they were grown.

Nearly the whole of the fruit in Monmouthshire and other South Wales counties is grown in what are commonly known as grass orchards. These are in most cases situated in sheltered spots near to the homestead to which they belong. There is no record of the time when fruit-growing as an industry commenced, but from the general appearance of many of the orchards it certainly dates back to one hundred years ago, and in some cases to at least two hundred years. This refers more especially to the Monmouth, Abergavenny, Chepstow, and Usk districts. On the moors or alluvial flats fruit trees are much shorter lived, and consequently orchards have to be frequently renovated. This is caused by the damp nature of the soil; ditches, or what are more commonly known as "reens," take the place of hedges. During the greater part of the year these reens contain water, and in the winter months the surface of the ground will not be more than two or three feet above its level; indeed it frequently happens that during the spring tides many hundreds of acres are under water.

A great number of the farms in this district have orchards attached, and in many cases they are several acres in extent. In preparing the land the usual custom is to divide the ground intended to be planted into ridges: this is done by cutting a grip on each side of the ridge, throwing the soil taken out of the grip into the centre, and raising it almost into the form of a miniature arch or half-moon; the trees are generally planted on the surface, soil being carted from banks that have been accumulating for many years by the sides of public roads, or from what has been cast out of the reens or ditches, to cover the roots. After properly staking, a good dressing of stable or cow manure is placed on the surface round the tree, and this repeated the following year, with the result of forcing the trees into vigorous growth and also encouraging the fibrous roots to come to the surface. It is often necessary to lay drain pipes or cut cross-grips to more efficiently drain the land. Shelter has to be provided, and this is done by planting the Common Willow, and in some cases the English Elm, both of which grow very fast and soon form a belt sufficient to break the

strong westerly gales, which in certain seasons of the year are very prevalent.

Some people will probably ask, Is it possible to grow Apples under such conditions? My answer is that frequently very heavy crops are grown, equal in quality and size to any that I have seen in other parts of Great Britain. One of the varieties that are grown in quantity in most of the orchards in the district between Newport and Chepstow is 'King of the Pippins,' or what is known locally as 'Shropshire Pippin.'

It is well known from history that some 2,000 years ago the Romans occupied this part of the country, one of their chief fortified cities being Caerwent, situated on the main road from Newport to Chepstow, and about twelve miles from the former town. Now within the walls of this small but ancient city there are about 15 acres of orchard out of a total of 45 acres, or one-third of the whole city. The trees are perfectly healthy and although many of them are of great age they are still regularly bearing heavy crops of fruit; the reason given for this by the present tenant was that they were feeding upon the bones of the Romans. And in one sense this is certainly true. For in many places amongst the fruit trees are to be seen the ruins of the houses in which the Romans lived. Extensive excavations have lately been made within a few yards of the orchards, and almost beneath the shadow of the trees the foundations of two large Roman villas have been unearthed. Much of the fruit is used for making cider, but a large quantity is sent to the local markets, the better varieties including 'Coxes,' 'Blenheims,' 'Kings,' and 'Ribstons.'

About two miles from Caerwent we come to Portskewett, near to which is another ancient encampment, and here again is a very old orchard, about 9 acres in extent, which is partly enclosed by a high wall. Many of the trees are very large, and, when I saw them, were almost breaking down with their heavy crop of well-coloured fruit. The soil here is good, although not of great depth, the limestone in some places projecting above the surface. Near by is to be seen one of the relics of the olden times—a pair of stocks in perfect condition standing on the roadside close to the entrance to the parish church.

Leaving Portskewett we come to Caldicot, and here I found a good illustration of what can be done by honest industry. Some few years ago, the fruit gardens were in a very rough condition, and the present owner who had never had any special training for fruit-growing, purchased a quantity of Apple, Pear, and Plum trees, which were planted at sufficient distances apart to allow the ground between to be filled with "small fruits"; and in addition a plot has been set apart for growing Tomatos in the open air, and last season the results were so satisfactory that he intends to extend his fruit gardens.

On several occasions I have visited what is known as the Penhow and Llandevaud districts. In the latter place large quantities of 'Shropshire Prune' Damsons are grown, chiefly in the hedges and on waste pieces of land, and heavy crops of fruit are produced, which is a source of considerable profit to the cottagers and others. The soil here is shallow, but the trees root down into the crevices of the limestone, which in some places projects above the surface of the ground. No attempt is made to propagate by budding, &c., but the trees are all raised from suckers. On the

opposite side of the valley, and under what is known as the Wentwood Forest, Cherries are grown in large quantities. The fruit is small, but finds a ready sale in Newport and Cardiff, especially as they come in after the better varieties are gone. The trees are very large, and bear fine heavy crops of fruit. One of the growers told me that many times he has gathered from 50 to 60 lb. without moving the ladder. The whole of these Cherry trees are seedlings, and are said to be nearly two hundred years old, and I have no reason to doubt it.

In Penhow there are several large orchards, most of the fruit being grown for market. The favourite Apples are 'King of Pippins' and the old 'Cissy.' At one time great care was bestowed on these orchards, but afterwards they were allowed to fall into a very dilapidated condition; lately, however, there has been a great improvement. The old and broken-down trees have been removed and the vacancies have been filled up.

We now cross the Wentwood ridge, and descend into the fertile valley of the Usk. On each side of the river the soil is of a rich loam, whilst most of the hilly land adjoining is heavy clay. Of the more important orchards of this district, one on the Bertholly estate is about 5 acres in extent. Many of the older trees are local varieties, whilst amongst those recently planted are 'Bismarck,' 'Ecklinville,' 'Lord Derby,' 'Newton Wonder,' and 'Warner's King.' In the same parish there are several other orchards of which great care is taken, and this refers more especially to those situated near to the village of Llantrissant. In one of these nearly the whole of the trees were raised from seed by the father of the present owner, and they have never been grafted; and here my attention was drawn to a very heavy crop of Russets, the total weight of which I estimated to be over 10 cwt. on the one tree; and I have since been informed that I was very much below the mark. On the opposite side of the river, in the parish of Tredunnock, the trees are equally well cared for. One case I should like to mention where the owner took me to see his orchard. It is situated in a deep hollow, there being only one narrow outlet. To this gentleman the trees were like children: no effort was spared to keep them clean; vacancies, whenever they occurred, were at once filled up; the ground was regularly manured with the scrapings from the farmyard, and all animals dying from disease or accident were buried there—the result being that the trees were laden with large and well-coloured fruit. A similar case I discovered in Llanbaddock, near Usk, at a farm called Pant y Cuckoo, or Cuckoo's Hollow. Some two years ago this old orchard was renovated at the expense of the landlord, and after planting the trees, iron guards were sent to protect them at a cost, I was told, of 13*s.* each—to take care of 2*s.*! Some of the best specimens of Apples exhibited in the collection from Monmouthshire to-day were gathered from those very trees.

Passing through the town of Usk, and taking the main road leading to Abergavenny, we come to several orchards, the first at Trostrey farm, in the occupation of Mr. Marfell. Here were excellent crops of 'Kings,' 'Cox's Orange,' 'Alexanders,' and also the old 'Cat's-head.' Near the chain bridge which spans the Usk, on each side of the river and also in the parish of Goytrey, I found excellent crops of fruit. The 'Blenheims,'

'Cox's Orange,' 'King of Pippins,' and many other varieties in the whole of this district were very highly coloured. Most of the fruit is sold in the Pontypool and Abergavenny markets. In some of these orchards there is a marked improvement in the way in which they are kept, whilst others are still in a very backward condition.

In the Raglan and Monmouth district I spent several days this autumn, travelling over a hundred miles in different directions. The first place I visited was Cwmcarvan (the meaning of the word *cwm* is a "dingle"); the whole of this place is well sheltered from the easterly and westerly winds, the soil is of a stiff clay on the Red Sandstone. Many years ago there appear to have been extensive orchards in this place, and some attempts have been made to renovate them, but unfortunately the young trees that have been planted to fill up the vacancies have not had sufficient protection to prevent the cattle from rubbing against them and in many cases breaking them down; yet, notwithstanding this rough treatment, there were splendid crops of well-coloured fruit. The 'Blenheims' were the best I have seen this season, whilst on the old 'Cissy'

Fig. 116.—Apple Cissy. (*Journal of Horticulture.*)

trees the fruit was perfectly crimson in colour. I saw here for the first time an apple called 'The Ten Commandments'; there were several trees of it. Hitherto I had only read of it in Dr. Hogg's "Fruit Manual." Large quantities of cider fruit are also grown here, many of the trees breaking down with the weight of fruit. One of the varieties which appeared to be a great favourite through the whole of the Monmouth district was called the 'Potheer,' and I was told that it was raised at a mill of that name some short distance from Monmouth. It is considered to be an improvement on what is known there as the 'Belle Norman.' The trees

are of straggling habit, but they bear enormous crops of fruit every year, which frequently break the trees to pieces. Pear trees appear to do well here; the trunk of one I measured was six feet in circumference four feet from the ground, and of 'Catillac' I found some very large specimen trees.

I have already referred to a local variety of Apple known as the 'Cissy,' and in a few places as the 'Tampling.' It may be interesting to record that it was raised by a cottager named Tampling, who resided in the village of Malpas, near Newport, about a hundred years ago. During his lifetime he distributed grafts amongst his friends in different parts of the county, and after his death a sister named Cissy occupied the cottage, and the work of distribution continued until her death, and thus it obtained the name of 'Cissy's Apple,' by which it is known to this day. Some few years ago specimens of this Apple were exhibited at some of the large fruit shows, when it was given the name of 'Monmouthshire Beauty,' a name to which our people have not taken kindly. I am indebted for this information to Thomas Eboral Cooke, Esq., of Newport, whose father knew Mr. Tampling personally. (Fig. 116.)

After leaving Cwmcarvan we pass through Dingestow and Mitcheltroy; the orchards here are well cared for, 'Blenheims' and 'King of Pippins' (or, as it is known locally, 'Orange Pearmain') are grown in large quantities. Some of the farmers here have a much better system of gathering and marketing their fruit, the result being that much better prices are obtained. On the banks of the Trothy, and within a short distance of Troy House, I visited an orchard situated in a well-sheltered hollow: the soil was of a deep rich loam. To a question which I put to the aged farmer, a very intelligent man, as to some of the trees I saw, he replied that they could not be less than two hundred years old, for when he first knew them they were quite as large as they are now. Some of the trunks of the Pear trees were at least eight feet in circumference. I need hardly add that they were very common varieties, and that little care was taken in gathering the fruit, most of it being shaken from the trees, with the result that it was much bruised, and only realised a very low price in the market.

I will now refer to a very interesting experiment which has been made near by, and which should be an object-lesson to the inhabitants in this district. Three years ago about half an acre of ground was planted with the better varieties of culinary and dessert Apples and a few Pears; the trees were nearly all on dwarfing stocks, the ground between being cultivated and regularly cropped with vegetables. Lime and stable manure is used, and this year at least 75 per cent. of the trees bore heavy crops of fruit, one dish of 'Newton Wonder' taking the champion prize in the Monmouth Fruit Show.

I afterwards visited the Trelleck, Llanishen, and Llansoy districts. At the two latter places fruit-growing is considered one of the best and most profitable investments on the farm. Several of the orchards have been recently renovated, and the young trees are well protected and manured. Here I found a large number of 'Broad Eye' Pippins, or what is known locally as the 'Kentish Pippin'; 'Blenheims' and 'Kings' are also grown in quantity. In one of the orchards in this place I was somewhat

amused at a remark made by a farmer in reply to a question as to the name of one of the trees which was loaded with Apples. He said, "We call that 'The Parson,' sir, for until about ten years ago that tree never had an Apple on it, but I put up a small shed near by for a colt to shelter in in the winter, and the whole of the manure from that shed was thrown under that tree, and ever since it has borne heavy crops of fruit." Evidently the farmer thought it paid better to feed the parson than to starve him, for the lesson he learned by observing the result of manuring this one tree was put into practice throughout the whole of his orchard, and I have never seen a more healthy or cleaner lot of trees. Before I pass on to describe what I saw in other places I feel that I must say a word about the large number of cottages, well built, and gardens formerly well stocked with fruit trees that are now fast falling into ruins. Through the depression in agriculture, very few men are now regularly employed on the farms, the result being that they have left the country for the more populous districts and large towns.

Monmouth and the surrounding district is one of the prettiest parts of the county. About six miles from the town we come to the Hendre, the seat of Lord Llangattock. The fruit gardens were laid out in the year 1893 under the superintendence of Mr. Thomas Coomber, and are about two acres in extent. The soil is stiff clay and, underneath, blue marl. Previous to laying it out as fruit gardens it was pasture land, and before planting, the whole of it was trenched and divided into squares. The lower part is devoted to the different kinds of small fruit; adjoining and above are the plantations of Pears and Plums, the whole of which, including the small fruit, is enclosed and covered over with wire netting to the height of 8 feet. Most of the varieties of Plums were bearing very heavy crops, many of them weighted to the ground; amongst others I noticed the 'Czar,' 'Early Prolific,' 'Early Transparent,' 'Denniston's Superb,' 'Jeffersons,' 'Kirks,' 'Grand Duke,' 'Monarch,' 'Oulin's Golden Gage,' 'Pond's Seedling,' and 'Victoria.' The Pears included most of the leading varieties, and many of them were carrying good crops of fruit. The Apples are on the upper side of the gardens, and are enclosed with wire netting. The trees are planted 12 by 10 feet apart, and it is difficult to find words to describe the magnificent crop of fruit. The whole of the trees are in pyramid form and are well shaped; up to the present time the pruning has been done by Mr. Coomber personally. During the latter part of the summer the lateral shoots are taken out, to enable the fruit buds for the coming year to develop and ripen, the leading shoots only being shortened in the winter months. The ground between the trees is cultivated and kept free from weeds by continually stirring the surface; but no manure of any kind has ever been applied, not even when they were planted, and yet the branches of nearly every tree were laden with large and well-coloured fruits. Some of the best varieties were 'American Mother,' 'Bismarck,' 'Bramleys,' 'Belle du Pontoise,' 'Cox's Orange,' 'Gascoyne's Scarlet,' 'Lord Derby,' 'Lane's Prince Albert,' 'Peasgoods,' 'Bauman's Reinette,' 'Tyler's Kernel,' 'Wellington,' 'Newton Wonder,' 'Ribstons,' and 'Worcester Pearmain.' The fruit trees on the walls in the kitchen garden and the whole of the grounds are a credit to the genial and kindly-hearted head gardener.

The next place I visited was Llantillio, where to my mind the pruning of the trees had been done far too hardly, with the result of a fine crop of leaves but a small one of fruit. Many people, I think, prune their fruit trees too closely, for the sake of securing an effective-looking tree, whereas the true object to be aimed at should be an effective-bearing one, and it requires far more than an ordinary amount of patience, skill, and perseverance to combine the two effects in one and the same tree.

I next visited Brynderi, which is in a somewhat exposed position, especially in the winter months. In the kitchen garden my attention was drawn to several Apple and Pear trees upon which experiments had been made in root pruning, with the result that nearly the whole of the trees were dead. They had apparently been lifted and the soil entirely shaken out of the roots, which had then been shortened with a chopper. There are different methods of root pruning, and this had evidently not been one of the best. On the southern side of the hill the orchard or standard trees appear to have fared better, and many of them were carrying heavy crops of fruit. After this I went to Crossash, and thence to the top of Skenfrith Valley: this is very close to the borders of Herefordshire. And here I must pause, for words fail me when I attempt to describe what I saw in this beautiful valley. On one side of the road, and often on both sides, the orchards extended for a distance of about two miles, laden with crimson and golden fruit. Hundreds of trees had to be propped to prevent their breaking with the enormous weight of fruit. Much of the fruit was used for making cider, especially at the upper end of the valley, whilst lower down, nearer the river Monnow, large quantities of the better varieties were grown.

The last place I visited in this district was Hilston Court, which is in a somewhat exposed situation. The gardens are surrounded by a high wall. Here I found a large number of aged specimens of dwarf Apple and Pear trees, many of which, the gardener assured me, were over a hundred years old. Some of them, especially the Pears, were bearing heavy crops. In the grass orchard I found some of the finest fruit of 'Yorkshire Beauty' Apple I have seen this year.

I next visited the gardens belonging to the Right Hon. Lord Tredegar at Tredegar Park, near Newport, where the soil is not so favourable for fruit culture as in other parts of the county. Some years ago nearly the whole of the trees in these gardens were standards worked on the free stock, and these, rooting down into the gravelly subsoil, became cankered. Many of them have been removed, and young trees worked on the dwarfing stock have taken their place. The present gardener, Mr. Bone, has at considerable trouble carted a large quantity of red loam on to the fruit borders, and lifted the dwarf trees to a much higher level, for the purpose of keeping the roots from the gravelly subsoil, and this year some excellent fruit has been grown, some of which is exhibited to-day. I do not wish to speak of my own orchards, except just to say that most of my permanent trees are on the dwarfing stock. The whole of the ground is cultivated and kept free from weeds. The soil is of a good loam, in one part approaching to red clay. The trees are vigorous in growth and bear good crops of fruit. 'Bismarck' and 'Lane's Prince

Albert' do remarkably well, the success being much greater on the Paradise stock than on the Crab.

One of the things which struck me very forcibly in the remote and out-of-the-way parts of the country was the difficulty of finding a ready sale for the fruit, and also the want of a better method of gathering and packing for market. I have thought that possibly something might be done to remedy this state of things by establishing a good fruit market in one or more of the largest towns, and also by encouraging the farmers to grade and pack their fruit in such a way that it would find a more ready sale. At the present time the greater part is sold to dealers, who go round the farms at gathering time and generally purchase the whole of the crop for a lump sum. This does not apply to the districts near to good markets; in these places growers take a few hampers regularly as long as the fruit lasts, and retail them in small quantities to their customers.

A great deal of the success of fruit-growing in Monmouthshire is due to the kindly feeling existing between landlord and tenant. Of nearly the whole of the owners of large estates it can be said that they dwell amongst their own people, and no effort is spared to make the tenants comfortable in their homesteads. On nearly every estate trees are supplied to the tenants, the only condition being that they should take care of them. One of the best of landlords that it is possible to find we have in the Right Hon. Lord Tredegar, a name that is honoured wherever it is known; in the Monmouth district, too, we have the Right Hon. Lord Llangattock, another splendid specimen of the nobility of this country. Nearly the whole of the land is let on yearly tenancy, and the same families have been known to occupy farms to the fourth generation.

There are two names connected with fruit-growing in the county which I ought to mention, the first that of Pillinger, nurseryman, of Chepstow, whose business dates back to the year 1779, and is at the present time carried on by a member of the family; and that of James Sanders, of Abergavenny, which also dates back about a hundred years. The present proprietor is Mr. Phillip Shaw, who has kindly supplied me with much information. There is not the slightest doubt but that many of the larger and better of the old orchards were planted by these firms.

Much of the good work in the past, too, can be traced to a better class of agricultural labourer, who was formerly to be found in country districts, and it is surprising what an amount of work such men have done. In some places I have found traces of miniature nurseries, where the crab stocks raised from the woods have been planted and grafted with the varieties which best succeed in the neighbourhood. Many large orchards have been planted and kept up in this way. I remember one man whom I knew many years ago: he was only a farm labourer, whose ordinary clothing was a smock frock, and yet there are several large orchards which owe their origin to this man.

At the present time much interest has been taken by the Technical Instruction Committee of the County Council in endeavouring to improve the state of things in the county and throughout the whole of South Wales. Instruction in the planting, pruning, and general management of fruit trees is given in nearly all the villages, and during the past two

seasons lectures and demonstrations in cider-making have been delivered in many places.

I have already referred to one or more of the local varieties of Apples, but there are many others, some of which may be heard of at some future date. One that is only known in the district where I live is very similar to 'Bismarck.' Another (and I do not think anyone can beat this for a name) is called 'Afal bach coch y Vandra,' or 'The little red Apple of the Vandra.' It is a very heavy-cropping variety, but its best recommendation is its long-keeping qualities.

Before bringing my paper to a close I should like to add a word or so as to the filling up of vacancies or the renovation of old orchards. I know this is contrary to the advice given by some, but I want you to remember that we live in the hilly districts of South Wales, and that we have not, as you have in many parts of England, thousands of acres of level country suitable for the formation of fruit plantations. The sites chosen by our forefathers have been the very best on the holding, especially with regard to soil and shelter. I consider it far better in such a case to go to the expense of carting fresh soil to give the trees a good start, than to lay out an altogether new orchard in a far more exposed situation where the soil may not be so suitable. For many years I have carefully marked the results of such renovations, and I have no hesitation in saying that where the work has been done well such results have been quite satisfactory.

OBSERVATIONS ON SOME OF THE PLANTS EXHIBITED.

By the Rev. Professor G. Henslow, M.A., V.M.H., &c.

[Delivered December 5, 1899.]

Retinospora.—Mr. Henslow drew attention to a large collection of Conifers exhibited by Mr. Russell. With regard to Retinosporas, botanists had not agreed as to their affinities. Bentham and Hooker included *Retinospora* under *Chamæcyparis* (this being a section of *Thuya*), because the seeds were usually two at the base of each scale, and not many as in the Cypress. Others would refer it to *Cupressus*, because the fruit (a "galbulus") was globular, and not ovoid or elongated as in *Thuya*. The numerous varieties are referable to two species, natives of Japan, viz. *R. obtusa* and *R. pisifera*, and are remarkable for dimorphic foliage. In the younger state, *i.e.* as appearing first on seedlings, the leaves are less adherent, and more pointed or spinescent. In the later stage the basal part of the leaf is adherent for a greater length, while the apex is short and obtuse. This latter condition gives a resemblance to a Club Moss, hence the specific name *Lycopodioides*. The more pointed leaf resembles that of a Heath, and has suggested the specific name *Ericoides*. The origin or cause of these two types of leaf appears to be climatal, since analogous forms appear in many different plants growing in such conditions as tend to arrest development of the foliage. The Club Moss type is seen in various plants of arctic, antarctic, alpine, and desert regions. One of the most instructive is the genus *Veronica* in New Zealand, species of which on high elevations assume precisely similar forms of foliage.

Under cultivation in good soil, and in our milder and moister climate, the arresting conditions are non-existent. The foliage, therefore, often tends to assume its more primitive form. Thus in *Retinospora* and *Juniperus* the minute leaves become replaced by the longer pointed form; while in the Azores *Juniperus brevifolia* has leaves like those of the Yew. *Veronica cupressoides* sometimes acquires a lobed herbaceous type of leaf under cultivation.

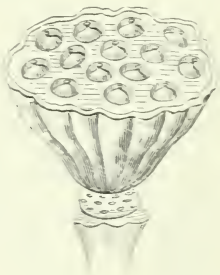
Yews.—Mr. Henslow compared the ordinary form of this tree bearing horizontal boughs and leaves with that of the Irish or fastigiate variety, on the branches of which, as they are erect, the leaves are dispersed all round, and are more or less erect also. In both cases the object gained is to acquire the best possible directions to receive the incident light. The fastigiate form is characteristic of the Cypress, Lombardy Poplar, and many other trees, of which the original type has horizontal and spreading branches. In order to distribute the leaves horizontally two methods are adopted. In the common Laurel, for example, the leaves issue in two ranks (distichous) from the branch which extends horizontally; but if a shoot appear on the upper part of the bush and grow up vertically, then the leaves will be in five ranks (pentastichous). In the

Irish Yew they are in eight ranks: but in the Common Yew, instead of assuming the distichous type, the leaves are simply twisted at the base so as to make them all lie flat in the same horizontal plane, thereby imitating the true distichous arrangement.

Angræcum Humblotii.—This Orchid from Madagascar has produced a new variety, exhibited by Mr. Sander, called *maximum*, remarkable for its broad labellum. The genus contains the species *sesquipedale*, remarkable for the extraordinary length of the spur, which is usually upwards of a foot in length, though perhaps not reaching "a foot and a half," as the specific name implies. When Mr. Darwin examined it in reference to the insect fertilisation of Orchids, he said there must be some moth with a proboscis of corresponding length. This has since then been found.

Chrysanthemum Flowers.—A small yellow-flowered variety was compared with one having a very large white flower. Mr. Henslow observed that this plant appears capable of acquiring a far larger flower when compared with the original wild type—about the size of a shilling—than any other garden plant. Though it is true that the enormous size is obtained by removing all the other flower buds from the stem which bears it, yet in Tulips, for example, the bulbs bear only one flower, but this plant has never acquired a proportionally large flower when compared with that of wild Tulips.

Salsify.—Large roots of this plant were exhibited. It is a native of Greece, Italy, and Algeria, but is often naturalised. It bears large purple flowers. Like our common species, the yellow-flowered Goat's-beard, it has a feathery or "plumose" pappus, not a "pilose" or one of simple hairs as in the Dandelion. It was more cultivated a century or two ago than at the present time. It is sometimes confounded with Scorzonera (*S. hispanica*), which the root resembles: but this latter has a brown skin, which gives the name *écorce noire* in French and *scorzonera* in Spain. It is common in Spain, South France, and Germany to the Caucasus. It has been cultivated for about two hundred years.



POTATO-GROWING EXPERIMENTS,

With Special Reference to Seeding and Manuring.

By Mr. James S. Gordon, B.Sc., F.L.S., of the Horticultural School, Holmes Chapel.

The potato is one of the most profitable crops which can be grown at the present time, even although prices were much lower than they have been during the past few years, and as this crop is so important throughout England—especially in Cheshire, which occupied fourth place in 1899 for growing the largest area of potatos in the United Kingdom, viz. 26,125 acres—the Cheshire County Council in their experimental work at the Agricultural and Horticultural School, Holmes Chapel, have given special attention to the potato crop during the last four years. This experimental work is being carried on entirely with a view of benefiting the agricultural and horticultural community, and although the amount expended in carrying on this class of work throughout England is very small, still we meet with people who seem to think the results gained are worse than useless, and that the money is wasted; but we are prepared to show that this is not the case. If we take potatos and look over the crop returns published by the Board of Agriculture for 1899, we find there were 387,715 acres in potatos in England last year, and the average yield was 5·81 tons per acre. Now if the various experiments with potatos throughout this country only enabled farmers to increase this yield one ton per acre—and this is quite possible—it would mean an increase of 387,715 tons in one year, which, if sold at the present marketable price, viz. £3 per ton, would realise £1,163,145, or ten times more than the whole amount spent upon agricultural education and experimental work throughout England. Many will at once say, "Is such a gain possible?" and in reply we can give our experience on the Agricultural School Farm in Cheshire. In 1896 our average return for the potato crop per acre was £45; in 1897, £52; and in 1898, £60. We cannot yet give last year's results, as the potatos are not all disposed of, but in 1898 the average yield was 15 tons per acre, and the average price £4 per ton. From these results we feel certain that the average yield of potatos throughout the United Kingdom could easily be increased at least one ton per acre.

The object of these experiments is to try to show how this increase can be obtained. In growing a crop there are three factors which must be considered, over which we can exercise a good deal of control, and upon them our results mainly depend. We will name these in their order of importance: (1) Seed; (2) texture or mechanical condition of the soil; (3) manures. With two of these factors we have been carrying out experiments, as upon them our success or failure largely depends.

Seed is the most important factor, because if the seed is unsound or weak one cannot expect a good crop, no matter how fine the tilth or

mechanical condition is, nor what manures one may apply, or in what quantities.

Now there are a few points connected with seed well worth considering:—

(*a*) New varieties generally do much better than old varieties: they are stronger in growth, producing broader leaves and thicker haulms; they are less liable to be attacked by disease, and better able to withstand frost. But as these new varieties become older they are almost certain to degenerate. The reason is quite simple. A potato multiplies in two ways: (1) By seed, or sexually; (2) by tubers, or asexually; and the latter way is the more common method by which the potato crop is reproduced.

Professor Johnson says * "that it is a generally accepted principle in biology that the possession of sexuality is a sign of vigour; that a plant possessing male and female organs, which results in the production of fruit and seeds, is more likely to maintain its tone than a plant which has no fruit or seeds and reproduces itself vegetatively." This is the case with the potato; and the cause of rapid degeneration in many varieties can be explained by this repeated vegetative reproduction, that is, by means of tubers. We have frequently noticed that the variety which has no sexual organs or produces no flowers is much more likely to degenerate rapidly than those which produce flowers or those of more vigorous growth.

By hybridising or crossing two varieties we introduce new varieties: these are more vigorous, owing to the introduction of new protoplasm. New varieties cannot be raised vegetatively, that is, by tubers.

(*b*) It is very important that the seed should come from a more northerly district or from a colder climate, because a plant brought from a cold region to a milder or warmer climate will be more vigorous in growth, hardier, and better able to withstand frost and disease than those brought from a warmer climate. But from experiments carried out at Holmes Chapel we find that seed potatos brought from Scotland are from ten to fourteen days later in sprouting and ripening than seed from the South of England; therefore we should say, if a grower wants to have potatos earlier than those of his own district, he should go south for seed, but if a heavy crop is wanted and early maturity is of no importance, one should certainly procure seed from the north.

(*c*) The soil on which the seed has been grown is another point worthy of attention. The seed should be procured from soil as different as possible in composition and texture from that upon which it is intended to plant the tubers. If the soil is sandy, we would procure the seed from heavy clay land, from peat or alluvial soils; if, on the other hand, the soil is heavy, the seed should be procured from sandy land or from peat. The greater the difference in soils, the better will the results be.

(*d*) The size of seed or tubers planted influences the crop to a wonderful extent; but we intend to refer to this point later on.

(*e*) The tubers selected must be sound, free from all traces of disease; those varieties must be chosen which are the best disease resisters, with shallow eyes, rough skin, and white in flesh and skin, as these take best in the market, also those which form a good soapy lather when cut in

* See *Report of the Conference and Exhibition of the Tercentenary of the Potato.*

two and the two cut surfaces are rubbed together, as this denotes richness in starch, and those rich in starch are always good cookers.

The next factor in importance is tilth. Potatos require a loose free-working soil, containing plenty of organic matter. By having the soil loose and well tilled we increase the root area of the plant, supplying it with food, and thus ensuring a vigorous plant growth. We think very often the land is not sufficiently cultivated both before and after the crop is planted. Frequent cultivation until the haulms almost close across the drills invariably gives good results, except in the case of early potatos, where the chief object is to check growth, and hasten maturity.

The last time the potatos are moulded, the soil should be put up on the drills as high as possible, in order to have no open space on the crest of the drills and to have them quite taper or steep: this is to prevent disease from attacking the tubers, because if the drills are open on the top, the spores are sure to drop off the leaves on the cleft in the drills and are washed down to the tubers by rain. We carried out an experiment in 1897 with high and shallow moulding, and found 25 per cent. more diseased tubers after the shallow than the high moulding. Experiments carried out by Prof. Carroll, of the Albert Model Farm, Glasnevin, seem to prove that the potato disease reaches the tubers from without. In 1892 this experiment was carried out at three stations, with the same variety of potato and upon similar lines. Prof. Carroll says: * A portion of ground upon which these potatos were growing was covered beneath the potato stems and leaves with a layer of cotton wool. This cotton wool was carefully placed around the stems, and every means was used to have the ground perfectly covered with it, with a view to filtering out the spores that might fall off the leaves upon the ground. The cotton wool was put on in June, before any sign of disease was noticeable. Disease appeared in July, and the leaves of the potato plants were in each case badly affected.

Upon raising the potatos in October, the following results were noticed:—

Albert Model Farm, Glasnevin.

Potatos where ground was covered with cotton wool.

Sound tubers . .	75 tubers.
Diseased . . .	nil.

Potatos where ground was uncovered.

Sound tubers . .	40 tubers.
Diseased . . .	33 ,,

Garryhill.

Potatos where ground was covered with cotton wool.

Sound tubers . .	95
Diseased . . .	nil.

Uncovered ground.

Sound tubers . .	61
Diseased . . .	15

* See *Report on Experiments in Checking Potato Disease in the United Kingdom*, published by the Board of Agriculture, 1893.

Munster School Farm.

Covered ground.

Sound tubers . .	95
Diseased . . .	nil.

Uncovered ground.

Sound tubers . .	76
Diseased . . .	15

If the soil is not thoroughly stirred and the drills loose, with plenty of soil on the top, the tubers will when expanding force their way to the surface, in the direction of least resistance, and many of the tubers will be exposed to the light and become green or sunburnt, and thus unmarketable except for seed.

Organic matter in a soil is of the greatest importance, because it helps to conserve moisture and thus supplies the plants with water; it also keeps soils free and open and prevents them from becoming hard and unworkable. In a wet season it promotes drainage.

We will now take up the results obtained from the experiments at Holmes Chapel. The first portion of the work consisted in testing nearly all the new varieties introduced, in order to ascertain the yield and main characters of each variety. This experiment is carried out with each variety for three years, in plots 21 yards long by $\frac{3}{4}$ yard wide. Those varieties which are promising are then selected and planted on another set of plots one-twentieth of an acre in size, and the next year they are planted on larger plots half an acre in area: by this method we can thoroughly test each variety, and we find they vary very much in yield.

This year the minimum yield on the small plots from 7 lb. of seed in the case of Second Early Rounds was 40 lb., the maximum yield on the same sized plot with another variety being 194 lb., or almost five times this yield.

In the case of First Early Kidneys, the heaviest yield was 133 lb., and the smallest was 22 lb., or only one-sixth of the yield. This shows clearly the vast difference in yield in different varieties.

The second point was to test whole sets *versus* cut sets. This is a question which has caused a considerable amount of controversy; and even yet we find people who are not decided about which is the better to plant. In some districts in the United Kingdom only cut sets are ever planted; in other districts we find nothing but whole sets planted. It would be quite an easy matter to prove that cut sets are better, and equally as easy to prove the opposite. It depends upon several conditions :—

1. The variety of potato. White-blossomed varieties are usually soft and much more easily injured, and therefore likely to miss when cut; but coloured-blossomed varieties stand cutting well.

2. Varieties which produce usually only one or two sprouts, that is haulms, are much more liable to miss than those which produce many sprouts or haulms.

3. If the sets are cut thin and weak from small tubers they will only produce puny buds and stunted plants, and if not very carefully treated

after being cut it is almost certain that there will be a large number of blanks where they are planted.

The tubers selected in this experiment were large ones, and were cut into two or three sets, two eyes being left in the rose end of each set. The sets were cut from eight to ten days before planting, and the cut surface of each set was dusted over with air-slaked lime, in order to allow a crust to form to prevent the sap from exuding and the set shrinking. The sets were then put into potato-sprouting boxes, and not too thickly packed together, in order to prevent them from heating, as this is frequently the cause of failure in cut sets. The whole sets planted were dressed over 1½ inch riddle, and the large ones were removed.

This experiment was carried out with five varieties, as shown in Table 1.

TABLE No. 1.

Cut Sets *versus* Whole Sets.

Variety	Flower	Yield per acre			
		Saleable	Small	Diseased	Total
		T. C.	CWT.	CWT.	T. C.
'Scottish Triumph'. . cut sets .	Coloured	14 2	30	14	16 6
,, ,, . . whole sets	,,	13 12	23	18	15 13
'Sutton's Reliance'. . cut sets .	,,	13 6	25	—	14 11
,, ,, . . whole sets	,,	12 9	26	—	13 15
'Challenge' . . . . cut sets .	,,	9 19	25	—	11 4
,, ... whole sets	,,	9 13	31	—	11 4
'British Queen' . . . cut sets .	White	13 14	40	—	15 14
,, ,, ... whole sets	,,	16 1	33	—	17 14
'Hough Giant' or 'Motor' cut sets .	Coloured	12 12	9	13	13 14
,, ,, ,, . whole sets	,,	13 19	9	5	14 13

Average Yield of these Five Varieties, 1899.

Saleable		Small		Diseased		Total	
Cut sets	Whole sets	Cut sets	Whole sets	Cut sets	Whole sets	Cut sets	Whole sets
T. C.	T. C.	CWT.	CWT.	CWT.	CWT.	T. C.	T. C.
12 15	13 3	26	24	5	5	14 6	14 12

In the five trials of cut sets *versus* whole sets three cases show that cut sets produced the heaviest yield of saleable potatos, and, in the other two, whole sets gave the best results in both total quantity and saleable potatos; but if the average of the five varieties is taken, it shows that cut sets produced 12 tons 15 cwt. saleable potatos, and whole sets 13 tons 3 cwt., or a difference of 8 cwt. in favour of whole sets; also that cut sets produced rather more small potatos; but it will be noticed that in this trial there was a white-flowered variety, viz. 'British Queen,' and also one which produced very few buds, viz. 'Hough Giant.' If they

had all been coloured varieties the gain would probably have been in favour of cut sets.

TABLE No. 2.

CUT SETS *versus* WHOLE SETS.

Average for four years.

	Saleable		Small		Diseased		Total	
	Cut sets	Whole sets	Cut sets	Whole sets	Cut sets	Whole sets	Cut sets	Whole sets
	T. C.	T. C.	CWT.	CWT.	CWT.	CWT.	T. C.	T. C.
Average for 1896 . .	11 4	12 6	7	15	—	1	11 11	13 4
„ 1897 . .	11 14	11 10	31	19	22	24	14 7	13 13
„ 1898 . .	16 0	16 8	13	15	4	4	16 17	17 6
„ 1899 . .	12 15	13 3	26	24	5	5	14 6	14 12
Average for 4 years .	12 18	13 7	19	18	8	8	14 5	14 14
Increase . . .	—	0 9	1	—	—	—	—	0 9

Now if we look at the next Table, No. 2, which shows the average results of sixteen trials during the last four years with eight varieties, we will see that whole sets give slightly better results, with an increase of 9 cwt. of saleable potatos per acre. From this experiment the conclusion can be drawn that there seems to be very little difference between planting whole and cut sets, but if anything the average results of the last four years are in favour of whole sets.

The third point was:—

To try the effect of different-sized sets, the object being to see which is the most profitable size to plant, and if it is wise to cut small sets.

In each case the same variety of potato was planted, viz. 'Maincrop, and the $\frac{1}{20}$ of an acre was weighed. The sets were passed through riddles of different-sized meshes and weighed, an average weight of the sets being taken.

There were six sizes tried, averaging respectively 1 inch in diameter, $1\frac{3}{8}$ inch whole, $1\frac{3}{8}$ inch cut in two, $1\frac{5}{8}$ inch, $1\frac{7}{8}$ inch, and $2\frac{1}{8}$ inch. The weights were respectively 1 oz., 1·37 oz., 0·68 oz., 2·6 oz., 3·9 oz., and 5·4 oz.

We find that seed weighing from 1·37 to 2·5 oz. each, or those which pass through $1\frac{3}{4}$-inch riddles, but not through $1\frac{1}{4}$-inch riddles, produce the most economical results, as shown in Table No. 3, when we consider the cost of seed per acre; seed weighing 1·37 oz., or that which passed through $1\frac{1}{2}$-inch riddle, but not through $1\frac{1}{4}$-inch, gave a profit of £2. 2*s*. 6*d*. per acre; those sets which passed through $1\frac{3}{4}$-inch, or weighed 2·6 oz., left a profit of 10*s*. 3*d*. per acre; but all others gave a loss.

TABLE No. 3.

Different Sizes of Sets Planted with Variety 'Maincrop.'

Size of seed planted	Average weight of sets	Yield per acre: Saleable			Yield per acre: Small			Yield per acre: Total			Quantity of seed per acre	Profit + or Loss − per acre		
	oz.	T.	C.	Q.	T.	C.	Q.	T.	C.	Q.	cwt.	£	s.	d.
Whole sets passed through 1¼-in. riddle	1	11	1	1	0	14	2	11	15	3	10	—		
Whole sets passed through 1½-in. riddle, but not through 1¼-in.	1·37	11	19	3	0	13	2	12	13	1	14	+2	2	6
Whole sets passed through 1½-in. riddle, but not through 1¼-in., cut in two	0·68	10	7	3	0	5	3	10	13	2	7	−2	0	3
Whole sets passed through 1¾-in. riddle, but not through 1½-in.	2·6	11	17	3	1	0	1	12	18	0	25	+0	10	3
Whole sets passed through 2-in. riddle, but not through 1¾-in.	3·9	12	4	2	0	16	2	13	1	0	40	−0	18	3
Whole sets passed through 2¼-in. riddle, but not through 2-in.	5·4	12	11	1	1	7	0	13	18	1	55	−1	12	6

Now if we look at Table No. 4, we see that this year's results confirm those of last year, viz., that fairly large seed produces heavier yields than small seed, but is not so profitable.

We also notice that large seed always produces more stems and more chats than small seed; the large sets yielded 24½ cwt. per acre on an average, whereas small sets yielded 12½ cwt. per acre: this seems to prove that the more stems a potato produces, the greater the yield of small potatos. It is also worth noting that in a dry season the strong-haulmed varieties withstood the drought best and produced the heaviest yields.

TABLE No. 4.

Sets passed through 1½-inch Riddle *versus* Sets passed through 2¼-inch and 2½-inch Riddles.

	Yield per acre: 1898				1899				Average			
Size of seed	Passed through a 1½-in. riddle			Through a 2½-in. riddle	Through a 1½-in. riddle			Through a 2¼-in. riddle	Through a 1½-in. riddle			Through 2¼- and 2½-in. riddles
Average weight of set	—			—	1·37 oz.			5·4 oz.	—			—
Weight of seed per acre	14 cwt.			60 cwt.	14 cwt.			55 cwt.	—			—
	T.	C.	Q.	T. C. Q.	T.	C.	Q.	T. C. Q.	T.	C.	Q.	T. C. Q.
Saleable	10	1	2	11 8 1	11	19	3	12 11 1	11	0	2	11 19 3
Small	0	11	2	1 2 0	0	13	2	1 7 0	0	12	2	1 4 2
Total	10	13	0	12 10 1	12	13	1	13 18 1	11	13	0	13 4 1
Increase	—			1 17 1	—			1 5 0	—			1 11 0
Gain	—			£4 10 9	—			£2 8 0	—			£3 9 9
Cost of increased seed	—			£6 18 0	—			£6 3 0	—			£6 10 6
Loss	—			£2 7 3	—			£3 15 0	—			£3 0 9

From the results of the last two years' trials shown on Table 4A, it seems to be a great mistake to cut small seed, because those which pass through a 1½-inch riddle, when planted whole, produced 2 tons 5 cwt. more per acre than when cut in two, or a gain of £6. 3*s*. per acre.

TABLE No. 4A.

SETS PASSED THROUGH 1½-INCH RIDDLE *versus* SAME SETS CUT IN TWO.

Yield per acre

Size of seed	1898		1899		Average	
	Whole sets passed through 1½-in. riddle	Whole sets passed through 1½-in. riddle, cut in two	Whole sets passed through 1½-in. riddle	Whole sets passed through 1½-in. riddle, cut in two	Whole sets passed through 1½-in. riddle	Whole sets passed through 1½-in. riddle, cut in two
Average weight of sets	—	—	1·37 oz.	0·68 oz.	—	—
	T. C. Q.	T. C. Q.	T. C. Q.	T. C. Q.	T. C. Q.	T. C. Q.
Saleable	10 1 2	7 16 0	11 19 3	10 7 3	11 0 2	9 1 3
Small	0 11 2	0 5 3	0 13 2	0 5 3	0 12 2	0 5 3
Total	10 13 0	8 1 3	12 13 1	10 13 2	11 13 0	9 7 2
Increase	2 11 1	—	1 19 3	—	2 5 2	—
Gain	£7 2 3	—	£5 3 9	—	£6 3 0	—

We now come to the last factor, viz. manures. These experiments will show the effects and value of different manures.

In each case one-fifteenth of an acre was weighed; all the plots were planted with 'British Queen' or 'Hough Giants,' with whole sets.

The farmyard manure was put in the drill at the time of planting, and the artificial manures were sown on top of the farmyard manure, except in one case where nitrate of soda was applied as a top-dressing in June.

The farmyard manure was considered worth 6*s*. per ton, and the saleable potatos are calculated as being worth £3 per ton, small at £1 per ton, and the diseased are not counted at all.

On the sulphate of ammonia and nitrate of soda plots exactly the same quantity of nitrogen was applied in each case, and the same quantity of potash was applied when kainit and 1 cwt. muriate of potash were tried.

In the following tables the weights obtained are given per acre.

TABLE No. 1.

The Effects of Artificial Manures alone, and of Farmyard Manure alone, upon the Yield.

Variety, 'British Queen.'

Manures applied per acre	Yield per acre					
	Saleable	Small	Diseased	Total	Increase	Net gain
	T. C.	CWT.	CWT.	T. C.	T. C.	£ s. d.
No manure	5 0	24½	—	6 4½	—	—
3 cwt. superphosphate 1 cwt. sulphate of ammonia 1 cwt. muriate of potash	11 6½	39	—	13 5½	7 1	18 4 3
No manure	5 0	24½	—	6 4½	—	—
15 tons farmyard manure	14 12¾	30¼	—	16 3	9 18½	24 14 0
15 tons farmyard manure	14 12¾	30¼	—	16 3	2 17½	6 10 3
3 cwt. superphosphate 1 cwt. sulphate of ammonia 1 cwt. muriate of potash	11 6½	39	—	13 5½	—	—

Variety, 'Hough Giant.'

Manures applied	Yield per acre					
	Saleable	Small	Diseased	Total	Increase	Net gain
	T. C.	CWT.	CWT.	T. C.	T. C.	£ s. d.
No manure	8 3½	9½	2¼	8 15¼	—	—
3 cwt. superphosphate 1 cwt. sulphate of ammonia 1 cwt. muriate of potash	11 2¾	10½	3¼	11 16½	3 1¼	7 8 6
No manure	8 3½	9½	2¼	8 15¼	—	—
15 tons farmyard manure	14 17	0	8¼	16 5¼	7 10	16 1 0
15 tons farmyard manure	14 17	20	8¼	16 5¼	4 8¾	8 12 6
3 cwt. superphosphate 1 cwt. sulphate of ammonia 1 cwt. muriate of potash	11 2¾	10½	3¼	11 16½	—	—

The objects were:—

Table No. 1.—To test the effect of farmyard manure alone, compared with no manure and artificial manures alone.

These were carried out in duplicate plots.

Artificial manures produced a heavier yield than no manure. In the case of 'British Queen' the crop was more than doubled, giving an actual increase of 7 tons 1 cwt., valued at £18. 4*s*. 3*d*. per acre. In the case of 'Hough Giants,' the increase was not so great, being 3 tons 1¼ cwt., valued at £7. 8*s*. 6*d*. per acre.

The artificial manures produced a much stronger haulm and broader leaves of a dark green colour. The potatos ripened later, and the percentage of saleable tubers showed an increase of 4·6 per cent., while the percentage of small was proportionately reduced. The saleable potatos were larger where artificial manures were applied.

Farmyard manure gave a heavier yield than no manure in both varieties tried. In the case of 'British Queen,' the total yield was increased by 9 tons 18½ cwt. per acre: of this increase 9 tons 12 cwt. were saleable potatos, the net gain being £24. 14*s*. per acre. In the case of 'Hough Giants' the increase was 7 tons 10 cwt., valued at £16. 1*s*. per acre.

On no-manure plots the haulms were short and the leaves small and crumpled, so much so that the general character of the foliage was quite different from that of those growing on the farmyard manure plots adjoining; nearly every person who saw these plots thought that those potatos which received no manure were a different variety. The potatos also ripened fully a month earlier than those which received farmyard manure.

On farmyard-manure plots the haulms were very strong, the leaves broad and of a dark green colour. The saleable potatos on no-manure plots were nearly all seconds or seed size, small undeveloped tubers, whereas those on the farmyard-manure plots were much larger.

The application of farmyard manure increased the percentage of saleable potatos by 10·3 per cent., and reduced the percentage of small accordingly. No-manure plot had the lowest percentage of saleable potatos.

Farmyard Manure *versus* Artificial Manures.

Farmyard manure gave a much larger yield than artificial manures. In the case of 'British Queen' the increase was 2 tons 17½ cwt., leaving a net profit of £6. 10*s*. 3*d*.; with 'Hough Giants' the increase was 4 tons 8¾ cwt., leaving a profit of £8. 12*s*. 6*d*. per acre.

The effect of farmyard manure shows clearly that the yield of crop does not depend entirely upon the chemical ingredients used, but that the mechanical condition of the soil influences the yield to a large extent, as in both cases the same manurial ingredients were applied.

The farmyard manure undoubtedly made the soil more open and more easily worked, and at the same time it conserved moisture and supplied the potatos with water, and no doubt the increased yield is due to these properties, which artificial manures have not.

The farmyard manure produced a stronger haulm and much larger tubers than the artificial manures. The percentage of saleable potatos was increased by 5·7 per cent.

TABLE No. 2.

The Effects of Farmyard Manure alone, compared with Farmyard Manure and Artificials, upon the Yield.

Variety, 'British Queen.'

Manures applied	Yield per acre: Saleable	Small	Total	Increase	Net gain
	T. c.	cwt.	T. c.	T. c.	£ s. d.
15 tons farmyard manure	14 12¾	30¼	16 3	—	—
15 tons farmyard manure 3 cwt. superphosphate 1 cwt. sulphate of ammonia 1 cwt. muriate of potash	16 1½	33	17 14½	1 11½	2 19 0

No. 2.—To try the effect of farmyard manure and artificial manures containing nitrogen, phosphorus, and potash together.

The farmyard manure supplemented with artificial manures gave an increase of 31½ cwt. per acre when compared with farmyard manure alone; 28 cwt. of this increase were saleable potatos, the net gain being £2. 19*s.* per acre.

This shows that it is advisable to use moderate dressings of farmyard manure, and to supplement these with a suitable mixture of artificial manures containing nitrogen, phosphorus, and potash. By adopting this method the maximum yield can be obtained at the minimum cost.

The percentage of saleable and small potatos was scarcely altered, but the size of the saleable potatos was larger on the plot receiving farmyard and artificial manures. No difference could be perceived in the foliage.

TABLE No. 3.

The Effects of Superphosphate upon the Yield when added to Farmyard Manure.

Variety, 'British Queen.'

Yield per acre.

Manures applied	Saleable	Small	Diseased	Total	Decrease	Loss
	T. c.	cwt.	cwt.	T. c.	T. c.	£ s. d.
15 tons farmyard manure	14 12¾	30¼	—	16 3	—	—
15 tons farmyard manure 3 cwt. superphosphate	12 0¾	45¾	—	14 6½	1 16½	7 9 6

Variety, 'Hough Giant.'

Yield per acre.

Manures applied	Saleable	Small	Diseased	Total	Decrease	Loss
	T. C.	CWT.	CWT.	T. C.	T. C.	£ s. d.
15 tons farmyard manure .	14 17	20	$8\frac{1}{4}$	16 $5\frac{1}{4}$	—	—
15 tons farmyard manure . 3 cwt. superphosphate .	13 $13\frac{1}{2}$	11	$8\frac{1}{4}$	14 $12\frac{3}{4}$	1 $12\frac{1}{2}$	4 8 6

No. 3.—Farmyard manure *versus* farmyard manure and superphosphate.

When superphosphate was used in conjunction with farmyard manure it diminished the yield. In the case of 'British Queen' the decrease in weight of saleable potatos was 52 cwt. and the increase in chats was $15\frac{1}{2}$ cwt., leaving a total decrease of $36\frac{1}{2}$ cwt., entailing a loss of £7. 9*s*. 6*d*. per acre. In 'Hough Giants' the decrease in weight was $32\frac{1}{2}$ cwt., valued at £4. 8*s*. 6*d*.

This decrease was probably due to the effects of the dry season, as it was noticed that those potatos which received superphosphate alone, in addition to farmyard manure, ripened off much earlier, thus causing the increase in chats. It reduced the percentage of saleable potatos by 6·7 per cent., and increased the percentage of small proportionately. The crop was ready to lift a month earlier than those of any other plots receiving farmyard manure; besides, the haulm was weaker and the tubers were reduced in size.

TABLE No. 4.

The Effects of Nitrate of Soda *versus* Sulphate of Ammonia upon the Yield.

Variety, 'British Queen.'

Yield per acre.

Manures applied	Saleable	Small	Diseased	Total	Increase	Net gain
	T. C.	CWT.	CWT.	T. C.	T. C.	£ s. d.
15 tons farmyard manure . 3 cwt. superphosphate . $1\frac{4}{15}$ cwt. nitrate of soda .	14 $1\frac{1}{4}$	30	—	15 $11\frac{1}{4}$	—	—
15 tons farmyard manure . 3 cwt. superphosphate . 1 cwt. sulphate of ammonia .	15 10	30	—	17 0	1 $8\frac{3}{4}$	4 5 6

THE EFFECTS OF NITRATE OF SODA UPON THE YIELD, WHEN APPLIED AT THE TIME OF PLANTING, AND ALSO AS A TOP-DRESSING TWO MONTHS LATER.

Variety, 'Hough Giant.'

Yield per acre.

Manures applied	Saleable	Small	Diseased	Total	Increase	Net gain
	T. C.	CWT.	CWT.	T. C.	T. C.	£ s. d.
15 tons farmyard manure 3 cwt. superphosphate $1\frac{4}{15}$ cwt. nitrate of soda, applied when planting	13 19½	16¾	10	15 6¼	—	0 8 6
15 tons farmyard manure 3 cwt. superphosphate $1\frac{4}{15}$ cwt. nitrate of soda, applied as a top-dressing, June 21	13 15¾	19½	11	15 6¼	—	—

No. 4.—To see which nitrogenous manure produces the best results, sulphate of ammonia or nitrate of soda.

Sulphate of ammonia gave 28¾ cwt. more saleable potatos than nitrate of soda, leaving a net gain of £4. 5*s.* 6*d.* per acre. On these plots exactly the same quantity of nitrogen was applied in each case, and the artificials were applied at the same time, on top of the farmyard manure when planting the sets. There was no difference in the quantity of small potatos.

Sulphate of ammonia produced more haulm than nitrate of soda; it also increased the percentage of saleable by 1 per cent., and reduced the percentage of small, besides increasing the size of the saleable tubers.

Last year's results confirm these, viz.:—

That sulphate of ammonia produces better results than nitrate of soda.

The yield for sulphate of ammonia was 18 tons 11 cwt. 1 qr., with a net profit of £6. 3*s.* 9*d.*, whereas nitrate of soda gave a yield of 17 tons 5 cwt. 3 qrs., leaving a net profit of £2. 13*s.* 4*d.* If we subtract these it shows a gain in favour of sulphate of ammonia of £3. 10*s.* 5*d.* per acre.

These results have also been confirmed by the experiments carried out on nineteen farms in the centre and south-west of Scotland, by Professor Wright of the Agricultural College, Glasgow, and by those in Yorkshire conducted by Professor Campbell.

To see the effects of nitrate of soda applied at the time of planting and as a top-dressing two months later:—

This year nitrate of soda, when applied at the time of planting, on April 25, gave better results: it increased the yield of saleable potatos by 3¾ cwt., and diminished the small potatos by 2¾ cwt., leaving a net gain of 8*s.* 6*d.* per acre. On June 21 the nitrate of soda was applied as a top-dressing on the other plot, being sown up the drill, and then covered in with a turn of the drill plough.

Nitrate of soda applied as a top-dressing reduced the yield of saleable potatos by 1·2 per cent., and increased the percentage of small potatos by 1 per cent., and diseased by 0·2 per cent.

The extremely dry season may have had a good deal to do with these results.

TABLE No. 5.

To try the Effects of Potash on the Crop, also different kinds of Potassic Manures, and in different quantities.

Variety, 'British Queen.'

Yield per acre.

Manures applied.	Saleable	Small	Total	Increase	Net gain
	T. c.	cwt.	T. c.	T. c.	£ s. d.
15 tons farmyard manure 3 cwt. superphosphate 1 cwt. sulphate of ammonia	15 10	30	17 0	—	—
(*a*)					
15 tons farmyard manure 3 cwt. superphosphate 1 cwt. sulphate of ammonia 1 cwt. muriate of potash	16 1½	33	17 14½	0 14½	1 6 9
15 tons farmyard manure 3 cwt. superphosphate 1 cwt. sulphate of ammonia 5 cwt. kainit	14 17½	33½	16 11	—	—
(*b*)					
15 tons farmyard manure 3 cwt. superphosphate 1 cwt. sulphate of ammonia 1 cwt. muriate of potash	16 1½	33	17 14½	1 3½	3 12 0
15 tons farmyard manure 1 cwt. superphosphate 3 cwt. sulphate of ammonia 1 cwt. muriate of potash	16 1½	33	17 14½	3 11½	11 7 3
(*c*)					
15 tons farmyard manure 3 cwt. superphosphate 1 cwt. sulphate of ammonia 2 cwt. muriate of potash	12 9	34	14 3	—	—

Table No. 5.—To try the effects of potash on the crop, also different kinds of potassic manures and in different quantities.

(*a*) Farmyard manure, sulphate of ammonia and superphosphate *versus* the same manures with the addition of 1 cwt. of muriate of potash.

The potash plot gave an increase of 11½ cwt. of saleable potatos and 3 cwt. more chats per acre, the net gain being £1. 6*s*. 9*d*., but the percentage of saleable potatos and chats varied only very slightly.

The haulm on the muriate of potash plot was stronger and kept green

longer than on the plot which received no potash, and the saleable potatos were much larger.

(*b*) Muriate of potash *versus* kainit.

Muriate of potash gave a heavier yield than kainit by 23½ cwt.: this increase was in saleable potatos and was valued at £3. 12*s*. per acre.

These results are confirmed by last year's, when muriate of potash gave a yield of 19 tons 14 cwt. 1 qr., and kainit gave 16 tons 13 cwt. 1 qr., a difference of 3 tons 1 cwt., or £6 3*s*. per acre in favour of muriate of potash. These results have also been confirmed by the experiments carried out at Cockle Park, Northumberland, under Professor Somerville, where kainit gave a yield of 3 tons per plot, sulphate of potash 3 tons 6 cwt., and muriate of potash 3 tons 17 cwt. of saleable potatos.

The results at Holmes Chapel last year were—

For kainit	.	16 tons	13 cwt.	per acre.	
Sulphate of potash	.	18 „	16 „	„	„
Muriate of potash	.	19 „	14 „	„	„

Both muriate and kainit gave good-sized saleable potatos, but those grown with muriate of potash were larger, the haulms were also stronger and remained green longer. The percentage of saleable potatos was slightly in favour of muriate of potash by 0·75 per cent.

We believe that the form of potash has a good deal to do with these results. Kainit is in the crude state as procured from the mines; the potash contained in it is practically all in the form of sulphate of potash, but besides it contains large quantities of common salt (about 33 per cent.) and smaller percentages of magnesium chloride and magnesium sulphate. It is liable to injure the young rootlets of the potatos if applied at the time of planting, as both chloride of sodium and magnesium chloride in quantity are hurtful to roots. The poor returns from kainit may be due to this, and probably if applied a considerable time before planting the results might be different.

Kainit is usually the most expensive potassic manure, if calculated according to the unit value; besides, the carriage is a serious item, as one ton of kainit contains about 12 per cent. of potash, and one ton of muriate will contain 60 per cent., or, to put it in another way, one ton of muriate of potash will contain as much potash as five tons of kainit and only cost one-fifth of the carriage.

Muriate of potash is a manufactured product containing from 50 to 60 per cent. of potash, and guaranteed 80 to 96 per cent. purity. Its chief impurity is common salt, but if you get it containing 96 per cent. of muriate of potash it practically contains no impurities. We believe this is the reason that muriate gave better results than kainit.

Sulphate of potash is also a manufactured product containing 50 per cent. of potash and guaranteed to consist of 95 to 98 per cent. pure sulphate of potash. It is not so diffusible as muriate of potash in the soil.

(*c*) Double quantities of muriate of potash.

The application of 1 cwt. of muriate of potash gave better results than when 2 cwt. were applied, the increase being 3 tons 11½ cwt.,

showing a gain of £11. 7*s.* 3*d.* per acre in favour of 1 cwt. of muriate of potash. This we think is probably due to the dressing of muriate of potash being too large; as the potash is in the form of potassium chloride, and when used in excess chlorides are most injurious to plant life, unless applied a considerable time before planting; now in this case they were applied in the drill immediately before planting. The application of 2 cwt. of muriate of potash increased the size of the saleable tubers, but reduced the percentage by 2·75 per cent.

In testing the effects of different manures on the cooking quality of the potato, it was found that those grown with sulphate of ammonia were white, dry and mealy, and of good quality, whereas those raised with nitrate of soda, were waxy, wet, dark in colour and poor in quality. The test in each case was carried out with the same variety of potato.

The effects of potassic manures were also tried, and those raised with kainit were wet, pasty, and dark in colour, but both sulphate and muriate of potash produced dry, floury potatos, quite white in colour.

The quality of potatos depends upon other conditions besides manures, the most important being the variety. Some potatos are naturally white in colour, while others are dark, yellow or red streaked; some are poor in starch and rich in water, while other varieties are very rich in starch. The soil upon which they were grown has also a great influence upon the quality. Peaty or wet stiff clays invariably produce wet, waxy potatos; but sandy loams, sandy and alluvial soils generally produce those of first-class quality.

Dry seasons are usually conducive to the production of floury potatos, and wet seasons have the opposite effect; finally, the quality depends largely on how they are cooked. This question of quality is really one of the most important, because bad cooking varieties are almost unsaleable; we require therefore to be very careful in the selection of our varieties.

In order to be successful in growing potatos, it is wise to select good sound seed of heavy-cropping varieties, of good cooking quality, white in flesh, with shallow eyes which ensure least waste in peeling. The land must be well cultivated before and after the potatos are planted, in order to have as fine a tilth as possible, and moderate dressings of farmyard manure should be applied, supplemented with a complete mixture of artificial manures containing nitrogen, phosphorus, and potash in suitable quantities for different soils.

EXAMINATION IN HORTICULTURE.

1900.

The Annual Examination in the Principles and Practice of Horticulture was held on April 25 : 236 papers were sent in.

Three hundred marks were allotted as a maximum, and all candidates who obtained 200 marks and upwards were placed in the First Class. The total number was 141, or nearly 60 per cent.

The highest number of marks (300) was awarded to Miss E. Welthin Winlo, from the Horticultural College, Swanley, Kent.

Those who secured 150 and less than 200 marks were placed in the Second Class. The number was 61, or nearly 26 per cent.

Those who obtained 100 and upwards were ranked in the Third Class. The number was 30, or nearly 13 per cent.

Four candidates, obtaining less than 100 marks, were not placed.

Comparing the results with those of the last two years * the entry has greatly increased ; viz., from 190 in 1898, and 165 in 1899, to 236 in 1900. It will be observed that the percentage of the First and Third Classes is much higher than in previous years.

The Second has remained about stationary.

The questions were, as a rule, very satisfactorily answered. We observe, as might be expected, that the students from colleges are in some cases better prepared in the elementary principles than in practical horticulture ; many were unacquainted with the importance and meaning of Respiration in plants.

The candidates were well versed in Practical Horticulture, and showed greater knowledge in minor details than heretofore. Many of them in their answers branched off into extraneous matters not required in reply to the question at all. It is important that they should keep strictly to the text of the questions.

George Henslow,
James Douglas, } *Examiners.*

* See Journal of the R.H.S., vol. xxiii. p. 64.

First Class.

		No. of Marks gained.
1.	Miss E. Welthin Winlo, Horticultural College, Swanley	300
2.	Miss Helen Draper, Horticultural College, Swanley	290
2.	Mr. Christopher Richards, Horticultural School, Holmes Chapel	290
2.	Mr. Bernard N. Wale, County Technical School, Stafford	290
5.	Miss E. Wright, Horticultural College, Swanley	285
5.	Mr. Alfred William Day, 29 Turnford Villas, Turnford, near Broxbourne, Herts	285
5.	Mr. Edward T. B. Reece, The College, Reading	285
5.	Mr. George Underwood, Municipal Technical School, Leicester	285
5.	Mr. F. C. Walton, The Gardens, Lower Hare Park, Newmarket	285
5.	Mr. George Wassell, Stretton House Gardens, Alfreton	285
11.	Miss Emily Boorman, Horticultural College, Swanley	280
11.	Mr. Charles H. Buck, Horticultural College, Swanley	280
11.	Miss Dora Fearnley, Horticultural College, Swanley	280
11.	Miss Amy M. Foster, Horticultural College, Swanley	280
11.	Miss Isabel T. Hopkins, The College, Reading	280
11.	Mrs. J. Marsh, The Grove, Dedham, Colchester	280
11.	Miss Frances Meadmore, Horticultural College, Swanley	280
11.	Miss Mabel Rayner, The College, Reading	280
11.	Mr. B. Smith, County Technical Laboratory, Chelmsford	280
20.	Miss Grace d'Arcy, Horticultural College, Swanley	275
20.	Miss Edna M. Gunnell, 13 High Street, Skipton	275
20.	Mrs. Isabel E. Dymond, The College, Reading	275
20.	Mr. A. Sowman, 102 Cauldwell Hall Road, Ipswich	275
24.	Mr. E. M. Bear, Royal Horticultural Society's Gardens, Chiswick	270
24.	Mr. A. A. Butcher, County Technical Laboratory, Chelmsford	270
24.	Mr. Alfred E. Say, Horticultural College, Swanley	270
24.	Miss Marguerite Dowding, Horticultural College, Swanley	270
24.	Miss Ella M. Ebbutt, Horticultural College, Swanley	270
24.	Miss C. E. Dunham-Massey, Horticultural College, Swanley	270
24.	Mr. Francis E. Tremain, Horticultural College, Swanley	270
24.	Mr. C. J. Yates, County Technical School, Stafford	270
32.	Mr. Edward Wilson, County Technical School, Stafford	265
33.	Mr. B. Ashling, Southwood Hall Gardens, Highgate	260
33.	Miss Amelia M. Clough, Horticultural College, Swanley	260
33.	Mr. James Donald, Royal Botanic Gardens, Edinburgh	260
33.	Mr. Louis Farrand, Horticultural College, Swanley	260
33.	Mr. C. W. Gale, 183 Cranbury Road, Eastleigh, Hants	260
33.	Mr. H. Groves, Sunnyside Cottages, Caterham Valley, Caterham	260
33.	Mr. Henry Hand, Horticultural School, Holmes Chapel	260
33.	Mr. Richard Lewis, Horticultural School, Holmes Chapel	260
33.	Mr. Daniel Massey, Horticultural School, Holmes Chapel	260
33.	Miss Ena Powell, Horticultural College, Swanley	260
33.	Mr. Arthur Salt, County Technical School, Stafford	260
33.	Mr. William Warburton, County Technical School, Stafford	260

		No. of Marks gained.
33.	Mr. Joseph Williamson, Horticultural School, Holmes Chapel	260
46.	Mr. Reginald Ashley, Horticultural School, Holmes Chapel	255
46.	Miss Saydie B. Bond, Horticultural College, Swanley	255
46.	Mr. F. W. Brow, 22 Thomas Street, Annan, Dumfries	255
46.	Mr. Arthur Broughton, Horticultural School, Holmes Chapel	255
46.	Mr. K. G. Burbridge, County Technical Laboratory, Chelmsford	255
46.	Miss Maud Culleton, The College, Reading	255
46.	Mr. William Good, Royal Horticultural Society's Gardens, Chiswick	255
46.	Mr. John Potter Holt, Horticultural School, Holmes Chapel	255
46.	Mr. R. G. King, Horticultural College, Swanley	255
46.	Mr. A. Mason, County Technical Laboratory, Chelmsford	255
46.	Mr. William Saunders Patey, Halewood, Liverpool	255
46.	Mr. William Stephen Sharp, Ness, Neston, Cheshire	255
46.	Miss Dorothy Shove, Horticultural College, Swanley	255
46.	Mr. H. Smith, County Technical Laboratory, Chelmsford	255
46.	Miss Gwendolin R. Tudor, The College, Reading	255
61.	Miss Tilly B. Baker, Horticultural College, Swanley	250
61.	Mr. Alfred Elisha, Claremont, Esher	250
61.	Mr. Henry R. Farmer, The Castle Gardens, Cardiff, S. Wales	250
61.	Mr. Harry L. Jones, Standen Hall Gardens, Clitheroe	250
61.	Mr. John W. Molyneux, 39 Hargwyne Road, Stockwell	250
61.	Mr. Robert Neish, 16 Turnford Villas, near Broxbourne	250
61.	Mr. A. J. Pye, County Technical Laboratory, Chelmsford	250
61.	Mr. William Henry Waite, Royal Botanic Gardens, Edinburgh	250
69.	Mr. James W. Bamber, Technical School, Accrington	245
69.	Mr. William Easson, Heathfield, Wimbledon Common	245
69.	Mr. Howard P. Glaister, Royal Horticultural Society's Gardens, Chiswick	245
69.	Mr. D. McGregor, The Palace Gardens, Dalkeith, Midlothian	245
69.	Miss F. D. Sanford, F.R.H.S., Horticultural College, Swanley	245
69.	Mr. Leonard Scott, Horticultural School, Holmes Chapel	245
69.	Miss Elsie D. Varley, Horticultural College, Swanley	245
69.	Miss Kate Wilkinson, Horticultural College, Swanley	245
77.	Mr. Arthur Bettesworth, Elvetham Park Gardens, Winchfield	240
77.	Mr. W. Brown, Cally Gardens, Gatehouse, Kirkcudbright	240
77.	Mr. G. A. Fryer, Horticultural School, Holmes Chapel	240
77.	Mr. James J. Graham, Breynton, Penarth, S. Wales	240
77.	Mr. Charles F. Hughes, Horticultural School, Holmes Chapel	240
77.	Mr. George H. Larnder, Horticultural College, Swanley	240
77.	Mr. Henry R. Quinn, Technical Institute, Cambridge	240
77.	Miss Ella Read, Horticultural College, Swanley	240
77.	Mr. Albert Richardson, Horticultural School, Holmes Chapel	240
77.	Mr. Harry Tomalin, Milton Heath Lodge, Dorking	240
77.	Mr. W. A. Ward, County Technical Laboratory, Chelmsford	240
77.	Mr. Gurney Wilson, F.R.H.S., "Mayfield," 21 Christchurch Road, Streatham Hill, S.W.	240
89.	Mr. D. G. McIver, County Technical Laboratory, Chelmsford	235
89.	Mr. William Jones, County Technical School, Stafford	235

		No. of Marks gained.
89.	Mr. G. Scourfield, Oakwood Gardens, Tidenham, near Chepstow	235
89.	Mr. John P. Watson, Municipal Technical School, Leicester	235
93.	Mr. Timothy J. Adnitt, Technical Institute, Cambridge	230
93.	Miss Florence St. Barbe, Horticultural College, Swanley	230
93.	Mr. Maurice Field, Newnham House, Wallingford	230
93.	Mr. W. B. Sanday, 165 Knights Hill Road, West Norwood, S.E.	230
93.	Mr. John Sibley, The Grove, College Road, Dulwich Common, S.E.	230
93.	Mr. Ernest W. Wakeham, Dawson Park Gardens, Bexley Heath	230
99.	Mr. Oliver Berry, Horticultural School, Holmes Chapel	225
99.	Mr. William Lewis, County Technical School, Stafford	225
99.	Mr. Frederick Peaples, Hardy Mill House, Harwood, near Bolton	225
99.	Mr. Thomas Simpson, Enville Gardens, Enville, nr. Stourbridge	225
103.	Mr. Esau Buck, Technical Institute, Cambridge	220
103.	Miss Mabel Y. Carlyon, The College, Reading	220
103.	Mr. William Dear, Inverlochy Castle Gardens, Spean Bridge, Inverness-shire	220
103.	Mr. Richard Timmis, County Technical School, Stafford	220
103.	Mr. James Good, Falkland Park Gardens, South Norwood Hill, S.E.	220
103.	Miss Marian Hitchfield, Horticultural College, Swanley	220
103.	Mr. Jos. McGowan, Horticultural School, Holmes Chapel	220
103.	Mr. Frank G. Storrs, 13 Heathfield Gardens, Chiswick	220
103.	Mr. Frank Watson, Municipal Technical School, Leicester	220
112.	Mr. H. C. Chapelow, Royal Horticultural Society's Gardens, Chiswick	215
112.	Mr. C. P. Cretchley, The Honeys, Twyford, Berks	215
112.	Mr. John Pillington, Horticultural School, Holmes Chapel	215
112.	Mr. Cyril Sausmarez Carey, Twyford, Winchester	215
112.	Mr. Arthur Usher, Municipal Technical School, Leicester	215
112.	Miss Margaret Walker, Horticultural College, Swanley	215
118.	Mr. H. P. Appleton, Municipal Technical School, Leicester	210
118.	Miss Lilian Gibbs, Horticultural College, Swanley	210
118.	Mr. Henry Hewitt, County Technical School, Stafford	210
121.	Mr. Frank Briggs, Cragdale Gardens, Settle, Yorks.	205
121.	Mr. Henry Corlett, Woolton Wood, Woolton, Liverpool	205
121.	Mr. E. H. Crisp, County Technical Laboratory, Chelmsford	205
121.	Miss Jessie S. Davies, The College, Reading	205
121.	Mr. Thomas Dent, Howbery Lodge, near Wallingford	205
121.	Mr. Arthur Kirkman, 303 Stitch-my-Lane, Bolton	205
121.	Mr. Alex. Paterson, 18 Kingswood Road, Wimbledon	205
121.	Miss Lucy Powell, Fyning, Austen Road, Guildford	205
121.	Mr. G. W. Pyman, Royal Horticultural Society's Gardens, Chiswick	205
121.	Miss Annie Smit, Horticultural College, Swanley	205
121.	Mr. John Walker, The Gardens, Fairfield, Cobham, Surrey	205
132.	Mr. John Botley, Blythewood Gardens, Maidenhead	200
132.	Mr. Thomas Brown, Technical Institute, Cambridge	200

		No. of Marks gained.
132.	Miss C. M. Carylon, F.R.H.S., Horticultural College, Swanley	200
132.	Mr. F. W. Harvey, County Technical Laboratory, Chelmsford	200
132.	Mr. James Hutchinson, Royal Botanic Gardens, Edinburgh	200
132.	Mr. Frank Johnson, 71 Brompton Road, Attercliffe, Sheffield	200
132.	Miss B. M. S. Niederhüber, Horticultural College, Swanley	200
132.	Mr. Percy W. Philpott, Brine Baths Park, Droitwich	200
132.	Miss Grace Robinson, The College, Reading	200
132.	Mr. Sidney Sparkes, 54 Richmond Place, Bath	200

Second Class.

1.	Mr. George Astridge, Easton, Winchester	195
1.	Mr. F. Ball, Vine Cottage, Long Ditton, Surrey	195
1.	Mr. John Drew, Fantall Park, Bromsgrove	195
1.	Mr. W. H. Gilbey, Technical Institute, Cambridge	195
1.	Mr. John T. Hargreaves, The Ruins, Harwood, nr. Bolton	195
1.	Mr. William Neish, Caldy Manor Gardens, West Kirby	195
1.	Mr. Arthur Painton, Winterbrook, Wallingford, Berks	195
1.	Mr. Edwin Scowcroft, 381 Church Lane, Harwood, Bolton	195
1.	Mr. John Shrives, County Technical School, Stafford	195
10.	Mr. George G. Buck, Technical Institute, Cambridge	190
10.	Mr. George A. Hobbs, The Gardens, Hamble Cliff, Netley Abbey, Southampton	190
10.	Mr. Maurice Housego, The Castle Gardens, Cardiff, S. Wales	190
10.	Miss Lilian Kelsall, The College, Reading	190
10.	Mr. William Marsden, Technical School, Accrington	190
10.	Mr. John James Parnell, County Technical School, Stafford	190
10.	Mr. J. W. Guttridge, Woodhatch Lodge Gardens, Reigate	190
10.	Mr. Ernest Smith, Horticultural College, Swanley	190
10.	Mr. Basil J. Spong, The Gardens, Lindisfarne, Bournemouth	190
10.	Mr. S. H. Stanbridge, Anyards Road, Cobham, Surrey	190
10.	Mr. Alfred E. Turk, Ashurst Park Gardens, Tunbridge Wells	190
10.	Mr. James Walker, Technical Institute, Cambridge	190
10.	Mr. George Willan, Booth's Hill, Lymm, Cheshire	190
23.	Miss E. B. Pitman, Basford Vicarage, Nottingham	185
23.	Mr. Ernest E. Scowcroft, 381 Church Lane, Harwood, Bolton	185
23.	Mr. William T. Taylor, Municipal Technical School, Leicester	185
26.	Mr. Samuel Mayoh, Technical Schools, Bolton	180
26.	Miss Marguerite Potter, The College, Reading	180
26.	Mr. T. W. Rolfe, County Technical Laboratory, Chelmsford	180
26.	Mr. G. Stedman, Anyards Road, Cobham, Surrey	180
26.	Mr. W. H. Tuff, 1 Richmond Road, Isleworth	180
31.	Miss G. M. Franklin, Technical Institute, Cambridge	175
31.	Mr. Thomas Hunter, Coombe Cottage, Kingston-upon-Thames	175
31.	Mr. John Jeffery, Royal Gardens, Kew	175
31.	Mr. Thomas M. Parry, County Technical School, Stafford	175
31.	Mr. F. F. Paul, County Technical Laboratory, Chelmsford	175
31.	Mr. Herbert H. Readett, Cherry Lane, Lymm, Cheshire	175
31.	Mr. James G. Richards, County Technical School, Stafford	175

		No. of Marks gained.
31.	Mr. Frank Smith, 3 Harestone Lane, Caterham	175
31.	Mr. W. A. Whitehurst, County Technical School, Stafford	175
40.	Mr. Spencer Boon, County Technical School, Stafford	170
40.	Mr. Herbert W. Brown, "Salmons," Whyteleafe, Surrey	170
40.	Mr. G. F. Greenhalgh, Carr Bank, Hawkshaw, Bury	170
40.	Mr. Ernest H. Scott, 3 Gladstone Villas, Wallingford, Berks	170
40.	Mr. William Yeomans, The Gardens, Pinehurst, Farnborough, Hants	170
45.	Miss E. Ecclestone, County Technical School, Stafford	165
45.	Mr. George E. Hutt, Technical Institute, Cambridge	165
45.	Miss Norah C. Pascoe, Technical Institute, Cambridge	165
45.	Mr. Henry J. S. Stobart, Church House, Bilbroughton, Stourbridge	165
45.	Mr. James W. Watson, Upper Sleigh Lea, Fulwood, Preston	165
50.	Mr. G. Curry, Wiseton Gardens, Bawtry, Notts	160
50.	Mr. William S. Edwards, Whitecross, Wallingford	160
50.	Miss A. E. Clarke, Technical Institute, Cambridge	160
50.	Mr. F. W. Fortune, The Gardens, Rownhams House, Southampton	160
50.	Mr. Henry Smith, 3 Harestone Lane, Caterham	160
55.	Mr. William J. Nash, Belvedere Nursery, Wimbledon	155
55.	Mr. John Shaw, 19 Fern Dale, Tottington, Bury, Lancs	155
55.	Mr. James F. Wood, Technical Schools, Bolton	155
55.	Mr. William Worsley, Technical Schools, Bolton	155
59.	Miss Hannah Haworth, County Technical School, Stafford	150
59.	Mr. Robert W. Routley, Clent, nr. Stourbridge	150
59.	Mr. Thomas F. Tilbrook, Technical Institute, Cambridge	150

Third Class.

1.	Mr. E. Brown, The Gardens, Copped Hall, Epping	145
1.	Mr. Arthur S. Poole, Technical Institute, Cambridge	145
1.	Mr. J. R. Wright, Chalk Pits, Caterham Valley	145
4.	Mr. William Bradburn, Rush Green, Lymm, Cheshire	140
4.	Rev. F. R. Lawson, Clent Vicarage, Stourbridge	140
4.	Mr. William Tucker, 3 Harestone Lane, Caterham	140
7.	Mr. Thomas Caless, Technical Schools, Bolton	135
7.	Mr. John J. Hall, Springdale Cottages, Wallingford	135
7.	Mr. B. Hygate, The Briary, Cowes, Isle of Wight	135
7.	Mr. C. A. Spragg, Technical Institute, Cambridge	135
7.	Mr. Alfred Steventon, Coulsdon Road, Caterham	135
12.	Mr. John R. Arthurson, Lowther Villas, Wood Road, Halewood, Liverpool	130
12.	Mr. Samuel H. Brooks, Yew Tree Cottage, Lymm, Cheshire	130
12.	Mr. Charles Harwood, The Gardens, Wiseton Hall, Bawtry, Notts	130
12.	Mr. J. J. Hurstfield, Rush Green, Lymm, Cheshire	130
12.	Mr. Thomas Masters, The Gardens, St. Andrew's House, Droitwich	130

		No. of Marks gained.
12.	Mr. H. W. Spong, The Gardens, Lindisfarne, Bournemouth .	130
18.	Mr. Frederick C. Halliwell, Technical Schools, Bolton . .	125
18.	Mr. Richard B. Harrison, 75 Bolton Road, Quarlton, Lancs .	125
18.	Mr. James Price, East Lodge, Shillingford, Wallingford . .	125
21.	Mr. Arthur Wood, Technical Schools, Bolton	120
22.	Mr. John Coombes, Fulford, Arreton, Isle of Wight . . .	115
22.	Mr. Arthur Edwards, Wiseton Gardens, Bawtry, Notts . .	115
24.	Mr. Fred C. Crack, Wiseton Gardens, Bawtry, Notts . .	110
24.	Miss Annie E. Morris, Technical Institute, Cambridge . .	110
24.	Mr. P. Mossman, Wiseton Gardens, Bawtry, Notts . . .	110
24.	Mr. Frank H. Tipping, Church Close Nursery, Clent, Stourbridge	110
28.	Mr. E. Rushling, Wiseton Gardens, Bawtry, Notts . . .	105
29.	Mr. G. Hayles, The Nook, Shillingford, Wallingford . .	100
29.	Mr. John Twynham, Wiseton Gardens, Bawtry, Notts . .	100

PAPERS SET AT THE EXAMINATIONS

HELD BY THE

ROYAL HORTICULTURAL SOCIETY

FROM 1893 TO 1900.

1893.

EIGHT QUESTIONS ONLY TO BE ANSWERED;

Any Eight the Candidate prefers.

HIGHER GRADE.

1. Explain the mode of formation of the soil.

2. What evils arise from stagnant moisture in the soil; and why is access of air necessary to the roots of plants?

3. In the selection of a site for the formation of a garden, what are the principal conditions to be observed? Describe those of most importance.

4. Describe the usual system of rotation of cropping in the kitchen garden, and what are the advantages derived therefrom?

5. Mention a few common weeds which usually grow—

   (1) On clay soils;

   (2) On sandy soils;

   (3) On limestone soils.

6. Explain the ill effects which arise from too deep planting.

7. How may a succession of vegetables be obtained during every month in the year?

8. Explain the process of grafting, and state what objects are served by it.

9. By what circumstances is the work of the leaves impeded?

10. Why is a combination of various substances in manure generally preferable to the application of one substance alone?

11. Describe the method of preparing the ground for Strawberries; the preparation of the runners; also the best time and method of planting.

12. Give some illustrations where Fungi, so far from being injurious, contribute to the welfare of the plant on which they grow.

13. What are the relative advantages of training fruit-trees on the espalier system, and on walls?

14. What variations occur in the mode of growth of a cutting?

1893.

LOWER GRADE.

1. On what circumstances does the productiveness of the soil depend?

2. Describe the method of preparing the ground for fruit-trees, and the method of planting standard, pyramid, and bush trees on free, and on dwarfing stocks.

3. In laying out a garden, what are the first operations to be performed? Describe them in detail.

4. What do plants derive from the soil, and how do they take up nourishment from it?

5. What purposes are served by digging and hoeing?

6. What are the best manures for fruit-trees? Describe the best way of applying them.

7. Describe the method of preparing the ground for such crops as Carrots, Beet, and Parsnips.

8. What are the circumstances favourable to the germination of seed?

9. What is understood by wireworms, and what are the best methods of dealing with them?

10. What are the conditions most favourable to the growth of Asparagus?

11. Why is blanching required in the case of Sea-kale, Celery, and some other crops?

12. Some plants produce their flowers from the old, others from the new wood. Mention the method and season of pruning adapted to both circumstances.

13. At what season of the year does the Celery-fly attack the plants? How may it be prevented?

14. Describe the system of culture by which Cucumbers can be grown out of doors in England at a profit.

1894.

Elementary Principles.

1. Write as full a description as you can of the Potato plant in the various stages of its growth, from the sprouting of the tuber to the formation of the flower.

2. What is meant when the soil is said to be sour? What steps should be taken to remedy that condition?

3. How do the roots of a plant grow, and what circumstances are favourable to their growth?

4. How is it that one particular manure may be useful to one crop and valueless to another?

5. Explain the course of growth in an Onion from the seedling stage to the formation of the bulb.

6. Describe the method of fertilisation in the flower of the Cabbage, or in any other common garden plant.

7. Explain the evil results that arise from thick sowing or planting.

8. What causes produce clubbing in Cabbages? What remedies can be applied?

Horticultural Practice.

9. Describe the preparation of the ground and the manner of planting such fruit-trees as the Apple, Pear, Plum, Cherry, &c., and point out the manner of preparing the trees for planting.

10. What position in the garden should Peach, Nectarine, and Apricot trees occupy? To what diseases are they subject, and by what insect pests are they liable to be attacked? Mention the remedies to be applied in each case.

11. Describe the preparation of the ground for vegetable crops, and briefly describe the rotation of cropping a kitchen garden.

12. How would you proceed to obtain a succession of Peas, Beans, and Runner-beans for as long a period as possible? State the best varieties to cultivate, and the quantities required for a given length of row.

13. Describe the culture of Cucumbers and Tomatos under glass, and show their value as crops for market purposes.

14. Give the details of Mushroom culture out of doors as well as in the usual Mushroom-house.

15. How are Roses propagated? Mention the best method of culture. Enumerate

the insect enemies and diseases to which they are subject, and point out the best ways of dealing with them.

16. Mention the time of planting, and indicate the general method of culture suitable for the flower-garden.

1895.

Elementary Principles.

1 (*a*). What substances do plants absorb by means of their roots? Explain the process of absorption by the root.

(*b*). What elements do plants obtain from the air, and by what agency do they obtain them?

2. Explain the effect on flowering plants of an adequate, a deficient, or of an excessive amount of heat.

3. How are "cuttings" made? Describe the changes that occur during the process of "striking."

4. What are the objects sought to be obtained in digging the soil?

5. Write as fully and orderly a description as you can of any plant in common cultivation, through all stages of its growth, from the germination of the embryo to the formation of the seed.

6. What organs of the plant are represented respectively by an Onion, a Potato, Beet, Turnip, and a Pea-pod?

7. Describe the mode of growth of the common Mushroom.

8. What is meant by "green-fly"? What is the best application to rid plants growing out of doors of this pest?

Horticultural Practice.

9. Name six of the best species of hothouse flowering plants and give some of the general details of culture. Name some of the insect pests that infest such plants, and state the best method to be adopted for their destruction.

10. Give general details for growing Peas, and the method of culture, time of sowing, &c., to give a supply for as long a period as possible. What is the use of the nodules on the roots?

11. What is an Alpine plant, as the name is generally understood in gardens? Describe the cultural requirements of such plants, and the best way to propagate them.

12. What is the original parentage of the Cauliflower and Broccoli? Give the method of culture, and the best varieties to obtain a succession all the year round.

13. Give some details of the culture of Grape-vines under glass. Describe the diseases to which they are subject and the insect pest which attack them, and their cure.

14. What kinds of fruit-trees and bushes are best adapted for culture in small gardens? Briefly describe the best method of culture, and arrangement of the trees and bushes.

15. In a walled garden what kind of fruit-trees would you recommend to be planted on the four aspects—south, north, east, and west? What distance apart should the trees be? Suggest the best width of the borders and height of the walls.

16 (*a*). What do you consider the best class of soil for fruit-trees, and how ought it to be prepared for them?

(*b*). Is there any method of culture likely to prevent canker in Apple trees or gumming in Apricots, Cherries, and Plums?

1896.

Elementary Principles.

1. What are the objects sought to be obtained by digging the soil? Of what use is it to the crops?

2. What do plants do when exposed to bright sunshine, and what takes place when they are subjected to total darkness?

3. Of the elements and compounds that go to make up the constitution of plants, a few occur in much larger proportion than others. Which are they, and whence are they obtained?

4. What are the "reserve materials" of plants? Where are they stored? What use is made of them?

5. What are the essential points in the structure of roots as contrasted with that of stems?

6. What are the special effects produced by nitrogenous manures and by mineral manures respectively?

7. Describe the shoot of a Peach tree and the arrangement of its buds.

8. What part of the plant furnishes the vegetable known as Asparagus?

9. What are the main differences between the "seed" of a flowering plant and the "spore" of a fungus?

Horticultural Practice.

10. Describe the preparation of the ground for the Onion crop; the method of sowing the seed and subsequent treatment, also the most suitable soil.

11. What are the circumstances which should regulate the frequency of watering and the amount of water to be given to plants in pots?

12. Describe the most suitable soil, and the method of culture, for such tap-rooted vegetables as the Carrot and Parsnip.

13. Say what you know about the origin of the Cherry and Apricot, the soil and manure most suitable to each, the diseases they are subject to, and the most effective remedies.

14. Give the names of the best varieties of Strawberries. What is the most suitable soil for their culture? Describe the culture (in detail) for forcing and the open garden.

15. What is the origin of the Carnation and the Garden Pink? How may a supply of flowers be obtained from these plants all the year round? Describe the diseases and the method of prevention and cure.

16. Describe the culture of the Daffodil: its propagation, the diseases and other enemies that attack the plants, and the best treatment.

17. Describe the general details of Orchard House culture, and state whether there are any advantages in growing fruit-trees in pots.

18. What are the best methods for ventilating hothouses and for shading the plants? Give general details.

1897.

DIVISION A.

Elementary Principles.

1. What are the three chief mineral ingredients of a soil? Name garden plants or shrubs which delight in each kind respectively.

2. What differences may be expected from growing unripe, perfectly ripe, and long-kept seeds respectively?

3. In transplanting why is it necessary to preserve the extreme and most delicate tips of the root-fibrils?

4. Why does covering Rhubarb redden and lengthen the leaf-stalks and stop the growth of the blade?

5. Describe the structure of a Hyacinth bulb, and explain why the Dutch method of slashing or hollowing out the bottom induces the formation of bulbils.

6. What are the essential conditions for successful grafting?

7. How does the structure of a Plum differ from that of an Apple? Explain the origin of each.

8. Name the natural orders or families to which the following plants belong:—Cyclamen, Rhododendron, Clematis, Stock, Pelargonium, Borage, Potato, Onion, Parsley, and Turnip.

DIVISION B.

Horticultural Practice.

9. Explain the process of cross-fertilisation in garden flowers, and give examples of both hardy and exotic plants that have been improved thereby.

10. After seed of the Chinese Primula has been ripened describe the method of sowing and subsequent treatment of the plants up to the period of their flowering.

11. What is the native country of the Celery plant, and under what conditions does it grow naturally? Give a short account of its culture, such as time of sowing and subsequent treatment.

12. When and under what conditions is Sea-kale found in a wild state? Describe its culture, and state the time of the year it is in use.

13. Where is the Common Asparagus said to be found in a wild state? State all you know of its culture, and for how long a period it may be had in use.

14. Give an account of the Apple. How are the trees propagated? State what you know of its culture, and the diseases to which the trees are liable, and the remedies. Name one good cooking variety for use in each month from August to April inclusive.

15. State all you know about the Raspberry. What sort of soil is best adapted to its culture? Give method of training and pruning, and the best varieties to cultivate, both yellow and red.

16. Give an account of the usual method of Gooseberry culture adopted in gardens; and also the Lancashire method to obtain prize fruit. Name six of the best prize varieties and six best for ordinary garden culture.

1898.

DIVISION A.

Elementary Principles.

1. Describe the methods of propagation of different weeds; explain why Groundsel and Chickweed and the large white-flowered Convolvulus are particularly troublesome. What are the best means of exterminating these plants?

2. Point out the importance to the plants of a good circulation of air in a hot-house, and the consequence of a stagnant condition of the atmosphere within it.

3. Describe the different functions of leaves, and the best way to secure their due performance.

4. What are the component parts of a flower, and of what use are they respectively to the plant?

5. What external conditions are favourable for inducing variations to appear in cultivated plants, and how would you proceed in order to fix any variation?

6. What parts of the *flower* are retained and altered in forming the *fruit* of the Peach, Melon, Mulberry, Fir-cone, and Pine-apple?

7. To what natural orders do the following trees belong:—Tulip-tree, Maple, Apricot, Ash, Laburnum, Guelder-rose, Horse-chesnut, Horn-beam, Thuia, and Evergreen Oak? Which are natives of this country?

8. Describe the structure of the *bulb* of the White Lily, the *corm* of Gladiolus, the *creeping-stem* of Couch-grass, the *rhizome* of the Flag, and the *tuber* of the Potato, and explain their uses to the plants.

DIVISION B.

Practice.

9. Describe Landscape Gardening as an art.

10. Describe the formation of a Garden Lawn, and the details of the work necessary to keep it in condition during the year.

11 What are the preliminary operations necessary to the laying-out of a garden for Fruit and Vegetable culture? Describe the arrangement of the Fruit-trees, and the method of planting them.

12. A garden having four walls facing north, south, east, and west, what varieties of Fruit-trees should be planted on each? Describe their first year's pruning and training.

13. Give full details of the propagation and culture of Grape-vines and Fig-trees in pots.

14. Describe the culture of Sea-kale, Asparagus, and French Beans, and the best method of forcing them.

15. What are the best Manures for Kitchen and Fruit Gardens? How ought they to be applied, and when?

16. Describe the propagation and culture of Roses and Carnations intended to be cultivated under glass.

1899.

DIVISION A.

Elementary Principles.

1. Compare the structure of a Bean with that of an Onion Seed. How do they differ in germination? Describe the peculiar movements which germinating seeds exhibit.

2. What differences exist between the manner and places where rootlets arise from roots, and branches from stems? Of what use are branches, and what trees have none?

3. What hinders the proper functions of leaves, and what should a cultivator attend to, in order to enable them to exercise their complete action?

4. Give any instances of failures, and state your opinion as to their causes, in crossing distinct species. What are the general characteristics of hybrids?

5. What is meant by "fixing" a new race, and how is it to be effected, if possible.

6. Describe the flower of the Pea, of a Primrose, of a Salvia, and of any Orchid, and explain how they are adapted to insect pollination.

7. What are the injurious effects of (i) too much water; of (ii) too great a heat; and of (iii) excessive drought, upon plants?

8. To what natural orders do the following plants belong, and why.—Clematis, Malope, Geum, Gunnera, Fuchsia, Scabiosa, Cobœa, Amaranthus, Ixia, and Ruscus?

DIVISION B.

Horticultural Practice.

9. What is generally understood in this country by an "American Garden"? Give the names of the most suitable plants for it, and the best kind of soil.

10. What is meant by a "Sub-tropical Garden"? Describe the best position for such a garden; also the most suitable plants, and how to cultivate them.

11. What is the right width for garden paths and carriage drives? Describe their formation, and the best materials to use.

12. Is it possible to obtain a supply of Roses all the year round from an English garden? Describe their propagation and culture under glass and in the open ground.

13. What are the most useful Fruit-trees* to grow under glass? Describe the best form of glass structure for the purpose, and the method of culture.

14. How would you proceed to obtain a succession of Garden Peas and Dwarf Kidney Beans? Can they be obtained all the year round? If so, how?

15. What plants are generally grown for Salads in British Gardens? How may a supply be obtained all the year round?

16. What is the best aspect for a Flower Garden? How would you proceed to lay it out, and stock it?

* The word is intended to exclude Vines.

1900.

Two and a half hours are allowed for this Paper, but Eight Questions only may be answered; four from Division A, and four from Division B.

Each Candidate must write his name and address very legibly on the first sheet of his answers, and must securely fasten all the sheets together in their right order.

DIVISION A.

Elementary Principles.

1. How would you treat a poor soil to make it productive?

2. What is the use of air to roots, and why may not seeds be buried deeply?

3. What effects has a deficient supply of light upon plants, and explain why all kinds of coloured glasses are injurious to the growth of plants?

4. Compare the structure of a bulb, a leaf-bud, and a flower-bud.

5. What is the object of earthing up Potatos? Point out the use of it as a partial preventive to the disease.

6. What are the general effects and advantages of hybridising plants? Are there any rules to be followed in selecting the parents to be crossed?

7. Explain the principles of grafting. Describe the structure of the tissues in contact. What may cause failures?

8. How are food-materials stored up in bulbs and tubers? Point out the importance of healthy foliage in the process.

DIVISION B.

Horticultural Practice.

1. What is understood by a "Wild Garden"? Give the names of the most suitable plants for it.

2. Name six evergreens and six deciduous shrubs, suitable for a clay, a gravelly, and a chalky soil respectively.

3. What do you consider the best form of house for Grape-vine culture? And how can a supply of Grapes be maintained all the year round?

4. Give some account of the cultivation of the Strawberry in the open garden, and also for forcing. Name the three best varieties in each case.

5. What preparation of the ground is necessary for the cultivation of Fruit-trees? What distance apart should pyramid trees and dwarf bushes be planted?

6. What are the principal enemies of the Apple, Pear, Plum, and Cherry trees, and how would you deal with them?

7. What is the best time of year to sow Onions, Carrots, Parsnips, and Beet? Give some hints as to the cultivation of each.

8. Give the names of the best and most suitable Orchids for a cool house; also some hints on culture, and the requisite temperature at different seasons of the year.

[*Copies of this Paper may be obtained at the Society's Offices. Price 6d., or 2s. 6d. per doz.*]

REPORT ON LATE-FLOWERING CHRYSANTHEMUMS AT CHISWICK.

A collection of 252 stocks of Chrysanthemums was grown in 10-inch pots in 1899 for greenhouse decoration during the autumn and winter. The plants were placed on a bed of ashes in the open air in June, and taken indoors on the approach of frosty weather. No disbudding was done, the object of the trial being to discover the best varieties for simply decorative purposes, but the plants were staked and tied out so as to allow a current of air to pass between them. Some of the plants carried a profusion of flowers, but a great many buds of others were turned quite black and destroyed by the number of dense fogs between October and the early part of December. Notwithstanding this drawback the trial was interesting, and it proved that some of the large-flowered show varieties were of little or no value for decorative purposes when not disbudded. The Floral Committee inspected the collection on two occasions and highly commended eighteen varieties.

F.C. = First-class Certificate.
A.M. = Award of Merit.
× × × = Highly Commended.

1. Ada Foster (Single) (Cannell).—Height 3 feet; diffuse habit; moderately free flowering; flowers bronzy yellow.

2. Adelaide Russell (Jap.) × × × November 17, 1899 (Cannell).—Height 3 feet; compact habit; exceptionally free flowering; flowers orange yellow, with a reddish orange reverse.

3. Adèle Prisette (Pom.) (Cannell).—Height 3 feet 6 inches; erect habit; free flowering; flowers small, with fimbriated petals, rose pink tipped with yellow.

4. Aglaia (Pom., Anem.) (Cannell).—Height 3 feet; straggling habit; free flowering; flowers small, guard petals blush white or pale pink suffused with rose pink on the exterior.

5. A. H. Fewkes (Jap.) (Haywood).—Height 3 feet 6 inches; sturdy habit; moderately free flowering; flowers large, deep golden yellow with broad flat petals.

6. A. H. Wood (Jap.) **A.M.** November 11, 1890 (Haywood).—Sport from Primrose League. Height 3 feet; sturdy habit; free flowering; flowers large, sulphur yellow.

7. Alfred Lyne (Inc.) (Dobbie).—Sport from Novelty. Height 4 feet; vigorous habit; very free flowering; flowers of a deep shade of purple lilac.

8. Alfred Salter (Inc.) (Haywood).—Sport from Queen of England. Height 3 feet; sturdy habit; moderately free flowering; flowers pink shaded with lilac.

9. Alice Carter (Dec.) (Cannell).—Height 3 feet; diffuse habit; moderately free flowering; flowers with narrow spidery florets, reddish brown shaded with orange.

10. Amiral Avellan (Jap.) (Haywood).—Height 3 feet 6 inches; sturdy habit; very free flowering; flowers deep golden yellow, with rather broad sharply pointed petals.

11. Antonius (Pom., Anem.) (Haywood).—Height 2 feet; bushy spreading habit; very free flowering; flowers rich yellow.

12. Arbe de Noël (Pom.) (Haywood, Cannell).—Height 3 feet 6 inches; compact habit; free flowering; flowers small, orange-red, with fimbriated petals tipped with yellow.

13. Aurora (Single) **A.M.** November 5, 1889 (Cannell).—Height 4 feet; slender habit; free flowering; flowers brownish crimson, lower portion of petals deep yellow.

14. Australie (Jap.) (Haywood, Dobbie).—Height 6 feet; vigorous habit; moderately free flowering; flowers large, silvery rosy purple with a paler reverse.

15. Barbara (Inc.) (Haywood).—Height 3 feet 6 inches; erect habit; free flowering; flowers of excellent form, with narrow petals, orange, shaded with red.

16. Barbara Forbes (Inc., Jap.) (Dobbie).—Height 4 feet; sturdy habit; very free flowering; flowers pure white, excellent for cutting.

17. Baron Hirsch (Inc.) **A.M.** October 18, 1892 (Haywood).—Height 3 feet 6 inches; erect bushy habit; very free flowering; flowers of good shape and substance, orange brown suffused with bronze.

18. Bessie Flight (Pom., Anem.) (Haywood).—Sport from Madame Montels. Height 2 feet 6 inches; bushy habit; free flowering; guard petals rose pink with a raised yellow centre.

19. Black Douglas (Pom.) × × × November 17, 1899 (Cannell).—Height 4 feet; sturdy habit; very free flowering; flowers small with slightly frimbriated petals, rich crimson.

20. Blanche Chapman (Single) × × × November 17, 1899 (Cannell).—Height 3 feet; bushy habit; very free flowering; flowers large, pale pink.

21. Bonnie Dundee (Inc.) **A.M.** November 26, 1895 (Dobbie).—Height 4 feet; vigorous habit; moderately free flowering; flowers of good form, bronzy yellow flushed with purple on the reverse side of petals.

22. Bouqueterre (Dec.) (Cannell).—Height 3 feet; bushy habit; very free flowering; flowers canary yellow with thread-like florets.

23. Briolis (Pom., Anem.) (Haywood, Cannell).—Height 4 feet; erect slender habit; moderately free flowering; flowers small, lilac-pink.

24. Brookleigh Gem (Inc.) (Haywood).—Sport from Jeanne d'Arc. Height 4 feet; erect habit; moderately free flowering; flowers silvery pink.

25. C. A. Owen (Jap.) **A.M.** November 24, 1896 (Haywood).—Height 3 feet 6 inches; spreading habit; very free flowering; flowers large, with broad rich yellow petals touched with bronze yellow.

26. Cannell's Gem (Single) (Cannell).—Height 3 feet; bushy habit; very free flowering; flowers rosy purple.

27. C. B. Haywood (Jap.) **A.M.** October 15, 1895 (Haywood).—Height 4 feet; vigorous habit; free flowering; flowers large, creamy white, reverse of petals flushed with pale rose.

28. Cecil Wray (Jap.) (Dobell).—Height 3 feet 6 inches; bushy compact habit; free flowering; flowers large, deep yellow.

29. Centaurea (Dec.) (Cannell).—Height 3 feet; sturdy habit; free flowering; flowers small, with narrow deep yellow florets.

30. Charles Davis (Jap.) (Haywood).—Sport from Viviand Morel. Height 3 feet 6 inches; diffuse habit; very free flowering; flowers orange red with a yellow reverse.

31. C. H. Curtis (Inc.) **A.M.** October 29, 1895 (Dobell).—Height 3 feet 6 inches; vigorous habit; moderately free flowering; flowers large with long pointed petals, rich yellow.

32. Christmas Gold (Jap.) (Dobbie).—Height 4 feet 6 inches; bushy habit; very free flowering; flowers with long narrow bright yellow drooping petals.

33. Clinton Chalfont (Jap.) **A.M.** November 12, 1895 (Dobbie).—Height 4 feet 6 inches; vigorous habit; exceptionally free flowering; flowers deep yellow.

34. Cloth of Gold (Ref.) (Haywood).—Height 4 feet; bushy habit; rather shy flowering; flowers rich yellow.

35. Col. W. B. Smith (Jap.) **A.M.** November 10, 1891 (Haywood, Dobbie).—Height 3 feet; bushy habit; free flowering; flowers bronzy yellow.

36. Commandant Blusset (Jap.) (Dobbie).—Height 3 feet; sturdy habit; very free flowering; flowers with long drooping petals, rosy carmine, with a silvery reverse.

37. Country of Gold (Dec.) **A.M.** November 26, 1895 (Cannell).—Height 3 feet; bushy habit; very free flowering; flowers small, with narrow twisted rich yellow florets.

38. Cullingfordi (Ref.) **F.C.** November 11, 1884 (Haywood).—Height 3 feet 6 inches; erect bushy habit; exceptionally free flowering; flowers rich crimson, with a bronzy yellow reverse.

39. Curiosity (Pom.) × × × November 17, 1899 (Haywood, Cannell).—Height 3 feet 6 inches; very free flowering; flowers small, yellow outer rows of petals brown.

40. C. W. Richardson (Jap.) (Dobell).—Height 3 feet 6 inches; spreading habit; very free flowering; flowers deep yellow.

41. Delaware (Anem.) (Haywood).—Height 3 feet; bushy habit; free flowering; flowers large, white, touched with cream white.

42. Dolly (Pom.) (Haywood, Cannell).—Height 4 feet; sturdy habit; very free flowering; flowers small, rich yellow with fimbriated petals.

43. Dorothy Gibson (Ref.) **A.M.** October 29, 1895 (Haywood).—Height 4 feet; bushy compact habit; free flowering; flowers rich golden yellow.

44. Duke of York (Jap., Inc.) **A.M.** November 14, 1893 (Dobbie).—Height 3 feet 6 inches; vigorous habit; moderately free flowering; flowers large, violet purple with a paler reverse.

45. Dupont de l'Eure (Pom.) (Cannell).—Height 3 feet 6 inches; bushy habit; very free flowering; flowers deep yellow shaded with bronze.

46. Edelweiss (Jap.) (Dobell).—Height 4 feet; bushy habit; shy flowering; flowers white, with a pale yellow centre.

47. Edith Tabor (Jap.) **A.M.** October 29, 1895 (Haywood).—Height 4 feet; vigorous habit; moderately free flowering; flowers large, with long broad petals curled at the points, rich yellow.

48. Edwin Molyneux (Jap.) **F.C.** October 23, 1888 (Haywood).—Height 4 feet; vigorous habit; free flowering; flowers intense crimson, with old gold reverse.

49. E. G. Hill (Jap.) **A.M.** December 8, 1891 (Dobbie).—Height 4 feet; robust habit; free flowering; flowers rich buttercup yellow.

50. Elsie Walker (Pom.) **A.M.** November 28, 1893 (Haywood).—Height 3 feet; spreading habit; free flowering; flowers small, with fimbriated petals, orange-brown tipped with canary yellow.

51. Emily Rowbottom (Pom., Anem.) × × × November 17, 1899 (Haywood).—Sport from Marie Stuart. Height 4 feet; bushy habit; very free flowering; guard petals blush white, centre pale yellow.

52. Emily Silsbury (Jap.) (Dobell).—Height 3 feet; bushy habit; very free flowering; flowers white, with long drooping, curling petals.

53. Emily Wells (Single) × × × November 17, 1899 (Haywood).—Height 4 feet; erect habit; very free flowering; flowers pink.

54. Empress of India (Inc.).—Syn. White Queen (Haywood). Sport from Queen of England. Height 4 feet; sturdy habit; moderately free flowering; flowers large, of good shape, pure white.

55. Ernest Asmils (Jap.) (Haywood).—Height 3 feet 6 inches; diffuse habit; very free flowering; flowers orange yellow.

56. Etoile de Lyon (Jap.) **F.C.** November 5, 1889 (Dobbie).—Height 3 feet; bushy habit; free flowering; flowers very large, with broad flat petals, rosy lilac.

57. Eva Knowles (Jap.) (Dobell).—Height 4 feet; spreading habit; free flowering; flowers large, with broad spreading petals, apricot yellow, with a paler reverse.

58. Eynsford Gem (Pom.) **F.C.** November 9, 1886 (Haywood).—Height 2 feet 6 inches; bushy spreading habit; free flowering; flowers small, crimson, flushed with purple and slightly tipped with white.

59. fimbriatum (Pom.) (Cannell).—Height 3 feet; bushy compact habit; moderately free flowering; flowers small, rose-pink touched with yellow in the centre.

60. Fouinette (Pom., Anem.) (Haywood).—Height 3 feet 6 inches; erect habit; free flowering; flowers small, blush pink.

61. Frieda (Single) × × × November 17, 1899 (Cannell).—Height 2 feet; bushy compact habit; very free flowering; flowers rose, shading to white.

62. Gem of Earlswood (Pom., Anem.) **A.M.** November 24, 1896 (Haywood, Cannell).—Height 3 feet; sturdy habit; free flowering; guard petals bright pink, small yellow disc.

63. General Maurice (Inc.) (Haywood).—Height 3 feet 6 inches; erect bushy habit; very free flowering; flowers creamy yellow, touched with rose pink on the reverse side of petals.

64. General Roberts (Jap.) (Haywood).—Height 3 feet 6 inches; robust habit; free flowering; flowers large, with long petals, reddish crimson with a golden reverse.

65. G. J. Warren (Jap.) **A.M.** October 26, 1897 (Haywood, Dobbie).

—Sport from Madame Carnot. Height 4 feet 6 inches; vigorous habit; free flowering; flowers large, of good form and substance, canary yellow.

66. Globe d'Or (Inc.) (Haywood).—Height 3 feet 6 inches; diffuse habit; free flowering; flowers of excellent form, deep yellow, shaded with bronze buff.

67. Golden Christine (Ref.) (Haywood).—Height 3 feet 6 inches; spreading habit; moderately free flowering; flowers yellow, touched with rosy lilac.

68. Golden Empress of India (Inc.) **F.C.** December 4, 1877 (Haywood). —Syn. Bruce Findlay. Height 4 feet; diffuse habit; rather shy flowering; flowers cream yellow.

69. Golden Gate (Jap.) **A.M.** November 28, 1893 (Haywood, Cannell). —Height 3 feet 6 inches; sturdy habit; free flowering; flowers large, with spreading petals, deep yellow.

70. Golden Gem (Haywood, Cannell).—Height 3 feet 6 inches; compact bushy habit; free flowering; flowers orange red varying to yellow.

71. Golden Madlle. Marthe (Pom.) × × × November 17, 1899 (Haywood).—Syn. Miss Aubridge. Height 2 feet; compact bushy habit; very free flowering; flowers small, primrose yellow.

72. Gus Harris (Single) (Haywood).—Height 2 feet 6 inches; bushy habit; free flowering; flowers small, rosy lilac.

73. Harvest Queen (Ref.) (Cannell).—Height 3 feet; bushy habit; very free flowering; flowers cream white.

74. Houppe Fleurie (Dec.) (Cannell).—Height 3 feet; bushy habit; very free flowering; flowers small with narrow orange red petals, the basal portions being stained with yellow.

75. H. Shoesmith (Inc.) (Haywood).—Sport from Mr. Bunn. Height 3 feet 6 inches; diffuse habit; moderately free flowering; flowers bronzy yellow.

76. Irene (Single) × × × November 17, 1899 (Cannell).—Height 2 feet; sturdy habit; very free flowering; flowers delicate blush white.

77. Jane (Single) **F.C.** Nov. 9, 1886 (Cannell).—Syn. Snowflake. Height 2 feet 6 inches; diffuse habit; moderately free flowering; flowers pure white.

78. Jardin des Plantes (Inc.) (Haywood).—Height 4 feet 6 inches; diffuse habit; rather shy flowering; flowers large rich yellow.

79. Jeanne d'Arc (Inc.) (Haywood).—Height 4 feet 6 inches; erect habit; free flowering; flowers large; white with a faint suspicion of purple on the reverse side of petals.

80. Jeanne Vuillermet (Jap.) (Haywood).—Height 4 feet 6 inches; robust habit; very free flowering; flowers carmine crimson with a yellow reverse.

81. Jeannette Sheaham (Jap.) **A.M.** January 15, 1895 (Dobbie). —Sport from Princess Blanche. Height 2 feet 6 inches; sturdy habit; free flowering; flowers sulphur yellow; deeper centre.

82. Jitsujetui (Dec.) (Cannell).—Height 3 feet 6 inches; bushy habit; very free flowering; flowers small with thread-like petals, purplish pink.

83. John Bunyan (Jap., Anem.) **A.M.** November 14, 1893 (Hay-

wood).—Height 4 feet; sturdy habit; very free flowering; flowers of excellent form, canary yellow.

84. John Doughty (Inc.) (Haywood).—Sport from Queen of England and syn. Mr. Robert Mudie. Height 3 feet 6 inches; diffuse habit; moderately free flowering; flowers bronzy yellow, shaded with rose pink.

85. John Lambert (Inc.) (Haywood).—Sport from Lord Alcester and syn. Golden Queen of England, Emily Dale. Height 4 feet; sturdy habit; moderately free flowering; flowers yellow shaded with buff.

86. John Shrimpton (Jap., Ref.) (Haywood). — Height 2 feet; compact bushy habit; very free flowering; flowers crimson scarlet with a gold reverse.

87. John Tyars (Single) (Cannell).—Height 3 feet; bushy habit; free flowering; flowers rosy carmine shading to white at the base of petals.

88. Joseph Brooks (Jap.) (Haywood, Dobbie). — Height 4 feet; sturdy habit; free flowering; flowers large, orange red with old gold reverse.

89. Julia Scaramanga (Jap.) **A.M.** November 23, 1897 (Haywood, Dobbie).—Height 4 feet; robust habit; rather shy flowering; flowers large, terra cotta with a paler reverse.

90. King of Crimsons (Ref.) (Haywood).—Height 4 feet; compact bushy habit; very free flowering; flowers crimson maroon.

91. King of Plumes (Dec.) **A.M.** December 11, 1894 (Haywood).—Height 3 feet 6 inches; diffuse habit; free flowering; flowers with deeply cut petals, rich golden yellow.

92. King of Siam (Single) (Cannell).—Height 3 feet 6 inches; bushy habit; flowers deep crimson.

93. Laciniata rosea (Pom.) (Cannell).—Height 4 feet; bushy habit; very free flowering; flowers small with fimbriated petals, rose pink shaded with pale yellow towards the centre, and faintly tipped with white.

94. Lady Churchill (Single) (Cannell).—Height 3 feet 6 inches; vigorous habit; very free flowering; flowers yellow tipped and shaded with brownish crimson.

95. Lady E. Saunders (Jap.) (Haywood).—Height 3 feet; sturdy habit; free flowering; flowers large, with drooping petals, pale primrose yellow.

96. Lady Hanham (Jap.) **A.M.** October 26, 1897 (Haywood).—Sport from Viviand Morel. Height 3 feet 6 inches; robust habit; moderately free flowering; flowers large, salmon pink touched with cerise.

97. Lady Isabel (Inc.) (Haywood).—Height 4 feet; vigorous habit; free flowering; flowers large, white occasionally suffused with lavender.

98. Lady Margaret (Jap., Anem.) (Dobbie).—Height 5 feet; diffuse habit; moderately free flowering; flowers rather flat, pure white.

99. Lady Ridgeway (Jap., Inc.) **A.M.** October 26, 1897 (Dobbie, Haywood).—Height 4 feet; vigorous habit; free flowering; flowers yellow shaded with salmon and rose, and tipped with gold.

100. Lemon Yellow (Jap.) (Cannell).—Height 4 feet; rather slender habit; very free flowering; flowers clear yellow.

101. Lizzie Mainwaring (Single) (Haywood).—Height 3 feet 6 inches; robust habit; very free flowering; flowers white.

102. Lizzie Morley (Single) (Cannell).—Height 2 feet 6 inches; sturdy habit; shy flowering; flowers white.

103. Lord Brooke (Jap., Inc.) **A.M.** November 15, 1892 (Haywood).—Height 5 feet; robust habit; free flowering; flowers large, of excellent form; colour old gold.

104. Lord Wolseley (Inc.) **F.C.** November 14, 1882 (Haywood).—Sport from Prince Alfred. Height 3 feet 6 inches; sturdy habit; moderately free flowering; flowers reddish bronze.

105. Louis Dalle (Jap.) (Haywood).—Height 3 feet 6 inches; erect vigorous habit; moderately free flowering; flowers large, orange-red shading to yellow.

106. Louise (Jap., Inc.) **A.M.** October 24, 1894 (Haywood).—Height 3 feet 6 inches; compact habit; moderately free flowering; flowers large, broad petals, white heavily shaded with blush-lilac.

107. Madame Ad. Chatin (Jap.) (Dobbie).—Height 2 feet 6 inches; bushy habit; free flowering; flowers large, white.

108. Madame A. Rosseau (Jap.) (Haywood).—Height 3 feet 6 inches; robust habit; very free flowering; flowers large, pink flushed with lilac.

109. Madame Boudion (Jap.) (Haywood).—Height 3 feet; bushy habit; free flowering; flowers large, with broad petals, white suffused with cream in the centre.

110. Madame Carnot (Jap.) **A.M.** November 27, 1897 (Haywood).—Height 4 feet; robust habit; free flowering; flowers large, of excellent form, with long, drooping white petals.

111. Madame C. Kratz (Jap.) × × × November 17, 1899 (Dobbie).—Height 4 feet 6 inches; rather slender habit; very free flowering; flowers rosy carmine, with a silvery reverse.

112. Madame de Seven (Jap.) × × × November 11, 1899 (Dobbie).—Height 3 feet 6 inches; spreading habit; very free flowering; flowers rose-pink, shading to white in the centre.

113. Madame Edouard Rey (Jap., Inc.) **A.M.** October 9, 1894 (Dobbie).—Height 3 feet 6 inches; compact habit; very free flowering; flowers of good shape, rose-pink shading to a delicate pink.

114. Madame Ferlat (Inc.) (Haywood).—Height 3 feet 6 inches; vigorous habit; free flowering; flowers white, occasionally tipped with soft yellow.

115. Madame Gajac (Jap.) × × × October 22, 1897 (Haywood).—Height 2 feet 6 inches; bushy habit; very free flowering; flowers pale lilac.

116. Madame Gustave Henry (Jap.) **A.M.** October 13, 1896 (Haywood).—Height 3 feet 6 inches; spreading habit; free flowering; flowers large, creamy white.

117. Madame Louis Remy (Jap.) (Haywood).—Sport from Mrs. C. H. Payne. Height 3 feet 6 inches; bushy spreading habit; very free flowering; flowers large, creamy white.

118. Madame Marcus Ricaud (Jap.) (Dobell).—Height 4 feet; robust habit; free flowering; flowers lilac-rose, with a silvery reverse.

119. Madame Montels (Pom., Anem.) (Haywood, Cannell).—Height

3 feet 6 inches; bushy habit; free flowering; flowers small, guard petals white, disc deep yellow.

120. Madame Philippe Rivoire (Jap.) **A.M.** October 26, 1897 (Haywood).—Height 4 feet 6 inches; vigorous habit; free flowering; flowers large, with long broad petals, creamy white.

121. Madame Rene Cohn (Jap.) (Dobell).—Height 3 feet; bushy habit; very free flowering; flowers delicate pink shading to white.

122. Madame Sentir (Pom., Anem.) (Haywood).—Height 2 feet 6 inches; spreading habit; shy flowering; flowers small, guard petals pure white, disc primrose yellow.

123. Mdlle. Guindudeau (Jap.) × × × October 4, 1897 (Haywood).—Height 2 feet 6 inches; compact habit; free flowering; flowers pinkish purple, gradually changing to white with age.

124. Mdlle. Lawrence Zede (Jap.) (Dobbie).—Height 4 feet 6 inches; diffuse habit; shy flowering; flowers purple shaded with lilac.

125. Mdlle. Marie Hoste (Jap.) (Dobell).—Height 3 feet 6 inches; bushy sturdy habit; free flowering; flowers large with broad drooping petals, white suffused with pink.

126. Mdlle. Marthe (Pom.) (Haywood).—Height 3 feet 6 inches; diffuse habit; shy flowering; flowers small, white touched with yellowish green in the centre.

127. Mdlle. Nathalie Brun (Anem.) (Haywood).—Height 3 feet; compact habit; very free flowering; flowers white, tipped with pale primrose yellow in the centre.

128. Mdlle. Thérèse Rey (Jap.) **A.M.** November 14, 1893 (Dobbie).—Height 5 feet; vigorous habit; free flowering; flowers large, of excellent shape, white with a pale sulphur-coloured centre.

129. Madge (Single) (Cannell).—Height 3 feet; sturdy habit; free flowering; flowers orange-red, sometimes shaded with crimson.

130. Maid of Kent (Pom.) (Haywood).—Height 4 feet; bushy habit; free flowering; flowers of good form, small with fimbriated petals, white suffused with pink.

131. Major Bonaffon (Inc.) (Haywood).—Height 3 feet 6 inches; robust habit; moderately free flowering; flowers clear yellow; similar to No. 31.

132. Margot (Jap.) (Dobbie).—Height 4 feet 6 inches; vigorous habit; free flowering; flowers mauve-pink.

133. Mephisto (Jap.) (Dobbie).—Height 2 feet; compact habit; free flowering; flowers reddish crimson with a yellow reverse.

134. Mignonette (Dec.) **A.M.** November 10, 1896 (Dobbie).—Height 4 feet; diffuse habit; free flowering; flowers small with narrow soft yellow florets.

135. Minnie Chate (Jap., Anem.) (Haywood).—Height 4 feet; spreading habit; very free flowering; flowers large, guard petals delicate lilac blush, with a rosy lilac centre.

136. Miss Alice Robertson (Ref.) (Haywood).—Sport from White Christine. Height 3 feet 6 inches; diffuse habit; moderately free flowering; flowers primrose yellow.

137. Miss Annie Holden (Single) **A.M.** October 29, 1895 (Haywood).—Yellow sport from Miss Mary Anderson. Height 3 feet 6 inches; bushy habit; very free flowering; flowers sulphur yellow.

138. Miss Annie Low (Anem.) (Haywood).—Sport from Lady Margaret. Height 4 feet; vigorous habit; moderately free flowering; flowers pale yellow.

139. Miss Dorothea Shea (Jap.) **A.M.** November 15, 1892 (Dobbie).—Height 4 feet; robust habit; free flowering; flowers large with drooping petals, terra cotta, reverse buff colour.

140. Miss Florence Lunn (Ref.) (Haywood).—Height 4 feet; vigorous habit; moderately free flowering; flowers rosy amaranth.

141. Miss M. A. Haggas (Inc.) **F.C.** November 5, 1889 (Haywood).—Sport from Mrs. Heale and syn. Richard Parker. Height 4 feet; robust habit; free flowering; flowers primrose yellow.

142. Miss Mary Anderson (Single) × × × November 17, 1899 (Cannell).—Height 3 feet 6 inches; compact habit; very free flowering; flowers large white, with a faint suffusion of pink.

143. Miss Rose (Single) (Cannell).—Height 2 feet; compact habit; very free flowering; flowers small, delicate pink shaded with white.

144. Miss Sarah (Single) × × × November 17, 1899 (Cannell).—Height 4 feet; diffuse habit; very free flowering; flowers bronzy yellow, touched with red.

145. Mr. A. G. Hubbuck (Jap.) (Dobbell, Haywood).—Height 3 feet; sturdy habit; moderately free flowering; flowers large with long petals deep rosy purple with a silvery reverse.

146. Mr. Holmes (Pom.) (Cannell).—Height 3 feet; diffuse habit; shy flowering; flowers small with fimbriated petals, orange-red and yellow.

147. Mr. James Murray (Inc.) **A.M.** October 27, 1896 (Haywood).—Height 4 feet; robust habit; moderately free flowering; flowers globular, bright pink.

148. Mrs. Chas. Blick (Jap.) **A.M.** October 29, 1895 (Haywood).—Syn. Mrs. Richard Jones. Height 3 feet 6 inches; diffuse habit; moderately free flowering; flowers large with long petals, pure white.

149. Mrs. C. Brown (Jap.) (Haywood).—Height 4 feet; robust habit; very free flowering; flowers large with long curling pure white petals.

150. Mrs. C. H. Payne (Jap.) (Dobbie).—Height 3 feet 6 inches; bushy vigorous habit; free flowering; flowers large, rose-pink shaded with white.

151. Mrs. C. Orchard (Jap.) **A.M.** November 10, 1896 (Haywood).—Height 4 feet; vigorous habit; moderately free flowering; flowers large, with broad incurving petals, sulphur-yellow.

152. Mrs. George Hill (Jap.) (Cannell).—Height 3 feet 6 inches; compact habit; very free flowering; flowers large, white, with a cream-white centre.

153. Mrs. H. B. Higgins (Jap.) (Haywood).—Height 4 feet; diffuse habit; moderately free flowering; flowers cream-white.

154. Mrs. Heale (Inc.) (Haywood).—Sport from Princess of Wales and syn. White Princess. Height 4 feet; robust habit; moderately free flowering; flowers white, with a primrose yellow centre.

155. Mrs. Hicks Arnold (Jap.) (Haywood).—Height 3 feet 6 inches; diffuse habit; very free flowering; flowers blush-white.

156. Mrs. Hugh H. Gardiner (Jap., Anem.) **A.M.** November 10, 1896 (Haywood).—Height 5 feet; rather shy flowering; flowers rosy crimson, high disc.

157. Mrs. J. P. Bryce (Jap) (Haywood, Cannell).—Sport from G. C. Schwabe. Height 3 feet; robust habit; free flowering; flowers large, fiery bronze, with a gold reverse.

158. Mrs. J. Shrimpton (Jap.) (Dobbie).—Height 4 feet; vigorous habit; free flowering; flowers large, bronzy yellow.

159. Mrs. Judge Benedict (Jap., Anem.) **F.C.** November 5, 1889 (Haywood).—Height 4 feet; bushy spreading habit; very free flowering; flowers large, guard petals blush-pink, disc sulphur yellow.

160. Mrs. J. W. Banks (Jap.) (Haywood, Cannell).—Sport from Edith Tabor. Height 3 feet 6 inches; vigorous habit; free flowering; flowers bronzy yellow.

161. Mrs. Maling Grant (Jap.) (Haywood, Dobbie).—Height 4 feet; robust habit; free flowering; flowers large, bronzy yellow, changing to clear yellow with age.

162. Mrs. Martin (Jap., Anem.) (Haywood).—Height 3 feet; spreading habit; very free flowering; flowers white.

163. Mrs. R. Filkins (Dec.) **A.M.** November 13, 1894 (Cannell).—Height 3 feet 6 inches; slender habit; free flowering; flowers with deeply forked petals, bright yellow.

164. Mrs. Robinson King (Inc.) **A.M.** December 13, 1892 (Haywood).—Sport from Golden Empress. Height 3 feet 6 inches; diffuse habit; shy flowering; flowers canary yellow.

165. Mrs. S. Coleman (Inc.) (Heywood).—Sport from Princess of Wales. Height 4 feet; vigorous habit; free flowering; flowers pale yellow suffused with rosy lilac.

166. Mrs. S. C. Probin (Jap. Inc.) (Haywood).—Height 3 feet 6 inches; sturdy habit; free flowering; flowers large, pink, with a silvery reverse.

167. Mrs. Squire (Jap.) (Cannell).—Height 2 feet; bushy habit; free flowering; flowers white suffused with pink.

168. Mrs. W. Butters (Dec.) (Cannell).—Height 3 feet; bushy habit; free flowering; flowers small, white, with thread-like petals.

169. Mrs. Wingfield (Jap.) **A.M.** October 12, 1897 (Wingfield).—Height 2 feet 6 inches; bushy compact habit; very free flowering; flowers delicate pink shading to white.

170. Modesto (Jap.) **A.M.** October 26, 1897 (Dobell).—Height 3 feet 6 inches; diffuse habit; moderately free flowering; flowers rich yellow.

171. Mons. Auguste Perin (Jap.) (Haywood).—Height 6 feet; bushy habit; free flowering; flowers large, with long petals, rose pink.

172. Mons. Backman (Jap.) × × × November 17, 1899 (Dobell, Dobbie).—Height 4 feet; sturdy habit; very free flowering; flowers buff, shaded with salmon, sometimes tipped with gold.

173. Mons. Chanchard (Jap.) (Dobbie).—Height 3 feet 6 inches; bushy habit; very free flowering; flowers with narrow petals, canary yellow shaded crimson.

174. Mons. Charles Lebocqz (Anem.) (Haywood) **A.M.** October 22, 1889.—Height 3 feet; diffuse habit; free flowering; flowers large, guard petals pale yellow, centre deep yellow.

175. Mons. Charles Molin (Jap.) **A.M.** October 23, 1894 (Haywood). —Height 4 feet; vigorous habit; moderately free flowering; flowers large, orange red, with a paler reverse.

176. Mons. Displand (Jap.) (Dobbie).—Height 4 feet; diffuse habit; free flowering; flowers rose-pink shaded and tipped with yellow.

177. Mons. Foukabra (Jap.) (Haywood).—Height 3 feet; bushy compact habit; very free flowering; flowers bronzy yellow.

178. Mons. G. Menier (Jap.) (Haywood).—Height 3 feet 6 inches; diffuse habit; shy flowering; flowers rose-pink.

179. Mons. Gruyer (Jap.) (Haywood).—Height 3 feet 6 inches; slender habit; moderately free flowering; flowers large, rose-pink touched with rose.

180. Mons. Hoste (Pom.) (Haywood, Cannell).—Height 3 feet 6 inches; diffuse habit; free flowering; flowers small, pale pink or blush white.

181. Mons. Pankoucke (Jap.) (Haywood) **A.M.** October 22, 1889.—Height 4 feet; vigorous habit; moderately free flowering; flowers with long drooping petals, rich yellow.

182. Mons. R. Bahuant (Inc.) **A M.** October 27, 1891 (Haywood).—Height 4 feet; diffuse habit; moderately free flowering; flowers carmine-rose.

183. Mons. Van Geert (Jap.) (Cannell).—Height 3 feet 6 inches; diffuse habit; free flowering; flowers with long narrow drooping petals, rich canary yellow.

184. Morces d'Or (Haywood, Dobell).—Height 4 feet; bushy habit; free flowering; flowers large, yellow touched with old gold.

185. Myra (Jap.) (Cannell).—Height 3 feet 6 inches; diffuse habit; free flowering; flowers deep yellow, flushed with orange.

186. N. C. S. Jubilee (Jap.) **A.M.** October 26, 1897 (Haywood).—Height 4 feet; robust habit; free flowering; flowers of good form with long broad petals, soft pink.

187. Niveus (Jap.) **A.M.** November 14, 1893 (Haywood).—Height 4 feet; vigorous habit; moderately free flowering; flowers large, pure white.

188. Novelty (Inc.) (Haywood).—Height 4 feet; sturdy habit; moderately free flowering; flowers cream-white, suffused with pink and tipped with yellow.

189. Oceana (Jap., Inc.) **A.M.** November 12, 1895 (Cannell).—Height 4 feet; sturdy habit; moderately free flowering; flowers large with broad petals, deep yellow.

190. Owen's Perfection (Jap., Anem.) **A.M.** November 13, 1894 (Haywood).—Height 4 feet; diffuse habit; moderately free flowering; flowers large, guard petals delicate lilac-white, disc lilac touched with gold.

191. Perle (Pom., Anem.) (Haywood, Cannell).—Height 4 feet; rather slender habit; free flowering; flowers small, guard petals rosy lilac, disc pale rose.

192. Perle Dauphinoise (Inc.) × × × November 11, 1899 (Haywood).—Height 3 feet; bushy habit; very free flowering; flowers yellow touched with old gold.

193. Perle des Beautés (Pom.) × × × November 17, 1899 (Haywood)

—Height 4 feet; erect bushy habit; exceptionally free flowering; flowers small, canary yellow.

194. Phidias (Ref.) (Haywood).—Height 3 feet 6 inches; spreading habit; moderately free flowering; flowers rose, shading to white.

195. Phœbus (Jap.) **F.C.** November 9, 1886 (Haywood).—Height 3 feet 6 inches; sturdy habit; moderately free flowering; flowers clear yellow.

196. President Hyde (Ref.) × × × November 17, 1899 (Cannell).—Height 3 feet; compact bushy habit; very free flowering; flowers bronzy yellow.

197. President Lefevre (Jap.) (Dobbie).—Height 3 feet 6 inches; diffuse habit; very free flowering; flowers white, shaded with mauve.

198. Pride of Exmouth (Jap.) **A.M.** October 27, 1896 (Haywood).—Height 4 feet 6 inches; robust habit; free flowering; flowers white suffused with rosy lilac.

199. Pride of Madford (Jap.) **A.M.** October 15, 1895 (Haywood).—Syn. Beauty of Teignmouth. Height 3 feet 6 inches; sturdy habit; free flowering; flowers rosy crimson, with a silvery reverse.

200. Pride of Mychett (Jap.) (Haywood).—Height 2 feet; bushy habit; very free flowering; flowers pale sulphur yellow, with a deeper centre.

201. Pride of Stokell (Jap.) (Haywood).—Sport from Pride of Madford, and syn. Mabel Kerslake. Height 3 feet 6 inches; vigorous habit; moderately free flowering; flowers crimson, shaded with gold on the reverse side of petals.

202. Pride of the Market (Jap.) (Haywood).—Height 3 feet 6 inches; compact bushy habit; very free flowering; flowers rich yellow, shaded with reddish bronze.

203. Prince Alfred (Inc.) (Haywood).—Height 4 feet; robust habit; moderately free flowering; flowers large, rosy carmine.

204. Princess May (Jap.) (Dobbie).—Height 3 feet 6 inches; compact habit; free flowering; flowers large with long drooping white petals.

205. Princess of Wales (Inc.) (Haywood).—Syn. Beauty of St. John's Wood and Princess Alexandra. Height 4 feet; vigorous habit; moderately free flowering; flowers of good form, blush tinted with mauve.

206. Purity (Pom.) (Cannell).—Height 3 feet 6 inches; vigorous habit; very free flowering; flowers small, pure white. Excellent for cutting.

207. Pygmalion (Pom.) (Haywood, Cannell).—Height 3 feet; sturdy habit; free flowering; flowers small, rosy crimson.

208. Queen of England (Inc.) (Haywood).—Height 3 feet 6 inches; sturdy habit; moderately free flowering; flowers blush white.

209. Queen of the Earlies (Jap.) (Haywood).—Height 4 feet; vigorous bushy habit; very free flowering; flowers with broad drooping petals, white verging on cream-white.

210. Ralph Brocklebank (Jap.) (Haywood). — Sport from Meg Merrilees. Height 3 feet 6 inches; moderately free flowering; flowers canary yellow.

211. Robert Petfield (Inc.) **A.M.** November 14, 1893 (Haywood).—

Height 3 feet 6 inches; diffuse habit; moderately free flowering; flowers with broad petals, silvery rose tipped with white.

212. Robert Powell (Jap.) **A.M.** October 26, 1897 (Heywood).—Height 4 feet; compact habit; free flowering; flowers with long drooping petals, chestnut brown, with a golden reverse.

213. Robin Adair (Jap., Anem.) **A.M.** November 12, 1895 (Haywood).—Height 3 feet 6 inches; diffuse habit; moderately free flowering; flowers blush white, or pale pink suffused with lilac.

214. Rose Wynne (Jap.) **A.M.** November 14, 1893 (Haywood).—Height 4 feet; robust habit; free flowering; flowers with long broad petals, blush white.

215. Rosea superba (Jap.) **F.C.** November 13, 1893 (Haywood).—Height 4 feet 6 inches; rather slender habit; very free flowering; flowers rose-pink, with a silvery reverse.

216. Royal Sovereign (Jap.) (Haywood).—Height 6 feet; robust habit; free flowering; flowers large, with broad incurving clear yellow petals.

217. St. Michael (Pom.) (Haywood).—Height 4 feet; diffuse habit; free flowering; flowers small, deep golden yellow.

218. Sam Caswell (Dec.) (Cannell).—Height 4 feet 6 inches; bushy habit; free flowering; flowers with thread-like petals, soft pink.

219. Secrétaire Alfred Bleu (Jap.) (Haywood).—Height 3 feet; compact habit; very free flowering; flowers canary yellow shaded with violet.

220. Secrétaire Rivoire (Jap.) (Haywood).—Height 3 feet; diffuse habit; moderately free flowering; flowers pale yellow, streaked with purple.

221. Sidonie (Pom., Anem.) × × × November 17, 1899 (Haywood, Cannell).—Height 3 feet; bushy compact habit; moderately free flowering; flowers small, guard petals lilac, disc blush-white.

222. Silk Twist (Dec.) (Cannell).—Height 3 feet; sturdy habit; very free flowering; flowers with narrow petals, cream colour shaded with pink.

223. Simplicity (Jap.) **A.M.** October 26, 1897 (Dobell, Haywood).—Height 4 feet; diffuse habit; moderately free flowering; flowers with long drooping petals, pure white.

224. Sir Richard Wallace (Pom.) (Cannell).—Height 3 feet; bushy habit; moderately free flowering; flowers small, with fimbriated petals, delicate pink.

225. Sir Walter Raleigh (Jap., Anem.) (Haywood).—Height 3 feet; sturdy habit; free flowering; flowers large, delicate pink or pale blush.

226. Source d'Or (Jap.) (Haywood).—Height 4 feet; vigorous habit; very free flowering; flowers orange-red tipped with gold.

227. Souvenir de A. R. Bowman (Jap.) (Dobell).—Height 4 feet; moderately free flowering; flowers rose-pink shaded with white towards the centre.

228. Souvenir de Petite Amie (Jap.) **A.M.** October 9, 1894 (Dobell, Haywood).—Height 3 feet; compact bushy habit; very free flowering; flowers pure white.

229. Star (Single) (Cannell).—Height 2 feet 6 inches; compact bushy habit; very free flowering; flowers small, pink.

230. Sulphur Marabout (Pom.) (Cannell).—Height 3 feet; diffuse habit; moderately free flowering; flowers small, with fimbriated petals, primrose yellow.

231. Sunstone (Jap.) **A.M.** October 26, 1897 (Haywood, Dobbie).—Height 4 feet 6 inches; vigorous habit; moderately free flowering; flowers large, yellow touched with bronze.

232. The Convention (Jap.) (Haywood).—Height 3 feet 6 inches; sturdy habit; free flowering; flowers bronzy yellow.

233. Tissandier (Pom.) (Cannell).—Height 3 feet 6 inches; compact habit; very free flowering; flowers small, with fimbriated petals, deep violet.

234. Toussaint l'Ouverture (Pom.) (Cannell).—Height 2 feet; bushy habit; very free flowering; flowers small, with fimbriated petals, mauve-pink tipped with yellow.

235. Toussaint Maurisott (Pom.) (Haywood).—Height, 4 feet; sturdy habit; free flowering; flowers with fimbriated petals, rosy lilac touched with greenish yellow in the centre.

236. Trafalgar (Pom.) (Dobbie).—Height, 2 feet; bushy habit; free flowering; flowers small, brownish crimson.

237. Tutton (Jap) (Haywood).—Height, 4 feet; diffuse habit; rather shy flowering; flowers rich yellow.

238. Val d'Andorre (Jap.) **F.C.** October 25, 1885 (Haywood).—Height, 3 feet; compact bushy habit; very free flowering; flowers orange-red shaded with scarlet.

239. Viviand Morel (Jap.) **A.M.** October 28, 1890 (Haywood, Dobell).—Height, 3 feet 6 inches; bushy habit; very free flowering; flowers with long drooping petals, delicate mauve.

240. Violet Foster (Jap.) (Haywood).—Height, 4 feet; spreading habit; moderately free flowering; flowers rosy purple with a silvery reverse.

241. Werther (Jap.) (Haywood, Dobbie).—Height 4 feet; diffuse habit; free flowering; flowers large, crimson with a silvery reverse.

242. White Christine (Ref.) (Haywood).—Syn. Mrs. Forsyth. Height 3 feet 6 inches; diffuse habit; free flowering; flowers white.

243. W. H. Morter (Jap.) (Haywood).—Height, 2 feet; sturdy habit; free flowering; flowers large, bronze touched with gold.

244. Wilfred Marshall (Jap.) **A.M.** November 14, 1893 (Haywood).—Height 4 feet; robust habit; free flowering; flowers with broad incurving petals, rich yellow.

245. William Firkins (Dec.) (Cannell).—Sport from Bouquet de Dame. Height 3 feet 6 inches; diffuse habit; very free flowering; flowers rich primrose yellow.

246. William Kennedy (Pom.) (Haywood, Cannell).—Height, 3 feet 6 inches; bushy habit; free flowering; flowers small, crimson-purple.

247. William Payne (Pom.) (Haywood).—Height 2 feet; sturdy bushy habit; very free flowering; flowers small with fimbriated petals, bronzy yellow.

248. William Seward (Jap.) **A.M.** October 18, 1892 (Haywood).—

Height, 3 feet, bushy habit; very free flowering; flowers with long drooping petals, deep crimson with a yellowish reverse.

249. William Westlake (Pom.) (Haywood, Cannell).—Height 4 feet; diffuse habit; moderately free flowering; flowers small, rich golden yellow touched with red.

250. W. W. Astor (Jap., Anem.) (Haywood).—Height 3 feet 6 inches; sturdy habit; very free flowering; flowers large, guard petals blush white, centre pale yellow suffused with rose-pink.

251. Yellow Jane Improved (Single) (Dobbie).—Height 2 feet; bushy habit; very free flowering; flowers bright yellow.

252. Yellow Source d'Or (Jap.) **A.M.** October 29, 1895 (Haywood).—A bright yellow-flowered sport from No. 226.

Fig. 117.—Maxillaria Sanderiana. (*Journal of Horticulture.*)

REPORT ON MISCELLANEOUS FLOWERING PLANTS AT CHISWICK, 1899.

F.C.C.=First-class Certificate.
A.M.=Award of Merit.
× × ×=Highly Commended.

Ageratum.

1. Blue Perfection (Watkins & Simpson).—Plant of dwarf compact habit, bearing in great profusion clusters of large deep blue flowers.

2. Imperial Dwarf Blue (J. Veitch).—Plants of variable habit; some dwarf and bushy, others tall and sparsely branched; moderately free flowering; flowers rich blue.

Angelonia.

3. Grandiflora alba (J. Veitch).—A very neat dwarf growing plant, with a single erect stem clothed with opposite lanceolate serrated sessile leaves; flowers small white, borne in the leaf axils with great freedom.

Antirrhinums.

4. Mixed (Rowatt).—Plants of compact habit; free flowering; flowers of various colours.

5. The Bride (Watkins & Simpson).—Very similar to A. Queen of the North.

Arctotis.

6. Breviscapa (J. Veitch).—Height 8 inches; very free flowering; flowers rich orange yellow.

Argemone.

7. Grandiflora (J. Veitch).—Height 2 feet; free flowering; flowers white with golden yellow anthers, bearing some resemblance to Romneya Coulteri; leaves glaucous and very prickly.

Asters.

8. Comet Giant White (Atlee Burpee, Watkins & Simpson).—A very fine strain with large pure white flowers.

9. Comet Dwarf White (Watkins & Simpson).—A dwarf selection of No. 8.

10. Twenty varieties from home-saved seed (Cannell).—These gave a grand display of flower during the summer, quite equal to those raised from Continental seed.

Begonias.

11. Superb Prize Double (Sydenham).—Failed.

12. Unnamed (Smythe).—This was stated to be a cross between B. Weetoniensis and a tuberous variety, but there was no evidence of any cross having taken place.

Caladiums.

13. Thirty varieties from Mr. McLeod.

14. Twenty-nine varieties from Messrs. J. Veitch.

These will be grown again next year.

Calceolaria.

15. Pinnatifolia (A. Dean).—Failed.

Calliopsis.

16. Crimson King (Watkins & Simpson).—Height 8 inches to one foot; bushy habit; free flowering; flowers deep crimson.

Candytuft.

17. Dwarf Purple (Carter).—Height 10 inches; very free flowering; flowers rich purple.

18. Dwarf Rose (Carter).—Height 8 inches; free flowering; flowers deep rose shading to pale rose.

19. Little Prince (R. Veitch).—Height 6 inches; bushy habit; very free flowering; flowers pure white borne on stout spikes.

20. Rose Celestial × × × July 27, 1898 (Watkins & Simpson).—Height one foot; compact habit; very free flowering; flowers deep rose.

Canna.

21. Madame Ch. Maron (C. Madame Crozy × C. Liliiflora) (De Beucker).—A vigorous green-leaved variety bearing tall spikes of orange flowers shaded with scarlet and edged with rich yellow. The lower petals are pale yellow suffused with orange.

Carnations.

22. Amber Witch (Douglas).—Lovely cream yellow flowers, faintly edged and flaked with lilac.

23. Amy Robsart (Douglas).—Plant of vigorous growth; flowers rich scarlet.

24. Asphodel (Douglas).—Large handsome rose pink flowers.

25. Bella Donna (Douglas).—Large salmon red flowers.

26. Boadicea (Douglas).—Similar to No. 25.

27. Cadi (Douglas).—Bright scarlet flowers.

28. Cissie (Evans).—A very pretty fancy variety with small pink flowers, spotted and striped with crimson.

29. Diana (Douglas).—Large pale yellow flowers.

30. Effie Deans (Douglas).—Flowers lovely yellow edged and flaked with rose.

31. Haidee (Douglas).—Flowers very large, mauve touched with purple.

32. His Excellency (Douglas).—Large well formed flowers, yellow edged with light red.

33. Lamplighter (Douglas).—Medium-sized scarlet flowers of good form.

34. Melbourne (Douglas).—Flowers deep yellow edged and barred with red.

35. Mrs. Tremayne (Douglas).—Flowers rich yellow deeply margined and flaked with scarlet.

36. Nautch Girl (Douglas).—Flowers blush white, of good form and substance.

37. Queen of Scots (Douglas).—Large rose-coloured flowers suffused with pink.

38. Red Ribbon (Evans).—Flowers scarlet flaked with white.

39. Regatta (Douglas).—Large well formed rose-pink flowers.

40. Richmond (Douglas).—Flowers white, of good form and substance.

41. The Begum (Evans).—Flowers canary-yellow striped with red and white.

42. Vesta (Douglas).—Large well shaped pure white flowers.

43. Winnie Webb (Evans).—Flowers pale mauve ; very free flowering.

44. Zingari (Douglas).—Flowers pale yellow edged and heavily flaked with crimson.

Centaurea.

45. Imperialis (J. Veitch).—Height 4 feet ; bushy habit ; very free flowering ; flowers sweet-scented, borne on long stalks with great freedom.

Chrysanthemum.

46. Inodorum plenissimum (J. Veitch).—Stock not fixed.

Clarkias.

47. Minima lilacina (Carter).—Height 6 inches ; free flowering ; flowers pale blue.

48. Minima alba (Carter).—A white-flowered form of No. 48.

Convolvulus.

49. Minor Crimson Velvet (Watkins & Simpson).—Height 1 foot ; very floriferous ; flowers crimson and violet shading to white towards the yellow centre.

Dahlias.

50. Margaret Bruant (Bedding variety) (Forbes).—Height 2 feet ; sturdy habit ; moderately free flowering : flowers large white borne just above the foliage.

51. Mont Blanc (Bedding variety) (Forbes).—Similar to No. 51.

52. Rising Sun (Bedding variety) (Forbes).—Height 2 feet ; compact habit ; moderately free flowering ; flowers large, bright scarlet sometimes tipped with white.

53. Zelinda Purple (Bedding variety) (Forbes).—Height 2 feet ; sturdy habit ; flowers large and partly hidden by the foliage.

54. Zimpani (Wakefield).—A small dark-flowered species almost lost to cultivation.

Dianthus.

55. Heddewigii Eastern Queen (Carter)—Height 8 inches : flowers single ; colours various.

56. Heddewigii Purity (Watkins & Simpson)—Height 8 inches ; very free flowering ; flowers double white.

57. Heddewigii Queen of Holland (Carter)—Height 8 inches; free flowering; flowers white with a circular band of pink near the centre.

Eccremocarpus.

58. Scaber (Hutton).—An old well known climber introduced from Chili in 1824. It is well adapted for covering trellises, pillars, &c., and bears numerous racemes of orange-coloured flowers.

Eschscholtzia.

59. Carminea rosea (Watkins & Simpson).—Height 1 foot; free flowering; flowers carmine and rose suffused with pale sulphur.

60. Douglasii (Carter).—Failed.

61. Golden Sunbeam (R. Veitch).—Height 10 inches; free flowering; flowers canary yellow heavily blotched with golden yellow on the basal portion of each petal. A continuous bloomer.

Godetias.

62. Dunnetti compacta (Carter).—Height 10 inches; flowers pale purple blotched with crimson; glaucous tinted foliage.

63. Whitneyi splendour (R. Veitch).—Height 10 inches; flowers of medium size, crimson touched with rose.

Hemerocallis.

64. Apricot, **A.M.** May 25, 1893 (Yeld).—A magnificent variety with large rich orange-yellow flowers.

Hunnemannia.

65. Fumariæfolia, **A.M.** Aug. 23, 1898 (J. Veitch, R. Dean).—The deep golden yellow poppy-like flowers with conspicuous yellow anthers in the centre are very handsome. The foliage is elegantly cut and of a glaucous green hue. This charming Mexican annual delights in a warm soil and sunny position.

Lachenalia.

66. tricolor × aurea (Butters).—This is a grand variety producing long stout flower spikes and large deep yellow flowers.

Larkspur.

67. Empress Rose (J. Veitch).—Height 18 inches; free flowering; flowers semi-double borne on long spikes.

Lavatera.

68. Trimestris Red (J. Veitch).—Height 2 feet 6 inches; moderately free flowering; flowers red.

69. Trimestris White (J. Veitch).—A white flowered form of No. 69.

Lobelia.

70. Elegantissima (Carter).—Height 6 inches; slender habit; free flowering; flowers deep blue with a white centre.

LUPINUS.

71. Moritzianus (J. Veitch).—Height 3 feet 6 inches; free flowering; flowers blue and violet.

72. Mutibilus Cruickshanki (J. Veitch).—Height 4 feet; free flowering; flowers blue and white.

MARIGOLD.

73. Silver King (Carter).—Very closely resembles Tagetes Légion d'Honneur.

MIGNONETTE.

74. Crimson Giant (Watkins & Simpson).—Plants of bushy spreading habit; free flowering; flowers crimson borne on stout spikes.

75. Large flowered French (Atlee Burpee).—Height 10 inches; plants of sturdy habit; free flowering; flowers very fragrant.

76. Perfection (Carter).—Plants of bushy habit; flowers red borne on rather slender spikes.

MICHAELMAS DAISY.

77. Mrs. W. Peters (Peters), **A.M.** Sept. 7, 1897.—Plant of dwarf bushy habit; very free flowering; flowers large and white with a prominent yellow disc.

NASTURTIUMS.

78. Beauty of Malvern (R. Dean).—Height 10 inches; leaves rich green; flowers orange scarlet borne well above the foliage.

79. Bedford Rival, **F.C.C.** Aug. 16, 1882 (R. Dean).—Height 10 inches; very free flowering; flowers scarlet borne well above the pale green foliage.

80. Caprice (Atlee Burpee).—Mixed.

81. Chameleon (Toogood, J. Veitch).—Mixed.

82. Empress of India, **F.C.C.** July 25, 1882 (R. Dean).—Height 10 inches; bushy habit; very free flowering; flowers rich crimson borne well above the foliage.

83. Luteum Improved (R. Dean).—Stock not fixed.

84. Moonlight (Atlee Burpee).—Height 15 inches; flowers pale yellow with a deeper centre.

85. Sunlight (Atlee Burpee).—Height 1 foot; free flowering; flowers lovely canary yellow.

NEMESIA.

86. Compacta bicolor (J. Veitch).—Failed.

87. Strumosa nana (J. Veitch).—Failed.

NICOTIANA.

88. Sylvestris, **A.M.** July 25, 1899. See vol. xxiii. page cxxxii.

ONOPORDON.

89. tauricum (Cator).—A very attractive free growing Thistle-like plant with large broad deeply cut prickly arching leaves covered with white tomentum on both sides. The stems are also covered with white tomentum. It is a splendid plant for sub-tropical bedding.

PENTSTEMONS.

90. Seedlings (J. Veitch).—A good selection; flowers large and variously coloured.

91. Seedlings (Rowatt).—A very fine strain.

PETUNIA.

92. Emperor (Carter).—Flowers large and of various colours.

93. Lord Courteney (R. Veitch).—A distinct and pretty free flowering variety bearing medium-sized bright rose-pink flowers. Height 1 foot.

94. Morning Star (Carter).—Mixed.

PHACELIA.

95. Tanacetifolia (J. Veitch).—Height 15 inches; very free flowering; flowers mauve.

PICOTEE.

96. Ernest Marshall (Evans).—Large flowers; white ground heavily edged and streaked with deep crimson.

POLYANTHUS.

97. Seedlings (Forbes).—An ordinary strain.

SOLANUM.

98. Unnamed (Matthias).—Failed.

STOCK.

99. Giant Crimson Jubilee (Dean).—Plants of bushy habit; flowers rose-purple freely produced on long stout spikes.

SUNFLOWER.

100. Golden Nigger (Watkins & Simpson).—Height 5 feet; flowers golden yellow with a dark centre.

SWEET PEAS.

101. Black Knight (Eckford).—An improvement on Stanley.

102. Burpee's Beauty (Atlee Burpee).—Height 6 inches; flowers pale pink shading to rose.

103. Burpee's Earliest of all (Atlee Burpee).—Standards rose-scarlet; wings cream white.

104. Burpee's Bush (Atlee Burpee).—Flowers large, light ground shaded and splashed with purple.

105. Colonist (Eckford).—Very bright rose-pink flowers, of good form.

106. Chancellor (Eckford).—Clear salmon-pink flowers.

107. Countess Cadogan, **A.M.** July 14, 1898. (Eckford).—Flowers blue shaded with mauve on reverse of standard.

108. Countess of Powis, **A.M.** July 10, 1894 (Eckford).—Standards salmon; wings rose-pink.

109. Duchess of Sutherland (Eckford).—Lovely pale pink self.

110. Duke of Sutherland (Eckford).—Standards maroon; wings shaded violet.

111. Duke of Westminster × × × July 27, 1898 (Eckford).—Flowers rich purple.

112. Fashion (Atlee Burpee).—Flowers purplish rose, of good form and substance.

113. Gorgeous (Atlee Burpee).—Standards pale salmon; wings rose-pink.

114. Hon. F. Bouverie (Eckford).—Flowers delicate pink suffused with pale salmon.

115. Lady Grisel Hamilton, **A.M.** July 14, 1896 (Eckford).—Flowers large, pale lavender blue.

116. Lady Mary Currie, **A.M.** July 14, 1897 (Eckford).—Flowers large, orange pink touched with rosy mauve.

117. Lady Nina Balfour (Eckford).—Large well-formed pale mauve-coloured flowers borne freely on long stems.

118. Navy Blue (Atlee Burpee).—Flowers large; deep blue standards touched with bluish purple.

119. Othello (Eckford).—Similar to Stanley.

120. Prince Edward of York, **A.M.** July 14, 1896 (Eckford).—Flowers large, salmon-rose; wings bright rose.

121. Prince of Wales, **A.M.** July 14, 1897 (Eckford).—Flowers large, bright rose, of good form and substance.

122. Queen Victoria (Eckford).—Flowers large, well formed, pale cream yellow.

123. Sadie Burpee × × × July 27, 1898 (Eckford).—Large pure white flowers.

124. Unnamed from California (Atlee Burpee).—Flowers salmon red; wings carmine.

Tropæolum.

125. Lobbianum Black Prince (Watkins & Simpson).—Height 1 foot; flowers rich scarlet borne well above the deep green foliage.

126. Lobbianum Defiance (Watkins & Simpson).—Height 1 foot; very free flowering; flowers deep crimson borne well above the foliage.

Tulips.

127. Billietiana (J. Veitch).—Flowers orange yellow, shaded with reddish orange.

128. Bouton d'Or (J. Veitch).—Golden yellow flowers with broad well formed petals.

129. Cornuta (J. Veitch).—Flowers yellow splashed and striped with red.

130. Elegans (J. Veitch).—Large rich carmine flowers with reflexed petals.

131. Golden Eagle (J. Veitch).—Large well formed rich yellow flowers.

132. Isabella (J. Veitch).—flowers rose pink with deeper shadings.

133. Macrospelia (J. Veitch).—Flowers rich crimson scarlet marked with black in the centre.

134. Summer Beauty (J. Veitch).—Flowers mauve, flaked with scarlet and white.

135. Variegated-leaved Yellow Prince (J. Veitch).—Broad pale green leaves, striped and margined with yellow ; flowers canary yellow.

Verbenas.

136. Mammoth White (Atlee Burpee).—Failed.

137. Unnamed varieties from Cleveland, Ohio (Jackson).—An ordinary strain.

Viola.

138. Ladas (R. Dean).—Plants of compact bushy habit ; free flowering ; flowers small rich yellow.

Wallflower.

139. Carter's Annual (Carter).—Height 18 inches; moderately free flowering ; flowers yellow.

Double Yellow (Leech).—A very old well known variety with fragrant flowers.

Zea.

140. Japonica gigantea quadricolor (R. Veitch).— A very ornamental free growing Grass with long arching green leaves beautifully striped and blotched with yellow and sometimes shaded with red.

REPORT ON CABBAGES AT CHISWICK, 1899.

Seeds of five varieties of Cabbage were received for trial and sown in cold frames on March 16. Later on they were planted out twenty inches apart each way. They were examined by the Fruit and Vegetable Committee on November 7, 1899.

A.M.=Award of Merit.

1. Early Eclipse (Fidler).—Plant very dwarf and sturdy, with large spreading leaves, heads of medium size, conical, and firm.

2. Early October (Wythes).—Plant rather tall, with small compact foliage, heads medium, deep, round, and firm.

3. Jubilant (Harrison).—Plant very dwarf and sturdy, with large spreading foliage; heads large and conical, and moderately firm.

4. Perfection (Dickson's).—Plant very dwarf and sturdy, with a moderate spread of foliage; heads flattish round, large, and firm.

5. St. Martin's (Wythes).—**A.M.** November 7, 1899. Plant moderately dwarf, with spreading foliage; heads roundish oval, of medium size and very firm. This variety is the result of Colewort × Christmas Drumhead.

REPORT ON BRUSSELS SPROUTS AT CHISWICK IN 1898 AND 1899.

Five stocks of Brussels Sprouts were grown in 1898 from seed sent for trial, but the season being so unfavourable for them, they were sown and tried again in 1899, when the whole collection made very satisfactory growth.

1. Cambridge Champion (Ridgwell).—Sutton's Exhibition × Dwarf Gem.—Growth tall and strong; buttons of moderate size and very firm; foliage rather small and compact.

2. Covent Garden (Watkins & Simpson).—Growth dwarf and sturdy; buttons large, closely placed, and firm; foliage large and compact.

3. Scrymyer's Giant (J. Veitch).—Growth tall and strong; buttons large, firm, and moderately thick on the stem; foliage large and spreading.

4. Wroxton (Watkins & Simpson).—Very similar to No. 3.

5. Wythes' Favourite (Wythes).—Growth dwarf and sturdy; buttons small and firm, closely packed on the stem; foliage small and compact. Very similar to the old 'Imported' variety.

REPORT ON BORECOLE OR KALE AT CHISWICK, 1899.

Three stocks of Borecole were received for trial. The seeds of each were sown in cold frames on February 27, and when large enough they were planted out on good soil three feet apart each way. All three varieties made excellent growth.

1. Improved Hearting (Harrison).—A strong growing form of No. 2.

2. Read's Hearting (Cutbush).—A remarkably true stock of this well-known variety.

3. Veitch's Selected (J. Veitch).—Growth moderately strong; foliage beautifully curled, but quickly injured by the London fog.

REPORT ON HORTICULTURAL APPLIANCES AT CHISWICK, 1899.

1. American Blight Destroyer (Bunyard).—A liquid insecticide that proved very deadly to all American blight that it came in contact with, the pest never appearing where the insecticide had been applied.

2. Abol Insecticide (White).—A liquid insecticide tried with good results for Black Aphis and Red Spider on Peach trees outside, two applications cleansing the trees of both pests.

3. The Chelsea Horticultural Manure (J. Veitch).—A chemical manure which proved valuable for plants in pots and trees planted out. On Fig trees in pots the results were remarkable for the increase in the size of leaf and fruit, and sturdy growth.

4. Patent Labels (Outram).—The labels are apparently made of compressed paper, dull red in colour. They proved durable, but the writing both with ink and pencil, quickly become indistinct.

5. Thermometer Indicator (Outram).—A useful apparatus, easily fitted to any thermometer, to indicate how high or how low the temperature may go.

6. Trumpet Sprayer (Maggs Bros.).—A small mouth sprayer, but not of any special value for horticultural purposes.

7. Wood Labels (Taylor).—Slightly different in shape to the labels in common use, but no particular improvement thereon.

NOTE ON THE LIBRARY.

The enlargement and perfecting of the Library have long been matters of great solicitude to the Council. Year after year they have invited Fellows to present books, with the result that since January 7, 1887, about 750 volumes have by this means been added to the Library. The Council have themselves from time to time purchased expensive books and made frequent grants of money for binding and other necessary purposes, and the Lindley Library Trustees have devoted all the small fund at their disposal annually to the same object.

Thus, together with the steady onward progress of the Society itself since the beginning of 1889, the Library also has progressed, and has been enormously improved. It consists now of about 4,000 volumes, and is certainly one of, if not the best horticultural library in the kingdom.

A catalogue, which can be obtained from the Society, office 11 Victoria Street, S.W., price 2*s.* 6*d.*, has recently been published, so that everyone can now inform himself of what books the Library consists.

Great, however, as the improvements of recent years have been, it is still felt that there are multitudes of Fellows who might be prevailed upon either—

(*a*) To at once present books that are still absent from the shelves ; or

(*b*) Leave to the Society by will any books in their library on horticultural or botanical subjects ; or

(*c*) Leave to the Lindley Library Trustees a small legacy to help to augment the very small funds which they at present have to administer.

At the annual meeting of the Society in 1899 Mr. J. G. Elwes, F.R.S., in congratulating the Society on the issue of the Library Catalogue, expressed the opinion that many Fellows would be only too glad to help in the excellent work of improving the Library if only its existence and value were brought home to them, and himself offered to set the example.

Good words were followed by good deeds. Mr. Elwes procured a copy of the Catalogue, and, after comparing it with his own list of books, most kindly sent the following memorandum to the Council :—

"I enclose a list of botanical and horticultural books which I have that are not apparently in the Library of the Society, and which, according to promise, I present and bequeath to the Trustees of the Lindley Library.

"Those marked with a * are books which I am likely to want for my own use at present, but which will revert to the Trustees at my death if not sent before. But those unmarked I am sending now addressed to the office.

"As I stated at the meeting, I think that there are other members of the Society who would do the same if it were properly put before them, and this would tend to keep the Library more up to date than it can be at present.

"J. G. ELWES."

List of Books Referred to in the Opening Sentence of Mr. Elwes's Letter.

Regel, "Conspectus specierum generis Vitis regiones Americæ borealis, Chinæ borealis," &c. Petropolis, 1873. P.
Regel, "Flora der Gebiete des Russischen Reichs östlich vom Altai," &c. Bd. I. Heft 2.
Regel, "Alliorum adhuc cognitorum Monographia." Petropolis, 1875.
* Regel, "Primulaceæ and Liliaceæ of Turkestan" (part of "Fedtchenko's Reise").
* Hooker and Thompson, "Introductory Essay to the Flora Indica."
Rattray and Mill, "Forestry and Forest Products."
Donn, J., "Hortus Cantabridgiensis."
* Mongrédien, A., "Trees and Shrubs for English Plantations."
"List of Medicinal and Poisonous Plants cultivated in the Royal Botanic Garden of Edinburgh," 1859.
"Transactions of the Wisconsin State Agricultural Society," 1860.
Koch, Karl, "Dendrologie." Stuttgart, 1875.
Watson, H. C., "Supplement to Cybele Britannica," 1860.
* Pratt, Anne, "British Grasses and Sedges."
Mathews, W., "Flora of Algeria."
* Baker, J. G., "A Synopsis of the known Species of Iris" (newspaper cuttings).

* Baker, J. G., "On Crocus" (newspaper cuttings).
* Baker, J. C., "On Liliaceæ" (from *Journal Linn. Soc.*).
* Gray and Hooker, "On the Rocky Mountain Flora." *Bull. U.S. Geo.* Survey.
* Clarke, C. B., "Botanic Notes from Darjeeling to Tongloo," 1875 (*Journ. Linn. Soc.*?).
* Duchartre, "Observations sur les Bulbes des Lis."
* Spae, D., "Mémoire sur les Espèces du Genre Lis," 1847.
* d'Hamale, "Monographie des Lis," 1870.
* Duchartre, "Rapport de la Commission d'Enquête sur l'Hiver de 1879–1880."
Watson, Sereno, "Bibliographical Index to N. American Botany." Part 1. Polypetalæ, 1878.
* Moggridge, J. T., "Flora of Mentone."
* Tchihatcheff, "Asie Mineure," &c Botanique I., 1860.
* Boissier, "Flora Orientalis," 6 vols.
* Waugh, F. E., "Conspectus of Genus Lilium," Chicago, 1899. Pam.
* Oliver, F. W., "On Sarcodes sanguinea." *Annals of Botany.* August, 1890.
Watson, Sereno, "Contributions to American Botany." XVIII.
* Levier, E., "L'Origine des Tulipes de la Savoie et de l'Italie," 1884. Pam.
* Hemsley and Hooker, "Introduction to Biologia Centrali Americana." Botany.
* Maximowicz, "Primitiæ Floræ Amurensis."
Boissier and Buhse, "Botany of Transcaucasus and Persia."
Schmidt, F., "Plants of Amurland and Sachalin."
* Watson, Sereno, "U.S. Geo. Exploration of the 40th Parallel." Botany.
* Sargent, C. S., "Report on the Forests of North America," with imperial folio atlas.
Todaro, "Hortus Botanicus Panormitanus," vol. ii., fasc. 2, 3, folio.
King, "Species of Ficus," Pt. II., 2, 1888. Index and Appendix, 1889.
* McCoun, "Catalogue of Canadian Plants." vols. i. and ii.
* Monroe's "Monograph of Bambusaceæ," Scott's "Tree Ferns of British Sikkim," Hooker's "Botany of Kerguelen's Island." 1 vol. (papers from *Linnean Transactions*).
Elwes, "Monograph of Lilium." Complete copy unbound.
* Cathcart's "Illustrations of Himalayan Plants," folio, coloured plates.
* Hooker's "Rhododendrons of Sikkim Himalaya," 30 coloured plates.

The warmest thanks of the Society are due to Mr. Elwes, not only for the books which he has given and bequeathed, but also for the admirable example he has set; and it is earnestly hoped that many others will be induced to do as he has done, and that those who have no books to give will leave a small legacy, to be administered by the Trustees of the Library in keeping it up to date with all horticultural and botanical literature.

BOOKS PRESENTED TO THE SOCIETY DURING THE YEAR 1899.

"Monandrian Plants of the Order Scitamineæ," by W. Roscoe, presented by the late Miss M. J. King.
"Hooker's Icones Plantarum," vi., pt. 4, presented by the Bentham Trustees.
"Atlas de la Flore Alpine," par H. Correvon, 6 vols., presented by the author.
"Album des Orchidées," par H. Correvon, presented by Miss Willmott.
"Le Potager d'un curieux histoire, culture et usages de 250 plantes comestibles peu connues ou inconnues," par A. Paillieux et D. Bois, presented by D. Bois.

Presented by Rev. Prof. G. Henslow, M.A.

"The Origin of Floral Structures through Insect and other Agencies," by Rev. Prof. G. Henslow, M.A.
"Botany for Beginners," by Rev. Prof. G. Henslow, M.A.
"The Making of Flowers," by Rev. Prof. G. Henslow, M.A.
"The Origin of Plant Structures by Self-adaptation to the Environment," by Rev. Prof. G. Henslow, M.A.
"How to Study Wild Flowers," by Rev. Prof. G. Henslow, M.A.
"Floral Dissections, illustrative of Typical Genera of the British Natural Orders," by Rev. Prof. G. Henslow, M.A.
"The Plants of the Bible," by Rev. Prof. G. Henslow, M.A.
"Vines and Vine Culture," by A. F. Barron.

Presented by the Director, Royal Gardens, Kew.

"Catalogue of the Library of the Royal Gardens, Kew."
"Bulletin of Miscellaneous Information," 1898.
"Flora Capensis," vii., pt. 3.
"Flora of Tropical Africa," v., pt. 1.

BOOKS PURCHASED DURING THE YEAR 1899.

"Bush Fruits," by F. W. Card.
"Sketch of the Evolution of our Native Fruits," by L. H. Bailey.
"Symbolæ Antillanæ," vol. i., fasc. 1, 2, by J. Urban.
"Fertilisers," by E. B. Voorhees.
"Plantæ Europææ," vol. ii., fasc. 2. Ed. M. Gürke.
"Flore Forestière de la Cochinchine," fasc. 25, par L. Pierre.
"Die Vegetation der Erde," vols. i.–iii., herausg. von A. Engler u. O. Drude.
"The Silva of North America," vol. xii., by C. S. Sargent.
"The Flora of Cheshire," by Lord de Tabley.
"Lectures on the Evolution of Plants," by Dr. D. H. Campbell.
"Atlas de Poche des Plantes des Champs, des Prairies et des Bois," par R. Siélain.
"Monographieen Afrikanischer Pflanzen-Familien und -Gattungen," herausg. von A. Engler; II. "Melastomataceæ," bearbeitet von E. Gilg; also III. "Combretaceæ–Combretum," bearbeitet von A. Engler u. L. Diels.
"History of European Botanical Discoveries in China," by Dr. E. Bretschneider.
"Die Bäume und Sträucher des Waldes," von G. Hempel und K. Wilhelm.
"Die Orchidaceen Deutschlands, Deutsch-Oesterreichs und der Schweiz," bearbeitet von M. Schulze.
"The Orchids of the Sikkim-Himalaya," by Sir G. King and R. Pantling.
"Handbuch der Blütenbiologie," Bd. 2, Teil 2, von Dr. P. Knuth.

DONORS OF PLANTS, SEEDS, &c., TO THE SOCIETY'S GARDENS AT CHISWICK DURING THE YEAR 1899.

Alexander, S. R., Sutton Court Road, Chiswick. One packet of unnamed Seeds.
Ashton, B., Latham Gardens, Ormskirk. Culinary Peas.
Atlee Burpee, Messrs., Philadelphia. Vegetable and Flower Seeds.
Barr, Messrs., King Street, Covent Garden, W.C. Tulips and Culinary Peas.
Bateman, A., Brixworth Hall Gardens, Northampton. Fifteen Plants.
Beddome, Colonel, West Hill, Putney. Plants of Bilbergia nutans and Achimenes longiflora.
Bennett-Poë, J. T., Holmwood, Cheshunt. Two Daturas.
Bonavia, Dr., Richmond Road, Worthing. Twenty varieties of Hardy Vine Cuttings and five packets of Seeds.
Bostock, E., Tixall Lodge, Tixall. Two packets of Seeds.
Bradley, F. M., Church Street, Peterborough. Seed Potatos.
Breton, Miss, Sandhurst, Forest End, Berks. Ten packets of Seeds.
Briggs, J., Beech Hill, Lea, Matlock. Seed Potatos.
Bryson, J., 173 Princes Street East, Helensborough. Culinary Peas.
Bunyard, Messrs., Maidstone. Three Fruit Trees.
Burt, T. W., Caen Wood Towers, Highgate. Crotons and Dracænas.
Bury, Lindsay, Wilcot Manor, Pewsey, Wilts. Two packets of Flower Seeds.
Butters, J. T., St. George's Park, Port Elizabeth. Lachenalia tricolor × aurea.
Caddick, E. W., Caradoc, Ross, Hereford. Seed Potatos.
Cannell, Messrs., Swanley. Collection of Chrysanthemums and Dahlias.
Carles, W. R., Tientsin. Cabbage Seed.
Carter, Messrs., High Holborn. Vegetable and Flower Seeds.
Carter, T., 56 Burnt Ash Hill, Lee. Four Iris Plants.
Cator, D., The Cedars, Upper Tooting. One packet of Seeds.
Cheal, Messrs., Crawley. Collection of Cactus Dahlias.
Close, Miss, Lampern, Dursley. Tubers of Gloriosa superba.
Cooling, Messrs., Bath. Dwarf Bean Seeds.
Compton, J. Duffield, Derby. Seed Potatos.
Cove, H. G., 41 Wellington Street, W.C. Salvia splendens, silver spot.
Crellin, Miss, Orry's Dale, Isle of Man. One plant.
Cross, Messrs., Wisbech. Four Apple-trees.
Crowley, P., Waddon House, Croydon. Dracænas, Anthuriums, and Dieffenbachias.
Cutbush, Messrs., Highgate. Vegetable Seeds.
Cuthbertson, M., Rothesay. Tomato Seed.
Daniels, Messrs., Norwich. Culinary Peas.
Davies, Dr. Livingstone, Preswylfa, Criccieth. Dracænas, Crotons, Dieffenbachias, &c.
Davis, Miss, Sutton Court Road, Chiswick. Seed of Myosotidium nobile.
Deal, Jun., W., Feering Hill, Kelvedon. Culinary Peas.
Dean, A., 62 Richmond Road, Kingston. Vegetable and Flower Seeds.
Dean, R., 42 Ranelagh Road, Ealing. Vegetable and Flower Seeds and Plants of a new Viola.

De Beucker, J. J., Carnststraat, Antwerp. One new Canna.
Dickson, Messrs., 55 Royal Avenue, Belfast. Seed Potatos.
Dicksons, Messrs., Chester. Vegetable Seeds.
Director, Botanic Gardens, Calcutta. Seeds of Balanites Roxburghii.
Director, Botanic Gardens, Kew. Ninety packets of Seeds and eight Aquatic Plants.
Dobbie, Messrs., Rothesay. Vegetable Seeds and collection of Chrysanthemums and Dahlias.
Douglas, J., Edenside, Great Bookham, Surrey. Carnation Plants and Seeds.
Eckford, H., Wem, Salop. Twenty-six packets of Culinary and Sweet Peas.
Ellington, W., West Row Gardens, Mildenhall, Suffolk. Seed Potatos.
Elliot, Dr., Sutton Court Road, Chiswick. Fourteen loads of Manure.
Eves, J., Eynsford, Dartford, Kent. Seed Potatos.
Fidler, Messrs., Reading. Vegetable Seeds.
Forbes, J., Hawick. Cactus and Pompon Dahlias.
Force, F. W., 14 Montpelier Road, Ealing. Twenty-one packets of Seeds.
Gibson, T. Ellis, Woodridings, Pinner. Tomato Seed.
Gott, J. T., Holbeach, St. John's. Seed Potatos.
Grahame, C. J., Wrydelands, Leatherhead. Collection of Tea Rose Cuttings.
Grantham, Lady, 100 Eaton Square, S.W. Twenty-two packets of Seeds.
Green, R. W., Wisbech. Seed Potatos.
Guilfoyle, W. R., Botanic Gardens, Melbourne. Thirty-five packets of Seeds.
Handley, E., Hendra, Alma Chine, Bournemouth. A packet of Vegetable Seed.
Hansen, Professor Carl, Copenhagen. Cauliflower Seed.
Harrison, Messrs., Leicester. Vegetable Seeds.
Haydon, C. E., Avenue Road, Southgate. Brooms and Patent Fasteners.
Haywood, T. B., Woodhatch, Reigate. Collection of Chrysanthemum Cuttings.
Heaton, S., Avondale Road, Newport, I.W. Seed Potatos.
Heinemann, F., Erfurt. Cauliflower Seed.
Henderson, Messrs., New York. Bean Seeds.
Henslow, Rev. Professor, 80 Holland Park, W. Eight books for Garden Library.
Hibberd, H., Botley, Hants. Seed Potatos.
Hogg & Robertson, Messrs., Dublin. Collection of Tulips.
Hollingworth, J., Margam Park, Taibach, Glamorganshire. Plants and Cuttings.
Hope, J., Brackley Road, Chiswick. Packet of Seeds.
Hudson, J., Gunnersbury House, Acton. Plants of Acalypha hispida, Begonia Gloire de Lorraine, Nicotiana sylvestris, and Seeds of Asparagus Sprengeri.
Hueg, W., Claire, Cookstown, Co. Tyrone. Seed Potatos.
Hurst, Messrs., 152 Houndsditch, E.C. Vegetable Seeds.
Jackson, Miss, Beechund, Carshalton. Verbena Seed.
Jardinier-en-Chef, Jardin Botanique, Varcovie. Collection of Seeds.
Jones, H. J., Lewisham. Collection of Tulips.
Kemp, D., Stoke Park, Slough. Dracænas.
Kerr, Messrs., Grassendale, Liverpool. Bean Seeds.
Kimes, T., Boston, Lincolnshire. Seed Potatos.
Knight, J., Ruskinville, Dalton-in-Furness. Seed Potatos.
Krelage, Messrs., Haarlem. Collection of Tulips.
Laird, Messrs., Frederick Street, Edinburgh. Tomato Seed.
Laxton, Messrs., Bedford. Seed Potatos.
Lye, J., Easterton, Market Lavington. Fuchsias, Geraniums, Pelargoniums, &c.
Lynch, R. J., Botanic Garden, Cambridge. Seventy-three packets of Seeds.
Lynn, B., 36 Sunnyside Road, Ealing. Forty-nine packets of Seeds.
McLeod, J. F., Dover House Gardens, Roehampton. Collection of Caladiums.
Maggs, Messrs., Swansea. The Trumpet Sprayer.
Marshall, W., Bexley. Indoor Plants and Hardy Ferns.
Mather, M., Davidsonsmams, Midlothian. Seed Potatos.
Mathias, Mrs., Thames Ditton. Packet of Seed.
May, H. B., Upper Edmonton. Ferns.
Morgan, J. H., Priory Park Road, Kew. Chemical Instruments.
Morris, W. E., Netley Hall Gardens, Dorrington, Salop. Seed Potatos.
Mortimer, S., Farnham. Collection of Dahlias.
Outram, A., Moore Park Road, Fulham. Three packets of Flower Seeds.
Pearce, Messrs., 119 Dundas Street, London. Seven packets of Seeds.
Pearson, Messrs., Chilwell, Notts. Variegated sport from Pelargonium Henry Jacoby.
Peters, W., Givars, Leatherhead. Michaelmas Daisy.
Proudlock, R. L., Botanic Gardens, Ootacamund. Ten packets of Seeds.
Ranger, C. P., East Hoathly, Sussex. Seed Potatos.
Roscoe, Lady, 10 Bramham Gardens, Wetherby Road, S.W. Dracænas.
Roupell, W., Harvey Lodge, Roupell Park. Vine Cuttings.
Rowatt, J., Glassford, Strathaven. Two packets of Seeds.

Searing, W. A., Parkwood, Swanley. Bean Seeds.
Sharp, W., Ness, Neston. Plants and Cuttings of Salvia angustifolia and Perowskya atriplicifolia.
Smith, Miss, Britwell House, Wallingford. Dracænas.
Smythe, W., Basing Park Gardens, Alton, Hants. Two Begonias.
Soloman, Leopold, Norbury Park, Dorking. Seed Potatos.
Sutton, Messrs., Reading. Turnip Seed.
Sydenham, R., Birmingham. Begonia and Potato Seeds.
Taylor, A., Ash Vale, Surrey. Dracænas.
Taylor, E. J., Clifton. Wood Labels.
Thompson, Mrs., Holmewood, Fortis Green. Packet of Seeds.
Thorne, F. J., Sunningdale Park, Sunningdale. Carnations.
Toogood, Messrs., Southampton. Cannas, Vegetable and Flower Seeds.
Towler, Messrs., Bedale. Culinary Peas.
Turner, C., Slough. Collection of Pompon Dahlias.
Veitch, Messrs. J., Chelsea. Dahlias, Caladiums, Pentstemons, Tulips, Vegetable and Flower Seeds.
Veitch, Messrs. R., Exeter. Vegetable and Flower Seeds.
Watkins & Simpson, Messrs., 12 Tavistock Street, Covent Garden. Vegetable and Flower Seeds.
Webber, E. R., St. Catherine's Hill Gardens, Worcester. Culinary Peas.
Welchman, Mrs., Down Lodge, Epsom. Two packets of Seeds.
Wheatly, S.W., Butterton, Newcastle, Staffs. Dracænas.
White, E. A., Beltring Paddock Wood, Kent. Abol Insecticide.
Wilks, Rev. W., Shirley Vicarage, Croydon. Forty Crinums and three packets of Flower Seeds.
Willmott, Miss, Warley Place, Great Warley. Cuttings of Begonias and Erysimums.
Wingfield, Mrs., Ampthill House, Ampthill. Chrysanthemum and Onion Plants.
Wythes, G., Syon House Gardens, Brentford. Five packets of Vegetable Seeds.
Yeld, G., Clifton Cottage, York. Hemerocallis Apricot.

THE DISEASE AFFECTING THE ELM TREES ON THE ESTATES OF THE CONDE DEL RETAMOSO, NEAR TARANCON, SPAIN.

By Señor B. Giner Aliño, Corresponding Member of the Society.

The agriculturists of Tarancon, who cultivate the Elm largely for its timber, have been very much troubled by a mysterious disease which is not very apparent in the living trees, but which shows itself very plainly when buyers come to purchase the hewn timber.

The Elms grow in apparently perfect health. The central or tap-root is thick, oblique, and deep, except in the case of a few trees which doubtless are merely offshoots. One cannot find any external sign of deterioration, no fungus, and no parasitic insects.

By far the greater number of the trunks are upright, well formed, and smooth when the tree is young, tall, and with but few side branches.

The foliage is abundant and shining green, and by its beautiful appearance does not suggest the presence of any disease. With the miscroscope one cannot find a single parasite.

The blossoms and fruit are normal and abundant.

The trees continue in this healthy condition until they are full-grown. Then cracks begin to appear in the trunk, on the surface at first, but increasing in depth with the age of the tree, until in some old Elms these cracks are so deep that they pierce to the very heart of the tree. Frequently the number of these cracks is considerable, though only a few of them may be deep.

In these cracks there are no fungi or insects, nor does any sap exude from the trunk; the wood is healthy, but it is easy to understand that it is in such a miserable condition from the cracks that it is absolutely useless for industrial purposes.

Very often it happens that when the tree is cut down the trunk does not show any cracks or other defects. The wood is subsequently worked, and in a short time the articles made from it fall to pieces.

Naturally the cabinet-maker and the timber merchant fight shy of such wood, and the loss to the grower, whose timber is unsaleable, is very great. It is easy therefore to understand the enormous importance to the agriculturists of Tarancon of finding out a way of preventing this loss.

I have seen diseased plantations where one recognises the damage not only by the small amount of bark which covers the cracks, but also by the hollow sound of the wood when struck.

I have occasionally seen trees whose trunks were streaked by running sap. This effusion of sap is produced by a physiological change in the wood. It oozes through the bark and runs down the trunk. On the attacked wood various bacilli fix themselves, principally the *Micrococcus dendroporthos* and *Tormla monilivides*, that assist in the disintegration

of the tissues and produce a special fermentation which gives off a greasy smell as of butyric acid.

As comparatively few trees are attacked by this sap exudation we need hardly trouble to consider them in our investigation.

In the same way we can omit the few trees many of whose leaves are sprinkled with black spots and covered on the under side with a kind of efflorescence. It is practically certain that these are produced by the parasitic fungus *Taphrinanlime*, whose attacks are not dangerous. Neither the dampness nor the dryness of the soil could be the cause of the change in the wood we are investigating, because in the plantations on the banks of the river Mansares, where the soil is wet, as well as in dry places, the trees are affected in the same manner; and as the subsoil in all the Elm groves is generally accessible to deep roots, it does not seem likely that the trees could become root-bound and thus set up disease in the wood.

To my mind we have to deal with the wood disease known to woodmen under the names of "wood frost," "curling frost" and "shocked" or "thunderstruck wood."

I think the disease is produced by malnutrition. One cannot attribute it to any parasite. It is simply a physiological disease or disintegration.

With a defective nutrition the tissues are badly constructed, there are no strong walls between the fibres and cells, and consequently the wood is feeble, soft, and of small durability or cohesion.

In such a condition a low temperature contracts the tissues, and at the same time the sap contained in them expands. These two antagonistic forces strain the cells and ducts, and, the structure of both these organic bodies being frail, their walls are unable to resist the combined pressure and give way. The exterior tissues, which are the weakest and least formed, are most influenced by cold, and break first. In consequence of these breakages the wood itself is exposed, and the split opens wider and wider until at last it reaches the very heart of the trunk. The trunk is not generally transformed into perfect wood. The timber consequently remains soft, light of colour, and loose-grained—in one word, useless wood.

By regulating the nutrition of the tree, one can arrange that the elements of the tissues shall be better constituted, more solidly formed, and in themselves more adherent and consequently possessing more regular tissue, harder, and offering greater resistance to the action of low temperatures.

The Elms I am speaking of grow on lands that are full of humus, but not particularly rich in phosphoric acid. The withered leaves that fall from the trees and the great quantity of moss form a kind of manure. There is undoubtedly plenty of nitrogen in the soil, and, considering the natural humidity, it is easy to understand that the trees grow very rapidly. With watery and nitrogenised sap the anatomical elements of the bark contain little consistency, wanting mineral salts to harden the tissues and repress the over-luxuriant growth often found where nitrogen is superabundant and there is too much moisture.

The way to prevent this is to clear the ground of the moss, and from time to time take away the fallen leaves and add phosphoric acid and

potash, the first in the form of superphosphate, the second in the form of wood ashes. It is clear that in forestry one cannot use manures freely, since the result would not repay the expense ; but bearing in mind that superphosphate is very cheap manure, and that wood ashes can be obtained at slight cost, it would seem reasonable to employ these fertilisers. With them the luxurious vegetation due to the excess of nitrogen can be repressed, the nutrition regulated, and the tissues formed in a regular and perfect way.

As the Elm groves of which I speak are used solely for the growth of timber, and the use of leaves and branches for feeding cattle is a secondary consideration, it is necessary to keep them thinned out with great care, since trees which are much damaged by pruning off the side branches cannot make good building wood.

Understand, then, that you must not strip the trunks, leaving only a little leafy top; all the branches which the tree throws out must be preserved, and room must be allowed for the natural habit of the tree to form itself into a leafy and extended pyramid. The greater the number of leaves, the greater the absorption of aërial carbon, and consequently the greater the nutrition. This carbon, with the elements of water (oxygen and hydrogen), constitutes, after various chemical changes, the first compound, forming a cellular and ligneous part—in a word, the wood.

When the first flowers appear, the best plan is to pick off as many of them as possible, thus causing the phosphorus which would have been used up in the formation of the fruit to remain in the tree, and contribute in forming new wood cells and tissues. Besides, the flowers which remain on the tree will produce ample seed of superior germinating power. It is a good thing to open up the plantations, particularly those parts where the trees, being close together, have difficult access to air and light.

When timber recently cut shows deep cracks, it is difficult to do anything with it; but if the cracks are small, one can at least prevent an increase of the evil.

For this purpose the hewn wood should be put in a tank or pool, for ten to twelve days, filled with water containing the following solution per hectolitre: Acetate of copper, 10 grains ; chloride of sodium, 20 grains ; and chloride of calcium, 10 grains. If there is not sufficient depth of water to cover the timber, dissolve the same quantity of salts in a decalitre of water, and with this frequently bathe the outside of the trunk. It is as well also to submit wood that does not show any cracks to the same bath in order to prevent cracks developing later on. For chloride of calcium it is necessary to employ pure lime 19, clo-hydric acid 32, water 49 parts, chloride of calcium crystallised 100. It may be prepared by putting into a tub the acid and water, adding broken-up calcareous stone until it no longer effervesces and the liquid loses its acidity. Then it is filtered through a cloth. In the less humid soils I believe the Walnut tree would give good results ; in the other lands one might try the Hazel-nut, Chesnut, and some varieties of White Mulberry, natives of cold climes. Also one might try the Lote tree on dry positions protected from the cold.

DISEASE OF THE BLACK CURRANT

Caused by the Gall Mite, *Phytoptus ribis*.

By John H. Wilson, D.Sc., F.R.S.E., St. Andrews University.

No enemy of the fruit-grower has of late made more rapid, insidious, and certain advance than that which has chosen the Black Currant as the victim of attack. At almost every centre in Fife where I have lectured during the present winter—from Dysart to Dunfermline, and from Leven to Newburgh—I have received information of the prevalence and spread of the Currant-bud disease. So widespread and serious has it become, and so mistaken are the opinions of many horticulturists on the subject, that there is ample occasion for setting forth what is known of the life-history of the pest, and at the same time of pointing out what may be done to check its ravages.

It is not known how it originally got into our gardens. Possibly enough it may have for centuries found a home in the buds of the wild or strayed Black Currant. The earliest reference to the disease in Scotland seems to date back fifty years.* It was not until twenty years later, however, that anything definite was known of its cause. Since then the disease has secured a firm hold, and made rapid progress in all directions. My earliest practical acquaintance with it was from material sent me in 1889 from the Crieff district, where at that date it was making great headway. In the end of May 1891 I had specimens forwarded from Auchterarder to report on, and these were accompanied by a similarly alarming account of the havoc wrought.

A very little experience is needed to diagnose the disease, the infested buds being much larger and rounder than the healthy ones. The abnormal swelling is quite evident in the early winter. The illustration (Fig. 118, 2), drawn in December from a Newburgh specimen, serves to show the characteristic appearance of the "big buds," a healthy shoot (from a seedling) being also figured for the purpose of comparison. If one of the swollen buds be opened at this time it will be found to be green and spongy inside, and if the contents be shaken out on a glass slip, and examined under a highly magnifying microscope, the cause of the swelling will be at once rendered visible, the field of view being more or less crowded with mites of unmistakable character. It should be carefully remembered that they are of extreme minuteness. With the keenest eyesight it is possible to observe them, against a suitable background, when one knows precisely where to look for them; but, seeing that they cannot be recognised at all unless under special circumstances, they may virtually be held to be invisible to the unaided vision. The largest range from $\frac{1}{100}$ to $\frac{1}{150}$ of an inch in length. When very greatly enlarged they present the form figured. (Fig. 118, 4.) Unlike such mites as the so-called

* See Ormerod's *Handbook of Insects, &c.*

Red Spiders, which are rounded and possess eight legs, they are worm-like, with only four legs placed together anteriorly. The elongated part of the body is faintly and closely ridged transversely by numerous dotted rings, and from it project four pairs of bristles. The longest pair arises from the back, close to the posterior extremity.

The mites wriggle along with some speed when liberated from the buds, and no doubt while they are still enclosed they will be in an active state. The swelling or gall-growth is doubtless due to the irritation set

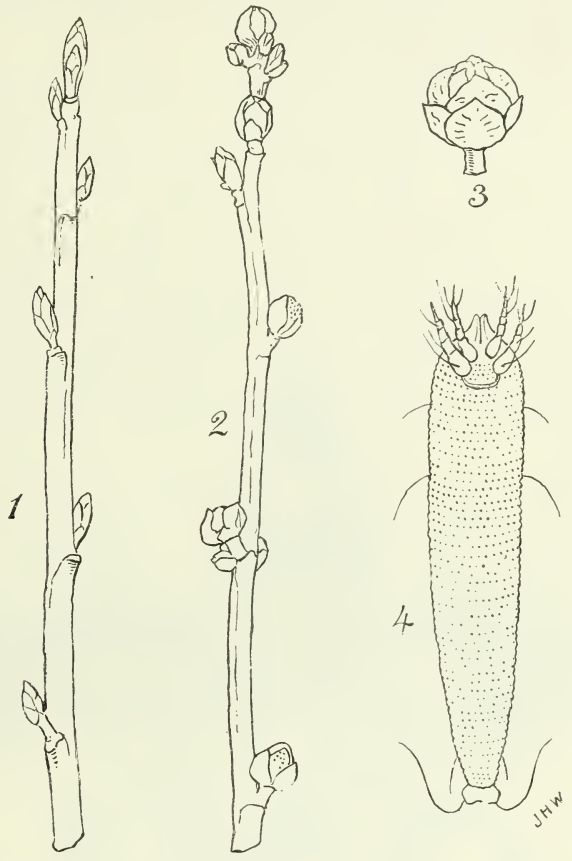


Fig. 118. 1.—Healthy shoot in December. 2.—Shoot in December with swollen buds (galls). 3.—Infested bud in June. 4.—Mite (*Phytoptus ribis*) greatly magnified.

up by the mites as they move about and feed on the developing leaves. Their presence obviously stimulates the buds to abnormally rapid growth for a time.

In December a few eggs are found amongst the enclosed mites, and by February they are very numerous. The eggs are proportionately large in size. The attacked buds, after swelling considerably and opening out somewhat like a miniature Cabbage, cease to develop. The largest have a diameter of $\frac{3}{8}$ to $\frac{1}{2}$ inch. The floral organs and associated leaves are

aborted at a very early stage, so that neither flowers, fruit, nor foliage are produced. The drying-up of the infested buds is completed by July, and previous to that event, probably from the time when the supply of nutriment from the tumid tissues (and perhaps also oily fluid from the yellow scent glands) ceases,the mites come forth and wander about to find fresh food. They seek the proper quarter, specimens being found at the bases of the leaf-stalks when the buds there are still very small. It is probable that the buds when still quite young are already so lax as to permit the microscopic travellers to enter between the scales, and ultimately to reach the centrally situated tissues, which are the goal they instinctively have in view, for provender and protection.

The power of locomotion possessed by the mites is considerable, and it is likely enough that they pass from the old to the new wood and from branch to branch by creeping; but, being so minute, it is hardly conceivable that they can cover the distances between widely planted bushes by way of the ground. When contiguous bushes touch at any point, a bridge is formed by which they can pass in hordes. While, however, the mites cannot of themselves accomplish aërial flight, they (and the eggs also) may quite readily be blown from bush to bush by the wind, or be carried in the feathers or on the feet of birds, on the bodies of insects, or on the hands and clothes of people pruning the bushes or gathering the fruit. Further, the dried remains of infested buds may often be the vehicle of distribution when carried along by the wind or other agent There seems to be nothing to hinder the mites from escaping from the buds at any time.

The removal and destruction of the buds is of course an evident means of killing multitudes of the enclosed mites, but it gives no more than a temporary check to the disease, and is too expensive to carry out in large plots.

Spraying with insecticides cannot affect the mites when ensconced in the buds. This would be of service when the mites have left the dead and dying buds, and are moving on to new ones; but if fruit were present it would be liable to be damaged by the fluids applied.

No natural enemies of the mites with which we could ally ourselves have been discovered.

Cutting back the bushes so as to get fresh clean shoots has seldom been found satisfactory. This practice has proved fairly successful occasionally when the bushes have been cut close down, so as to cause them to bud and send up new branches from beneath the surface of the soil, quicklime being spread pretty thickly over the stumps and the ground around them. The removal of the surface soil, and the substitution of fresh earth, might be suggested as an additional safeguard.

We do not hear for certain of any variety of Currant being less subject to attack than others; nor has it been shown that special cultural conditions would induce constitutional peculiarities in the plants tending to render them immune or less readily attacked.

We are thus in the meantime left with only one reliable course of action, viz. eradication and destruction by burning of the infested bushes.

It would be a wise precaution to apply gas lime to the ground after

lifting the bushes, and to refrain from planting Black Currants there again for a season or two. In planting it would be well, wherever practicable, to place the Currant bushes in rows, with some other kind of bushes or crops between, so as to minimise the possibility of the spread of infection in at least two directions.

Great care should be exercised in the selection of healthy stock for propagation.

Fig. 119.—Odontoglossum crispum Moortebeekiense. (*Gardeners' Chronicle.*)

NOTES ON THE PRUNE, PRINCIPALLY FROM A CALIFORNIAN POINT OF VIEW.

By Mr. Sidney C. Lamb, F.R.H.S.

Introduction of the Industry to America.

Although the name "Prune" is a merely Anglicised form of the Latin word *prunus*, a plum, the name is generally accepted as applying only to those special varieties of the Plum family which are of firm texture, possess exceptional curing qualities, and are easily dried whole in the sun or artificially without fermenting at the pit. Such varieties only of the Plum form the Prune of commerce, and it is of these that the present paper treats, although in the matter of soil, climate, method of cultivation, &c., there is little difference in the propagation of the various members of the Plum family: the treatment adapted to one is usually applicable to all.

According to Theophrastus, the Prune was cultivated in Asia Minor in remote ages. Pliny speaks of its cultivation by the Romans, and makes mention of eleven varieties originating from the domestic Prune introduced into Italy by the elder Cato. It grew without cultivation in the environs of Damascus, and a very rustic and vigorous variety known as the 'Black Damascus' is still much used by nurserymen in Europe for grafting other varieties upon.

The introduction of the Prune into France is attributed to the Crusaders. If tradition be correct, it was first cultivated in the south-west of France, at a convent near Clairac. In travelling from Aiguillon to Fumel, through the productive valley of the Lot, fertile plains are seen, bordering the picturesque river-sides, covered with Plum trees which furnish the famous 'Prunes d'Ente' and 'Robe-de-Sergent,' which are exported to the remotest corners of the world. It is also extensively cultivated in the valley of the Loire, and the departments of the Gironde, Tarne, Dordogne, and Aveyron. The well-known brand called Tours Prunes comes from the orchards of the Loire.

It is to France that California is indebted for this wholesome and profitable fruit. According to De Moines, Louis Pellier, a French sailor who had visited many ports of the world, arrived in 1849 at San Francisco, and went to work in the mines in Trinity County. He did not succeed there, and so, early in the fifties, removed to San José, where he established a nursery, and soon after induced his brother Pierre to come out and join him in California. The two brothers worked the nursery together until the spring of 1856, when Pierre returned to France to get married. Combining business with matrimony, he secured a large number of cuttings of Prunes, Grapes, and other fruits, which he brought back with him. His bride and his brother Jean accompanied him, and, together with the box of precious cuttings, they crossed the Isthmus of Panama and arrived at San Francisco in December 1856. The Prune cuttings were procured from Ville Neuve d'Agen, whence the common Californian Prune derives its name of 'Petite Prune d'Agen.' They were carefully packed in a box about 16 in. wide and 4 ft. long, which was

lined with cloth, so that every precaution was taken to ensure the safe arrival of what became the germ of one of the most important industries

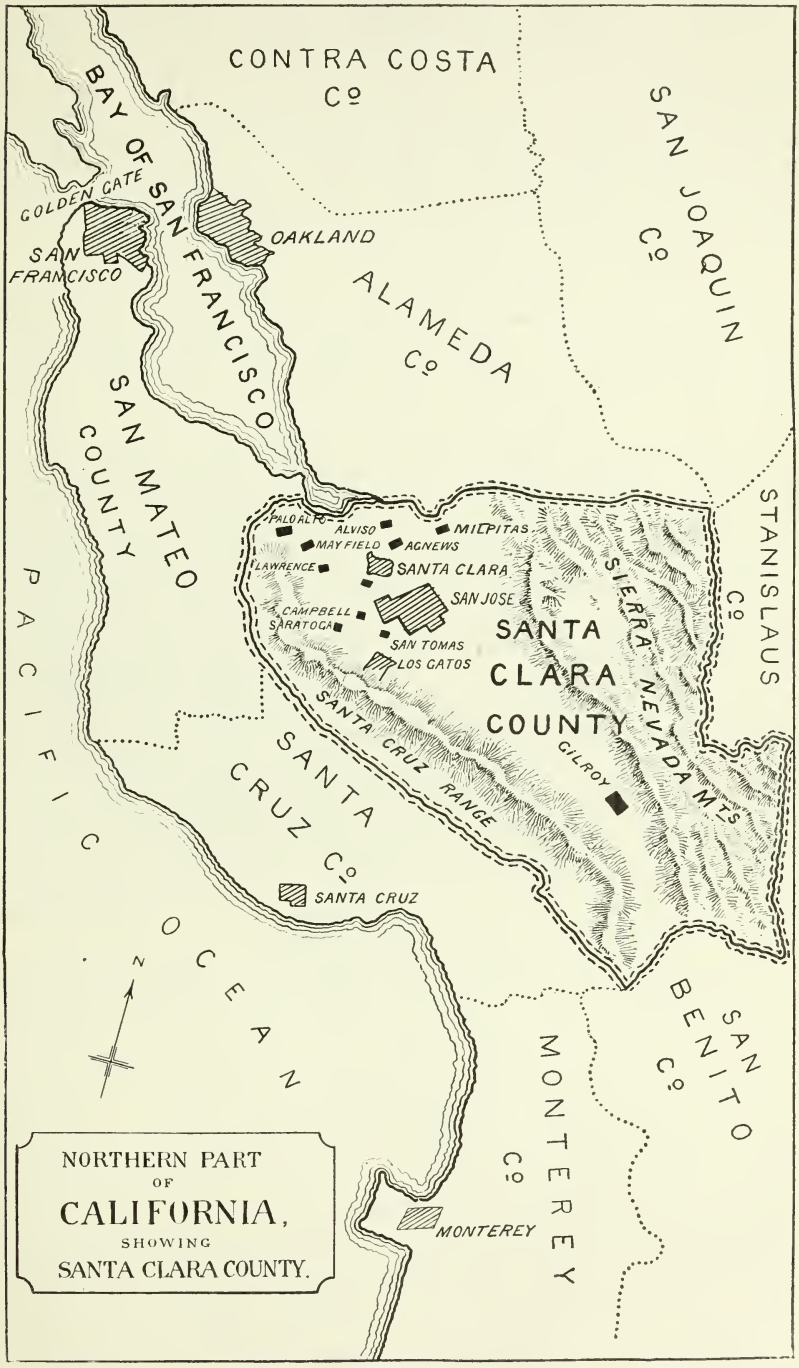


Fig. 120.

of California. The box was at once sent on to Louis Pellier at San José, and a number of Plum roots were grafted with the newly arrived Prunes. This started the first Prune nursery on the Pacific Coast, situated in San José City, in Devine Street, between Tarraine and Santa Teresa. San José is the county town of Santa Clara County, and the centre of the Prune industry.

The importance of Pellier's experiment was not at first appreciated. A German nurseryman named Kamp procured some grafts from Pellier, and also worked at the cultivation of the Prune. He was one of the first to plant Prune trees out in orchard rows. But comparatively little attention was paid to Prune-growing as a speciality for almost a quarter of a century after its introduction into the State.

The superiority of California, however, as a fruit-growing State at last forced itself upon public attention, and among other fruits the Prune was given a trial. It soon proved its great capabilities as a profitable crop, and to-day ranks among the leading industries of the Golden State.

Growth of the Industry.

Probably the oldest orchard of any size in the State of California is the Bradley, on Steven's Creek road, about two miles out of San José. This was set out in 1870, and its success led others to go into Prune-growing. The O'Banion and Kent Orchard, near Saratoga, was planted in 1878. The Dr. Handy Orchard of 100 acres followed in 1880, and in 1881 the Buxton. Both of these were planted in Saratoga, so that Prune-growing and curing on a large scale commenced there, and the result has been quite phenomenal. The Prune industry has been practically the growth of the past decade, for within that period the planting of orchards, their cultivation, and the proper treatment of the fruit have grown into a system. From the great Prune centre of Santa Clara County, which ten years ago did not produce a pound of this fruit, it is now exported by the car load. Above Los Gatos (a little town nestling in the foot-hills of the Santa Cruz range of mountains, and about ten miles from San José), Mr. Morrell was then one of the heaviest producers; his output was five or six tons a year. He now picks from five to six car loads each season from the same orchard.

Santa Clara County was from the beginning the centre of the Prune industry, and here it was demonstrated that Prune-growing would pay, that no extraordinary care was required in cultivation nor any mysterious skill in preparation. As soon as these facts were proved and became known, other counties took up the pursuit, until now the Prune is found in all except the highest mountain counties of California. In 1870 there were but 19,059 Prune trees in the State, while the Assessor's Report for 1886 (which is probably 25 per cent. too low an estimate) makes the number at that time 1,077,841. His report for 1891 shows a very large increase in those counties which had made returns, and since then there has still been a steady increase going on all through the State. A large proportion of the trees, perhaps one-half, are not yet in full bearing. It is estimated that when the trees now growing in Santa Clara County alone are full grown, the annual product will be over fifty million pounds of the dried fruit.

Habitat of the Prune.

The Prune is a very hardy tree, and will thrive under a wide range of climate and soil and at various elevations. Wherever the Greengage Plum will grow the Prune can be grown. It will stand severe winter weather, growing indeed where the thermometer touches zero. Its favourate habitat, however, is a temperate climate, and a warm, generous soil. It can be grown in the Eastern States of America, but the short seasons there, the numerous insect and fungoid pests, and the unfavourable conditions for drying prevent the Eastern States ever competing with California in this industry. Even in California, while the tree will grow in nearly all the counties, there are but few favoured localities in which it appears at its best. In some sections of the State where the Prune makes a thrifty growth and yields heavily, there is a lack of saccharine matter in the fruit that deprives it of its best qualities and when dried a very inferior article is the result. In other localities large juicy fruit will be grown, which shrinks greatly in drying. The prime requisites in a Prune are solid, firm flesh, that will not ferment at the pit in drying, a rich fruity flavour, and bouquet and keeping qualities that will stand the test of months or years without serious loss from shrinkage. Those districts which possess the peculiarities of soil and climate which produce these results in their greatest perfection are the true Prune districts. The drying quality of the Prune varies very greatly, owing to the varieties of soil in which it is grown. In some localities it will shrink in drying from 4 to 1, while in others $2\frac{1}{2}$ lb. of fresh fruit will make 1 lb. of dried. The fruit from different places will also vary in thickness and toughness of skin.

The Prune is a gross feeder, and wants for its finest development a rich heavy soil with considerable moisture. The foot-hills of Santa Clara County have long been regarded as the districts specially favourable to the Prune; but as experiments have been made elsewhere, other localities have been found that furnish all the requirements; therefore, while Santa Clara is still, and probably always will be, the centre and most important district of the industry, it is not now the only Prune county of the State.

The most extensive orchard of Prunes only in California is now in the Salinas Valley, in San Luis, Obispo County, on the eastern slope of the Coast Range, near the town of Templeton. In this orchard there are nearly 300 acres of Prunes in one holding containing 324,000 trees. Some very excellent Prunes are produced in Los Angelos, Orange, San Bernardino, San Diego, Ventura, Alameda, Monterey, Napa, Sonoma, and in the counties of San Joaquin and Sacramento Valleys, while specially good results have been reported from Tehama, Shasta, Humboldt, Sutter, and Yuba Counties. It is not improbable that in time the different districts of the State will discover certain lines in which each excels, and the production of specialities will result, the fruit from each being known for its own peculiar excellence.

Soil and Stock.

The soil required for Prunes depends largely upon the stock used, or rather, perhaps, the stock should be selected to suit the soil.

A light, deep, sandy loam, not too moist and well drained, is adapted to the Peach stock, which does well on the sedimentary deposits of the higher valleys. Such soils are warm and light. Experience has proved

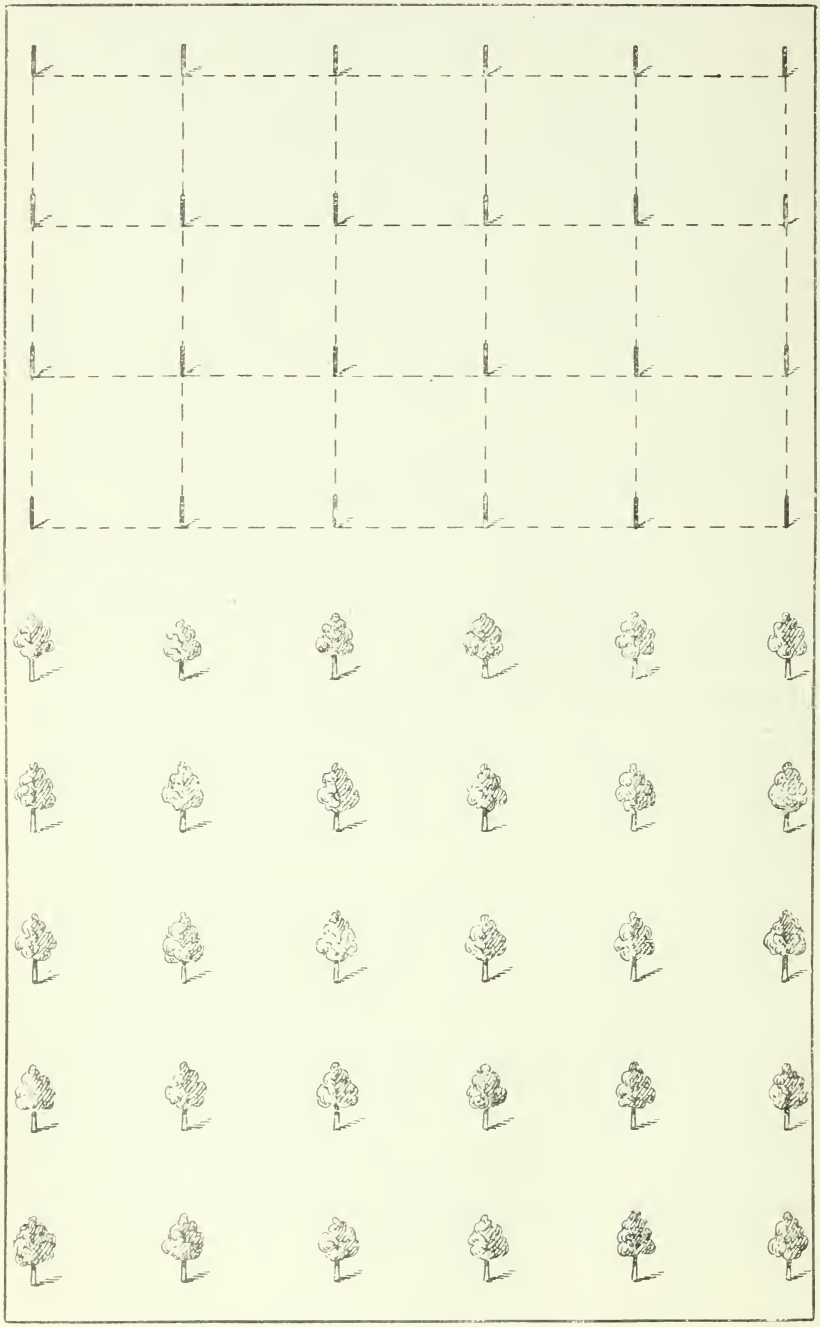


Fig. 121.—The Square System.

that the Peach stock will do better on such soils than on the heavier clayey lands of the bottoms. In the heavier soils, the Plum stock does better than the Peach, and the Myrobalan, or Wild Plum, is the favourite. It is hardy, forms a good union with its graft, and does not throw out suckers as other Plum stocks will. The Almond stock is a favourite with many growers who have a rocky subsoil, and it does exceedingly well on such land, even better than the Peach.

The preparation of the soil depends largely upon its specialities. If heavy, it should be deeply ploughed and subsoiled. If there is a hard pan subsoil, this should be broken up with any good subsoil plough. In any case the ground should be ploughed deep and well stirred up for ventilation. Where practicable, it is well to begin the preparation of the land for an orchard some time before the planting of it. It should be thoroughly and deeply ploughed early in the autumn, leaving the surface rough and exposed to the air during the winter.

Following in the furrow with a subsoil plough is very desirable, especially in the conversion of old grain lands into orchards, as it breaks up the old hard pan, which has probably formed through years of shallow cultivation. A striking instance of this was seen on the property of Mr. W. O. Chandler, of Ash, near Dover, in Kent, a few years ago when converting grain land into a plantation. The land in question, being near the marshes, had been sadly neglected by the former tenant, but was by this process soon transformed into profitable land. The preparation may continue through the following summer ; hoed crops may be grown, or, better still, the land can be left to lie fallow during the summer, care being taken in any case to keep it thoroughly pulverised and free from weeds. If it be desirable to fertilise the land, manure can be applied in the winter before the trees are planted. If this is not done then, the work must be left until the trees are planted, and the manure should be evenly spread over the surface during the winter, to be ploughed in the spring. Care should be taken to spread it equally, and not mass it around the young trees, unless it be applied as a mulch to prevent evaporation after spring cultivation.

If the land has to be planted immediately after breaking it up, the work should be commenced as early in the autumn as it is possible to do deep ploughing, and the ground should be stirred to a depth of 8 or 10 inches or more, and afterwards thoroughly harrowed. Some of the orchards in Santa Clara County have been ploughed, just before planting the trees, to a depth of over 14 inches. If it be then still early, cross-plough deeply and follow with a subsoil plough working to a still greater depth. Harrow again thoroughly, and the land will be ready for the trees.

Planting the Orchard.

In laying out an orchard it is desirable to have it symmetrical, and to economise the land.

A little thought and care taken at the beginning will save much annoyance in after years, and it is no more trouble to have the orchard neat in appearance and symmetrical in outline than to have it in a haphazard condition.

There are three objects to be considered in laying out an orchard: (1) symmetry of appearance; (2) economy of space; and (3) facility for future attention. Of course the first thing is to get the trees in straight

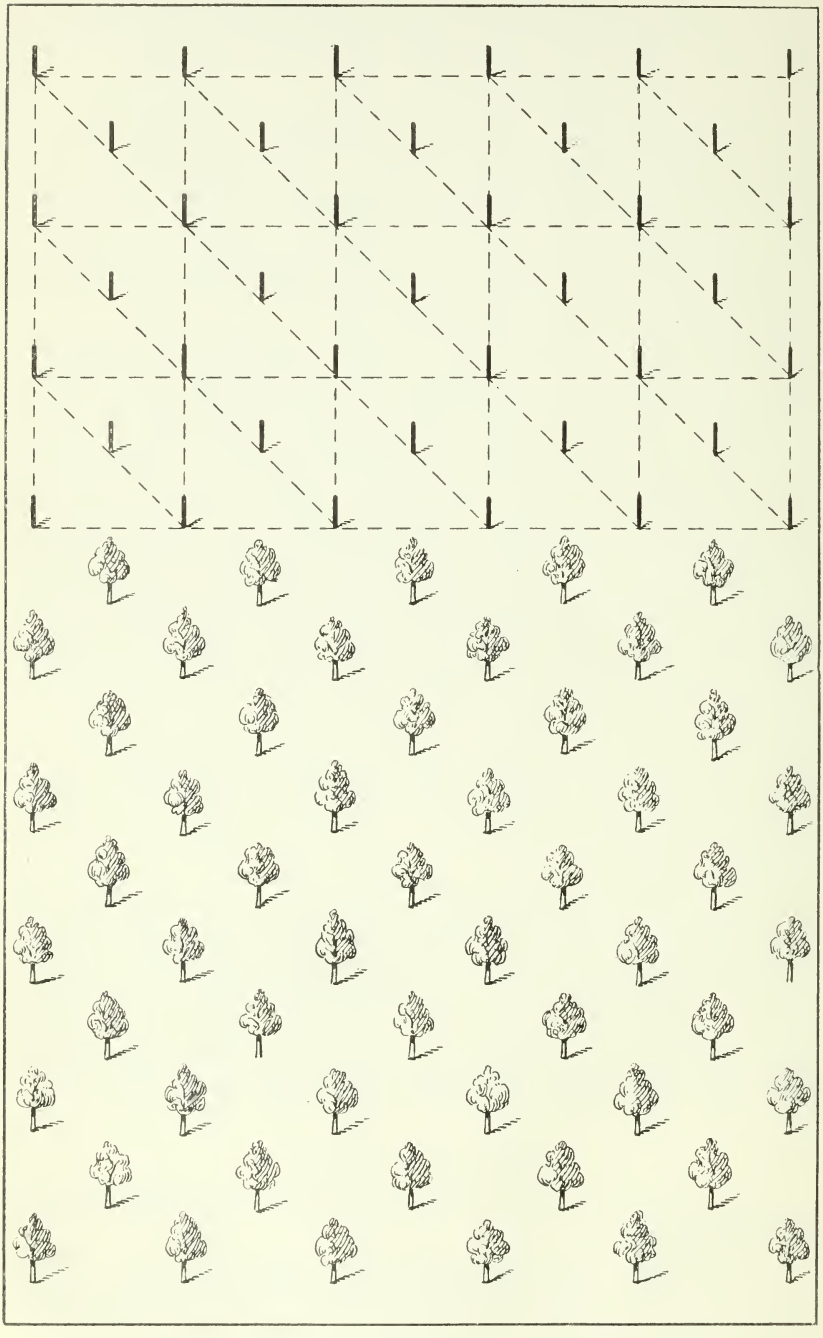


Fig. 122.—The Quincunx System.

rows, at equal distances apart, and everyone thinks he can accomplish this. But there are various methods of arranging straight rows, each of which has its advantages. The principal forms are the Square, the Quincunx, and the Hexagonal or Septuple, of which the two former are most commonly used. That most generally adopted is the Square system, because the orchard can then be changed to Quincunx, even after a number of years' growth.

In order that the most approved systems may be better understood, the following illustrations show how the orchards are first laid out, and how the trees look after several years of growth.

The Square System (fig. 121).—The orchard is laid out in lines crossing each other with equal intervals of space, and a tree planted at each crossing of the lines.

By the square method, at 20 feet apart, 108 trees are planted to the acre.

The Quincunx System (fig. 122).—In this system the orchard is laid out in the same manner as for planting the square, but the number of rows is doubled, and a tree planted in the centre of every square. This method is chiefly used with the intention of removing the centre trees (generally dwarfs), when the permanent ones shall have obtained a considerable size. The orchard then assumes the square form. At 20 feet apart 199 trees to an acre are planted by this method.

Hexagonal or Septuple System (fig. 123).—In this system the trees more completely fill the space than by any other plan. Six trees form a hexagon and enclose a seventh. The dotted lines indicate the method of laying out an orchard. By this means, at 20 feet apart, 126 trees are planted to the acre.

Triangular or Alternate System (fig. 124).—In laying out an orchard on this plan the lines are drawn forming a square, as in the square system, and a line is afterwards drawn diagonally across the former ones, and a tree planted alternately, forming a triangle.

The advantage of this system is that more space is given to the trees, and they can be planted closer together without crowding.

The following table will show the number of trees to the acre by each system :—

Distance	Square	Hexagonal	Quincunx *
10 feet	436	500	831
12 „	303	347	571
14 „	222	255	415
16 „	170	195	313
18 „	134	154	247
20 „	108	126	199
22 „	90	103	173
24 „	76	86	137
30 „	48	56	83

* In giving the distances of trees of the quincunx, the fifth or central tree is not taken into account, as it is generally removed after the others are grown.

In planting trees the proper exercise of discretion is absolutely necessary, as it is in all branches of orchard work. Rules that apply to one locality and one set of conditions will be out of place in another.

Some of the most successful orchardists advise the removal of the top spit carefully, then digging a somewhat deep hole, and placing the surface soil at the bottom ; and upon this the tree's roots are set out, and the hole filled up with the top spit. Where there is a subsoil of cold, heavy clay

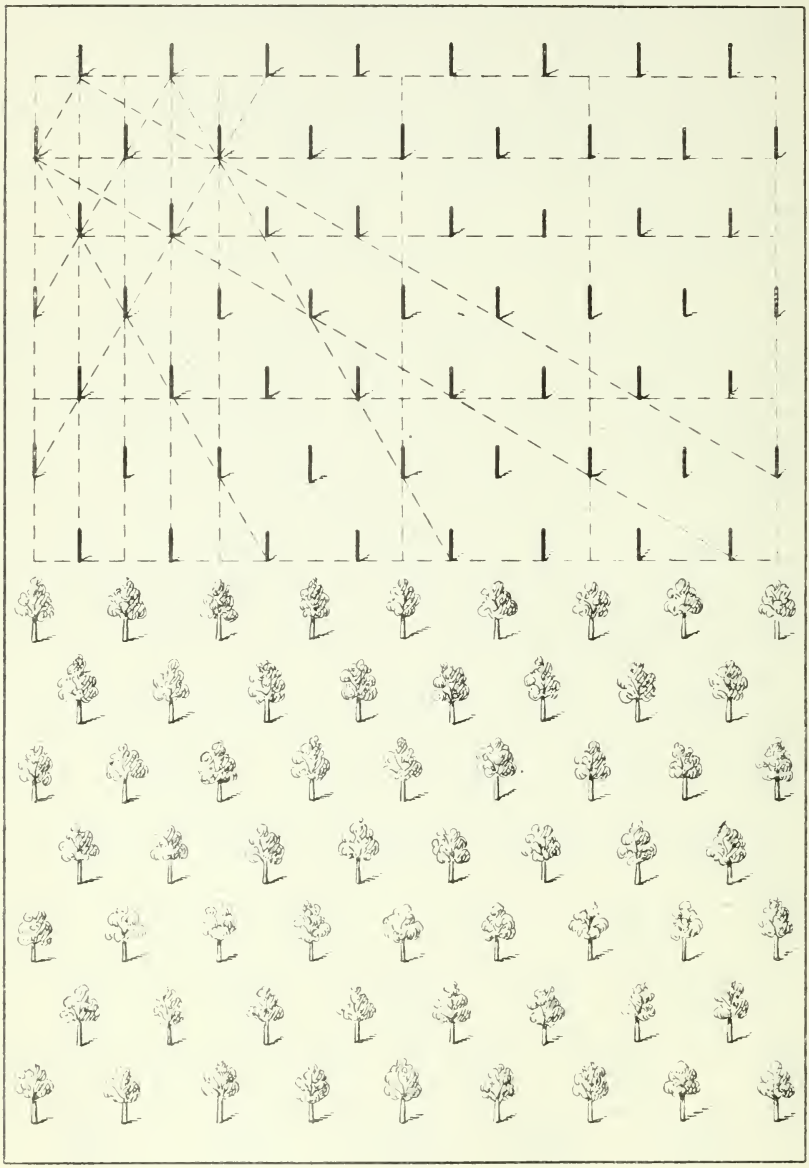


Fig. 123.—Hexagonal or Septuple System.

this plan is admirable, but in warmer sandy soils it is unnecessary. One of the most experienced Prune growers in Santa Clara County advises throwing out of dead furrow (after the land has been prepared), in which

the trees are to be set at proper distances, and the soil thrown back on them with a plough, and afterwards pressed closely around the roots.

The most careful method is the best, as it gives the young tree better

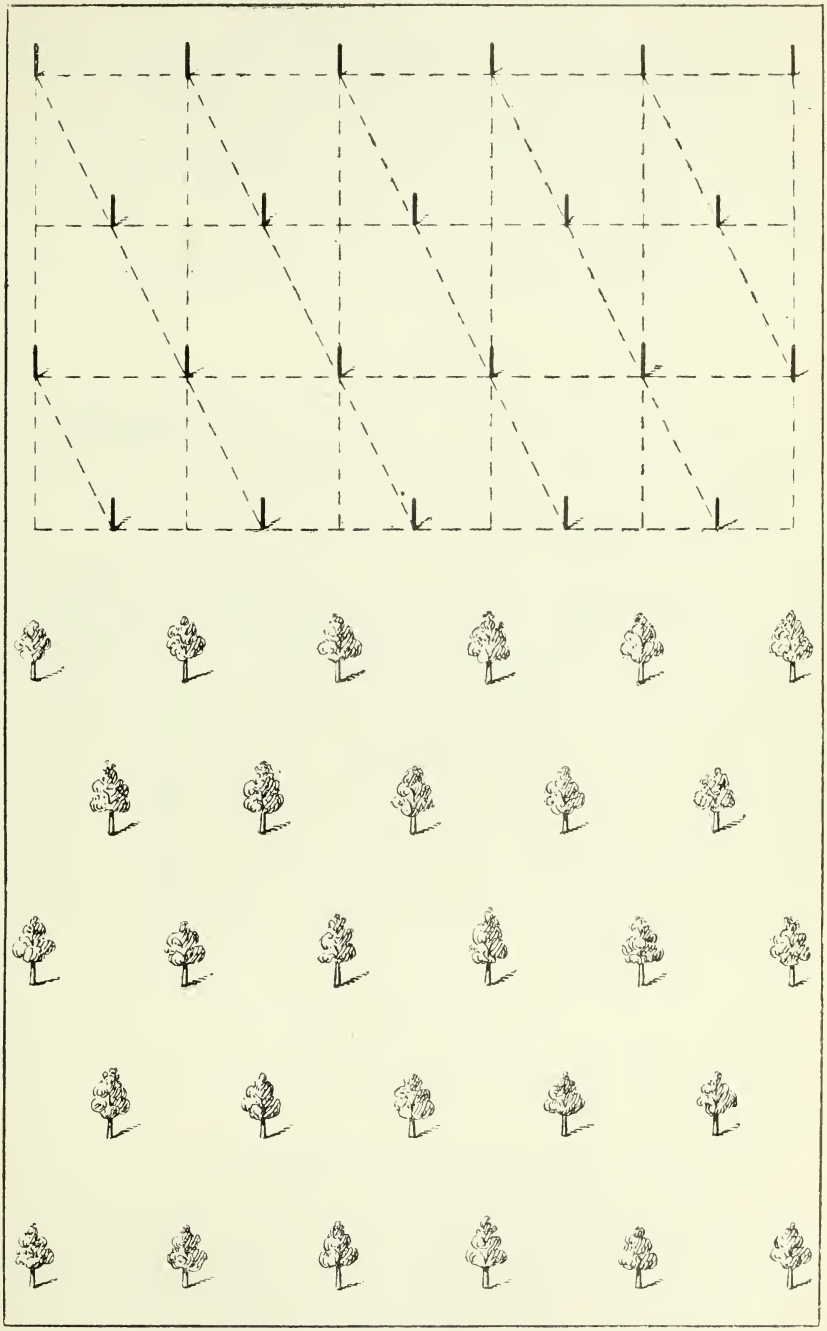


Fig. 124.—Triangular or Alternate System.

root-hold, and affords a larger area from which to derive its nourishment during its early period of growth.

The distance at which trees are planted in orchard rows varies from 18 to 24 ft., 20 ft. being the favourite, and probably, under most conditions, the best.

On very strong soil greater distance would be better, as if at all closely planted the limbs of the full-grown trees are in such soils liable to become intermingled, which renders pruning and gathering awkward.

After planting the young maiden trees should be cut back to 18 inches from the ground, and should be protected during the first season from the heat of the sun by a shade on the south side. Three or four buds should then be allowed to grow at the top, and the terminal buds of the lower shoots should be pinched back after they have grown out a little, so that the top buds will put forth leaves and shade the stem the first year.

Varieties.

The principal varieties are the 'Californian' ('Petite Prune d'Agen'), the 'Bulgarian,' the 'Fellenberg,' the 'German,' the 'Hungarian,' the 'Hungarian Date Prune,' the 'Robe de Sergent,' the 'Silver,' and the 'Tragedy.' Of these the first-named is by far the most popular, and forms the true shipping Prune of California.

'*Petite Prune d'Agen*' (fig. 125).—The branches are of middling strength, bent at their very short internodes, of a deep brown on the shady side, covered on the sunny side with a metallic whitish pellicle, smooth throughout their whole length. Wood-buds small, conical, not very sharp, lying in a direction somewhat diverging from the branch, borne on salient supports whose sides extend considerably; scales of a deep maroon, the outer ones bordered with whitish grey; shoots flexuous, smooth throughout; leaves hardly of medium size, oval-elliptic or sometimes obovate, ending abruptly in a short point, concave and often slightly wavy in their outline, bordered with teeth deeply cut and rounded, or rather deeply crenated, well supported on wine-coloured petioles of middling length and very slightly downy: two small globular, yellow, pedicellate glands attached to the base of the limb of the leaf. Fruit-buds medium size, not very sharp, gathered or rather short and thick. Flowers rather large; petals rounded, somewhat incised or emarginated at their extremity; divisions of the calyx short, rather large and spread out; pedicels rather long, strong, and smooth. General hue of the foliage a light green. The stiffness of all the leaves and the petioles of the leaves being well spread out and diverging are the striking characteristics of the tree.

Fruit medium size, exactly ovoid, more tapering on the side of the stock than on the side of the pistillary point, around which it is very obtuse, with the cheeks a little more convex than the faces, one of which is traversed by a scarcely appreciable furrow, and the other by a continuation of the furrow deep enough to make the fruit appear divided into two equal parts. Skin somewhat thick and firm, parting from the flesh, at first of a light purple tinged with green; at maturity the purple becomes very dark and covered with a thick bluish bloom. Pistillary

point a golden yellow, and attached very close to the surface of the fruit. Fruit-stalk somewhat long, not very strong, of a light green speckled

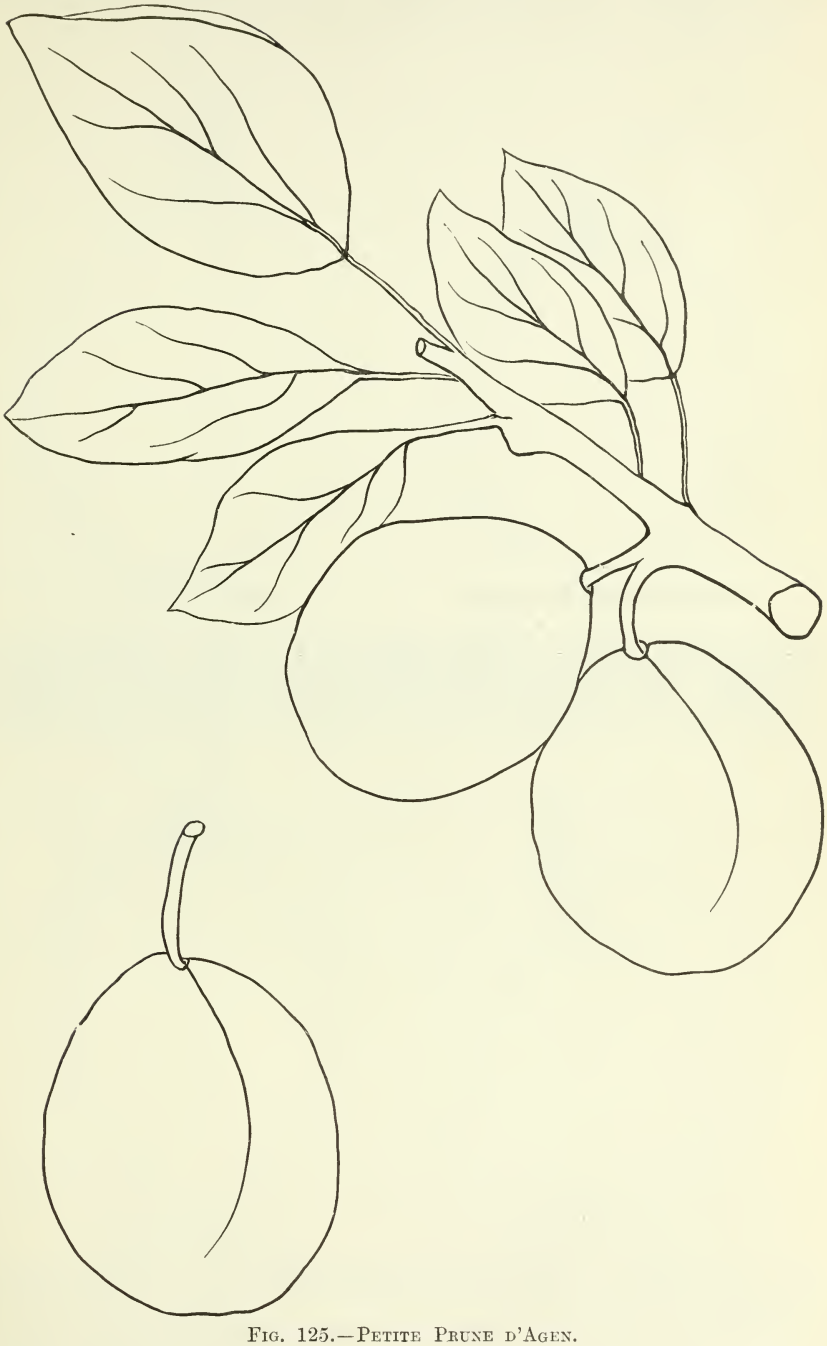


Fig. 125.—Petite Prune d'Agen.

with brown on the side next the sun, inserted in a narrow shallow cavity. Flesh yellow, fine, tender, rich in sugar juice, but the aroma is not fine

enough to constitute a toothsome fruit raw, though exceedingly good for drying. Stone small, almost exactly ellipsoid, flattened, emarginated at the end adjoining the stalk, rounded at the opposite extremity, with

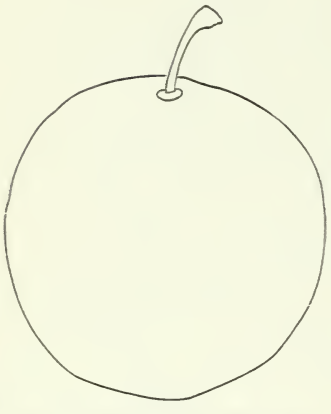


Fig. 126.—Robe de Sergent.

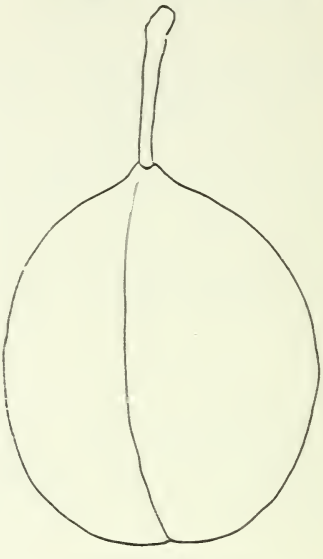


Fig. 127.—Silver.

cheeks not very convex, slightly wrinkled, and generally separating from the flesh. Ventral suture widely but not deeply furrowed, with denticulated edges: dorsal ridge not very salient, only somewhat sharp towards

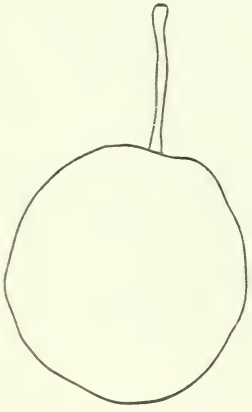


Fig. 128.—Bulgarian.

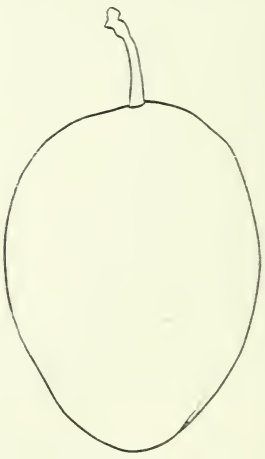


Fig. 129.—Brignole.

the end attached to the stalk, accompanied with fine but well-marked grooves.

'*Robe de Sergent*' (fig. 126).—This variety has been classed under various types of Prunes grown in several districts of France. Fruit medium size, oval. Skin deep purple, approaching to black, and covered

with a thick blue bloom. Flesh greenish-yellow, sweet and well-flavoured, sugary, rich, and delicious, slightly adhering to the stone. A valuable drying and preserving variety.

The tree is quite an upright grower, and has a much broader leaf

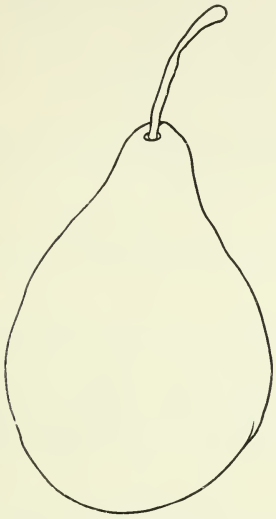


Fig. 130.—Fellenberg.

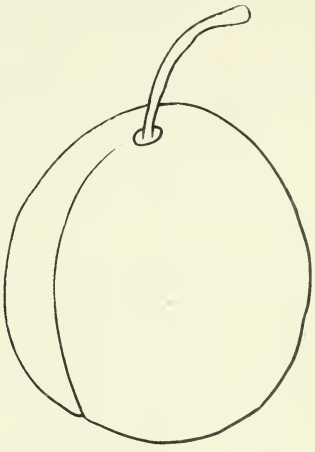


Fig. 131.—Wangenheim.

than the 'Prune d'Agen.' A peculiarity of this Prune is that it cannot be worked on any other than the Plum stock, except by double working. When budded on Peach or Almond it sooner or later parts from the stock.

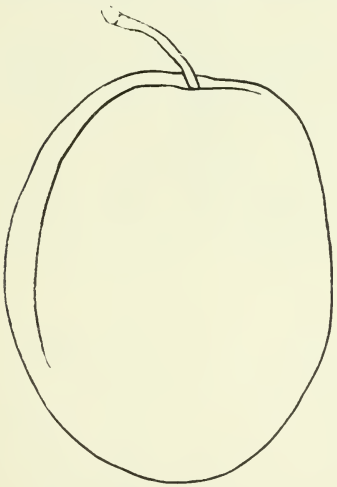


Fig. 132.—Hungarian.

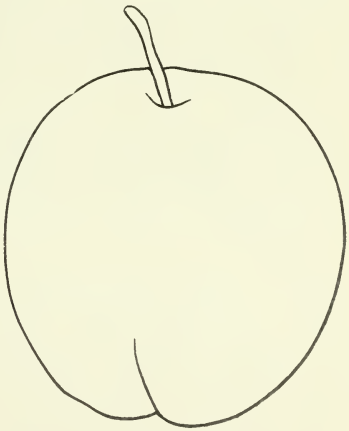


Fig. 133.—Tragedy.

The striking characteristics of this tree are its large, bright, shiny, lancet-shaped leaves, and its strong growth, tapering, violet-brown underneath with silvery skin pieces.

'*Silver*' (fig. 127) originated in Oregon : it is said to be a seedling from

Coe's 'Golden Drop,' which it very much resembles. In the judgment of fruit experts it is entitled to rank with the best drying Plums and Prunes because of its large size, handsome appearance, and superior flavour. Fruit large, oval; a little neck with one side swollen rather more than the other. Skin light yellow, marked with numerous dark red spots on the surface. Flesh yellow, firm, adhering to the stone, of sweet rich flavour.

The tree is a rapid grower, but does not bear so young as other varieties.

'*Bulgarian*' (fig. 128).—A variety cultivated in Alameda County, chiefly in the vicinity of Haywards. Fruit above medium size, dark purple, sweet and rich, with a pleasant acid flavour.

The tree is a vigorous grower, and an early, regular, and profuse bearer. The fruit is very tenacious, does not drop when ripe; valuable for drying.

'*Brignole*' (fig. 129).—Fruit medium, oblong; the skin is tough, tasteless, easily removed; colour violet with golden spots on the sunny side, covered with a whitish silver bloom and spotted all over with light yellow dots; sometimes it is covered with liver-coloured marks and spots. The flesh is greenish-yellow, varying to light yellow, tender and finely grained, very juicy and sweet.

The tree is a vigorous grower, but wants a warm climate. The big limbs at the upper ends are very crooked, of violet-brown colour, the under side greenish. The leaves are large and egg-shaped. A free stone.

'*Fellenberg*' (fig. 130).—This fruit is oval, narrower towards the stem; the flesh of a beautiful yellow colour, very juicy, with a sweet, slightly acid, agreeable taste. The skin is thick, easily removed, and of a violet-brown colour.

'*Wangenheim*' (fig. 131).—Fruit of medium size, oval. Skin deep purple, covered with a thick blue bloom. Flesh rather firm, greenish-yellow, juicy, sugary, rich, and separates easily from the stone. It ripens in August.

'*Hungarian*' (fig. 132).—Fruit very large, dark red, ovate, tapering towards the stalk, inclined to double, juicy and sweet. Its large size, bright colour, productiveness, and shipping qualities render it a profitable variety for home or distant markets. The tree is a rapid grower and profuse bearer.

'*Tragedy*' (fig. 133).—A new Prune originated by O. R. Runyon, near Courtland, in Sacramento County. It seems to be a cross between the 'German' and 'Purple Duane.' Fruit large, nearly as large as the 'Purple Duane,' which it greatly resembles, except that it is more elongated. Skin dark purple; flesh yellowish-green, very rich and sweet, being sweet from the time it commences to colour. Parts readily from the stone. Its early ripening (in June) makes it very valuable as a shipping fruit. One of the great points in favour of this Prune is that the tree is scale-proof, being in this respect like the Black Tartarian Cherry. The tree is a rapid grower and of beautiful form.

'*St. Martin*' (fig. 134).—A late variety, hardy and a good bearer; very blunt at the stalk end. The skin is thick, tasteless, and can be easily

drawn away from the flesh ; colour yellow varying to greenish, dotted with red spots. The flesh is golden-yellow, very sweet and agreeable to the taste. A cling stone.

'*German*' (fig. 135).—Fruit long, oval and swollen on one side, narrow-

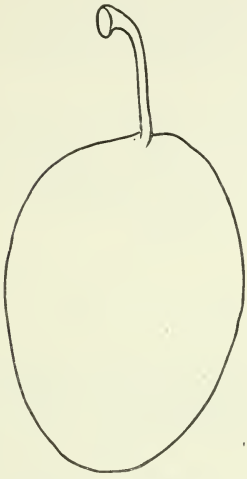


Fig. 134.—St. Martin.

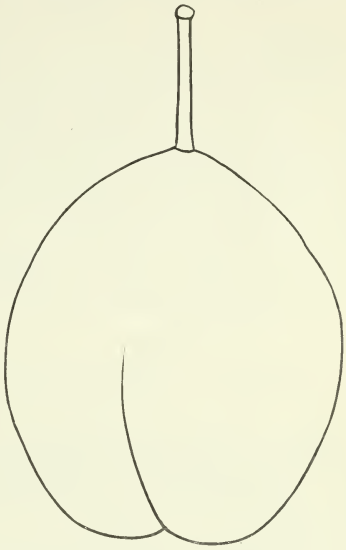


Fig. 135.—German.

ing a little at the point. Skin fine, easily removed, turns dark brown on the sunny side, and is covered with a light blue bloom. The flesh is greenish-

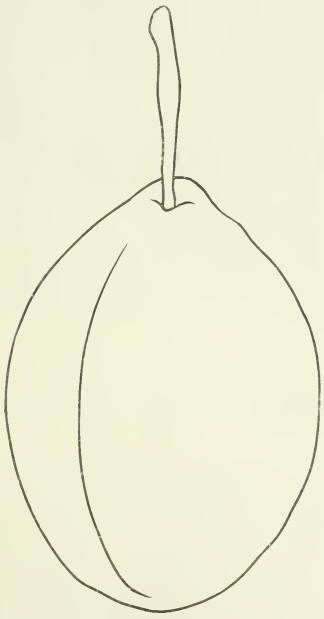


Fig. 136.—Hungarian Date.

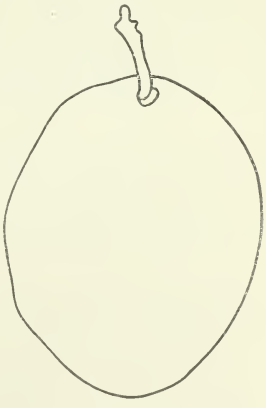


Fig. 137.—St. Catharine.

yellow, tender, quite sweet, with an agreeable acid taste. Separates readily from the stone.

'*Hungarian Date*' (fig. 136).—This fruit is large, long, thickest in the middle, narrowest at the stalk. Skin thick, tough, tasteless, and easily removed; colour dark violet blue with a reddish tinge. On the sunny side there are many red dots and liver-coloured spots. The flesh is greenish-yellow, coarse, shining, and of a juicy, sweet, vinous taste. A free stone.

'*St. Catharine*' (fig. 137).—Fruit medium size, narrowing considerably towards the stalk; skin very pale yellow, overspread with a thin white bloom. Flesh yellow, juicy, rather firm, and adheres partially to the stone; flavour sprightly, rich, and perfumed.

'*Golden*.'—This was originated from seed of the 'Italian Prune,' and is somewhat larger than its parent, of light golden colour, exquisite flavour, and good for drying. It is easily peeled, and separates readily from the stone, which is very small for the size of the fruit. The tree is a good grower, an abundant bearer, and has dark-green foliage.

Propagation of the Prune.

The first Prunes were grafted on Plum stocks, but this has fallen into disfavour on account of the tendency of Plums to throw up suckers. Other stocks, therefore, as the Peach, Apricot, and Myrobalan Plum, have come into use.

There is an intimate relation between soil and stock. For light sandy soils the Peach stock is still in great favour, and many growers prefer it to all others. Upon heavier soils it certainly does not do so well as the Myrobalan. For some time Apricot stock was the favourite, but it has now fallen into total disuse. Experience has taught fruit-growers a severe lesson. The Prune makes a very poor union with the Apricot, and when the trees get large enough to catch the wind, it invariably breaks off at the point of junction. In one instance a fruit-grower lost 1,000 trees in an orchard. Those who have Prunes grafted on Apricot root can, however, prevent their loss in the following manner: As the Peach makes a very good union with both the Prune and the Apricot, it can be used as a support. The soil must be removed so as to get at the Prune on Apricot union, and a Peach scion should be cut in such a way as to be inserted both above and below this Prune-Apricot union, when the Peach will unite with them both and form an arch with the trunk of the tree and help to support it.

On small trees two such aid-grafts will suffice, but on larger ones at least four should be placed. These grafts will eventually thicken and form a complete trunk for the tree.

The Myrobalan, or Cherry Plum (*Prunus myrobalana*), has of late come into great favour as a stock for the Prune. It is said by some growers that the fruit on Myrobalan stocks is smaller than that on Peach stocks, but that its flesh is more solid, and dries heavier. The influence of the root stock on the dried fruit is, however, still a moot question. The Myrobalan comes from France. It is a wild Plum, of great thriftiness, and is used very extensively in that country for a budding stock for the Prune. It grows readily from seed or cuttings, and is therefore easily

propagated. The seeds are generally sent to California in the middle of October, when they are at once planted. There has been considerable discussion during the last few years as to what is the true Myrobalan, and it must be acknowledged that some of the refined distinctions which have been drawn do not seem to be well founded.

Seedlings grown from the Myrobalan vary like other seedlings, both in fruit and foliage, and perhaps this fact has given rise to the distinction between so-called "true" and "false" Myrobalan.

Practical men have gone on without much reference to this discussion, and whether grown from seed of trees imported a long time ago or from cuttings of the same, or whether seedling stocks are imported directly from France, as large quantities are, the Myrobalan of French origin is now the accepted Plum stock of California.

It has largely displaced the 'St. Julien' and the 'Mirabelle,' as well as the Peach.

Though described by some authorities as a dwarfing stock, it is found to be sufficiently free-growing in California to suit all purposes, and to form a good foundation for large standard trees. Its leaves are smaller, and its shoots finer than the Cherry Plum, which is grown for its fruit in California. Whether the Myrobalan should be grown from seed or from cuttings is, according to Monsieur Balset, quite immaterial. Other growers hold with Mr. W. H. Pepper, of Petaluma, that Plum cuttings form a mass of fibrous roots at the lower end of the cuttings, and when transplanted fail to send out strong supporting roots as are obtained from seedlings. As for the durability of trees grown from cuttings, there can easily be found old thrifty orchards planted with such trees—though it must be acknowledged a better root system would be expected from a seedling—and there are instances in which trees grown from cuttings are said to be diseased at the root, while under similar conditions the seedling roots are quite healthy. Longer experience may perhaps solve the question.

Experience has shown that the Myrobalan stock thrives in this State both in low moist valley lands, in comparatively dry lands, and in stiff upland soils. Thus it has come to be accepted as an all-round stock for the Prune. It is urged against Peach stock, for damp heavy soils, that it does not do well; that the sap sours and the fruit will not set well, while the root is subject to root knot, borers, and other pests that do not affect the Myrobalan stock on the heavier soils.

The Prune is propagated by both budding and grafting. It is customary to bud the young stock first, as, if the bud does not take, it affords an opportunity to graft later on in the season, thus giving the nurseryman two chances. The budding season extends from the middle of July to the end of August.

The young trees are stripped of their leaves and twigs about six inches above the ground, at which place the bud is inserted. The grafting season is in January and February, when grafts are inserted in all the plants in which the buds have not taken. Grafting is done as near the ground level as possible, usually about two or three inches from the ground. These are, of course, the Californian seasons, and do not apply to colder climates.

Cultivation.

In the Prune orchard, as in all others, careful cultivation always repays. A double object is attained by keeping the surface well pulverised. First, the weeds, which draw heavily upon the vitality of the soil, so needful for tree and fruit growth, are destroyed, and the fertilising qualities which they would extract from the land are preserved for the benefit of the growing fruit. Secondly, it prevents the rapid evaporation of moisture from the soil, the loose surface acting as a mulch, and on dry lands especially rendering the need of irrigation less frequent. A neglected orchard overrun with weeds takes money out of the pocket of the owner.

It is customary to plough deeply in the early spring, usually as soon as the weeds are fairly started, their seeds being given a fair chance to germinate in order that the plough may turn under and destroy as many as possible. Near the rows of trees, shallow ploughing must be the rule, taking care to avoid injuring the roots as much as possible. After ploughing, the land should be thoroughly harrowed and left in as good condition as possible.

After the spring ploughing, a cultivator or weed cutter should be used three or four times in the season, as required, to keep the weeds down and the surface loose. Particular pains should be taken in this matter. Many growers use a fine rake or clod-smasher, breaking carefully all lumps, smoothing down all inequalities, and leaving a perfectly level and soft surface, upon which the ripe fruit can fall without injury.

In foot-hill land, it is usual after the harvest to plough a furrow on the low side of each row of trees. This is left during the winter to catch the rainfall and prevent its escape to the low lands. By this means the land gets the benefit of the entire winter rainfall, which is husbanded for summer use.

Irrigation.

Irrigation is another thing that depends wholly upon the character of the soil. Some lands producing excellent Prunes are so damp that draining has to be resorted to in order to prevent the surplus water from drowning-out the trees, while upon others—notably in the southern part of California, where dry land and intense evaporation are the rule—irrigation must be frequent and thorough, and careful cultivation must follow each period of irrigation.

In portions of Santa Clara Valley it is found that at least 20 inches of rain are necessary to ensure good crops. Here winter irrigation is resorted to, the land being thoroughly soaked while the trees are at rest, and no water is given in the summer. On this question there is as great diversity of opinion as there is in regard to soil, and each grower uses his own judgment, taking into consideration the characteristics of the soil upon which his orchard is situated.

Pruning.

The training of the young tree requires thoughtful care. In the first three years of its life it will assume the form which it is to retain. Here

again the individual judgment must be exercised, and conditions of soil, climate, &c., must be considered.

Two schools in regard to pruning have sprung up, each advocating a system diametrically opposed to the other, and each backing its opinion with plausible arguments: the one favouring high pruning (standard trees), the other low (dwarfs); one heavy pruning, and the other light. It is argued in favour of the high-cut or standard tree that it is much easier to cultivate when a horse can be driven under the limbs than when it is necessary to work under them with a hoe, as when they are trained low. In reply to the objection that high-pruned trees in hot climates are liable to sun-burn, the advocates of high pruning say that if planted close enough together they afford sufficient shade for each other. An orchardist ought therefore to decide in which way he intends to prune before planting.

In favour of low pruning (*i.e.* dwarf trees) it is urged that the limbs, bending beneath their weight of fruit, will find support on the ground, that the trunks are protected from the sun, and that the fruit is easier to gather.

Low training (bush or dwarf trees) and little pruning after the fourth year have grown in favour of late, and are the systems which have the largest support among Prune growers. The work of pruning should be commenced as soon as the sap stops flowing, which will depend upon the season, but as soon as the green leaves are gone, and no danger is to be apprehended from "bleeding," pruning may be advantageously begun.

Pests and their Remedies.

Plum Aphis (*Aphis prunifolia*).—These plant lice appear on the under side of the young leaves in spring, and increase very rapidly, so as to cover the new growth in a few weeks. During the last few years this pest has been on the increase. Plant lice, as a general rule, are hard to destroy, owing to their oily excrement. So far whale-oil soap has proved the best remedy. If a tree is badly infested, the lice produce such quantities of honey-dew as to make the leaves and fruit very sticky to handle.

Peach Moth (*Anarsia lineatella*).—This insect attacks the young shoots of the trees, bores into the pith, and causes the shoot to wither. The lime, salt, and sulphur remedy applied in winter checks it to a great extent.

Tree Cricket (*Oecanthus latipennis*).—The limbs of the Prune are bored into by this insect, and its eggs are found in the pith. When these crickets are numerous the young limbs become seriously damaged. The best remedy is to cut off all infested limbs and burn them.

Black Scale (*Lecanium olea*), *Apricot Scale* (*Lecanium armeniacum*), *Frosted Scale* (*Lecanium pruniosum*), *and Pernicious Scale* (*Asphidiotus perniciosus*).—These scale insects are the greatest trouble of Prune trees. Orchards badly infested cannot produce good crops, as the quantity of scale prevents the fruit from growing large and marketable.

The different scale remedies mentioned there * have been well tested

* See "Insects and Fungi in the United States," *Journal of the Royal Horticultural Society*, vol. xxi. page 191, by Sidney C. Lamb.

and proved to be efficient, provided diligence and pains are taken by the fruit-grower when he prepares them.

The following pests are common to the Plum and Prune in the Eastern States of America, where they have proved very destructive. A vigorous and efficient system of quarantine has so far prevented their introduction to California, and little danger is to be apprehended from them.

Plum Curculis (*Constrachelus nenuphar*).—This pest has been known since 1746, and is an indigenous species feeding upon wild stone fruits. The damage done by it in the Eastern orchards is too well known to require a detailed account. It is also known that the insect has increased enormously in districts where cultivated varieties of stone fruits are grown. Up to the present time the curculis has not been found in California, and care should be taken to prevent its introduction, for it would utterly ruin the Prune industry.

Root Borer (*Ægeria existosa*).—Trees grown on Peach stock imported from the Eastern States should be carefully examined, and if found infested must be destroyed, for these insects will ruin a tree in a very short time.

Yield.

The Prune is a prolific bearer, and can be relied on for annual crops. Unlike many fruits, it does not take an occasional season's rest, but will yield its average return every season.

If properly cultivated, some fruit may be gathered the third year after planting, and the fourth will yield a fairly profitable crop. The fifth year a tree will give from 50 to 60 lb., while the sixth year should double that. After this, the tree may be considered as in full bearing, and will give from 150 to 300 lb. of fresh fruit annually.

The average yield for Santa Clara County is about 300 lb. a tree. In some instances 600 to 800 lb. from a tree are reported, and one six-year-old tree in Visalia is credited with 1,102 lb. of fresh fruit in one season.

Picking.

The Prune is picked when fully ripe, which is indicated when it passes from light reddish to purple, and by the slightly withering condition of the fruit. It is very important that it be thoroughly ripe, or else when dried it will be devoid of that rich flavour so essential in a marketable fruit. In most places the Prune, upon ripening, has a tendency to drop on the ground, and this fruit is collected and dried with the rest of the crop. The picking, simple as it may appear, is one of the most important matters in Prune-growing. Many of the leading growers go over their orchards eight or ten times, gathering only the ripest each time. So great care as this may not be quite necessary, but in a great many instances sufficient care is not taken in the picking and handling of the fruit. People should be kept continually at work in the season, securing the ripe fruit. Starting at one end of the orchard, and working it over, if it be of any size, it will be time to start from the one end again by the time the other end has been reached. This is repeated until the entire

crop is harvested, and the fruit is secured in its very best condition, rich, full, firm-fleshed, and thoroughly ripe.

If Prunes begin to dry on the trees and to shrivel a little, they are none the worse; indeed, the fruit is generally allowed to drop on the ground, whence it is collected, no assistance being given it beyond a gentle shake at the trunk of the tree. At the last picking, the fruit that remains on the trees is knocked off with long sticks (taking care not to knock off the buds), and dried with that which is already fallen on the ground. By this method the fruit is assured of positive ripeness, is solid, and is charged with saccharine matter so desirable in the cured article. The Prune will not rot even if left under the trees for several days.

As the fruit shows signs of ripening, the ground under the trees is cleared of all litter and worthless fruit, so that when the good ripe fruit falls it can be picked up free from rubbish. Sometimes a sheet is laid on the ground under the tree, and the fruit is shaken into it, and turned into boxes, loaded on a truck or waggon, and taken to the drying ground.

Grading and Drying.

Prunes are usually graded (sorted into sizes) before drying, and various contrivances are employed.

Some use inclined planes of adjustable slats, the grader being thus available for other fruits besides Prunes; the large fruit rolls along into a box at the bottom, while the smaller falls through into other receivers.

Other grading devices are made with wire screens or riddles of different sizes of mesh. Some of them work on the principle of a fanning mill, three or four riddles placed one above another, each with a slight incline and a spout on the side where each grade drops into a box.

Some have a long riddle, say 12 ft. long, with three different sizes of wire screen upon it. This riddle is hung upon four ropes with an incline. The Prunes are thrown in at the higher end, and on shaking they roll down and fall through holes into boxes below. The first piece of screen should be quite small, so as to let only stems and dirt through and no Prunes at all. This same long hanging screen is also used to grade Prunes after drying.

The object to be obtained by grading before drying is equality in that process. The smaller fruit dries more rapidly than the larger; by grading it into two or three sizes as it comes from the tree, greater uniformity in evaporation is secured, and a more even quality and finish to the fruit is the result. The grading also removes all twigs, leaves, or other foreign substance which may have become mixed with the fruit in the picking.

The next process to which the fruit is subjected is known as *dipping*. This is one of the most important processes in the whole preparation of the Prune for market, and much of the success of the whole will depend upon the person having charge of the "dipper." The ripeness of the fruit, the toughness of the skin, and other peculiarities must be considered in the preparation of the Lye into which it is dipped. The object to be attained is to remove the bloom which fills up the pores, and at

the same time crack the skin of the fruit, so that evaporation may take place more rapidly. In its natural state the skin of the Prune is almost impervious, and unless dipped the fruit would need weeks, if not months, to dry. The usual strength of the dip is about 1 lb. of pure concentrated "lye" to ten gallons of water. The exact proportion, however, must be left to the judgment of the operator. The "lye" must be sufficiently strong to crack the skin of the Prune, and must be kept boiling hot during the operation; *i.e.* not allowed to cool by the immersion of the fruit. The length of time required for immersion also varies according to the soil upon which the fruit has been grown and the age of the orchard, fruit from old orchards and from heavy land being tougher than that from young orchards and from lighter soils. The average time required is about thirty seconds, but the fruit must be withdrawn as soon as the skin shows minute cracks on its surface. If left too long the sugar will ooze through the cracks in drying, rendering the fruit sticky and disagreeable to handle, and causing it to lose many of its best qualities. If it be removed too soon, it will not dry well.

After their removal from the lye-bath the scalded Prunes are plunged into clean fresh water, which rinses off all the lye that may have adhered to them. The water must be frequently changed to prevent its becoming impregnated with lye. For dipping, the fruit is put into wire baskets, or galvanised pails with perforated sides and bottoms. In the Buxton Orchard at Campbell, in Santa Clara County, a very ingenious device is used which does the work automatically. The Prunes are taken direct from the orchard and unloaded into a bin, which is then raised by an elevator up to the grader, which removes all twigs, leaves, and rubbish, and assorts the fruit into two sizes. These two sets of fresh Prunes each fall on to an endless apron provided with carrying slats, and are carried through the lye-baths, which are kept at boiling point by steam pipes, a separate bath being provided for each sized fruit. The apron continues from the lye-bath into the rinsing bath, which is kept fresh by a continuous stream of water flowing through it. From the rinsing bath the fruit is passed on to the trays.

Drying is done wholly by the sun. A number of experiments with evaporators have been made, but the machines were found quite inadequate for the purpose. Sunshine is so far superior that artificial methods have fallen into disuse. After the fruit comes from its second or fresh-water dip it is laid out evenly on wooden trays of convenient size, usually about 2 ft. × 7 ft. These trays are placed on the drying ground—a spot which has been carefully selected with a view to its full exposure to the sun. The drying season extends from the middle of August to the beginning of November. The length of time required for the complete drying of the fruit varies from a week to a month according to the weather and heat, the dryness or humidity of the atmosphere. In hot dry weather the fruit requires a shorter exposure than when it is cloudy and moist. It must be sufficiently dried to warrant its keeping under all conditions, but not so dry as to rattle. When sufficiently dried the fruit is taken to the processing house, where it is put into tins to "sweat." This operation takes two or three weeks, during which time the fruit must be carefully turned over several times with a shovel and

thoroughly mixed. At the end of the sweating season it assumes a blue glossy appearance, and resumes somewhat of its original plumpness. One of the largest Prune-drying scenes in California may be witnessed on the grounds of Frank Buxton, of Campbell, which cover twenty acres. Here ten thousand trays of Prunes are dried at one time.

Finishing.

The next process is that of *finishing*. This comprises a second bath, to which is added such ingredients as the judgment or whim of the individual grower may fancy will improve the appearance or quality of his fruit. The objects to be attained in the second dipping are to destroy whatever insect germs may have become attached in drying, and to soften the skin. The fruit should be left in the bath until partially cooked, when both these ends are accomplished. Some growers add sufficient salt to the dip to make a fairly strong brine, and this has the advantage of enabling the water to be heated several degrees beyond that to which fresh water can be raised. Others add a small quantity of glycerine, glucose, or fruit juices, and some few logwood or indigo. This is done for the purpose of improving the appearance of the fruit by adding to its gloss or its colour. In about three hours after the fruit is taken from the bath it will be sufficiently dry for packing. Before passing through the finishing process, the fruit is once more run through the grader and assorted into standard sizes for market. There are usually six sizes: *firsts*, those requiring from 40 to 50 to make a pound; *seconds*, 50 to 60 to the pound; *thirds*, 60 to 70 to the pound; *fourths*, 70 to 80 to the pound; *fifths*, 80 to 90 to the pound; and *sixths*, all the small fruits which run above 90 to the pound.

Packing.

The final operation in the handling of the Prune is *packing*. Here, again, great judgment is required in putting up a thoroughly good article that will present an attractive appearance and make its way on the market. To prevent the fruit in the box becoming mouldy great care must be exercised that all surplus moisture has disappeared. At the same time all overdried fruit must be thrown out. The skilful packer can tell just what fruit is fit for packing by running his fingers over the piles before him. Much of the fruit is packed in boxes of 10, 25, and 50 lb. each, but of late there is a growing demand for fruit in sacks, and large quantities are now shipped East in 100 lb. sacks, where it is either boxed by the dealer or sold direct from the sacks to the consumer.

The French Method.

Mr. George W. Roosevelt, United States Consul at Bordeaux, gives the following account of the French method of preparing the Prune for market:—

"When the Prune is ripe it is covered with a sort of glaucous powder called flower, which greatly adds to its value as a table fruit. As the gathering is an important factor in the subsequent value of the Prune, great care and good management are indispensable. The fruit is usually

gathered after the heat of the day has dissipated the humidity of the night. When possible straw is carefully spread beneath the trees to prevent the fruit coming in contact with the earth. The prevailing custom, however, is to harrow the ground before gathering the Plums. Only such fruit as readily falls when the tree is slightly shaken is gathered. As soon as harvested the fruit is taken to a building, properly called the fruitery, where it remains for a few days to complete maturity. Prunes are subjected to not less than three, and frequently to four, distinct cookings before being pronounced ready for market. Each of these operations has a special end, in sight of which great care is demanded. The first two preliminary cookings have for object evaporation of water contained in the fruit, and preparation for the final cooking, which dries the fruit and imparts a certain brilliancy much sought after by buyers. Sun-dried Prunes are most delicious in taste, but the exigencies of the trade do not permit of such long preparation. In several districts of France most primitive means are practised in curing the fruit for market. In Provence the freshly gathered fruit is plunged into pots of boiling water, where it remains until the water again arrives at a boiling point. It is then removed from the boilers, placed in baskets, and gently shaken until cool, when it is put upon long trays and exposed to the heat of the sun to complete desiccation. At Digne the Prunes are not gathered until completely matured. Women peel the fruit with their nails to avoid injury to the soft pulp. The fruit is strung upon small twigs, and in such fashion as not to touch. These sticks of Prunes are stuck into straw frames, which are suspended in the sun, until the Prunes easily detach from the stick: the stone is then removed, the fruit placed upon trays, exposed to the sun, and when thoroughly desiccated packed for market.

"In the departments of Indre-et-Loire and Lot-et-Garonne immense ovens purposely constructed for Prune-cooking are used, but the proprietors often suffer loss from want of more commodious cooking apparatus, especially in windy or stormy weather, when the fruit falls in an embarrassing abundance, and he finds himself without means of immediately curing or preserving it. Most Prunes are subjected to a preliminary washing to free them from dust or sand that may have adhered to them in falling to the ground. After washing, the fruit is exposed to the sun and air on beds of straw, or on the trays upon which it is to be cooked, to rid it of all humidity. When dry it is spread in a single layer on the tray and at once submitted to the oven. The trays used in rural districts are quaint affairs, varying in form, dimensions, and construction, according to locality. They are made during the winter months by peasants, are clumsy and cumbersome, and the only excuse for their use is that the peasant cannot afford to buy, and is not skilful enough to make better ones. They are very primitive in their construction, consisting of a frame made of hoop to which is fastened a wicker-like bottom fashioned from rushes or willow twigs. They hold from twelve to eighteen pounds of fresh fruit, representing about four or six pounds of Prunes. Care is exercised in preparing the oven for the first cooking that the degree of heat shall not exceed 50 degrees Centigrade, and in the second not over 70 degrees. If the heat is too strong an ebullition

is produced in the fruit, the skin bursts, the juice discharges, the Prune becomes sticky, loses its flavour, and consequently its commercial value. After each cooking, which occupies about six hours, the fruit is removed from the oven and exposed to the air. When the Prunes are cold they are carefully turned by women specially charged with this duty. They avoid disturbing the fruit while it is warm, as the touch renders it glutinous, and prevents the juice from congealing. The third cooking is performed at a temperature of 80 to 90 degrees, and occasionally at 100 degrees. This, like the two preceding, should be conducted under most intelligent care. After the third cooking the Prunes are sorted, and such as are found imperfectly cooked are again submitted to the oven. The degree of perfection in cooking is obtained when the fruit presents a dark purple colour, solid and brilliant surface, malleable and elastic to the touch, and when the kernel is well done and intact in the shell. When these conditions are not obtained the kernel ferments, and alters the entire Prune, which very soon mildews and becomes worthless. Each cooking should not consume more than six hours. In the last, however, the process is sometimes prolonged, depending upon the condition of the fruit. The fruit loses about 70 per cent. of its original weight. The dark colour depends largely upon the degree of maturity at time of gathering. The brilliancy of surface has no other commercial value than proving the cleanliness observed in preparation and attracting the attention of buyers. Besides the different uses of the Prune as an article of food, it is also employed in making an agreeable brandy."

In France "Prunes are divided into ten categories, taking the number of Prunes necessary to a pound as a basis, and were formerly classified as follows: (1) Trash or refuse, more than 125 to the pound; (2) small Prunes, 120 to 125 to the pound; (3) small ordinary, 110 to 115 to the pound; (4) fine ordinary 100 to 105 to the pound; (5) superior ordinary, second, 90 to 95 to the pound; (6) superior ordinary, for exportation, or half choice 80 to 85 to the pound; (7) first choice, 70 to 75 to the pound; (8) extra choice 60 to 65 to the pound; (9) imperial, 50 to 55 to the pound; (10) imperial flower, 40 to 45 to the pound.

"This classification offered opportunities to sell inferior Prunes for those of good quality, and to prevent this abuse was changed and simplified as follows: No. 1 represents 90 to 92 to the pound; No. 2 represents 80 to 82 to the pound; No. 3 represents 70 to 72 to the pound; No. 4 represents 60 to 62 to the pound; No. 5 represents 55 to 56 to the pound; No. 6 represents 44 to 45 to the pound; No. 7 represents 40 to 41 to the pound; No. 8 represents 34 to 35 to the pound; No. 9 represents 30 to 31 to the pound." "In the beginning of the Prune industry many devices were employed for their proper preservation.

"The first ovens were very primitive and the work of preparing the fruit for market laborious. At present there are many different kinds of ovens in use, possessing more or less distinct features, but about the same in general principles. The most generally used are the Bournel and the Marleteau ovens. The only ovens in use are of French patent and make.'

Production and Markets.

The principal markets for Californian Prunes are Chicago and New

York, by far the greater part being shipped to Chicago. Some smaller shipments are sent to Philadelphia and Pittsburg. From these central points they find their way to the retailers all over the country. Although but a comparatively new competitor for public favour, the Californian Prunes have forced their way in advance of imported ones, and bring 1*d.* to 1¼*d.* per lb. more than the French Prunes sold in competition. The proportion of stone and skin to flesh is much less than that found in the French fruit, while the proportion of saccharine matter is much greater also. These features give it the superiority over the imported fruit, and its popularity is no surprise, for the Californian Prune is quite a different thing from the French. It is more like a Date, and when cooked has a most delicious flavour. Besides this, dealers have found that it keeps better and longer without sugaring than the French. In quite recent years small consignments of Californian Prunes have been sent to England, and it is said that no one who has tried them is ever content with the French Prunes again.

The amount of Californian Prunes now consumed in the United States is enormous, but the consumption is capable of still further extension by making known their superior quality, and when the demand in America has been supplied, there will be that of Europe and the rest of the world to satisfy.

Professor Allen, of San José, speaking of the rapid growth of the Prune industry, says :—"The first shipment of Prunes was made in 1867 by J. Q. A. Ballou, one of the oldest orchardists in the valley, and was consigned to A. Lusk & Co., of San Francisco; there were about 500 lb. of dried Prunes in the consignment. This was the first shipment of Prunes from the valley, and comprised the entire crop. During the autumn of 1891 there have been shipped from San José alone 19,207,165 lb., and there are at least 2,000,000 lb. more awaiting shipment."

It would appear that while the United States imports from three to four times the quantity of Prunes produced by California, there is still a large field for our domestic fruit. With the continually increasing population, the danger of over-supply is still very remote, and Prune-growing in California may be relied upon as a profitable industry for years, if not for generations, to come.

ALPINE PLANTS.

By Mr. Michael Cuthbertson, F.R.H.S., of Rothesay, N.B.

All who are interested in the cultivation of hardy plants must have observed with pleasure that during the last decade a marked change has taken place in outdoor gardening. For very many years the formal system, copied from our French neighbours, had held undivided sway; and on its introduction the old-fashioned hardy flowers, the beauties of which could not be seen through the jaundiced eyes of fashion, were ruthlessly consigned to the rubbish-heap, or stuck among shrubs and other out-of-the-way places, there to fall a prey to vermin, or dwindle away, neglected and forgotten, till they died of a broken heart. What sprung up in their place could hardly by any intelligent mind be called an improvement. Gardening became degraded to a mere matter of colour arrangement—lines and circles and pannels of blue, yellow, scarlet, white, and purple—the poor plants twisted and pegged, clipped and tortured, to bring out some pattern or design, which on a Brussels carpet might look very well, but in a flower-garden an outrage upon Nature. Visitors on entering such a garden exclaimed, "Oh! how beautiful!" And where their interest began there too it ended. What is there in lines of Lobelia, Violas, Geraniums, Beetroot, Perilla, Calceolarias, to satisfy the mind? The colours may please the eye for a moment, but to the heart the whole thing is a barmecide feast.

Happily, however, a change has come. Herbaceous and rock-gardens are now considered indispensable in all well appointed gardens. How far mere fashion, with its despotic rule, should be credited with the change it would be difficult to say. More likely it has been brought about by the influence of the Royal Horticultural Society and by the horticultural Press, whose efforts have of late years been persistent in trying to bring about a more rational style of gardening. It is a happy omen, too, that the old inflexible stiff formal standards of judging are being relaxed, and efforts are being made to have flowers shown more naturally as they grow. May good taste soon prevail and the flower-dresser's art become a crime.

Of hardy plants the beautiful inhabitants of Alpine regions are considered by a majority of plant lovers to be by far the most fascinating. To be successful in their cultivation a properly constructed rockery or rock-garden is indispensable. The study of its construction is a study in Alpine plant growing. What too often passes for a rockery is a confused and dangerous conglomeration of stones with their jagged ends pointing heavenward, like pikes ready to impale their victims; often, too, in the midst of the most incongruous surroundings suggestive of nothing in nature, and entirely unsuited for the purpose.

To be able to set about the work intelligently one must have some knowledge of the conditions under which the plants grow in their mountain homes. On the European Alps, so rich in its miniature flora,

it is June before the snows melt, suddenly exposing vegetation to a brilliant sunshine during a long summer day; and such sunshine too: it is fierce in its very intensity. No thick atmosphere such as on ordinary levels modifies the sun's rays is found in these Alpine heights. The result is that in a few days the slopes of the mountains are brilliant with blossoms of the richest hues to be found anywhere in the fair Kingdom of Flora. The natural conditions then are bright and continued sunshine, heating the rocks and earth several degrees higher than the air, but alternating with cold nights. The whole surface of the ground is kept well watered by the melting snows above. By day the heat produces a thin covering of vapour slightly protecting the plants from the sun's burning rays and promoting growth. These conditions prevail during the growing season, which is a very short one. By-and-by the melting snow recedes, stops melting, and then begins again to fall. Thus the supply of water is gradually cut off, bringing about a condition of things which we in these misty islands of ours cannot hope to imitate. The surface is now comparatively dry, there is no moisture-laden air to temper the still warm rays of the sun, the effect of which is to toughen and harden every part of the plant. The cell walls thicken, the cells diminish in size, and contain less sap, and that in a concentrated form. The leaves of such as are evergreen assume a leathery texture, and the whole plant is by a beautiful natural process fitted and prepared to withstand the Alpine winter as well as its burning summer suns. Usually by October the snow—the beautiful Alpine snow—descends upon the plants—a mantle of virgin purity. The thermometer may continue to fall, the storms and tempests common to these heights may rage in all their wild fury, but there they are—these little Alpine gems, snugly reposing under their snowy covering, heedless of the raging elements, until another June day's sun wakes them from their long sleep to bloom once more and fill the mountain slopes with beauty.

But they are not all protected thus by the snow's friendly covering. Dwarf Willows and Rhododendrons and such-like Alpine plants are to be seen clinging closely to the bare rocks; but, to use a common gardening phrase, they are so well "hardened off" as to be able to stand the extreme cold with impunity.

Such, then, is a brief outline of floral life and environment in the mountainous regions of the world. To imitate these conditions as far as possible is the object to be aimed at in constructing a rockery.

Position and Aspect.—The position should be away from walls and houses if possible. Not only is a rockery meant to be a suitable home for Alpines, but it should also be a veritable reproduction of natural rockiness, and to an artistic eye masonry in juxtaposition with it is somewhat jarring and neutralises the desired effect. What we want in a rock-garden is seclusion—retirement—away from the very sight of everything that reminds us of the work-a-day world, its cares and worries. We want to be alone, there to commune with Nature and, mayhap, with Nature's God. If it *must* be against a wall, then shrubs should be arranged at the back so that the wall may as far as possible be hidden. But the best position is an open space free from the shade of trees and clear of their roots, with an exposure to the east and south.

Form.—This term is used here in a very qualified sense. Formality in a rock-garden is quite inappropriate. In the informal formation of the rock-garden lies its beauty. "This is an art that doth mend nature, change it rather, but the art itself is nature." In carpet bedding we have art without nature: here we have art combining with nature to form in miniature craggy heights and deep ravines, sunny slopes and shady nooks, murmuring waterfalls and crystal lakelets. A carpet bed is a mere product of compass and shears. A well made rock-garden is a dream—a creation of the brain, as varied in character as the complex and subtle workings of the human mind. In short, it is the highest form of art in gardening.

A rockery may be built against a wall, with the wall blinded as I have shown; or it may be ridge-shaped, according to circumstances. Wherever a natural situation presents itself it should be utilised. In creating a rockery upon, or rather out of, a level surface, in my opinion, the best way is to dig out a deep trench or cutting running partly east and west, and partly north and south, using the dug-up soil to form the slopes, about half of which would be below and half above the surface level. The part running east and west should have the slope facing north little, if at all, above the level, with the opposite bank proportionately higher. Shade-loving plants being in the minority, less provision for them is required, and this arrangement admits more sunshine to the sunny side. The general form should be outlined on the soil before a stone is laid, the walks formed and bottomed with rough gravel or road metal and proper drainage secured. The entrance, with only one walk dividing the two banks, may gradually widen, and in the centre a low ridge rockery may be formed, or if water is to be introduced a pond or bog-garden, or all three, may be formed. It has been said that we form our ideas of heaven more from being told what will *not* be there than from what will be; and so if I enumerate some of the things that are *not* in a well-made rock-garden it may help us better than anything else to grasp what should be.

In an ideal rock-garden there are no regular or even slopes. The ridge rockery is not like a potato pit covered with sharp-pointed stones. The walks are *not* edged with tile, or wood, or carefully trimmed box. No brick-bats or broken-nosed Venuses ever trespass there. The sculptor's art, the mason's trowel, tree roots, and fire clinkers are unknown. The spirit-level and garden line are nowhere to be found because straight lines and levels have no existence there.

The Stones, and how to Build them.—Conglomerate rocks such as may be found along the shores of Bute cannot, in my opinion, be surpassed either in appearance or suitability. Break them as you will, each piece still retains the appearance of being complete in itself. A broken whin stone shows its wounds. The particular kind of stone is, however, not a matter of vital importance, but a porous, spongy material is to be preferred. Most of the blocks should be of a large size, from 50 to 100 lb. and over, in order to insure stability. In laying the stones the base to start from is of course the walk. The walk itself should wind its way in serpentine curves and sharp angles with a few ups and downs and natural-looking steps thrown in.

Among youthful reminiscences I recollect having often dinned in my

ears, "Aye! aye! there ye are noo, dod if there's a richt wi' an' a wrang wi' o' daen a thing, ye'r sure tae tak the wrang wi'." Whether or not this is characteristic of youth in general I am not prepared to say, but few inexperienced people arrange the stones the right way. The wrong way is to set the base in the soil, with the edges and sharp points sticking up. The right way is to *lay* them embedded about two-thirds of their height in the soil. Place the stones irregularly along the walk, leaving nooks and corners and crannies for such subjects as Stonecrops, Houseleeks, rayless Violas of pronounced tufted habit, Primroses, Thrifts, Alpine Phloxes, Dwarf Bellflowers, &c. It is difficult to describe in detail exactly how the work should be done. Good taste and sound judgment, a knowledge of the requirements of the plants to be grown, with the spirit of poetry as a guiding instinct hovering over all, are sure to lead to success.

Bind the stones one upon another, so as to leave open spaces for soil and foothold for plants, and pack them firmly with the prepared soil, which will be referred to further on. Remember such gems as the Androsaces—the most Alpine of Alpine plants—will not (particularly the tomentose rosetted forms) bear the drip of our winter rains. They must either be safe under a projecting ledge or protected from damp by a glass covering. They will not even bear to touch the damp soil in winter. Some parts therefore should be perpendicular and overhanging or at least with projecting ledges, the bulk sloped in various degrees interspersed with level patches and mounds. Stepping-stones should also be placed all through the rockery, so as to give easy access to every part. In building, keep in view the necessity for guarding against the disintegrating action of frost and water. Some hold that, in making a rockery, the stone framework should first be built. I have no doubt it is a very good method, but I do not think it essential.

Many form their ideas of the habits of Alpines by seeing such subjects as Stonecrops, Thymes, and the mossy Saxifragas creeping and spreading over almost bare rocks. They conclude depth of soil is not required. Such people look only on the surface of things. True it is, some plants live and thrive in such positions, but they are comparatively few. In nature a plant may be seen clinging to the surface of an apparently dry solid wall of rock, but a closer examination reveals a narrow seam or fissure filled with soil into which the slender spider-like roots of even very tiny plants penetrate to an almost incredible extent, one and two feet and even more. Try to dig out a plant and you will be surprised to find how far the roots travel, and how lovingly they cling to the rocks, and creep away into the narrowest cracks and crannies. The sun may beat on these almost perpendicular cliffs and their floral tenants, but with a secure foothold they withstand his burning rays, because their far-reaching roots have access to supplies of moisture lying deep down in the rocky fissures The tourist, unknowing, gazes and wonders how any green thing can exist there. Yet such are the environments in which many of our most beautiful Alpines live and thrive, develop lovely flowers, and ripen seeds.

Soil.—For general purposes rotted sandy turfy loam with a fifth or sixth part of leaf mould added is most suitable. For such as grow on

limestone rocks the addition of lime in some form is necessary. A fifth part of lime rubbish from an old building is just the thing. Failing this, fresh lime will do, but in smaller proportions. Mostly all the Saxifrages, particularly the encrusted species, grow on limestone at an altitude of from 6,000 to 9,000 feet. Some Alpines delight in a peaty soil, such as the hardy Ericas, Lithospermum, Rhododendrons, &c. Yet even these will grow and thrive in the compost I have named. The best way to apply the soil is to pack the stones with it while building. Soils for special plants can be added in special places as required.

The whole rockery is the better of an annual top-dressing of fresh soil, but care should be taken not to cover the stones too much, else its character as a rockery will be lost. Manure should not be applied except in quite special cases. Every means should be taken to prevent a strong soft growth, as it hinders many species from flowering, and unfits them for resisting the damp of winter, and the withering frosty winds of spring.

Suitable Plants.—The choice of these depends to a great extent on the taste of the cultivator and the size of the rockery. Where space is limited, it is advisable to select only the choicest Alpines. Where the rock-garden is a large one, in addition to the strictly Alpine kinds, plants of a dwarf and showy character should be added. To give a descriptive list of all the Alpine and dwarf plants suitable for rock-gardens in this country would take up too much space. There are hundreds of species and varieties. The strictly Alpine plants would be well represented by about 150 different kinds, while there are 450 or 500 species and varieties of dwarf plants eminently suited for the purpose.

The following is a list of the genera (but is by no means complete) which should be represented :—

Achillea
Æthionema
Alyssum
Androsace
Anemone
Antennaria
Aquilegia
Arenaria
Arabis
Arnebia
Aubretia
Campanula
Cyananthus
Cyclamen
Dianthus
Dryas
Erica
Erinus
Erodium
Erythronium
Genista
Gentiana
Geranium
Geum
Helianthemum
Hutchinsia
Hypericum
Iberis
Linaria
Lithospermum
Lychnis
Myosotis
Onosma
Ourisia
Phlox
Potentilla
Primula
Ramondia
Ranunculus
Saponaria
Saxifraga
Sedum
Sempervivum
Silene
Soldanella
Thymus
Tropæolum
Veronica
Viola
Wahlenbergia

From the above fifty genera an abundant supply of species and varieties can be got to make any garden a thing of beauty and a source of interest all the year through.

I have said nothing of the desirability of introducing Ferns into the shady parts. The pond has been mentioned, that is all, but it and the bog department are absolutely necessary adjuncts to a really good rock-garden. Our native Primroses, *Primula acaulis* and *P. Scotica*, the latter a pretty little species to be found growing on the moors of the far North, thrive well in a damp situation. The same may be said of the stately and beautiful Japan Primrose (*P. Japonica*), also *Primula rosea* and *P. involucrata*, the latter being quite a failure in a dry position. The American Cowslips (*Dodecatheon*) all do best in the bog-garden, while here only the Marsh Marigolds (*Caltha palustris*) grow to perfection. The bog-garden is also the home of the Orchis, *Cypripedium spectabile*, *C. acaule*, *C. calceolus* and *C. pubescens*, and their beautiful orange-flowered cousin *Habbenaria ciliaris*, several Iris and Lychnis, many Spiræas, and even a few of the Lily family and other plants that might be named.

I would emphasise the necessity, particularly in wet localities, of protecting some of the rarer Alpines from damp in winter with a covering of glass. This can be firmly fixed over them by a simple wire arrangement. Most of those with hairy or tomentose leaves should be thus treated. The tomentum is an excellent protection from extremes of heat and cold, but in damp climates it retains moisture and sets up rot with fatal results. Do not form your rockery against a naturally wet bank. It is probably an ideal position while summer lasts, but in winter it turns out, for many of our pets, a cemetery. As already indicated plenty of water is necessary in early summer. A simple and effective method of applying it would be, I think, to lay a lead pipe along the ridge, perforated at intervals with pin-pricks. Then water could be turned on and off as required, arranging the pipe so that it could be emptied in winter.

Seeds of many of the Alpines can now be procured, and some species are best grown from seed on the spot they are to occupy, or they may be raised in small pots in a cold frame and planted out when large enough. The procuring of plants is of course the speediest method of clothing the rockery, but it is obviously the more expensive.

Planting in autumn is not to be recommended, because of the danger of the plants being thrown out and destroyed by the winter frosts. Spring is the best time, the season when all animate nature bursts into new life; when the woodlands again put on their annual mantle of living green; when the sweet songsters of the grove trill out anew their love songs and fill the air with melody; when even man catches up the inspiration, and, as he walks along with elastic step and sparkling eye, wonders much how he ever came to think of this world as a waste, weary wilderness. Nature—or should I not rather say the Great Creator?—has clothed our earth in wondrous beauty. Be it ours to open our eyes to see it—especially to see the beauty of those little humble forms, which come to brighten our lives and win our love, from their far-away homes in the Alps.

NOTE ON AN ORANGE HAVING A DISTINCT STREAK OF LEMON COLOUR ON THE RIND.

By Dr. Bonavia.

I have received the Orange with a pale streak on the peel, and you ask me to explain this phenomenon. It is not an easy task you have set me.

But let us look over the facts we have regarding the Citrus.

I do not think that *because* we now find the Orange of the shops with a smooth and uniform surface all round that it was *so* in the genesis of the Orange.

Such phenomena as the one under discussion are not very uncommon, and if you refer to the monograph of Risso and Poiteau you will find that the "Bigaradier bicolor" is yellow with green stripes when unripe, and yellow with orange stripes when ripe.

Then they also show the "Bigaradier bizarrerie," which has the smooth parts orange colour, and the warty parts yellow. Rivers, at one of the R.H.S. meetings, has shown some beautiful specimens of the parti-coloured Orange, which are *normally* so.

I have reproduced in outline Risso's parti-coloured Citrus in my "Oranges and Lemons of India," plate 259.

Now, is any explanation possible of these interesting phenomena?

My belief is that in the genesis of the Citrus fruit (far prior to the one we see perfected to-day) things may have been very different.

In my same book (plates 139 and 140) I gave two interesting forms of the "fingered Citrus." These may, I think, be taken as reversions to some primitive attempt of the genus to make the beginning of our perfected Citron.

Then Penzig, in his "Studj degli Agrumi," fig. 6, pl. 9, gives a very extraordinary form of a fingered Lemon. This teratological specimen appears to have become split up into *independent* carpels.

I have reproduced this figure in outline on page 356 of "Philosophical Notes on Botanical Subjects."

If now you refer to plates 145, 147, and 149 of "Oranges and Lemons of India," which give various forms of Citron, you will see that the segments of the peel, seen as *separated* in the fingered Citron, are still very distinct, although they have quite coalesced, and have formed a *complete* covering to the inner portion of the fruit.

Now my contention is that these segments are of the nature of *leaves* set in a whorl, as we see them in many plants.

What I am coming to is this. The smooth-surfaced Orange of to-day is in its origin, in my opinion, nothing more than a coalesced whorl of segments, smoothed up to date by human selection.

Who can tell for how many centuries the Chinese and other peoples before them had been selecting the different kinds of Citrus from their beginnings as rude segmented surfaces? It is only by an occasional

reversion to possible remote conditions that we get some small glimpses of what *may* have been the state of affairs in primitive times.

Now, as I consider the Orange peel to be a coalescence of segments of the nature of leaves, it is not very difficult for me to try to explain the *difference* in colour of the segments which we occasionally meet with.

A Euonymus may have one leaf yellow and another green; so can the Ivy and others. But we do not know what causes some leaves to be wholly yellow; or if we take parti-coloured petals, such as in the Carnation, the Balsam, the York and Lancaster Rose, Tulips, &c., we do not know what causes certain colours to be aggregated in stripes, or in spots, as in some Camellias.

If my theory of the genesis of the Orange and Lemon peels can "hold water," then the same cause, whatever that may be. which produces a yellow leaf in the Euonymus may cause a segment of an Orange peel to assume a different colour from that of the rest of the peel.

If we could get a teratological Orange with *leaves* on its peel, then, perhaps, my theory would be on a somewhat firmer basis.

The nearest approach that I have ever seen to leaves on the peel is that shown in the *Gardeners' Chronicle* of March 29, 1890, page 60. I have reproduced it in outline in my "Philosophical Notes," page 349. Its peel seems to have given rise to abortive leaves.

The different coloured stripes on an Orange peel are, however, not the most curious features in the Citrus.

On some Oranges there appears a raised rib, extending from base to tip, and of the *same* colour as the peel.

This may be caused by the adhesion of a stamen *filament* to the ovary, and as the latter grows the adherent *white* filament *takes on the colour of the peel*; and in the mature fruit this filament appears as a mere raised rib of the peel. This fact seems to lend support to the notion that the peel is of a *phyllous* nature, as the stamens are acknowledged to be.

You will find examples of this adhesion in Risso and Poiteau's monograph, figs. 16 and 18, Tab. I., which I reproduced in "Philosophical Notes," page 354.

I do not know whether I have succeeded in giving you in any way some sort of lucid explanation of the pale stripe of your Orange.

You may say that all I have written is pure theory. But what is a theory? It is an attempt on the part of the human brain to gather up scattered facts and weave them into some sort of organised and intelligible whole.

The subject of striping, whether on leaves, petals, or covering of fruits, is a difficult one to unravel, and I have given you all there is stored in my brain convolutions under this head.

P.S.—What made me originally suspect that the Orange peel may be formed by the cohesion of a whorl of foliar elements *independent* of the pulp carpels was this:—

In Poona I found a flat Orange called 'Laroo.' It had a *large space* between the pulp carpels and the peel. The means of connection

between the former and the latter was only by thready fibres, as shown in plate 126 of "Oranges and Lemons of India." It is of the *Süntără* race, but in this kind the pulp ball could be made to rattle within the Orange.

If we are to believe that the peel represents the under (outer) side of the pulp carpel leaves, we have also to believe that the under side of a leaf can be separated from the upper side by nearly a quarter of an inch, as in the 'Laroo.'

Then there is another difficulty. If the peel is the outer surface of the pulp, why does it *never* insert itself *between* the pulp carpels?

My experience of Oranges leads me to think the latter theory is untenable, and I look upon the peel much as I do upon the envelope of the Cape Gooseberry (Physalis), only in some kinds the peel is adherent to the pulp ball, while in others it becomes quite detached from it.

VINES IN THE OPEN AIR.

By Mr. H. M. Tod, F.R.H.S.

In my previous paper on the growth of open-air Vines (see page 155) I reserved the question of how to prune. Although this is a separate subject, it will be found to be closely related to the other one of when to prune. The governing principle, as I suggested, should be the preservation of the health and strength of the Vine itself. Perhaps it was only by carelessness that many of the brandy Vines in the two Charentes had attained to 200 years of age at the advent of the phylloxera; but I for one am disposed to ascribe much of the specially fine quality of the old cognacs to their being largely the product of old Vines. This of course does not touch the peculiar and inimitable character of Cognac brandy, which distinguishes it from and above all other spirits. And so I say that it is well deserving of consideration whether the Vine should not be managed with more attention to its general wellbeing, and therefore giving somewhat less to the immediate prospect of what I have already ventured to call a greedy crop.

Thinking of those departments of France which produce the finest wines and brandies, I am impressed with the consideration that they not only need to maintain their production but to maintain their reputation. I rejoiced with the producers when I saw the great success attending the renewal of the vineyards by grafting the favourite local Vines on American stocks; but almost as soon as this was evidenced, it also became plain that there was another result. This was the great increase in the production of wine—a good thing *per se*, but suggestive of the questions: Will it last? Is the quality as good as in the great preceding years? Will the demand for these wines, and the prices they fetch, be maintained? He would be a bold man who should answer any of these questions in the affirmative: but I do not wish to labour the point. My object is to draw attention to it, and invite criticism and reply, especially as I know those who are engaged in this industry are quite ready to justify the old and time-out-of-mind mode of cultivation. Still every method of treating Vines cannot be best, and it should be worth the while of reasonable and interested people to consider any plan that is not merely well meant, but probably true to nature.

To return to the question of how to prune. I will ask my readers to remember that although we are dealing with "a trailing, deciduous, hardy shrub," we are also dealing with it as one—perhaps the only one—capable of becoming a tree, and also of outliving every other tree. It may give a special interest to my subject if I suppose that some Vines planted in Britain during the Roman occupation might, with the necessary care, be living still, and therefore older than the 1,500-year-old Berkshire yews, or those 1,000-year-old ones elsewhere. We do not know—at least I do not—how old the "Miller's Burgundy" was that Sir Joseph Banks *discovered* in an ancient vineyard at Tortworth, in Gloucestershire.

Deciding at once that the Vine should be treated as a plant having the greatest expectancy of longevity, I have been forced to adopt the "long rod" system of pruning, which is associated with the teaching of my favourite author, Clement Hoare. In doing so I am denying the supposed advantages of the extension theory. It is of course possible that I may have had very bad luck in my observation of "extension" Vines. Nevertheless, without spending time in actually looking for them, I have, I suppose, seen a much larger number of Vines than most people have, and then always made an exact examination of their condition. Generally these Vines—nearly always trained on walls—have been conspicuous for their comparative barrenness, their fruit, when worth mention, being confined to the extremities of the branches. Now, if this was a necessity, there would be nothing more to be said. But even then the quantity of wood in proportion to the fruit has often been remarked on, and this has led to proposals for grafting in short sections of young fruiting wood as low down as possible, both for sake of crop and also for appearance.

A good idea of the clogging effect of extended old wood in a Vine is got by referring to Hoare's description of it as "dowager wood." It does nothing for its living. If insects want bed, board, and lodging, there they are well and constantly supplied, because the accumulated dead bark is there, retained apparently expressly for their benefit. I have often seen from ten to twenty yards of old wood in an English wall Vine that would certainly have been twice or thrice as fruitful with only five feet of it; and those five feet horizontal and close to the ground. The true HOW in Vine pruning in the open air is to retain the smallest number of *inches* of old wood that will produce the crop, which on walls and for sixteen years can be attained with two fruiting canes, alternating with two young ones which will take their turn the following year, when the first two are spur pruned (in October) to the lowest eye. Hoare says that in the sixteenth year his Vines produced 60 lb. of ripe Grapes, and that it was only then that it might appear necessary to train in some more "old wood" on each arm or branch which I have already spoken of, and which would increase their joint length to seven and a half feet, which would before long increase the crop (with more certainty than any other fruit crop) to 90–100 lb. In viewing the matter in this way I assume that I have the reader's assent assured, that we treat open-air Vines with an intelligent understanding of their nature and powers, and hardly ever referring to the usual treatment of them as exotics under glass.

Before passing from this phase of my subject I will ask my readers to remember that this dowager wood, the intimate and necessary sequel to *extension*, should never be thought of as harmless, or even as a necessary evil. It takes toll not only of the ascending sap, and so directly defrauds the canes or fruiting shoots, but it does the same to the descending sap, and so defrauds the roots of what should be theirs.

As to the roots themselves, the subject is too large for me to do more here than to note a cardinal error which is so common that I do not believe, if I had kept a record of the instances I have noticed, it has been avoided once in fifty times. I refer to the need a wall Vine has to a space to itself in the ground, neither flower nor shrub, nor shadow if

possible, to dispute its right to that space. It is convenient to allot it a semicircle radiating 5 feet from the stem; and after heavy rain this plot of ground should be lightly forked to assist evaporation. Such forking, however, has its limits; because even in a wet season, after September 15, the heat of the ground must in no wise be prejudiced, but rather conserved.

William Speechley's work (York 1790) on the culture of the Vine was published by subscription, and is not in our library. It is worth referring to, if only on account of the latter portion, "with hints on the formation of vineyards in England." He describes and figures one of many great wall Vines at Northallerton. It appears as a great tree covering the face of three houses, with a stem as thick as a man's body. He says it once covered a space of 137 square yards, and "it is judged that if it had been permitted when at its greatest vigour to extend itself, it might have covered three or four times that area." It was then about 150 years old, growing in a light rich soil—of a dark colour—inclining to sand. He does not, however, say anything about its crop. To me it is interesting to speculate on what Hoare would have said about this extension, and how it would compare with his rule and estimate, which, except for the difference between $50\frac{3}{4}°$ and 54° 20′ N. latitude, should have approached a ton and a half of Grapes.

Speechley mentions a better "extension" Vine in 1786 at Bury, Suffolk, a Black Cluster covering a wall 44 yards long and 10 feet high; some branches ran over the wall and covered 12 yards on the other side. It was thirty-five years old. 8 inches in circumference at a foot from the ground, below which were protuberances, girth 13 inches, with some fruiting shoots emanating from them close to the ground. The stem of this Vine and its centre portion faced due south. Twelve yards faced west, and three-fourths of the whole faced eastwards.

It had for some years been confined in its growth, or, says Speechley, it might have covered three or four times as much walling. The clusters hung thickly, and weighed from $\frac{1}{2}$ lb. to 1 lb. each.

Now, to draw a little nearer the subject of English vineyards. We have in very modern times a considerable body of fact and opinion in favour of their cultivation.

Lord Chancellor Bacon says that Vines trained on arbours or pergolas make verjuice, he not being acquainted with some of our newer sorts, such as the 'Brandt,' which I described in my previous paper, a standard-trained Vine, ripe on September 15, 1899. His opinion is well supported by F. X. Vispre, who published a book at Bath in 1786, on "The Growth of Wine in England." He "wanted to be the restorer of vineyards in this country." He trained his Vines near the ground, as he had done at Wimbledon and Chelsea. In propagating by layering, the grapes increased in size larger than those grown on a south wall.

In 1763 there were in the cellars at Arundel Castle "sixty pipes of excellent Burgundy," grown by the Duke of Norfolk. I do not know when or why this vineyard was abandoned. Information about this would be acceptable.

Speechley mentions the Pain's Hill Vineyard, planted by Hon.

Charles Hamilton, on the south side of a gravelly, sandy hill (near Cobham). First two sorts of Burgundy were planted, and the process of making is described; but it seems that "this was a failure," the wine was "harsh and austere." (On this I will remark that probably it never had age enough to develop it.) Then white wine was grown, and Mr. Hamilton declares "it succeeded far beyond my most sanguine expectations." It closely resembled the flavour of champagne, and "in two or three years the wine, to my great amazement, had a finer flavour than the best champagne I ever tasted." He sold some of it to a wine merchant at 50 guineas a hogshead. Another bought £500 worth, and sold it from 7*s*. 6*d*. to 10*s*. 6*d*. a bottle. Some, kept sixteen years in wood, resembled old hock.

This vineyard was too much exposed to south-west winds, and what was damaged by May frosts and wet summers was balanced by one good year, making up for many disappointments.

Loudon (Lond. 1822) mentions Pain's Hill Vineyard as being neglected or destroyed at the beginning of this century. He also mentions St. Lawrence Cottage Vineyard, near Undercliff, Isle of Wight, as

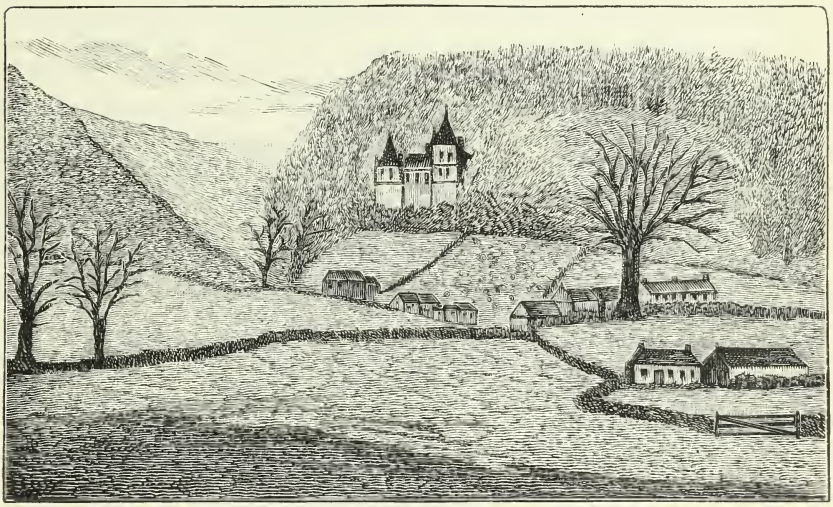


Fig. 138.—Site of the Vineyard at Castle Coch.

still existing—3 acres of rocky ground, sheltered from the north. It was commenced in 1792, and Muscadines were grown in beds; I think they were only 18 inches apart. "Pleasant light wine is made."

Speechley thinks that the whole South of England offers many sites for vineyards that would be profitable, and I am sure he is right; 51° north latitude is the nominal limit for the growth of the Vine, but with reasonable care and choice of situation (never in valuable soil) I can recommend this crop up to 53° N., always avoiding the west coast, wet neighbourhoods, and exposure to west or south-west winds.

Who will help in this restoration of English vineyards? The land itself should be the least part of the cost; and as many of our Fellows possess such soils and situations, I appeal to them and others to

consider this seriously, and to communicate with me. I could, if necessary, devote my remaining years to this in the interest of rural industry and comfort, and national well-being and temperance.

All the indications are in favour of the experiment. So long as the probable site is higher than the neighbouring high roads, uncultivated on account of its poor quality, stony, heathy, sandy, &c., but exposed to the sun, there is a potential vineyard; and if brambles have there an established home, then there is no longer a question about it, unless this high and dry position is wind-swept from the west or south-west. Some money is wanted, certainly, but it secures itself amply, though a return is not forthcoming the first few years. I invite replies to this proposal.

Miller thought that only obstinate prejudice against vineyards arising from improper experiments made near London on unfriendly soils could account for the opposition to or neglect of planting them, and adds that "under same disadvantages neither French nor Italian vine-growing could succeed."

I present my readers with a sketch of Castle Coch and its vineyard, which I made eight years ago. (Fig 138.) It is over-sheltered, as well as too far west, and under Gulf Stream influence.

I may add that a correspondent, thousands of miles away and located in a very different climate, does not relish—if I may so construe his questions on the subject—my recommendation of the sabbatical year. The more I see and hear of diseases and the results and prospects of different modes of culture, and the more I have occasion to compare the results of different vintages, the more I feel convinced that nothing has yet been discovered, nothing suggested, for the management of vines, with a view to their health and the crops to be got from them, that will compare for simplicity and efficiency with the sabbatical year. Not to be misunderstood I must add to this a thorough grasp of what I must still call THE problem—viz. How and When to prune.

REPORT ON THE METEOROLOGICAL OBSERVATIONS MADE IN THE SOCIETY'S GARDENS AT CHISWICK IN 1899.

By Mr. Edward Mawley, Sec., R. Met. Soc.

Previous Meteorological Records at Chiswick.—About seventy-five years ago a set of meteorological instruments of the best construction then known were provided for the Gardens at Chiswick, and observations started under the auspices of Professor Daniell, F.R.S. For nearly twenty years these observations were published *in extenso* in the transactions of the Society. In 1871 Mr. James Glaisher, F.R.S., issued as a supplement to volume ii. of the Society's Journal, New Series, a little work entitled "Reductions of the Meteorological Observations made at the Royal Horticultural Gardens, Chiswick, in the Years 1826–1869" in which the temperature and rainfall readings taken during those forty-four years were arranged and discussed. This series of observations came to an end in 1874, when the instruments were dismounted and removed.

The Present Observations.—Towards the end of 1898 the Council decided to commence a fresh set of meteorological observations in accordance with modern methods, being of opinion that the Society's Gardens would be incomplete without a trustworthy record being kept in them from day to day of temperature, atmospheric humidity, and rainfall, all of which exert such an important influence upon plant life. The shade temperature observations, as well as those of rainfall, were commenced on February 1, 1899, but the grass minima and soil temperature readings were not begun until a few days later, February 4. All the arrangements in connection with the establishment of the new meteorological station were carried out under the direction of the Garden Superintendent, Mr. S. T. Wright, under whose general supervision the observations have since been made.

Any Fellow wishing to start weather observations in his own garden cannot do better than take the present equipment at Chiswick as a model. It will show what instruments are necessary for such an equipment, and the best methods of exposing them in order that their readings may be strictly comparable with those made at any other well-ordered meteorological station in the British Isles.

The Position of the Instruments.—A suitable site for the instruments was readily found close to the spot selected for the former meteorological station in 1825. The situation chosen leaves nothing to be desired, being level, open, without being too exposed, and well away from trees, walls, and buildings. The instrument enclosure, which was in the first instance turfed over, is 26 feet long by 24 feet wide, and is surrounded by a light iron railing. Its height above mean sea-level is 24 feet. The instruments were placed in their present positions as soon as the necessary arrangements had been made for their reception.

The Thermometers generally.—All the thermometers are standard

instruments, for which certificates from Kew Observatory have been obtained.

The Shade Temperature Thermometers.—The thermometers for determining the temperature of the air in shade are suspended in a Stevenson thermometer screen of the Royal Meteorological Society's pattern. They consist of a maximum thermometer on the Negretti principle, which registers the greatest heat during the daytime, and a Rutherford spirit minimum thermometer for showing the lowest reading at night. There is also a dry and a wet bulb thermometer, which jointly give the humidity of the air, while the dry bulb is further available as giving the actual temperature at any time.

The Exposed Thermometer.—This is a very sensitive minimum ther-

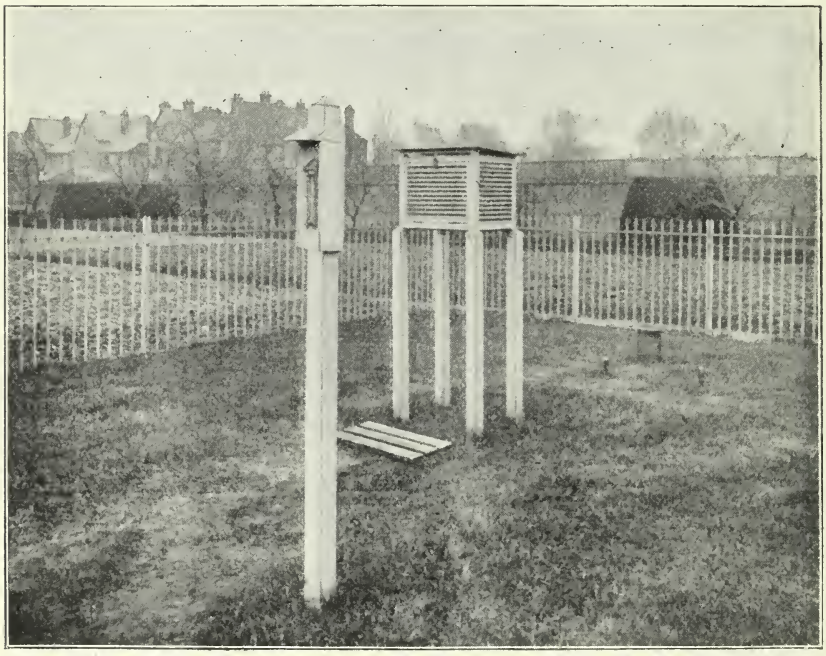


Fig. 139.—Meteorological Station at Chiswick.

mometer which rests horizontally on short grass and registers each night the greatest cold experienced by low-growing vegetation. When the ground is covered with snow this thermometer is placed lightly on the surface of the snow covering.

Soil Temperatures.—These are obtained by means of three Symons's earth thermometers, the bulbs of which are respectively 1 foot, 2 feet, and 4 feet beneath the surface of the grass covering the instrument enclosure. These earth thermometers show the temperature to which the roots of plants at the depths named are at any time exposed.

The Rain-Gauge.—This is a stout 8-inch copper rain-gauge of the Snowdon pattern, which has a deep rim to enable it to catch snow as well as rain. It is provided with a copper overflow bucket in case the glass

receiver should at any time prove too small for any exceptionally heavy downpour, or in case the receiver be broken by frost. The gauge is securely fixed in the ground, with the top of the rim 1 foot above the general level of the enclosure. This gauge has been tested by the late Mr. G. J. Symons, F.R.S., and has received from him a certificate of accuracy.

The Time of Observation.—The observations are made regularly at 9 A.M., and at that hour the self-registering thermometers are set. All the readings are entered against the date on which they are made, except those of the maximum thermometer and the rain-gauge, which are put down to the previous day. The students at the Gardens take the observations each month in turn, under the supervision of the regular observer, Mr. T. W. Turner.

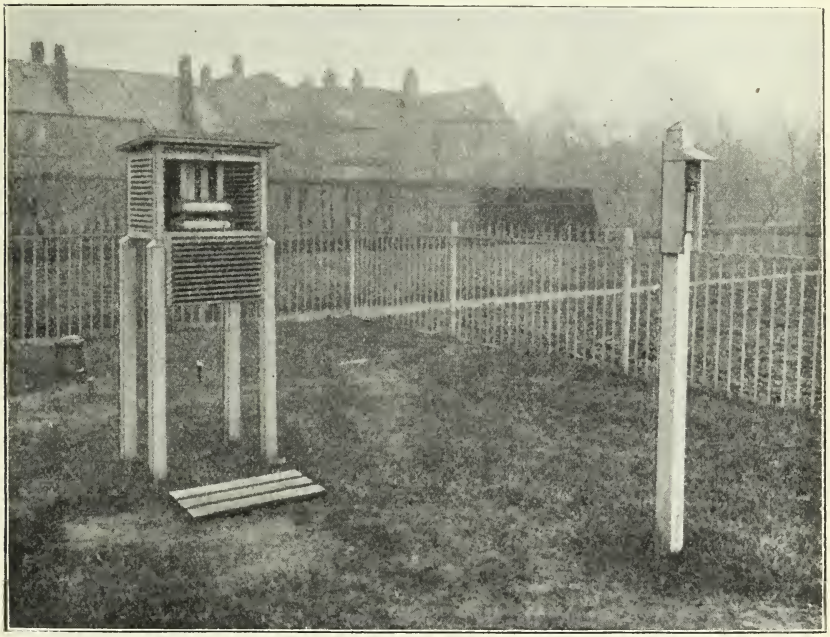


FIG. 140.—METEOROLOGICAL STATION AT CHISWICK.

Thermometer on Post.—In addition to the standard instruments a maximum and minimum Six's thermometer has been mounted on the north side of a post 3 inches square. In order to prevent the sun from shining upon the instrument at any period of the year it is protected at the sides by two flanges of wood, $4\frac{1}{2}$ inches deep by 16 inches long, in such a way that they project $1\frac{1}{2}$ inch beyond the north side of the post; and above by means of a sloping piece of zinc. The readings of this thermometer can only be regarded as sufficiently close approximations to the true air temperature for ordinary garden observations. For such a purpose this plan of exposing a Six's thermometer can be recommended as a very simple and inexpensive one. The instrument now in use has not a sufficiently open scale, and will be shortly replaced by a larger

thermometer on the same principle. Advantage will be taken of the change to ower the height of the thermometer from 5 feet to 3 feet above the ground, as better representing the changes in temperature to which most garden crops are exposed. It should be clearly understood that this thermometer has nothing at all to do with the regular equipment of the meteorological station in the Chiswick Gardens. It has simply been added in order to see how far temperatures so taken are in agreement with those made with verified thermometers exposed in the orthodox fashion.

A brief monthly summary of the observations taken in the Society's Gardens at Chiswick in 1899, *for the ten months, for which a complete set of readings was available, viz. March–December.*

March.—Very cold and very dry. The days were, as a rule, about 1 degree colder, and the night temperatures about 4 degrees colder, than is seasonable. On the coldest night the thermometer on the grass showed 20 degrees of frost.

The rainfall was very light, being only about one-third the average quantity for the month.

Mean temperature of the air in shade	40°.0
Highest	60°.7 on the 31st
Lowest	19°.5 ,, 21st
Lowest temperature on the grass	11°.6 ,, 25th

	At 1 ft. deep	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	39°.1	41°.0	43°.5
Highest	46°.3	44°.2	44°.5
Lowest	35°.5	39°.2	42°.9

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) ... 79

Rain fell on 7 days to the total depth of 0·45 in.
(Equivalent to about 2 gallons on each square yard of surface in the Gardens.)

Heaviest fall on any day 0·17 in. on the 25th

April.—Seasonable in temperature and very wet. The days were, as a rule, about 1 degree colder and the nights about 2 degrees warmer, than is seasonable. On the coldest night the thermometer on the grass showed 11 degrees of frost. The rainfall was heavy, being about 1 inch in excess of the average for the month.

Mean temperature of the air in shade	47°.6
Highest	64°.8 on the 1st
Lowest	29°.6 ,, 19th
Lowest temperature on the grass	21°.0 ,, 19th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	48°.2	47°.5	46°.6
Highest	52°.2	50°.2	48°.1
Lowest	45°.5	44°.9	43°.9

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) ... 77

Rain fell on 20 days to the total depth of 2·43 in.
(Equivalent to about 11 gallons on each square yard of surface in the Gardens.)

Heaviest fall on any day 0·30 in. on the 9th.

May.—Cold and very dry. Both the days and nights were, as a rule, about 1 degree colder than is seasonable. On the coldest night the thermometer on the grass showed 10 degrees of frost.

The rainfall was very light, being about three-quarters of an inch less than the average for the month.

Mean temperature of the air in shade	51°.4
Highest	71°.9 on the 31st
Lowest	30°.5 „ 5th
Lowest temperature on the grass	22°.3 „ 5th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	53°.4	52°.3	50°.3
Highest	57°.6	54°.5	51°.9
Lowest	48°.1	49°.6	48°.3

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 72

Rain fell on 10 days to the total depth of ... ... 1·24 in.
(Equivalent to about 6 gallons on each square yard of surface in the Gardens.)

Heaviest fall on any day ... ... 0·44 in. on the 14th.

June.—Very warm and rather dry. The days were, as a rule, about 3 degrees warmer, while the night temperatures were only about half a degree warmer than is seasonable. On the coldest night the thermometer on the grass showed 4 degrees of frost.

The rainfall was about a quarter of an inch below the average for the month.

Mean temperature of the air in shade	60°.8
Highest...	82°.7 on the 5th
Lowest	39°.3 „ 15th
Lowest temperature on the grass	27°.7 „ 15th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	62°.3	59°.6	55°.5
Highest	64°.9	61°.1	57°.4
Lowest	58°.9	55°.5	52°.1

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 65

Rain fell on only 5 days, and to the total depth of ... ... 1·70 in.
(Equivalent to about 8 gallons on each square yard of surface in the Gardens.)

Heaviest fall on any day ... ... 0·80 in. on the 30th

July.—Exceptionally warm and very dry. The days were, as a rule, about 5 degrees warmer, and the night temperature about 3 degrees warmer, than is seasonable. On the coldest night the thermometer on the grass fell to 38 degrees, or six degrees short of the freezing-point.

The rainfall was very light, being about an inch less than the average for the month.

Mean temperature of the air in shade	65°.7
Highest...	86°.2 on the 21st
Lowest...	47°.4 „ 28th
Lowest temperature on the grass	38°.1 „ 28th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	66°.4	63°.6	59°.4
Highest	70°.2	65°.5	61°.2
Lowest	60°.3	60°.1	57°.5

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 64
Rain fell on 8 days to the total depth of ... ... 1.37 in.
(Equivalent to about 6 gallons on each square yard of surface in the Gardens.)
Heaviest fall on any day ... ... 0·57 on the 22nd

August.—Exceptionally warm and dry. The days were, as a rule, about 6 degrees warmer, and the night temperature about 3 degrees warmer, than is seasonable. On the coldest night the thermometer on the grass fell to 37 degrees, or 5 degrees short of the freezing-point.

The rainfall was singularly light, being only about one-fourth of the average quantity for the month.

Mean temperature of the air in shade ... ... 65°.7
Highest ... ... 88°.2 on the 15th
Lowest... ... ... 45°.0 .. 22nd
Lowest temperature on the grass ... ... 36°.9 on the 21st and 22nd

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	66°.7	65°.0	61°.9
Highest	69°.1	65°.9	62°.3
Lowest	64°.1	64°.3	61°.3

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 67
Rain fell on only 5 days, and to the total depth of ... ... 0·60 in.
(Equivalent to about 3 gallons on each square yard of surface in the Gardens.)
Heaviest fall on any day ... ... 0·29 in. on the 31st

September.—Warm, with average rainfall. The days were, as a rule, about 2 degrees warmer, and the night temperatures about half a degree warmer, than is seasonable. On the coldest night the thermometer on the grass showed 8 degrees of frost. The fall of rain was about the average quantity for the month.

Mean temperature of the air in shade ... ... 57°.8
Highest .. .. 86°.3 on the 5th
Lowest ... ... 32°.9 .. 29th
Lowest temperature on the grass ... ... 24°.4 .. 29th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	59°.5	60°.8	60°.4
Highest	66°.7	63°.8	62°.1
Lowest	52°.1	56°.3	58°.1

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 72
Rain fell on 16 days to the total depth of ... ... 2·47 in.
(Equivalent to about 12 gallons on each square yard of surface in the Gardens.)
Heaviest fall on any day ... ... 0·98 in. on the 29th

October.—Seasonable in temperature and dry. The days were, as a rule, about 1 degree warmer, and the nights about 1 degree colder, than is

seasonable. On the coldest night the thermometer on the lawn showed 12 degrees of frost. The rainfall was light, being about half an inch less than the average quantity for the month.

Mean temperature of the air in shade	48°.6
Highest...	63°.7 on the 11th
Lowest	29°.0 ,, 14th
Lowest temperature on the grass	20°.2 ,, 14th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	49°.7	52°.5	54°.8
Highest	54°.7	55°.8	57°.8
Lowest	45°.6	49°.9	52°.8

Relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 88

Rain fell on only 8 days and to the total depth of ... ... 2·02 in.
(Equivalent to about 9 gallons on each square yard of surface in the Gardens.)

Heaviest fall on any day ... ... 1·08 in. on the 27th

November.—Exceptionally warm and wet. The days were, as a rule about 4 degrees, and the nights about 3 degrees, warmer than is seasonable. On the coldest night the thermometer on the grass showed 9 degrees of frost. The rainfall was singularly heavy, being about twice the average quantity for the month.

Mean temperature of the air in shade	46°.9
Highest	63°.3 on the 1st
Lowest	28°.0 ,, 30th
Lowest temperature on the grass	22°.6 ,, 18th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m	47°.7	50°.1	52°.1
Highest	54°.1	53°.2	53°.4
Lowest	42°.9	47°.6	50°.3

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 86

Rain fell on only 8 days, but to the total depth of ... ... 4·03 in.
(Equivalent to as much as 19 gallons on each square yard of surface in the Gardens.)

Heaviest fall on any day ... ... 1·33 in. on the 3rd

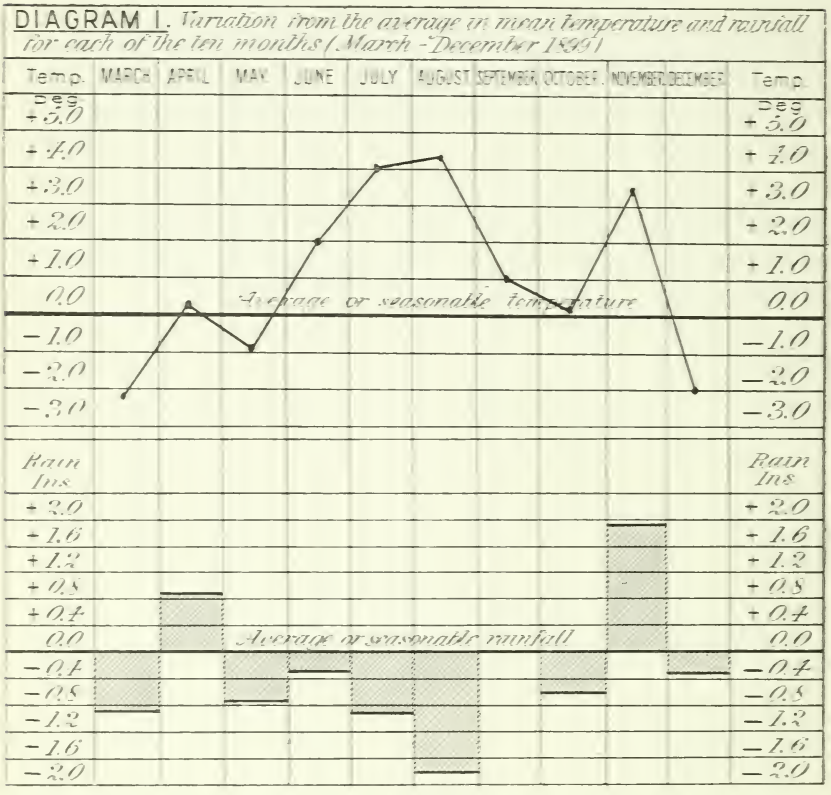
December.—Very cold and rather dry. Both the days and nights were, as a rule, about 2 degrees colder than is seasonable. On the coldest night a thermometer on the surface of the snow showed 20 degrees of frost. The rainfall was rather light, being about a quarter of an inch below the average for the month.

Mean temperature of the air in shade	36°.7
Highest	53°.2 on the 1st
Lowest	21°.9 ,, 14th
Lowest temperature on the grass	12°.5 ,, 16th

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 a.m.	39°.5	43°.2	47°.3
Highest	46°.5	47°.1	50°.2
Lowest	36°.2	40°.6	44°.9

Mean relative humidity of the air at 9 a.m. (complete saturation being represented by 100) 88
Rain fell on 11 days to the total depth of ... ... 1·22 in.
(Equivalent to 6 gallons on each square yard of surface in the Gardens.)
Heaviest fall on any day ... ... 0·27 in. on the 1s
On the 12th the ground was covered with snow to the average depth of ... 1 in.

The Diagrams.—The averages with which the different mean monthly temperatures are compared in diagrams 1 and 2 are derived from the observations taken at Kew Observatory during the twenty-five years ending

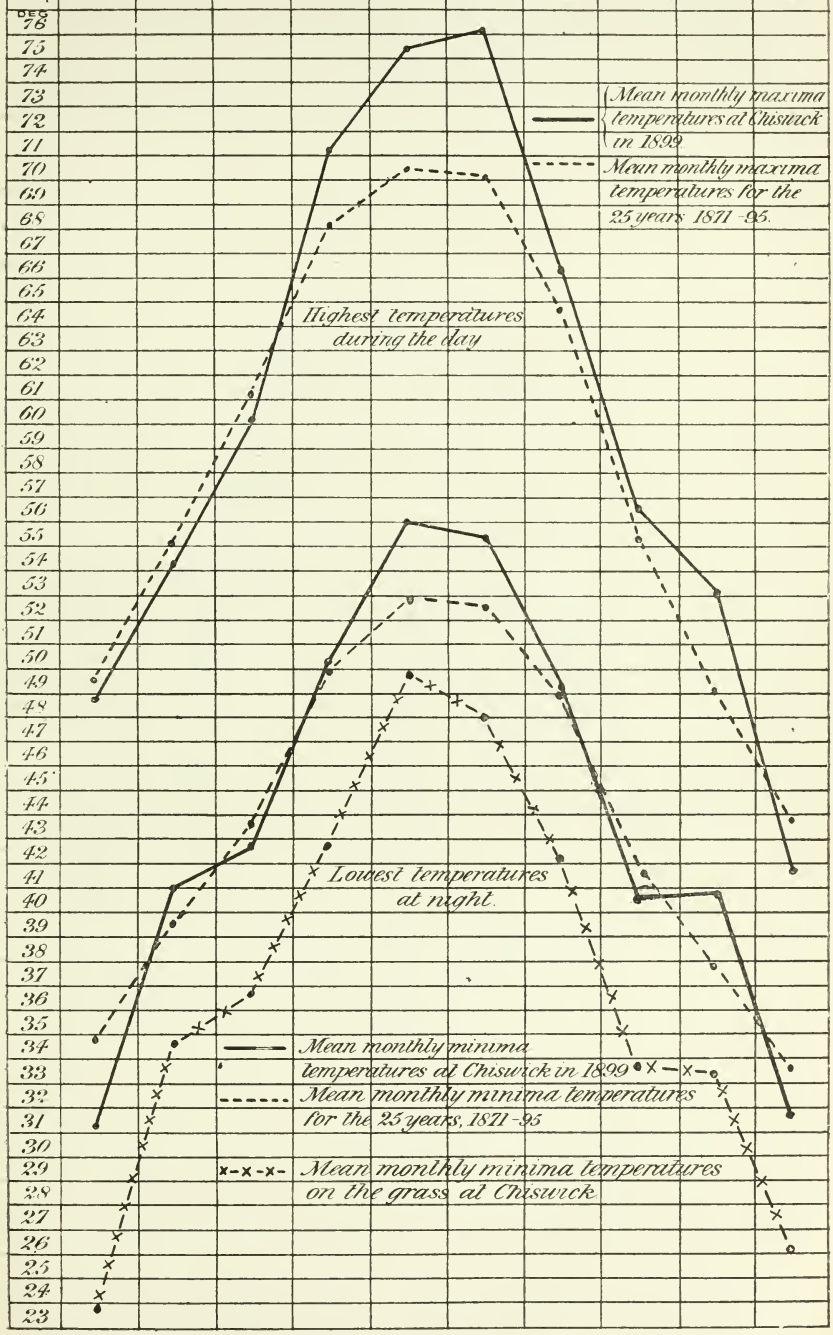


1895. The actual averages for Kew have not been used, but the departures in mean temperature, &c., from the monthly means for 1899 at that Observatory have been applied to the Chiswick temperatures; and in this way very close approximations to the true monthly averages have been obtained. Mr. Glaisher's discussion of the Chiswick temperatures (1826–1869) before referred to was not available for this purpose, as it gives no maxima or minima temperatures. The rainfall averages used in diagram 1 are, however, those given by Mr. Glaisher for the forty-four years ending 1869.

Diagram 1.—This diagram is intended to show at a glance the general character of the weather of each of the ten months under discussion, as

DIAGRAM 2.

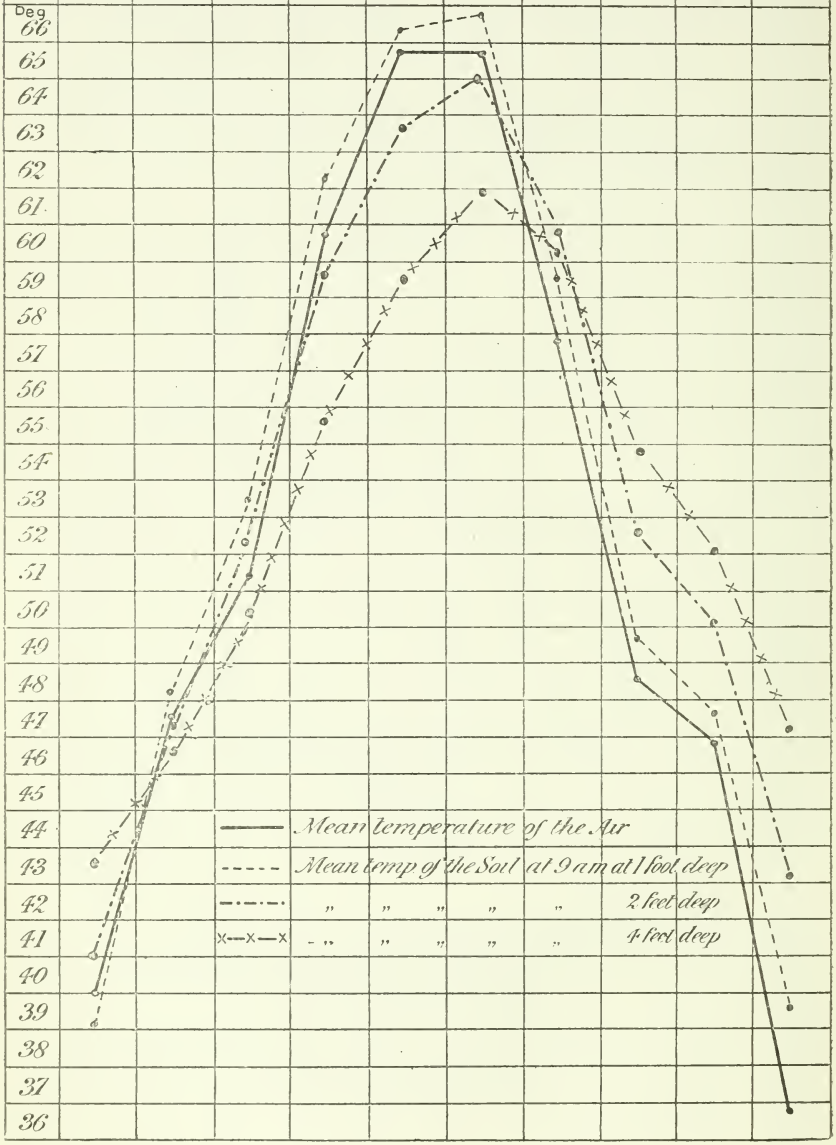
Variation from the average in the mean maxima and mean minima temperatures of the Air for each of the ten months (March December 1899)



regards temperature and rainfall. For instance, it will be seen that there were only three unseasonably cold months—March, May, and December—

DIAGRAM 3.

Mean Temperature of the Air at Chiswick, compared with the mean temperature of the Soil at 9 a.m. at 1ft., 2ft., and 4ft. deep, for each of the ten months (March - December, 1899.)



and that July, August, and November were exceptionally warm. Then, as regards rainfall, it will be noticed that only two of the ten months—April and November—were wet, all the others being more or less dry.

Diagram 2.—Here the most noteworthy feature is the unseasonable warmth of the weather of the three summer months, during the daytime.

Diagram 3.—It will be seen that in the coldest month (December) the soil at 4 feet deep was 10 degrees warmer than the air, at 2 feet deep 6 degrees warmer than the air, and nearly 3 degrees warmer than the air at 1 foot deep. Whereas, in the warmest month (August), the soil at 4 and 2 feet deep was respectively 4 degrees and 1 degree colder than the air, but at 1 foot deep about 1 degree warmer than the air.

ORIGINAL CHARTER OF THE HORTICULTURAL SOCIETY OF LONDON.

A.D. 1809.

GEORGE THE THIRD, by the Grace of God, of the United Kingdom of Great Britain and Ireland, King, Defender of the Faith, to all to whom these presents shall come, Greeting: Whereas several of our loving Subjects are desirous of forming a Society for the Improvement of Horticulture in all its branches, ornamental as well as useful, and having subscribed considerable sums of money for that purpose, have humbly besought us to grant unto them and such other persons as shall be approved and elected as hereinafter is mentioned, Our Royal Charter of Incorporation for the purposes aforesaid:

Know ye, that We, being desirous to promote such improvement, have, of our especial grace, certain knowledge, and mere motion, Given and Granted, and we do hereby Give and Grant, that Our Right Trusty and Wellbeloved Cousin and Counsellor George Earl of Dartmouth, Knight of the Most Noble Order of the Garter, Our Right Trusty and Wellbeloved Cousin and Counsellor Edward Earl Powis, Our Right Reverend and Wellbeloved Father in God Brownlow Lord Bishop of Winchester, Our Right Trusty and Wellbeloved John Lord Selsey, Our Right Trusty and Wellbeloved Counsellor Charles Greville, Our Right Trusty and Wellbeloved Counsellor Sir Joseph Banks, Baronet and Knight of the Most Honourable Order of the Bath, Our Trusty and Wellbeloved William Townsend Aiton, John Eliot, Thomas Andrew Knight, Charles Miller, Richard Anthony Salisbury, and John Trevelyan, Esquires, and James Dickson, Thomas Hoy, and William Smith, Gardeners, and such others as shall from time to time be appointed and elected in the manner hereinafter directed, and their Successors, be and shall for ever hereafter continue to be, by virtue of these Presents, one Body Politic and Corporate, by the name of "THE HORTICULTURAL SOCIETY OF LONDON"; and them and their Successors, for the purposes aforesaid, We do hereby constitute and declare to be one Body Politic and Corporate, and by the same name to have perpetual Succession, and for ever hereafter to be Persons able and capable in the Law, and have power to purchase, receive, and possess any Goods and Chattels whatsoever, and (notwithstanding the Statutes of Mortmain), to purchase, hold, and enjoy, to them and their Successors, any Lands, Tenements, and Hereditaments whatsoever, not exceeding, at the time or times of purchasing such Lands, Tenements, and Hereditaments respectively, the yearly value at a Rack Rent of One Thousand Pounds in the whole, without incurring the penalties or forfeitures of the Statutes of

Mortmain, or any of them: and by the name aforesaid to sue and be sued, plea and be impleaded, answer and be answered unto, defend and be defended in all Courts and places whatsoever, of Us, our Heirs, and Successors, in all Actions, Suits, Causes, and Things whatsoever; and to act and do in all Things relating to the said Corporation in as ample manner and form as any other Liege Subjects, being Persons able and capable in the Law, or any other Body Politic or Corporate, in our said United Kingdom of Great Britain and Ireland, may or can act or do: and also to have and to use a Common Seal, and the same to change and alter from time to time as they shall think fit.

And We do hereby declare and grant that there shall be an indefinite number of Fellows of the said Society, and that they the said George Earl of Dartmouth, Edward Earl Powis, Brownlow Lord Bishop of Winchester, John Lord Selsey, Charles Greville, Sir Joseph Banks, William Townsend Aiton, John Eliot, Thomas Andrew Knight, Charles Miller, Richard Anthony Salisbury, John Trevelyan, James Dickson, Thomas Hoy, and William Smith, shall be the first Fellows of the said Society, and that any five or more of them, all having been first duly summoned to attend the Meetings of the said Fellows, shall and may, on or before the First day of May next ensuing the date of these Presents, under their respective hands, in writing, appoint such other persons to be Fellows, Honorary Members, and Foreign Members of the said Society, as they may respectively think fit.

And We do further declare and grant, that, for the better Rule and Government of the said Society, and for the better direction, management, and execution of the Business and Concerns thereof, there shall be thenceforth for ever a Council, President, Treasurer, and Secretary of the said Society, to be elected in manner hereinafter mentioned; and that such Council shall consist of fifteen Members to be elected from among the Fellows as hereinafter directed, whereof any five shall be a quorum; and We do hereby nominate and appoint the said George Earl of Dartmouth, Edward Earl Powis, Brownlow Lord Bishop of Winchester, John Lord Selsey, Charles Greville, Sir Joseph Banks, William Townsend Aiton, John Eliot, Thomas Andrew Knight, Charles Miller, Richard Anthony Salisbury, John Trevelyan, James Dickson, Thomas Hoy, and William Smith, to be the first Council; the said George Earl of Dartmouth to be the first President; the said Charles Greville to be the first Treasurer; and the said Richard Anthony Salisbury to be the first Secretary to the said Society; all and each of the aforesaid Officers and Counsellors to continue in such their respective Offices until the First day of May One Thousand Eight Hundred and Ten: and that the said George Earl of Dartmouth shall have power to appoint such four Persons from and amongst the Members of the said Council, to be Vice-Presidents of the said Society, as he shall think fit, until some other Persons shall be chosen in their respective rooms, in the manner hereinafter mentioned.

And it is Our further Will and Pleasure that the Fellows of the said Society, or any eleven or more of them, shall and may, on the First day

of May One Thousand Eight Hundred and Ten, and also shall and may on the First day of May in every succeeding year, unless the same shall happen to be on a Sunday, and then on the day following, assemble together at the then last or other usual place of meeting of the said Society, and proceed, by method of Ballot, to put out and amove any three of the Members who shall have composed the Council of the preceding year, and shall and may in like manner by method of Ballot elect three other discreet persons from amongst the Fellows of the said Society to supply the places and offices of such three as may have been so put out and removed ; it being our Royal Will and Pleasure that one-fifth of the said Council and no more shall be annually changed and removed by the Fellows of the said Society: And also that they the said Fellows, or any eleven or more of them, shall and may at the time and in manner aforesaid, by method of Ballot, elect from amongst the Members of the said Council, when formed and elected in manner aforesaid, three fit and proper Persons ; one of such Persons to be President, another of such Persons to be Treasurer, and the other of such Persons to be Secretary of the said Society for the year ensuing : And also, in like manner, shall and may, in case of the death of any of the Members of the Council, or of the President, Treasurer, or Secretary for the time being, within the space of two months next after such death or deaths, in like manner elect other discreet Persons, being Fellows of the said Society, to supply the places and Offices of such Members of the said Council, or of the President, Treasurer, or Secretary so dying: And also shall and may appoint such other Persons to be Officers of the said Society for the year ensuing as they may think proper and necessary for the transacting and managing the Business thereof.

And it is Our further Will and Pleasure that, so soon after the Elections aforesaid as conveniently may be, the Person who shall at any time hereafter be elected to be President of the said Society, in manner aforesaid, may and shall nominate and appoint four Persons, being Members of the said Council, to be Vice-Presidents of the said Society for the year ensuing.

And We do further declare and grant, that, from and after the first day of May now next ensuing, the Fellows of the said Society, or any seven or more of them, shall and may have power from time to time at the general Meetings of the said Society, to be held at the usual place of meeting of the said Society or at such other place as shall have been in that behalf appointed, by method of Ballot, to elect such Persons to be Fellows, Honorary Members, and Foreign Members of the said Society, and all Fellows, Honorary Members, and Foreign Members, to remove from the said Society as they shall think fit. Provided that no such Fellow, Honorary Member, and Foreign Member shall be declared elected or removed, unless it shall appear upon such Ballot that two-thirds of the Fellows present at such Meeting shall have voted for the same.

And We do further declare and grant that the Council hereby appointed, and the Council of the said Society for the time being, or any three or more of them (all the Members thereof having been first duly

summoned to attend the Meetings thereof), shall and may have power according to the best of their judgment and discretion to make and establish such By-Laws as they shall deem useful and necessary for the Regulation of said Society, and of the Estate, Goods, and Business thereof, and for fixing and determining the times and places of meeting of the said Society, and also the times, place, and manner of electing, appointing, and removing all Fellows, Honorary Members, and Foreign Members of the said Society, and all such Subordinate Officers, Attendants, and Servants as shall be deemed necessary or useful for the said Society; and also for filling up from time to time any vacancies which may happen by death, removal, or otherwise, in any of the Offices or Appointments constituted or established for the execution of the Business and Concerns of the said Society; and also for regulating and ascertaining the qualifications of Persons to become Fellows, Honorary Members, and Foreign Members of the said Society respectively; and also the Sum and Sums of Money to be paid by them respectively, whether upon admission or otherwise, towards carrying on the purposes of the said Society; and such By-Laws, from time to time, to vary, alter, or revoke, and make such new and other By-Laws as they shall think most useful and expedient, so that the same be not repugnant to these Presents or the Laws of this our Realm.

Provided that no By-Law hereafter to be made, or alteration or repeal of any By-Law which shall hereafter have been established, by the said Council hereby appointed, or by the Council for the time being of the said Society, shall be considered to have passed and be binding on the said Society, until such By-Law or such alteration or repeal of any By-Law shall have been hung up in the Common Meeting-Room of the said Society, and been read by the President, or any one of the Vice-Presidents for the time being, at two successive General Meetings of the said Society, and until the same shall have been confirmed by Ballot by the Fellows at large of the said Society; such Ballot to take place at the ensuing Meeting next after such two successive General Meetings of the said Society, seven at least of the Fellows of the said Society being then present: and Provided that no such By-Law, or alteration or repeal of any By-Law, shall be deemed or taken to pass in the affirmative, unless it shall appear upon such Ballot that two-thirds of the Fellows present at such Meeting shall have voted for the same.

Witness His Majesty at Westminster, the 17th day of April, in the Forty-ninth year of Our Reign.

By Writ of Privy Seal,

WILMOT.

NEW CHARTER OF THE ROYAL HORTICULTURAL SOCIETY.

A.D. 1860.

VICTORIA, by the Grace of God, of the United Kingdom of Great Britain and Ireland Queen, Defender of the Faith, to all to whom these presents shall come, Greeting:

1. WHEREAS THE HORTICULTURAL SOCIETY OF LONDON, hereinafter referred to as "the said Society," was incorporated by Royal Letters Patent under the Great Seal of our said United Kingdom, bearing date at Westminster the 17th day of April in the 49th year of the reign of His late Majesty King George the Third, for the purpose of the improvement of Horticulture in all its branches, ornamental as well as useful.

2. And whereas it has been represented to Us that the said Society has sedulously pursued and successfuly promoted the objects for which it was incorporated; And it has been also represented to Us that, with the view of still further promoting such objects, an arrangement was lately entered into between the Commissioners for the Exhibition of 1851 (hereinafter referred to as "the Commissioners") and the said Society, which is contained in certain Articles of Agreement, dated the 24th day of July, 1860, and sealed with the corporate seals of the Commissioners and the said Society respectively, whereby it was agreed (amongst other things): first, that a piece of land at Kensington Gore containing 20 acres, or thereabouts, part of the estate of the Commissioners, should be leased to the said Society for a term of years; secondly, that the said Society, immediately after the execution by the said Commissioners of certain earthworks, should lay out and construct on the land an ornamental garden, with walks, trees, shrubs, terraces, steps, fountains, band-houses, statues, and vases, and at the north end of the said land a conservatory or winter garden, and expend not less than £50,000: and, thirdly, that the Commissioners, simultaneously with the progress of the works of the said Society, should at their own cost enclose the said land with arcades, distinguished as the upper arcades, central arcades, and lower arcades respectively, and that the upper arcades (except the parts thereof coloured green in the plan annexed to the said Articles of Agreement), and certain rights and easements as to the use or enjoyment of the central and lower arcades and the excepted parts of the upper arcades, should be included in the lease of the said land, and that the Commissioners shall expend the sum of £50,000 about such earthworks, and in erecting the said arcades. And it is also represented to Us that under the said Articles of Agreement the sum of £40,000 (part of the £50,000 to be expended by the said Society) is to be raised by debentures

(the remainder of the £50,000 having been already raised by donations and fees on the admission of Life Members), and divers stipulations or agreements are made thereby or contained therein for the application and disposition of the income of the said Society, it being part of such arrangements that the "receipts from the gardens," consisting of and including the moneys and income therein mentioned in that behalf, should be applied or disposed of in the following manner, viz., out of the gross amount of the "receipts from the gardens," such a sum as shall from time to time be allowed by the Committee hereinafter mentioned, in respect of the expenses therein mentioned of the said Society, and of carrying on the operations and concerns thereof, is in the first place to be retained by the said Society; secondly, there is to be then retained by the said Society, out of such receipts, the amount which may be, from time to time, payable by the said Society in respect of interest, not exceeding £5 per cent. on the sum of £40,000, to be borrowed on debentures as aforesaid, or on so much of the said sum of £40,000 as may remain unpaid or undischarged; and, thirdly, there is then to be paid by the said Society to the Commissioners, as rent, the yearly sum of £2,145, if the receipts shall be adequate for such payment, after retaining to the said Society the sums authorised to be retained by them, as therein mentioned, for the expenses and for the interest respectively aforesaid; but otherwise, such a sum only as shall be equal from year to year to the residue of the receipts over and above the sums so in precedence; and if there shall remain any surplus over and above the several payments hereinbefore mentioned, out of the "receipts from the gardens," there is to be paid to the Commissioners for their own use and as additional yearly rent, a sum equal to half such surplus: and, further, that by the said Articles of Agreement, it is provided or stipulated that for the purpose of regulating the amount to be retained by the said Society in each year for expenses, a Committee shall be appointed annually, which Committee is to consist of six persons, three of whom are to be appointed by the Commissioners and three by the said Society, and any three of such Committee are to form a quorum, so as one, at least, shall be a person appointed by the Commissioners, and one shall be a person appointed by the said Society; and as vacancies occur in each year, by death, incapacity, or resignation, such vacancies are to be filled up respectively by the Commissioners or the said Society, according as the original appointments were made by them respectively; and further, that the Committee is from time to time to select one of those Committee-men who have been appointed by the Commissioners as Chairman of such Committee, and he is to have an equal vote with the other Committee-men for the time being acting, and in case of equality a casting vote in addition; and the Committee is to have power to make bye-laws for their own government in the execution of the duties confided to them; and that it is also thereby provided or stipulated that the said Society shall devote and apply towards the liquidation of the debt of £40,000, to be raised by debentures as aforesaid, three-fifths of the money actually received by them from time to time, in respect of the "receipts from the gardens," after the retentions and payments aforesaid from and out of the "receipts from the gardens," for expenses and interest by the said Society and the rent to the Commissioners; and divers other agree-

ments or stipulations for carrying into effect, or consequent on, or relating to the said arrangement are contained in the said Articles of Agreement.

3. And whereas it is further represented to us, that by a Supplemental Agreement, dated the 20th day of November in the year 1860, and made and entered into in like manner between the said Commissioners of the one part, and the said Society of the other part (in which the said piece of land is referred to as "the gardens"), an arrangement has been made between the said parties for the occupation by the said Society of some additional land of the Commissioners shown on the plan annexed to such supplemental Agreement by a red colour adjoining or near "the gardens" (which additional land the Commissioners had, for the reason therein mentioned, declined to include in the lease to be granted under the first-mentioned Agreement), and for an access to "the gardens" by means of a lane or path shown on the same plan, marked with the colour "brown," and by the said supplemental Agreement the interest of the said Society in or with respect to the said additional land, and the right of the said Society with respect to such access, with the duties and rights of the said Society concerning the said additional land and access respectively are defined (the rent payable by the said Society in respect thereof being the nominal rent of 1*s*.), and power is reserved to the Commissioners at any time to resume possession of such additional land, and also, upon providing another road as therein mentioned, to stop up or take away the said road by or over which there is such access as aforesaid afforded to "the gardens."

4. And whereas it is further represented to Us that by further Articles of Agreement, dated the 1st day of March, in the year 1861, made and entered into in like manner between the said Commissioners of the one part, and the said Society of the other part; after reciting the aforesaid Articles of Agreement of the 24th day of July, 1860, and setting forth divers of the clauses or provisions contained in the same Articles, and reciting that the said Society and the Commissioners are each desirous of respectively having the right of increasing the outlay by them respectively undertaken to be made by the said therein recited Agreement, to any amount not exceeding as to each of them the sum of £10,000 over and above the respective sums of £50,000 by them respectively undertaken to be laid out as aforesaid, and of acquiring such rights and privileges as in the said further Agreement now in recital appear in respect of such additional outlay if made, it is thereby mutually agreed between the Commissioners and the said Society (amongst other things) that the said Society may at any time before the 1st day of January, 1864, borrow or take up on their debentures or other securities, any sum or sums of money not exceeding in the whole the sum of £10,000, in addition to the sum of £40,000 in the said therein-recited Agreement mentioned as having been borrowed, or for the borrowing of which arrangements had been made, and may within the like period lay out and expend the sum or sums so borrowed in addition to the original sum of £50,000 therein mentioned of the said Society, in and about such works and things as are in the clause in the said Agreement now in recital referred to as the 1st clause of the said therein-recited Agreement (being the clause

secondly mentioned in the recital hereinbefore contained of such Agreement) undertaken to be done by them, and in and about which such original sum of £50,000 is required by that clause to be expended, and that the Commissioners may at any time before the 1st day of January, 1864, lay out and expend such sum or sums of money as they may think fit, not exceeding in the whole the sum of £10,000, in addition to the original sum of £50,000 in the clause in the said Agreement now in recital referred to as clause 2 of the said therein-recited Agreement (being the clause thirdly mentioned in the recital hereinbefore contained of such Agreement) mentioned in and about such works, matters, and things as by that clause are undertaken to be done by them, and in and about which the same sum of £50,000 is required by that clause to be expended by them, and further that in case both or either of the parties thereto should think fit to make any such outlay, such parties respectively or party shall have no claim or demand against the other of them or against the gardens, or against the receipts from the gardens, save and except as thereinafter mentioned; *videlicet*, that with a view to compensate such parties respectively, or party in some degree for such additional outlay, the following alterations should be made in the said therein-recited Agreement and in the lease to be granted pursuant thereto, *videlicet*, the 14th clause (which provides for the application and disposition of "the receipts from the gardens," as hereinbefore mentioned), shall be altered and amended as follows, viz.:—Out of the gross amount of the receipts from the gardens there shall be first retained by the said Society such a sum as shall from time to time be allowed by the Expenses Committee, mentioned in the therein and first herein-recited Agreement in respect of the expenses mentioned in the said Agreement now in recital, being the same expenses as in the said therein and first herein-recited Agreement are directed to be first retained by the said Society from and out of "the receipts from the gardens." Secondly. There shall be then retained by the said Society out of such receipts the amount which may be from time to time payable by the said Society in respect of interest not exceeding £5 per cent. per annum, on the sum of £40,000 originally borrowed or agreed to be borrowed by them on debentures as aforesaid and on any further sum or sums they may borrow and expend in accordance with clause 1 of the Agreement now in recital, not exceeding £10,000, or on so much of the original and additional sums as for the time being may have been raised and shall not have been paid off; and, thirdly, there shall then be paid by the said Society to the said Commissioners, as rent, the yearly sum or sums therein and hereinafter in that behalf mentioned, if the receipts shall be adequate for such payment, after retaining to the said Society the sums authorised to be retained by them under the first and second heads of the present clause, but otherwise such a sum only as shall be equal from year to year to the residue of the receipts over and above the sums so in precedence, *videlicet*, if the Commissioners shall limit their outlay under clause 2 of the said therein and first herein-recited Agreement to £50,000, then the yearly sum of £2,145, only, but if under clause 2 of the Agreement now in recital they shall expend a larger sum, then an addition shall be made to such rent at the rate of £4. 5*s*. for every additional £100 which the

Commissioners shall think fit to expend in accordance with that clause, not exceeding £10,000 in the whole. And if there shall remain any surplus over and above the said several payments thereinbefore directed to be made or retained out of the "receipts from the gardens," there shall be paid to the Commissioners for their own use, and as additional rent, yearly (whether or not they make any additional outlay), a sum equal to half such surplus, and that it is by the said Agreement now in recital also provided (*inter alia*) that the clause (therein referred to as the 17th clause) of the said therein and first herein-recited Agreement relating to the application of the three-fifth shares of the said Society towards the liquidation of the said debenture debt of £40,000 shall be altered as follows: *videlicet*, the said Society shall devote and apply towards the liquidation of their debenture debt (whether it amount to the original sum of £40,000 only, or any increased amount under the authority of clause 1 of the Agreement now in recital), three-fifths of the money actually received by them from time to time in respect of the "receipts from the gardens," after the payments directed to be retained out of the said receipts for expenses and interest by the said Society and the rent to the Commissioners, and that certain alterations consequential on the execution of the said Agreement now in recital are thereby made in the other agreements or stipulations contained in the said therein and first herein-recited Agreement and hereinbefore mentioned or referred to.

5. And whereas it is further represented to Us that, in consequence of the arrangement and the several Articles of Agreement respectively aforesaid, and in order that the same and the objects thereof may, so far as regards the said Society, be fully carried into effect, it is necessary or expedient that the constitution of the said Society should be in some respects altered, and that the powers of the said Society should be enlarged, and it is also represented to Us that the usefulness of the said Society would be increased thereby, and that the said Society hath consented thereto. Therefore We have been besought to grant unto the persons now composing the Horticultural Society of London, and such other persons as shall be approved of and elected as hereinafter mentioned, Our Royal Charter of incorporation for the purposes aforesaid, and with and under such powers and directions as hereinafter mentioned. And it is Our will and pleasure that such Society shall henceforth be called "The Royal Horticultural Society."

6. Now know ye, that We, being desirous of promoting the objects of the said Society, and of increasing the usefulness thereof, have, of Our special grace, certain knowledge, and mere motion, given and granted, and we do hereby give and grant, That Our right, trusty, and well-beloved Cousin Henry John, Earl Ducie, Fellow of the Royal Society; Charles Richard, Lord Bishop of Winchester, Prelate of the Most Noble Order of the Garter; John Jackson Blandy, John Clutton, Charles Wentworth Dilke the younger, Charles Edmonds, Septimus Holmes Godson, Henry Thomas Hope, John Lee, Henry Pownall, James Veitch the younger, and Robert Wrench, (being respectively some of the persons now composing the Horticultural Society of London,) and all other persons now (with the persons respectively hereinbefore named) being

fellows or Members of the said Society, and such others as from time to time shall be appointed and elected in the manner hereinafter directed, and their successors, be and shall for ever hereafter continue and be, by virtue of these presents, one body politic and corporate, by the name of "The Royal Horticultural Society"; and them and their successors, for the purposes for which the Horticultural Society of London was incorporated by the same Letters Patent, and with and subject to such additions and modifications to or in the same purposes as appear in and by or flow from, or are consequent on, the said arrangement between the said Commissioners and the said Society, and the said Articles of Agreement of the 24th day of July, 1860, and of the 20th day of November, 1860, and of the 1st day of March, 1861, respectively, We do hereby constitute and declare to be one body politic and corporate, and by the same name to have perpetual succession, and for ever hereafter to be persons able and capable in the law, and to have power to hold and to purchase, receive and possess the goods and chattels already vested in or belonging to the Horticultural Society, incorporated by the recited Letters Patent, and any other goods and chattels whatsoever, and (notwithstanding the Statutes of Mortmain) to hold and to purchase, hold and enjoy to them and their successors, any lands, tenements, and hereditaments whatsoever, including as well the lands, tenements, and hereditaments now vested in or belonging to the said Society, or agreed to be leased to them as hereinbefore recited, as all other lands, tenements, and hereditaments wheresoever situate, such other lands, tenements, and hereditaments not exceeding in the whole the annual value of £5,000, without incurring the penalties or forfeitures of the Statutes of Mortmain or any of them, and by the name aforesaid to sue and be sued, plead and be impleaded, answer and be answered unto, defend and be defended, in all courts and places whatsoever of Us, Our heirs and successors, in all actions, suits, causes, and things whatsoever, and to act and do in all things relating to the said corporation in as ample manner and form as any other Our liege subjects being persons able and capable in the law, or any other body politic or corporate in Our said United Kingdom of Great Britain and Ireland, may or can act and do, and also to have and to use a common seal, and the same to change and alter from time to time as they shall think fit.

7. And we do hereby declare and grant that the several persons who respectively now are as aforesaid Members or Fellows of the first-mentioned Society, shall be or continue Members or Fellows, and shall be and continue subject and liable to all such duties and obligations as they are now subject or liable to as Members or Fellows of the first-mentioned Society, and that all such persons as shall be appointed and elected as hereinafter mentioned shall likewise become or be Fellows or Members of "the Society" hereby incorporated, which is hereinafter referred to as "the Society."

8. And We do further declare and grant, that for the better rule and government of "the Society," and for the better direction, management, and execution of the business and concerns thereof, there shall be henceforth such bodies and officers as are respectively hereinafter mentioned; that is to say, there shall be for ever a Council, one President,

a Treasurer, and a Secretary of "the Society" appointed, and to be elected in manner hereinafter mentioned, and with reference to the said Articles of Agreement dated the 24th day of July, 1860, between the said Commissioners and "the said Society," and so long as "the Society" shall hold and use or enjoy as aforesaid the said land mentioned in the same Articles of Agreement of the Commissioners at Kensington Gore in pursuance of the said arrangement, there shall be a Committee for regulating the amount to be retained by "the Society" in each year from the "Receipts from the Gardens" for expenses. The said Council shall consist of fifteen members appointed and to be elected as hereinafter mentioned, whereof any five shall be a quorum. The said Committee shall be appointed as hereinafter mentioned. And We do hereby nominate and appoint or confirm Our well-beloved Consort His Royal Highness Prince Albert, K.G., the said Earl Ducie, the said Bishop of Winchester, the said John Jackson Blandy, the said John Clutton, the said Charles Wentworth Dilke the younger, the said Charles Edmonds, the said Septimus Holmes Godson, the said Henry Thomas Hope, the said John Lee, John Lindley, F.R.S., the said Henry Pownall, William Wilson Saunders, F.R.S., the said James Veitch the younger, and the said Robert Wrench (who constitute the present Council of "the Society,") the Council. And We do hereby further nominate and appoint or confirm His Royal Highness the Prince Consort (now being President) the President, the said William Wilson Saunders (now being the Treasurer) the Treasurer, and the said John Lindley (now being the Secretary) the Secretary, of "the Society," (all and each of the aforesaid Councillors and Officers to continue in such their respective offices until the second Tuesday in the month of February, 1862; and as regards such of the said Councillors as shall not be balloted out from time to time as hereinafter mentioned, they shall continue in office until so balloted out). And We do also hereby nominate and appoint and confirm the said Earl Ducie, Bishop of Winchester, John Jackson Blandy, and Charles Wentworth Dilke (being the present four Vice-Presidents) to be the Vice-Presidents of "the Society," until some other persons shall be chosen in their respective rooms in the manner hereinafter mentioned.

9. And with respect to the said Committee to be appointed for regulating the amount to be retained by "the Society" for the expenses aforesaid from the "Receipts from the Gardens," We do hereby further declare and grant that such Committee shall consist of six persons, three of whom shall be appointed by the Commissioners, and three by the Council of "the Society," as hereinafter mentioned, and any three of such Committee shall form a quorum, so as one at least shall be a person appointed by the Commissioners and one appointed by "the Society." As vacancies occur in each year by death, incapacity, or resignation, such vacancies may be filled respectively by the Commissioners and "the Society" respectively, according as the original appointments were made by them respectively. The Committee shall from time to time select one of those Committee-men who have been appointed by the Commissioners as Chairman of such Committee, which Chairman shall have the power of voting on all occasions equally with the other Committee-men for the time being acting; and such Chairman,

in case of equality, shall have a casting vote in addition, and the said Committee shall have power to make bye-laws for their own government in the execution of the duties confided to them.

10. And it is Our will and pleasure also, that the Fellows of "the Society," or any eleven or more of them, shall and may, on the second Tuesday in the month of February in the year 1862, and on the second Tuesday in the month of February in every succeeding year, assemble together at the then last or other usual place of meeting of "the Society," or some other convenient place (which meeting shall be called the "Annual Meeting,") and that at each and every such meeting the Fellows then present shall proceed by method of ballot to put out and remove some three of the Members of the Council of the preceding year, and shall and may, by method of ballot, elect three other discreet persons from amongst the Fellows of "the Society," to supply the places of such three as shall have been so put out and removed (so that one-fifth of the Council shall be yearly removed and renewed by ballot as aforesaid). And it is Our will and pleasure also, that at each and every annual meeting the Fellows then present shall and may, in manner aforesaid, elect from among the Members of the Council for the year next ensuing, the President, Treasurer, and Secretary of "the Society" for such ensuing year (each of such offices to be filled by a distinct person), and also elect, as well in the first instance as annually from time to time afterwards from the members of "the Society," three persons, to form (with the three Committee-men appointed or to be appointed by the Commissioners,) the expenses Committee aforesaid for the year ensuing; and in case of the death or incapacity from any cause whatever of any of the Members of the Council, or of the President, Treasurer, or Secretary for the time being, or of any of "the Society's" Committee-men aforesaid, either before the first of the annual meetings aforesaid or between any two of such annual meetings, the said Council shall and may nominate or appoint some other discreet person or persons, being a Fellow or Fellows of "the Society," to supply the place or places of the Member or Members of Council and of the President, Treasurer, and Secretary respectively, and of the Committee-man or Committee-men respectively, or any or either of them respectively, so dying or becoming incapable, until the annual meeting next following such nomination or appointment; and such Member or Members of Council, President, Treasurer, and Secretary, and Committee-men or Committee-man respectively so nominated or appointed as aforesaid, shall until and on such next annual meeting be deemed to stand respectively for all purposes in the place of the person or persons respectively, or officers respectively, in or to whose place they respectively shall have been so nominated or appointed or should have succeeded; and further, as regards any Member or Members of Council dying or becoming incapable before the first annual meeting aforesaid, or in the interval between any two such annual meetings as aforesaid, and whose place or places shall not be supplied by the said Council as aforesaid, the place or places of such Member or Members of Council shall at the first or next annual meeting after the vacancy be supplied from the Fellows of "the Society," by ballot as aforesaid and in such case the number of Fellows to be balloted out at

such meeting shall be proportionably reduced, it being Our will and pleasure that the vacancy or vacancies by reason of death or incapacity, not supplied by the Council, and actually existing at the time of any annual meeting, shall be treated and supplied as and in lieu of a vacancy by ballot. And it is also Our will and pleasure that any such annual meeting as aforesaid may accept the resignation of, or for incapacity remove, any one or more of the Members of the Council for the time being, and elect in manner aforesaid any person or persons from among the Fellows in the place or places of the Members so retiring or being removed, in addition to the Member or Members which the Fellows present at such meeting are hereinbefore authorised to elect. And further, that it shall be lawful for any such annual meeting to resolve that the Secretary of "the Society" shall be a paid officer, and, accordingly, that such salary or compensation shall be paid to him as shall be determined by the said meeting, but in such case the Secretary shall be incapable of being a Member of the Council, and such meeting shall in manner aforesaid thereupon appoint a Member of Council in his place. And it shall also be lawful for any such annual meeting to resolve that the three members appointed by "the Society" to form part of the Committee for regulating the amounts to be retained by the said Society for the expenses aforesaid shall be paid, and accordingly that such salary or compensation shall be paid to them as shall be determined by the said meeting, but in such case the said Members of such Committee shall be incapable of being Members of the Council, and such meeting shall in manner aforesaid thereupon appoint Members of Council in their place.

11. And it is Our further will and pleasure, that so soon after the elections aforesaid as conveniently may be, the person who shall at any time hereafter be elected to be President of the said Society in manner aforesaid may and shall nominate and appoint four persons, being Members of the said Council, to be Vice-Presidents of "the Society" for the year ensuing.

12. And it is Our further will and pleasure, that the three persons who shall be appointed by the Commissioners Members of the said Expenses Committee shall be appointed simultaneously with or immediately before or after the appointment of the Members of the said Committee who shall be appointed by the Council, and that notice thereof shall be given by the Commissioners to "the Society" at the time of or immediately after the said appointment by "the Society," and that such Committee shall continue for the year ensuing. Nevertheless, on the death or incapacity of any or either of the Committee-men appointed by the Commissioners before the expiration of their or his year of office, the place of such deceased or incapable Committee-men respectively, or Committee-man, may be forthwith supplied by the Commissioners, and the person or persons so appointed shall continue in office until the time at which the deceased or incapable Committee-man would have vacated his office, if living.

13. And We do further declare and grant, that on, or at any time and from time to time after, the said second Tuesday in February, 1862, the Fellows of "the Society," or any seven or more of them, shall and may have power at the general meetings of "the Society," to be held at the usual place of meeting of "the Society," or at such other place as shall

have been in that behalf appointed by open voting (unless five or more Fellows then present shall in writing require a ballot, and in such case by method of ballot,) to elect such persons to be Fellows, Honorary Members, and Foreign Members of "the Society" as they shall think fit, and any of the Fellows, Honorary Members, and Foreign Members for the time being to remove from "the Society," the majority of the Fellows voting, in case of open voting, to bind the minority; in case of equality the Chairman to have a second or casting vote, but in case of a ballot no Fellow, Honorary Member, or Foreign Member shall be declared elected or removed, unless by a majority of two-thirds of the Fellows voting at such ballot. In case of a ballot scrutineers to be appointed, and the ballot to be taken at an adjourned meeting, in the like manner as is hereinafter mentioned in the 16th and 17th clauses; and further that all such persons as shall be elected Fellows or Members of "the Society" (other than Honorary and Foreign Members) shall, at the time of their election, or before they shall be entitled to enjoy the rights or privileges of members, sign a note or memorandum in writing, binding them to observe, perform, and abide by all the rules, laws, and regulations of "the Society," and that such note or memorandum shall constitute an agreement to the effect thereof with "the Society," and shall or may be enforced by "the Society"; and provided also that if any Member should refuse or neglect to pay his first or any annual subscription for the space of six calendar months next after the same shall, according to the rules or regulations of "the Society," become due or payable, or shall neglect or fail in the observance or performance of the same rules or regulations in anywise, then such non-payment, neglect, or failure may be treated at any general meeting of the Fellows of "the Society" as a forfeiture by the Fellow so making default as aforesaid of his rights and privileges as a Fellow or Member of "the Society," and in case of any resolution to that effect by the Fellows of "the Society" at a general meeting, every Fellow making such default shall by such default be deemed to have ceased to be a Fellow or Member, but without prejudice to the rights of "the Society" as regards the recovery of the arrears for the time being of the subscription of such Fellow or Member, it being hereby declared that such Fellow or Member shall continue liable to the payment of all such arrears.

14. And it is Our further will and pleasure, and We do further declare and grant, that "the Society" shall or may carry into effect the said arrangement between the said Commissioners and the first-mentioned Society, and that the Council of "the Society" shall or may do, perform, and execute such acts and things as shall or may be necessary or fit or expedient for that purpose, and generally for carrying into effect and performing on the part of "the Society" the said several Articles of Agreement dated the 24th day of July, 1860, and the 20th day of November, 1860, and the 1st day of March, 1861, respectively entered into between the said Commissioners and the first-mentioned Society, and in particular shall or may proceed to raise the said sum of £40,000, which by the first-mentioned Articles of Agreement is mentioned to be intended or to be then about to be raised by debentures, or such part or parts thereof as has not now already been or for the time

being shall not have been raised, and also when and as the said Council shall think fit, the said further sum of £10,000, which, by the said Articles of Agreement of the 1st day of March, 1861, the said Council are to have liberty to borrow or any part or parts thereof, or shall or may from time to time raise again or re-borrow any part or parts or sum or sums of money in respect of any money which shall at any time or from time to time be paid off or discharged, of or in respect of the said sums of £40,000 and £10,000, or any part thereof respectively, and shall or may for the purposes aforesaid, or any of them, or by way of security to the lenders, issue and deliver such debentures or other securities on behalf of or upon the property of "the Society" as the Council shall think fit, and without incurring any personal responsibility on account or in respect of the moneys now already raised or so to be raised or borrowed or raised again or re-borrowed, or by virtue of or under such debentures or securities, or in anywise howsoever in respect thereof, or of the matters aforesaid, or any of them; and We do hereby declare and grant that neither the Council of "the Society" nor any persons acting for or on behalf of "the Society" in the matter of the arrangement and the several Articles of Agreement, shall be personally responsible on account or in consequence thereof in anywise howsoever, and that they shall be respectively indemnified by or from the funds or property of "the Society" against all losses, costs, damages, and expenses, by reason or in consequence of the said arrangement, or the execution of the said Articles of Agreement or in relation thereto.

15. And We do further declare and grant that the Council for the time being of "the Society," or any five or more of them (all the Members thereof having been first duly summoned to attend the meetings thereof), shall and may have power, according to the best of their judgment and discretion, to make and establish such byelaws as they shall deem useful and necessary for the regulation of "the Society," and of the estate, goods, and business thereof, and for carrying into effect, on behalf of "the Society," the said arrangement between the Commissioners and the first-mentioned Society, and the said several Articles of Agreement, and the affairs in general of "the Society," and all matters or things in anywise relating thereto, and such byelaws from time to time to vary, alter, or revoke, and make such new and other byelaws as they shall think most useful and expedient, so that the same be not repugnant to these presents or the laws of this our realm. And further that the present existing byelaws of the said Society shall continue in force in their integrity, and shall be binding upon "the Society" hereby incorporated and the Members thereof, except and in so far as they shall be repealed or altered by any byelaw hereafter to be made by "the Society."

16. Provided that no byelaw hereafter to be made or alteration or repeal of any byelaw which shall hereafter have been established by the said Council hereby appointed, or by the Council for the time being of "the Society," shall be considered to have passed and be binding on "the Society," until such byelaw, or such alteration or repeal of any byelaw, shall have been adopted or confirmed at some general meeting of the Fellows at large of "the Society," either with or subject to any additions or amendments to or in the same which shall be resolved

upon or adopted by such meeting (it being competent for any Fellow present at such meeting to propose or move any such addition or amendment) or in its integrity. The votes upon such byelaws or any of them or the alteration or repeal in or of any such byelaws or byelaw, or upon any motion or resolution relating thereto, to be by open voting, unless any five Fellows present shall object to open voting, and shall require, by notice in writing to that effect signed by them and delivered to the chairman, the voting to be by ballot. In the case of open voting, the majority shall bind the minority, the Chairman may vote, and in case of equality may give a second or casting vote ; and provided that in the case of a ballot (but not in the case of open voting) no byelaw or alteration or repeal of any byelaw, shall be deemed or taken to pass in the affirmative, unless it shall appear that two-thirds of the Fellows voting shall have voted for the same. In every case of voting by ballot two Scrutineers shall be at once appointed by the Chairman, the Fellows present may proceed forthwith to vote, and the meeting shall be adjourned to some day, not being less than five days nor more than ten days from the original meeting, for taking or continuing such ballot, of which adjourned meeting, and of the object thereof, notice shall be given in some newspaper circulating in London two days at least before the day of such adjourned meeting.

17. And, lastly, every annual meeting shall be deemed a general meeting, and the Council may call at any time and from time to time any other general meeting of the Fellows of the Society. In case of a ballot under the 13th and 16th clauses respectively, the ballot shall be taken at an adjourned meeting on some day to be appointed at the general meeting at which the same shall be required within ten days next after such general meeting between the hours of twelve o'clock at noon and three in the afternoon. In Witness whereof We have caused these Our Letters to be made patent—

Witness Ourselves at Our Palace at Westminster this Eighth day of May in the 24th year of Our reign.

SUPPLEMENTAL ROYAL CHARTER GRANTED BY HER MOST GRACIOUS MAJESTY THE QUEEN EMPRESS

TO

THE ROYAL HORTICULTURAL SOCIETY.

A.D. 1899.

WHEREAS a Humble Petition has been presented to us by the Royal Horticultural Society, representing:—

1. That by Royal Letters Patent granted by his late Majesty King George III., and bearing date at Westminster the 17th day of April, in the 49th year of his reign, the Horticultural Society of London (hereinafter referred to as "the said Society") was incorporated for the purpose of the improvement of Horticulture in all its branches, ornamental as well as useful.

2. That upon representations to us that the said Society had sedulously pursued and successfully promoted the objects for which it was incorporated, and in consequence of an arrangement and certain agreements made between the said Society and the Commissioners for the Exhibition of 1851, with respect to a lease to the said Society of part of the Commissioners' estate at Kensington Gore, and other matters, it was by Royal Letters Patent granted by us, and bearing date at Westminster the 8th day of May, in the 24th year of our reign, declared to be our will and pleasure that the said Society should thenceforth be called "The Royal Horticultural Society": And by the same Letters Patent (hereinafter referred to as "the New Charter") all persons being then Fellows or Members of the said Society, and such others as should from time to time be appointed and elected in manner thereinafter mentioned, and their successors, were incorporated by the name of the Royal Horticultural Society (hereinafter referred to as "the Society") for the purposes for which the said Horticultural Society of London was incorporated by the Letters Patent granted by his late Majesty King George III., with and subject to such additions and modifications to or in the same purposes as appeared in and by, or flowed from or were consequent on, the said arrangement and agreements.

3. That the New Charter contained numerous provisions relating to the said arrangement and agreements, but the lease granted by the

Commissioners to the said Society, and the said agreements, have expired, and the said provisions of the New Charter have consequently become superfluous and valueless.

4. That it has now become desirable to define more precisely the objects of the Society, and to alter the provisions of the New Charter relating to the retirement and election of members of the Council, and to empower the Society to provide by bye laws for some of the details now contained in the New Charter, and to make other alterations and improvements in the New Charter with a view to expunging obsolete matter, and to greater simplicity and brevity.

5. That a Draft of the Petition for such Charter, and also a Draft of the proposed Charter had been submitted to and approved by a special general meeting of the members of the Society, held on the 21st day of July, 1899,

And praying that we would grant to the Society a Supplemental Royal Charter in the terms of the Draft Charter annexed to the said Petition, or in such other terms as to us, with the advice of our Honourable Privy Council, might seem meet.

NOW KNOW YE that We, considering the said Petition, and being satisfied that the objects of the Society are laudable, and being desirous of promoting its advancement and interest, have of our special grace certain knowledge and mere motion given and granted. And We do hereby give and grant as follows, that is to say :—

I.

Our trusty and well-beloved Sir James John Trevor Lawrence, Baronet, Sir John Talbot Dillwyn Llewelyn, Baronet, and John Thomas Bennett-Poë, Sydney Courtauld, Thomas Burt Haywood, Philip Crowley, Joseph Gurney Fowler, James Hudson, Frederick George Lloyd, Robert McLachlan, William Marshall, Hugo Müller, Alfred Hetley Pearson, Charles Edward Shea, and Harry James Veitch, and all other persons now being Fellows or Members of the Society, and such others as from time to time shall be appointed and elected in manner hereinafter directed, and their successors, shall for ever hereafter continue and be by virtue of these presents one body politic and corporate, by the name of "The Royal Horticultural Society." And them and their successors, for the purpose of the encouragement and improvement of scientific and practical horticulture in all its branches, We do hereby constitute and declare to be one body politic and corporate, with perpetual succession and a Common Seal, with power from time to time to alter the same and with power to hold, deal with, and dispose of all personal property already vested in or belonging to the Society, and to acquire, hold, deal with, and dispose of any other personal property whatsoever, and (notwithstanding the Statutes of Mortmain) to hold, deal with and dispose of the lands, tenements, and hereditaments now vested in or belonging to the Society, and to acquire, hold, deal with and dispose of other lands, tenements, and hereditaments wheresoever situate, such

other lands, tenements and hereditaments not exceeding in the whole the annual value of £5,000, without incurring the penalties or forfeitures of the Statutes of Mortmain or any of them. And with power by the name aforesaid to sue and be sued, and to act and do in all things in as ample manner and form as any other body politic or corporate in our United Kingdom of Great Britain and Ireland may or can act and do.

II.

The several persons now Fellows or Members of the Society shall continue or be Fellows or Members of the Society hereby incorporated, and shall continue and be subject and liable to all such duties and obligations as they are now subject or liable to as Fellows or Members of the Society, or such other duties and obligations as may be from time to time prescribed by bye-laws. Subject as aforesaid, the Society hereby incorporated shall consist of Fellows or Members of such classes and designations as may be from time to time prescribed by bye-laws.

III.

The government of the Society hereby incorporated, and of its business and affairs, shall be vested in a Council consisting of fifteen persons being Fellows of such Society.

IV.

The persons who are now members of the Council of the Society shall be Members of the Council of the Society hereby incorporated, and shall hold office till the Annual Meeting of such Society in the year 1900.

At that Annual Meeting, and at the Annual Meeting in every succeeding year, one-fifth of the Members shall retire from office, and their places shall be filled by election of three Members at the Annual Meeting, but no Fellow shall be capable of being so elected unless he shall have been nominated in writing by two or more Fellows fourteen days prior to the Annual Meeting, in such manner as may be from time to time prescribed by bye-laws.

At the Annual Meetings in the years 1900, 1901, 1902, and 1903, the Council shall prescribe the one-fifth of the original Members who are to retire, and in succeeding years the one-fifth of the Members who have been longest in office shall retire. Retiring Members shall, in all cases, unless disqualified under some bye-law for the time being in force, be re-eligible.

V.

The Officers of the Society hereby incorporated shall be a President, one or more Vice-Presidents, a Treasurer, and a Secretary, and such other officers as may be from time to time prescribed by bye-laws.

VI.

The persons who now fill the respective offices of President, Vice-President, Treasurer, and Secretary shall hold their offices till the Annual Meeting in the year 1900.

At that Meeting, and at the Annual Meeting in each succeeding year, a President, one or more Vice-Presidents, a Treasurer, and a Secretary shall be appointed by the meeting to hold office till the ensuing Annual Meeting, the holders of each of those offices being in all cases (unless disqualified under some bye-law for the time being in force) re-eligible.

VII.

The Council shall have power from time to time to make bye-laws for the Society hereby incorporated, and from time to time to revoke, alter, or amend any bye-law theretofore made. Provided that no such bye-law, nor any such revocation, alteration, or amendment shall take effect unless and until the same shall have been submitted to and sanctioned (either with or without any addition omission or alteration) by a majority of a General Meeting duly convened, it being competent for any Fellow present and entitled to vote at such meeting to propose any such addition omission or alteration as aforesaid, on giving such notice (if any) thereof as may be from time to time prescribed by bye-laws. And provided that the notice convening such meeting shall contain a notification that such new bye-law, or such revocation alteration or amendment will be taken into consideration at such meeting.

Provided always that the said bye-laws shall comply with the provisions and directions of these presents, and shall not be in any manner repugnant thereto, or to the laws and statutes of this realm.

VIII.

Subject as aforesaid, the bye-laws of the Society hereby incorporated may provide with respect to all or any of the following matters (namely) :—

(*a.*) The carrying out of any of the objects of such Society.

(*b.*) The qualifications, election, removal, and classification of Fellows or Members of such Society, and the conditions of Fellowship or Membership, including the contributions to be paid to the funds of such Society.

(*c.*) The qualifications, election, appointment, removal, continuance in office, and duties of the Members of the Council, and the mode of filling casual vacancies arising by death, resignation, or otherwise.

(*d.*) The qualifications, election, appointment, removal, dismissal, and remuneration of the officers and servants of such Society, and the mode of filling casual vacancies arising by death, resignation, or otherwise.

(*e.*) The summoning and holding of, and the proceedings at Meetings of such Society, including the voting at such Meetings, and the rights and duties of Fellows or Members present thereat, and the quorum necessary to constitute the same.

(*f.*) The summoning and holding of, and the proceedings at Meetings of the Council, the quorum of the Council, and the business, powers and duties of the Council.

(*g.*) The appointment of Committees of the Council for inquiring and reporting to either the Council or Meetings, or for the management of any part of the affairs of such Society, or the promotion or execution of any of its objects.

(*h.*) The management of the funds and property of such Society, and the conduct of the business and affairs of the Society.

(*i.*) Any matters connected with or relating to the affairs or government of such Society.

IX.

So much of the Letters Patent granted by his late Majesty King George III., and bearing date at Westminster, the 17th day of April, in the 49th year of his reign, and so much of the Letters Patent granted by ourselves, and bearing date at Westminster, the 8th day of May, in the 24th year of our reign, as is inconsistent with these presents, is hereby revoked and annulled, without prejudice nevertheless to anything done or suffered thereunder.

In Witness whereof we have caused these Our Letters to be made Patent. Witness Our self at Westminster the Fourteenth day of November in the Sixty-third year of Our Reign.

By Warrant under the Queen's sign manual.

MUIR MACKENZIE.

Seal

BYE-LAWS

OF THE

ROYAL HORTICULTURAL SOCIETY,

Adopted at a General Meeting held on July 3rd, A.D. 1900.

EPITOME OF THE CHARTER OF 1899.

I.—The Society is a Corporate Body, of an indefinite number of Fellows or Members, by the name of "The Royal Horticultural Society," with perpetual succession, and a Common Seal.

II.—It is governed by a Council of fifteen persons, being Fellows of the Society.

III.—At every Annual Meeting three Members of Council retire from office and three are elected. A President, one or more Vice-Presidents, a Treasurer, and a Secretary are appointed annually at the same meeting. Those retiring from office are eligible for re-election unless disqualified under some Bye-Law for the time being in force.

IV.—The Council may make, revoke, alter, or amend Bye-Laws for the regulation of the Society, its government, property, business, and affairs, or matters relating thereto, subject to such Bye-Laws being sanctioned by a subsequent General Meeting.

BYE-LAWS.

*** NOTE.—*The Bye-Laws shall comply with the provisions and directions of the Charter, and shall not be in any manner repugnant thereto or to the laws and statutes of the realm.—Charter* 1899, *Cap. VII.*

CHAPTER I.

General.

1. All the existing bye-laws of the Society are hereby revoked, and the following bye-laws are substituted in their place.

2. Wherever the context or meaning requires it, words implying the singular shall imply the plural, and male, female, and *vice versâ.*

3. The Council shall have power to regulate admission to and to close the Exhibitions, Gardens, and Rooms of the Society in such manner and at such times as they may consider necessary in the interests of the Society.

CHAPTER II.

Election and Admission of Fellows.

4. Every candidate for admission as a Fellow of the Society must be proposed by two or more Fellows.

5. The proposers must sign a certificate in recommendation of the candidate in the form marked A in the Appendix annexed hereto, and forward such certificate to the Secretary of the Society.

6. Such certificate of recommendation shall be laid before the Council of the Society for approval, and if approved the name of the proposed new Fellow shall be read at the next ensuing general meeting, and the election of the candidate shall be then put to the vote, unless a ballot is demanded in writing under the hands of five or more Fellows present, in which case the election shall be postponed until the next ensuing general meeting.

7. When the voting is open, the candidate shall be elected if a majority of the Fellows voting record their votes in his favour; when the voting is by ballot, a majority of two-thirds of the Fellows voting at such ballot is required.

8. When a ballot has been demanded, two scrutineers shall be appointed by the Chairman of the ensuing meeting, and it shall be their duty to superintend the ballot, and report the result to the Chairman, the manner in which the ballot is taken being such as the Council shall from time to time direct.

9. Every candidate elected, as aforesaid, shall become, and be admitted to enjoy the rights and privileges of, a Fellow on paying his first subscription and signing the form of obligation marked C in the Appendix.

10. Ladies may be admitted Fellows or Members of the Society.

CHAPTER III.

Subscriptions and Privileges of Fellows.

11. Each Fellow shall pay an annual subscription at his option of £4. 4*s*., and be entitled to

(i.) A vote at all meetings of the Society.

(ii.) Personal admission to all Conferences, General Meetings and Exhibitions, and to the Society's Rooms, Gardens, and Library, subject to the regulations of the Council for the time being in force.

(iii.) A copy of the Society's *Journal* post free.

(iv.) *One* non-transferable (personal) Pass and *Five* transferable tickets;

or of £2. 2*s*., and be entitled to

(i.), (ii.), and (iii.) as above.

(iv.) *One* non-transferable Pass and *Two* transferable tickets;

or of £1. 1*s*., and be entitled to

(i.), (ii.), and (iii.) as above.

(iv.) *One* transferable ticket in lieu of the personal Pass.

12. Any Fellow wishing to commute his Annual Subscription may do

so by making one payment of Forty Guineas in lieu of a £4. 4*s*. annual subscription; of Twenty-five Guineas in lieu of a £2. 2*s*. annual subscription; or of Fifteen Guineas in lieu of a £1. 1*s*. annual subscription; such commutation entitling the Fellow for life to all the privileges of the corresponding annual subscription.

13. The annual subscription is payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, shall pay the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he shall pay half a year's subscription; if elected after the 1st of October and before the 1st of January, he shall pay at the time of his election the full amount of the subscription for the year commencing from the 1st day of January then next, and no further subscription until the next succeeding 1st of January.

14. All subscriptions that have not been paid within three months after they have become due shall be reported by the Treasurer, and the Council shall take such measures as they consider expedient in respect thereof. Fellows shall have no claim to any privileges of the Society arising before the date of the payment of their first subscription, or after the date of their resignation.

15. A Fellow whose subscription is in arrear shall not be entitled to vote at any meeting of the Society, or to exercise any other rights or privileges of a Fellow.

16. The Council shall have power to exempt from payment of any subscription any number of Fellows, consisting of eminent British men of science, provided that the number so exempted shall at no time exceed twelve; and such Fellows shall be entitled to the same rights and privileges as Fellows paying an annual subscription of £1. 1*s*.

CHAPTER IV.

Election, Subscription, and Privileges of Associate-members.

17. The Council shall have power to elect as an Associate-member of the Society any *bonâ fide* gardener or employé in any Public or Botanic Garden, Nursery, Market Garden, or Seed Establishment who may be recommended to them for that purpose by two Fellows of the Society, one of whom shall be personally acquainted with the candidate in question.

18. An Associate-member shall pay an annual subscription of 10*s*. 6*d*.

19. Associate-members shall be entitled to personal admission to all Conferences and Exhibitions, and to the Society's Gardens and Library, subject to the regulations for the time being in force.

CHAPTER V.

Honorary and Corresponding Members.

20. Distinguished persons who have rendered important services to Horticulture may be elected by the Council Honorary or Corresponding Members of the Society.

21. There shall be transmitted to each Honorary or Corresponding

Member, after his election, a diploma of his election, under the common seal of the Society.

22. Honorary and Corresponding Members shall be exempted from the payment of any annual subscription. They shall be entitled to free admission to the Society's Rooms, Gardens, and Library, and to all Exhibitions and Conferences.

23. The provisions herein contained with respect to the removal of a Fellow shall, with the necessary variations, apply to the removal of Honorary and Corresponding Members.

CHAPTER VI.

Resignation, Removal, and Disqualification of Fellows and Associate-members.

24. If any Fellow or Associate-member refuse or neglect to pay his annual subscription for the space of six calendar months next after it has become due, or neglects or fails to observe or conform to the bye-laws and regulations of the Society, the Fellows assembled at a general meeting may, by resolution, declare such Fellow or Associate-member to have forfeited his rights and privileges as such, and he shall thereupon cease to be a Fellow or Associate-member. Nevertheless he shall continue liable to the payment of all arrears of subscription due to the Society, and the Society may recover the same by process of law.

25. Any Fellow or Associate-member who desires to retire from the Society shall be at liberty to do so, provided that he shall have paid all subscriptions and arrears and other sums, if any, due from him to the Society, and shall have returned or made full compensation for any books or other property borrowed or taken by him from the Society, by giving to the Secretary, before December 31 in any year, at the offices of the Society, a written notice of such his desire; but until the receipt of such notice every Fellow or Associate-member, unless removed from the Society under the bye-laws, shall remain liable for all continuing accumulations of annual subscriptions.

26. If any Fellow or Associate-member purpose to reside abroad for more than a year, and give due notice of such his intention in a letter addressed to the Secretary at the offices of the Society, the Council may release him from all payments to the Society accruing due during the time of his residence abroad; but he shall not, during such period, enjoy any of the rights or privileges of a Fellow or Associate-member.

27. A Fellow, Honorary or Corresponding member, or Associate-member may be removed from the Society by a vote of a general meeting, but no proposal for such removal shall be submitted to or entertained by such meeting until (*a*) a proposal for such removal stating in full the reasons for such removal, signed by ten Fellows of the Society, shall have been delivered to the Secretary at the office of the Society; and (*b*) a resolution of the Council that a *primâ facie* case has been made out for such removal shall have been passed. In the event of a compliance with both of these conditions, a general meeting of the Fellows of the Society shall

be called by the Council at such time and place, and upon such terms, and subject to such conditions as the Council may decide.

28. As soon as the resolution of the Council referred to in the last bye-law has been passed, a copy of the proposal delivered at the Society's office shall forthwith be sent by post, under registered cover, to the address (as entered in the Society's books) of the person proposed to be removed. Such proposal and its publication shall be deemed a privileged communication.

CHAPTER VII.

Annual and General Meetings.

29. There shall be held in every year, on the second Tuesday in February, a meeting of the Fellows of the Society, to be called the annual meeting, but deemed also a general meeting.

30. At this meeting the Council shall present to the Society a Report of their proceedings for the past year; and the election of members of Council and the Officers of the Society, as prescribed in the Charter, shall take place.

31. At this meeting any other business relating to the affairs of the Society may be transacted. Notice of the day, time, and place of holding the annual meeting shall be sent to all Fellows of the Society not less than seven days before the date of such meeting.

32. The annual and all other general meetings shall be held at the usual place of meeting of the Society, or at some other convenient place appointed by the Council, and at such time as may be determined by the Council, at least seven days' notice having been given.

33. The Council may, whenever they think fit—and they shall upon a requisition in writing signed by not less than twelve Fellows of the Society—call a general meeting; but every such requisition shall express the object of the meeting proposed to be called, and shall be left at the offices of the Society, addressed to the Secretary; and upon receipt of such requisition it shall be the duty of the Council to summon a general meeting to be held within twenty-one days thereafter.

34. Notice of the day, time, and place of holding such general meeting called upon the requisition of Fellows, and full particulars of the business to be transacted thereat, shall be given, one week at least before the meeting, in one or more of the London newspapers; and at such meeting no other business except that for which the meeting is called shall be transacted.

35. The President of the Society shall have power to summon a general meeting whenever he may consider it urgently necessary to do so.

CHAPTER VIII.

Proceedings at General Meetings.

36. The quorum present at any meeting other than the annual meeting shall be ten, and no business shall be transacted unless such quorum is present.

37. If within one hour from the time appointed for the meeting a quorum is not present, the meeting, if a meeting convened upon a requisition of Fellows, shall be dissolved; in any other case it shall stand adjourned to such place, day, and time as the Council shall direct; and if at such adjourned meeting a quorum is not present within one hour after the time appointed for such meeting, the meeting shall be dissolved.

38. The President, or in his absence some other member of Council, shall take the chair at all meetings; in case of the absence of all the members of the Council, one of the Vice-Presidents shall take the Chair, or in case of their absence, the Fellows present shall choose one of their number as Chairman.

39. At all meetings notes of the proceedings shall be taken, and minutes thereof shall afterwards be duly copied in a minute book to be kept for that purpose; and the first business shall be to read the minutes of the last meeting, and the Chairman of the day shall sign the same.

40. The Chairman may, with the consent of the meeting, adjourn any general meeting from time to time, and from place to place, but no business shall be transacted at any adjourned meeting other than such as was proposed to have been transacted at the meeting from which the adjournment was made.

41. Notice of such adjournment shall be given in such a manner as the Chairman of the meeting may direct.

42. The Council shall have power to direct that the voting on any question brought before the annual or any general meeting shall, if they think it necessary for the welfare of the Society, be taken by ballot.

43. At all general meetings the voting shall be open, except in the special cases where a ballot is directed by the Council or required by the bye-laws.

44. When the voting is open, it shall be conducted in such manner as the Chairman thinks most convenient for the purpose of ascertaining the sense of the majority of the meeting. When the voting is by ballot, the ballot shall be conducted as the Council shall direct.

45. The decision of the majority of Fellows voting at a meeting shall be considered as the decision of the meeting, except in the special cases where a larger majority is required by the Bye-laws, or where the consideration of a proposal is adjourned under Bye-law 46 or 49. In the case of an equality of votes the Chairman shall have a second or casting vote, but not to make up a prescribed quorum.

46. With respect to any proposal brought before a General Meeting and considered by the Chairman, or by a majority of the Members of Council present at such meeting, to be of vital importance to the welfare of the Society, the Chairman may, and (if requested by a majority of the Members of Council present) shall (whether a vote shall have been taken or not) adjourn the consideration of such proposal to a subsequent General Meeting (to be held within twenty-eight days thereafter), to enable the Council, if they think fit, to refer the decision on such proposal to the whole body of the Fellows, and to take a poll of the Fellows "for" or "against" it; and in the event of such adjournment any vote already taken upon such proposal shall be deemed inoperative and not to have been taken. And the meeting shall there-

upon nominate four Fellows to act as scrutineers of the poll (if taken), two of whom shall be chosen from the Members of the Council, and two from the general body of Fellows holding no official position in the Society.

47. If the Council shall resolve to refer the decision on any proposal (the consideration of which has been adjourned under Bye-law 46) to the whole body of the Fellows, the Council shall, within ten days after the meeting at which such adjournment has taken place, issue by post to every Fellow of the Society residing in the United Kingdom a copy of such proposal upon a voting paper in the form marked "D" in the Appendix. But the Council shall not therewith, or otherwise thereafter, at the expense of the Society, send any communication tending to influence the votes of the Fellows.

48. On a poll being taken upon any proposal, the scrutineers shall examine all voting papers returned to the Office of the Society within ten days after the dispatch thereof, and shall classify the votes of the Fellows and report the result to the Chairman of the General Meeting to which the consideration of such proposal has been adjourned. In a poll every Fellow shall have one vote, and one only, and the proposal shall be decided in accordance with the result of the poll.

49. Where any proposal is brought before a General Meeting and the majority for or against it does not exceed three-fifths of the total number of the Fellows present, the minority shall be entitled to demand a poll of the whole body of the Fellows, in which case the consideration of such proposal shall be adjourned, and the poll shall be conducted in the manner prescribed by Bye-laws 46, 47, and 48.

CHAPTER IX.

Council and Officers.

50. The government of the Society, and the direction of its concerns, shall be entrusted to the Council, subject to no other restrictions than are imposed by the Charter and bye-laws, and to no other interference than may be competent to the Fellows in general meeting assembled.

51. The Council may from time to time make such regulations as they think fit in regard to the Society's Gardens, Library, Exhibitions and Shows for the admission of the public by payment or otherwise.

52. The Council may provide for the affiliation of any Horticultural Societies and their members with the Society, and participation in such of its privileges, and upon such terms as the Council think fit.

53. The Council shall have power from time to time to appoint all salaried officials (except the Secretary), gardeners, clerks, and other persons necessary for transacting the business of the Society; to determine their number, duties, and salaries; and to remove such persons whenever they think fit.

54. The Council may appoint Committees to examine into, and report to them on, any special matters, scientific or otherwise, relating

to the objects or concerns of the Society; and may require such Committees to report, and may dissolve or alter the constitution of such Committees whenever they think proper.

55. The President, Secretary, or any three members of the Council may at any time call a meeting of the Council.

56. No meeting of the members of the Council shall constitute a meeting of the Council unless five or more members be present.

57. The President shall always be one of the members of Council, and shall be the Chairman of all meetings of the Council; or in case of his absence, some other member of the Council shall be elected as Chairman by the meeting.

58. The decision of the majority of members voting at a meeting of Council shall be considered as the decision of the Council, and the Chairman shall be entitled to vote; and if the votes on either side be equal, to give a second or casting vote, but not merely to make up a quorum.

59. Notes of the proceedings of every meeting of the Council shall be taken by the Secretary or his Assistant, and minutes thereof shall afterwards be made in a minute book to be kept for that purpose. The first business at every meeting of the Council shall be to read the minutes of the last previous meeting, and the Chairman of the day shall sign the same.

60. One-fifth of the Members of Council shall retire every year at the annual meeting. In the years 1900, 1901, 1902, and 1903, the Council shall prescribe the one-fifth of the original members who are to retire, and in succeeding years the one-fifth of the members who have been longest in office shall retire. Retiring members shall in all cases be eligible for re-election, unless disqualified under some bye-law for the time being in force.

61. Any member of the Council may resign his seat on the Council, and the Council shall have power to fill up the vacancy so caused.

62. If any member of the Council dies, or becomes incapacitated from any cause whatever before the expiration of his term of office, the Council shall fill up the vacancy so caused.

63. For the purpose of the last bye-law, a member of the Council may, by resolution of the Council, be declared incapacitated who shall fail to attend a meeting of Council for six calendar months, or who shall be suffering from any bodily or mental disqualification.

64. If at the time of any annual meeting a vacancy in the Council, created by the death, resignation, or incapacity of any member, has not been filled up by the Council, such vacancy shall be filled up at that meeting.

65. Any member of the Council may be removed for incapacity by a resolution passed at an annual meeting. The meeting at which such member is removed shall conclusively judge of what constitutes incapacity for the purposes of such removal: but no proposal for the removal of a member of the Council shall be entertained by an annual meeting unless there has been left with the Secretary, on or before the 1st of January preceding the annual meeting, a notice stating the name and address of the member proposed to be removed, and stating fully the nature of the incapacity in respect of which such proposal is made, nor unless such

notice is signed by the Fellow intending to propose the removal, and backed by the signatures of ten other Fellows of the Society. The vacancy in the Council so created shall be filled up at the same meeting.

66. A copy of the notice so left shall forthwith be sent by post by the Secretary, under registered cover, to the address of the member proposed to be removed.

67. A member of Council who is elected to fill a vacancy caused otherwise than by effluxion of time shall be deemed to represent the member in whose place he is elected, and shall retire at the time when the term of office of such last-mentioned member would have expired by effluxion of time.

68. Any retiring member of Council who shall not have attended more than three meetings of the Council during the twelve months preceding any annual meeting shall not be eligible for re-election as a member of Council at that meeting, unless the Council shall have declared by Resolution that his non-attendance has been due to unavoidable causes.

69. The President, the Vice-Presidents, the Treasurer, and the Secretary shall vacate their offices on the second Tuesday in the month of February in every year, but shall be re-eligible. In the event of any vacancy occurring in any of these offices by the death, resignation, or incapacity of any of the officers, such vacancy may be filled up by the Council, *ad interim*, until the next annual meeting.

70. No person shall at the same time hold any two of the offices of President, Treasurer, and Secretary.

71. The offices of President, Vice-President, and Treasurer shall be honorary. The office of Secretary shall also be honorary unless the Council resolve that he shall be a paid officer, in which case he shall be incapable of being a member of the Council.

72. A Chartered Accountant, not being a member of the Council, shall be appointed by the annual meeting in each year to act as Auditor for the ensuing year. In the case of the Auditor dying, becoming incapacitated, or declining or neglecting to act during the course of the year, the Council shall have power to appoint another *ad interim* in his place till the next annual meeting.

CHAPTER X.

Election of Council and Officers.

73. Any two or more Fellows desiring to nominate any other Fellow for election to the Council, or for appointment to the office of President, Vice-President, Treasurer, or Secretary, shall leave a nomination in writing signed by them at the offices of the Society at least fourteen days prior to the date of the annual meeting.

74. Not less than seven days before the annual meeting in each year the Council shall prepare a list of the names of all Fellows duly

nominated for election as members of Council and for appointment to the offices of President, Vice-President, Treasurer, and Secretary respectively with the names of the nominators of each such Fellow and shall circulate such list amongst the Fellows, and such list shall (if necessary) be used as a balloting paper.

75. If the number of Fellows duly nominated for election as members of Council does not exceed the number of vacancies to be filled at such annual meeting, all the Fellows so nominated shall be declared duly elected, and if one Fellow only shall be nominated for appointment to the office of President, Treasurer, or Secretary, the Fellow so nominated shall be declared duly appointed.

76. If the number of Fellows duly nominated for election as members of Council exceeds the number of vacancies to be filled, the number required to fill the vacancies shall be elected by ballot from amongst the Fellows so nominated. And if more than one Fellow is nominated for appointment to the office of President, Treasurer, or Secretary, the appointment to such office shall also be made by ballot from amongst the Fellows so nominated.

77. The Auditor shall be nominated and appointed in the way prescribed for the nomination and appointment of President, Treasurer, and Secretary; but he need not necessarily be a Fellow of the Society. The names of all persons duly nominated for appointment to the office of Auditor, with the names of the nominators of each such person, shall be included in the list provided for by Bye-law 74.

78. If any Fellow add any name or names other than those in the balloting-paper, or if he mark more than the proper number of names, such balloting-paper shall be deemed void, and be disregarded by the scrutineers in casting up the number of votes.

79. If from any cause no election, or an incomplete election, of members of the Council or of officers take place, the places of such of them as have not had their places filled up in pursuance of these bye-laws shall be filled up by the Council.

CHAPTER XI.

Property of the Society.

80. The property of the Society, and all additions to the same, shall be exclusively employed, under the direction of the Council, in promoting the objects of the Society as declared by the Charter of 1899; and, save as hereinafter mentioned, no dividend, gift, or bonus in money shall under any circumstances whatever be paid or made unto or between any of its Fellows. But the provisions of this bye-law shall not be construed to prevent Fellows from competing for and receiving prizes in money, medals, &c., at any of the Exhibitions of the Society, and shall not interfere with privileges of the Fellows as to seeds, plants, cuttings, grafts of plants, and publications of the Society.

81. The Council shall have power to award and pay to any official of the Society any donation or pension which they may think deserved.

CHAPTER XII.

Accounts.

82. The Treasurer shall sign all drafts to be paid by the bankers, and shall see that all receipts and payments by or on account of the Society are regularly entered in the Society's cash-book.

83. All drafts signed by the Treasurer shall be countersigned by such one of the Society's officials as the Council may appoint to this duty.

84. The Treasurer shall not issue any drafts for any sum above £20 without the authority of the Council, excepting drafts for the payment of all rents, rates, taxes, salaries, pensions, prizes, insurance, and interest on loans, mortgages and debentures, as and when they shall become due, provided that the respective amounts and times of such payments have been previously fixed by the Council.

85. The Chief Cashier shall, under the direction of the Treasurer, be responsible for all money received and paid at the offices of the Society, and shall pay the same to the Society's bankers, and, with the exception of the amount allowed him for petty cash, shall not retain in his own hands any of the Society's money, and he shall enter duly in the Society's cash-books all money so received and paid.

86. The Council shall cause true accounts to be kept of the property of the Society, of the sums of money received and expended by the Society, and the matters in respect of which such receipt and expenditure take place, and of the credits and liabilities of the Society.

87. The Council shall lay before the Society at the annual general meeting their report and a statement of the income and expenditure for the past year, made up to the 31st day of December preceding.

88. A balance-sheet shall be made out in every year, and laid before the Society at the annual general meeting, and such balance-sheet shall contain a summary of the property and liabilities of the Society, arranged under convenient heads.

89. A printed copy of such report and balance-sheet shall, at least seven days previously to such meeting, be sent to every Fellow residing in the United Kingdom.

90. Once at least in every year the accounts of the Society shall be examined, and the correctness of the balance-sheet ascertained and certified by the Auditor. The Auditor shall be supplied with a copy of the balance-sheet, and it shall be his duty to examine the same, with the accounts and vouchers relating thereto. The Auditor shall have a list delivered to him of all books kept by the Society, and shall at all reasonable times have access to the books and accounts of the Society.

CHAPTER XIII.

Publications of the Society

91. Every paper communicated to the Society for publication shall be deemed the property of the Society from the time of its being delivered at the offices of the Society, unless some previous engagement to the contrary has been made by the Council with the author.

92. The Council shall determine what papers are to be selected for publication, and the form in which, and the time when, they are to be published, and decide which publications shall be included freely in the privileges of Fellows, and which excluded therefrom.

CHAPTER XIV.

Common Seal and Deeds.

93. The Charters, the Common Seal, and the Deeds of the Society shall be kept in an iron chest, or strong-room, at the offices of the Society, or at their bankers.

94. Every deed or writing to which the Common Seal is to be affixed shall be sealed at a meeting of the Council, or in the presence of at least one member of the Council appointed for that purpose at a meeting of the Council, and countersigned by the Secretary.

CHAPTER XV.

Alteration of Bye-Laws.

95. The existing bye-laws may be revoked, altered, or amended, and new or other bye-laws made by the Council; but no revocation, alteration, or amendment of any existing bye-law, and no new or other bye-law shall take effect and be binding on the Society unless and until the same shall have been submitted to and sanctioned (either with or without any addition, omission, or alteration) by some general meeting of the Society.

96. Every revocation, alteration, or amendment of any existing bye-law, and every new bye-law, shall be printed and circulated amongst the Fellows twenty-one days at least before the date of the general meeting at which the same is to be submitted for sanction.

97. Whenever any revocation, alteration, or amendment of any existing bye-law, or any new bye-law, is submitted to a general meeting of the Society for its sanction, it shall be competent for any Fellow present, and entitled to vote, at such meeting to propose any addition, omission, or alteration thereto, or omission therefrom, on giving notice in writing of his proposal, and of the exact wording thereof, and delivering the same to the Secretary at the offices of the Society fifteen days at least before the date of such meeting; and no other or different proposal than such as has been so given notice of may or shall be entertained by the meeting except by the consent of the Chairman. The conduct and voting at such meeting shall be the same as that which is laid down in Chapter VIII. with respect to "Proceedings at General Meetings."

APPENDIX.

FORM A.

FORM OF RECOMMENDATION FOR A FELLOW OF THE ROYAL HORTICULTURAL SOCIETY.

Name.....

Description .....

Address.....

.....

being desirous of becoming a FELLOW of the ROYAL HORTICULTURAL SOCIETY, we whose names are underwritten beg leave to recommend .... to that honour; ..... is desirous of subscribing * .....guineas a year.

Proposed by .....

and by .....

* Kindly enter here the word *four* or *two* or *one*.

It would be a convenience if the Candidate's card were sent at the same time.

Signed on behalf of the Council this .....day of .....19.....

.....CHAIRMAN.

FORM B.

FORM OF RECOMMENDATION OF AN ASSOCIATE-MEMBER.

Name.....

Description .....

Address.....

being desirous of becoming an ASSOCIATE-MEMBER of the ROYAL HORTICULTURAL SOCIETY, we whose names are underwritten beg leave to recommend him to the Council for that honour.

(*To be signed by two or more Fellows, one of whom must be personally acquainted with the Candidate.*)

Signed on behalf of the Council this .....day of .....19.....

..... CHAIRMAN.

FORM C.

FORM OF OBLIGATION TO BE SIGNED BY FELLOW OR ASSOCIATE-MEMBER AFTER ELECTION.

I hereby promise that I will duly pay my annual subscription of * guineas, and observe the bye-laws of the Society, and the rules and regulations which may from time to time be established under the authority of the same for the government of the Society, as long as I continue a Fellow (or Associate-member) thereof.

Signed,

Dated this day of 19

* Here insert the words *four*, *two*, *one*, or *half*.

FORM D.

VOTING PAPER TO BE USED IN CASES WHERE A POLL OF THE WHOLE BODY OF THE FELLOWS IS TO BE TAKEN UPON ANY PROPOSAL BROUGHT BEFORE A GENERAL MEETING.

At a General Meeting of the Society held on [*date*] the following Proposal was proposed and seconded, viz. :—

[*Here insert the Proposal.*]

or,

The Chairman [*or*, A majority of the Members of Council present at the Meeting] considering this to be a matter of vital importance to the welfare of the Society,

The majority for [*or*, against] the proposal not having exceeded three-fifths of the total number of Fellows present, and the minority having demanded a Poll,

the consideration of the Proposal was adjourned (under Bye-law 46 [*or*, 49]) to the General Meeting to be held at [*hour*] on [*date*] at [*place*] to enable the Poll to be taken accordingly, and the Council has determined to take a Poll of the Fellows upon it.

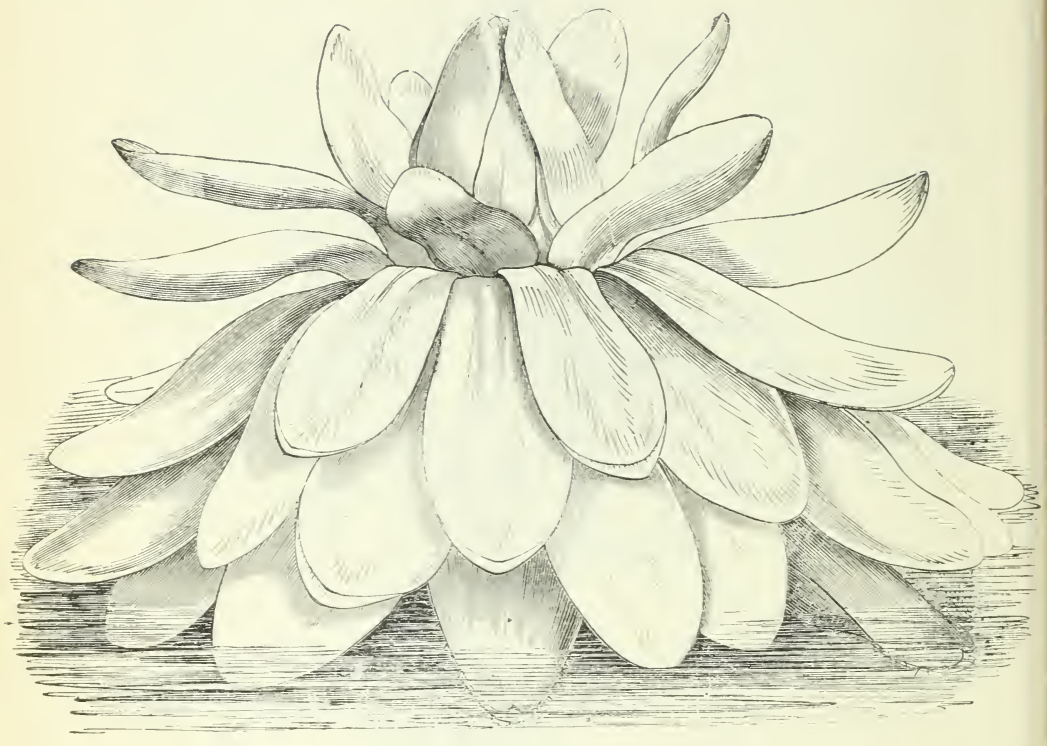
You are requested to sign your name in one or other of the two blank spaces below, and to return this paper entire in a closed envelope addressed to the Scrutineers, R.H.S. Office, 117 Victoria Street, so as to arrive there on or before the of , after which date the Poll will be closed.

I desire to vote	I desire to vote
FOR	AGAINST
the above Proposal.	the above Proposal.
Fellow's Signature :	Fellow's Signature :
.....	.....

This paper is issued by Order of the Council, and is sent by post to every Fellow residing in the United Kingdom.

Secretary.

N.B.—Nothing is to be written on this paper but the Fellow's signature only, otherwise the voting paper will be spoiled, and the Vote will not be counted.



EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 10, 1899.

Mr. JOHN T. BENNETT-POË in the Chair.

Fellows elected (53).—G. J. Allen, J. W. Arbuthnot, G. A. Armstrong, C. Attewell, G. Barber, Mrs. Windham Baring, R. Bence-Jones, D.L., J.P., Mrs. H. W. Bliss, William Boxall, V.M.H., F. M. Bradley, George W. Brocklehurst, Herbert L. Brousson, Francis G. Butler, Mrs. Minard Cammell, W. H. Chapman, W. Marston Clark, Gerald E. Coleman, Mrs. Coltman, Mrs. H. G. Dakyns, Rev. R. Bruce Dickson, Albert Domeier, Mrs. W. Vigor Fox, John P. Fry, Sir William Cameron Gull, Bart., M.P., C. T. Hills, Mrs. James Horne, Miss M. Houghton, Frederick J. Hurlock, Lancelot A. Huth, Mrs. Charles Jarrett, Robert Johnson, Hon. Edward H. Johnstone, W. R. N. Knaggs, Mrs. E. Lane, Miss Maud Llewellyn, F. W. Mayor, E. Miller, Mrs. Montague, J. C. Pare, Mrs. Payne, Rev. J. H. Pemberton, J. Richardson, H. Rides, Alfred C. Rogers, Miss Rouquette, Edward Scott, Mrs. Edward Scott, Frederick W. E. Shrivell, F.L.S., Richard T. Skelton, John Smith, Mrs. Tuckett, Francis G. St. G. Tupper, Egbert Walter.

Associates (2).—A. E. Lowe (New Zealand), E. O. Orpet (United States).

Society affiliated (1).—Cornwall Daffodil and Spring Show Society.

GENERAL MEETING.

JANUARY 31, 1899.

Mr. ALEXANDER DEAN in the Chair.

Fellows elected (66).—Lawrence W. Adamson, LL.D., James T. Atkinson, Mrs. Balfour of Balbirnie, H. D. Bailey, B. A. Plemper van Balen (France), Rev. H. Barnett, Col. John Mount Batten, Prof. S. A. Beach (United States), Major-General C. J. R. Bell, Joseph Bickeston, Charles F. Blinco, Henry S. Boby, Col. Boileau, C.B., Lord Carew, Cecil B. Cave-Brown-Cave, F. Clarke, Thomas Cockett, F. H. Crittall, J. Hudson Davis, Dowager Marchioness of Downshire, William Edgell, H. V. Edwards, Clarence Elliott, C. H. Everard, R. Falkner, Mrs. Fisher,

Alfred J. Foster, F. N. A. Garry, Rev. C. T. Gillett, Miss H. E. Gilling, Lady Grey, John P. Hartree, M.B., M.R.C.P., Rev. E. D. L. Harvey, Mrs. Hibbert, Ralph T. Hinckes, Hon. Robert James, David Johnson, F. Kessler, William W. Kirkman, Marquise de la Valette, P. Lelasseur, Mrs. McWhirter, Walter C. Mallett, Lady Methven, Mrs. Miller, G. F. Moore, R. Morton, Edgar Mountney, Miss M. F. Orrell, James H. Osborne, Francis Owen, Mrs. W. Pickett, R. W. Proctor, junr., Capt. J. H. W. Rennie, H. G. Rimestad (Java), Miss Louise Salaman, Frank Scrutton, William F. Stanley, Robert N. Stevens, Mrs. H. Urwick, W. G. Valentine, Capt. S. Walter, Spencer Whitehead, W. H. Whittaker, John E. B. Wimbush, Arthur L. Woodhouse.

Associates (3).—Charles Gosling, William Low, W. H. Needham.

Societies affiliated (3).—Blackburn and District Horticultural Society, Ipswich and East of England Horticultural Society, Newcastle and District Horticultural Mutual Improvement Society.

A lecture on "Twelve Months among the Orchards of Nova Scotia" was given by Mr. Cecil H. Hooper. (See p. 1.)

ANNUAL GENERAL MEETING.

February 14, 1899.

Sir Trevor Lawrence, Bart. (President of the Society), in the Chair.

The minutes of the last Annual General Meeting, held on February 8, 1898, were read and signed.

Fellows elected (37).—Hugh Aldersey, J.P., Francis H. Barclay, William E. Bear, Richard Blake, A. J. Brown, A. R. Brown, C. Wilhelm Browne, William J. Burn, Roger Buston, M.A., John Carter, G. W. Clare, W. F. M. Copeland, M.A., Randolph Curtis, Miss M. E. Dawson, Mrs. Edwin Edwards, Rev. P. P. Edwards, Mark Fenwick, Rev. W. W. Flemyng, Mrs. Huntley Garden, William C. Gray, Mrs. John H. Gregson, Cecil H. Hooper, Charles L. Huggins, Miss A. Hulse, Miss H. Hulse, H. Jonas, Alfred S. Knight, G. W. Lawrence, Joseph Loader, Mrs. J. McDiarmid, John Odell, Mrs. Charles Philips, C. S. Schreiber, C. B. Stevens, Sir James Stirling, Mrs. J. W. Temple, Gurney Wilson.

Associate (1).—J. M. Black.

Societies affiliated (5).—Darwen and District Floral and Horticultural Society, Fair Oak and District Horticultural Society, Kingsclere and District Horticultural Society, Penarth and District Horticultural Society, Seascale and District Horticultural Society.

Mr. James Douglas and Mr. A. Dean were appointed scrutineers of the ballot.

Mr. George Bunyard, V.M.H., proposed, and Mr. Geo. Paul, V.M.H., seconded, a vote of thanks to the retiring Members of Council, Sir Frederick Wigan, Bart., the Rev. George Engleheart, and Thomas Statter, Esq.

This proposal was carried with acclamation.

To fill the vacancies thus caused the following gentlemen had been

proposed, viz.:—Dr. Hugo Müller, F.R.S., Frederick G. Lloyd, Esq., and Alfred H. Pearson, Esq.

Upon the report of the scrutineers, the President declared these gentlemen duly elected as Members of Council.

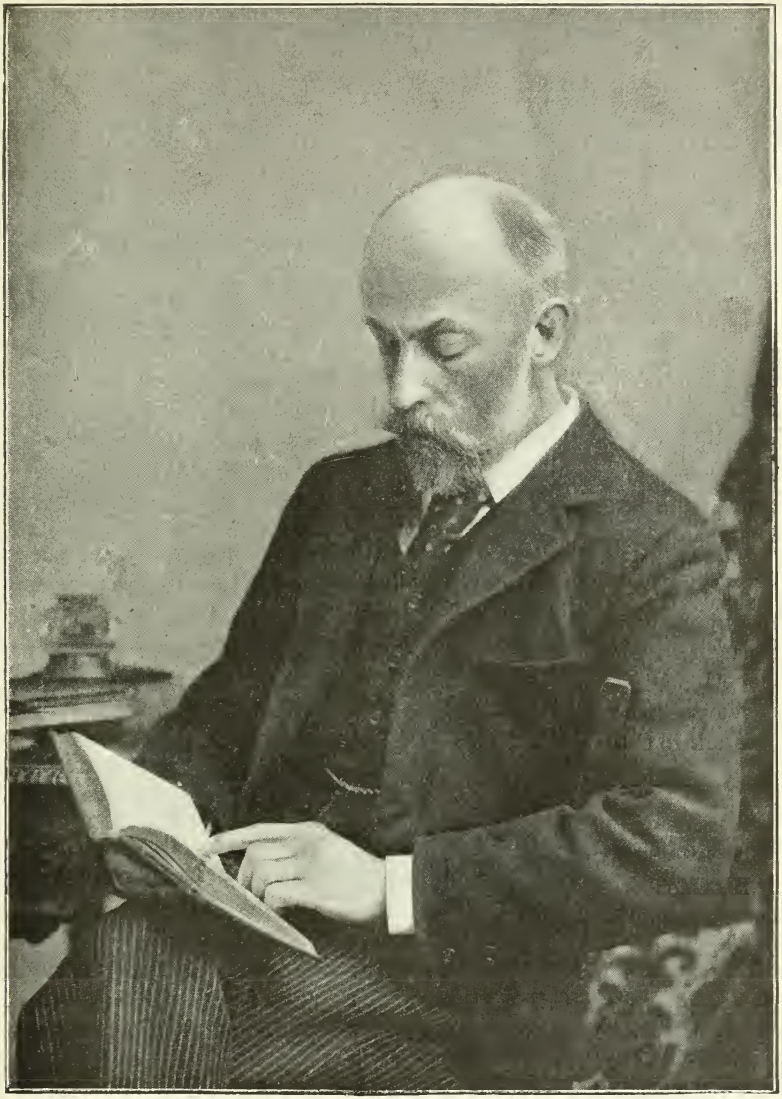


Fig. 6.—Sir W. T. Thiselton-Dyer, K.C.M.G. (*Gardeners' Chronicle.*)

The President, Sir Trevor Lawrence, Bart., moved the adoption of the report.

This was seconded by Sir William Thiselton-Dyer, K.C.M.G., and carried unanimously. (Fig. 6.)

A vote of thanks to the President concluded the business of the meeting.

REPORT OF THE COUNCIL

FOR THE YEAR 1898-99.

The year 1898-99 has been one of increased prosperity for the Society.

The Council have felt justified in spending a considerable amount on the Lindley Library, namely £170, to assist the Trustees in completing and publishing a Catalogue of the Library, and also in purchasing various books which the Catalogue showed to be wanting.

The Catalogue was published in December at a price of 2*s.* 6*d.* in the hope that many Fellows would purchase it, not only to inform themselves what books the Library contains, but also because it forms in itself a sort of reference list to the bibliography of Gardening. Some Fellows might also take note of books still wanting to the Library with a view to presenting them.

During the past year valuable books have been presented by the Director of the Royal Gardens at Kew, Dr. Maxwell Masters, F.R.S., T. J. Bennett-Poë, Esq., Miss Ormerod, Mrs. Holborn, Signor Alñio, and many others, to all of whom the best thanks of the Society are due. A full list will be published on April 1st in the Society's Journal, vol. xxii., part 4. Acting in conjunction with the Trustees, the Council have purchased for the Library—The Silva of North America, Prof. Sargent; The Flora of Northern America, Britton and Brown; *Nature*, from its commencement, 56 vols.; Flora of Tropical Africa; Flora Germanica, Reichenbach, 22 vols.; Flora Pyrenaica, Bubani; Atlas des Plantes, Bois; The Water Garden, Tricker; Flora of Berkshire, Druce; Chemistry of the Garden, Cousins; Garden-making, Prof. Bailey; British Orchids, Webster; and others.

Under the head of ordinary expenditure at Chiswick £1,850 has been spent on the general work and maintenance of the Gardens. Amongst other work, House No. 9 and the potting shed attached thereto have been painted and thoroughly repaired, Houses Nos. 3, 14, 16, and 21 have all been repaired and painted, as have also many of the frames. All this work has been done by the Society's own staff of men. The receipts by sale of surplus produce amount to £357, making the net ordinary cost of the Gardens £1,493.

At Westminster, twenty-two Fruit and Floral Meetings have been held in the Drill Hall, James Street, Victoria Street, and seven Committee Meetings have been held at Chiswick, besides the larger Shows in the Temple Gardens on May 25, 26, and 27; and at the Crystal Palace on September 29, 30, and October 1. Lectures have been delivered at nineteen of the Meetings. The number of awards granted by the Council, on the recommendation of the various Committees, has been as follows:—

Award	At provincial shows	Affiliated societies	On recommendation of				Total
			Fruit committee	Floral committee	Orchid committee	Narcissus committee	
Gold Medal	1	—	5	5	3	—	14
Silver-gilt Flora	3	—	—	32	7	—	42
Silver-gilt Knightian	—	—	16	—	—	—	16
Silver-gilt Banksian	1	—	5	34	—	—	40
Silver Flora	4	14	—	70	12	5	105
Silver Knightian	—	—	22	—	—	—	22
Silver Banksian	6	26	28	74	28	3	165
Bronze Flora	1	8	—	6	—	—	15
Bronze Knightian	—	—	—	—	—	—	—
Bronze Banksian	—	22	5	12	5	1	45
First-class Certificate	1	—	11	26	31	4	73
Award of Merit	—	—	49	167	68	8	292
Botanical Certificate	—	—	—	3	16	—	19
Cultural Commendation	—	—	32	3	23	—	58
Total	17	70	173	432	193	21	906

In addition to the above:—1 Silver-gilt Flora has been awarded to Miss O. Harrisson for having passed 1st in the Society's Examination, and 4 Hogg Memorial Medals have been awarded; 85 Bronze Banksian Medals have also been granted to Cottagers' Societies.

The Council are fully aware (as all Fellows visiting the Drill Hall Shows must also be) how very meritorious the Groups of Flowers, Fruits, Vegetables, &c., are, and how oroughly, as a rule, they deserve the Medals recommended by the Committees. The Council entirely recognise the difficulty of the work of the Committees in decreasing the number of Medals they recommend. At the same time they feel it their duty to urge upon all the Committees, and upon the individual Members thereof, the necessity of gradually but continually raising the standard of excellence which they set before themselves in recommending awards.

Another point which the Council desire to suggest to the Committees is whether Groups exhibited by the Horticultural Trade and Groups exhibited from Amateurs' gardens should be judged by exactly the same standard of excellence. Whether (except in cases of open competition for prizes) some slight favour should not be shown to encourage the latter.

During the past year the Society has been presented with the dies of a very fine Medal, which has been struck, and subscribed for by numerous friends, in memory of the late Dr. Robert Hogg. The Council have decided to restrict the use of this Medal to the Fruit and Vegetable Committee, with which Committee Dr. Hogg was so intimately and specially connected from its very foundation in 1858.

On Tuesday, July 5, the Council invited all the Members of the several Committees to lunch with them at Chiswick, and to examine the Gardens. An account of the proceedings will be found in the JOURNAL, vol. xxii. p. 237.

An International Conference on Hybridisation has been arranged for July 11 and 12, 1899, to commence with a luncheon at Chiswick, to

which all the Committees of the Society will be invited, and to close with a Banquet in the Whitehall Rooms, Hôtel Métropole, in honour of the distinguished Foreign Guests who are expected to attend the Conference. Full particulars concerning the Conference will be found in the Society's Book of Arrangements for the year 1899. Any Fellows desiring to be present at the Banquet, and wishing for tickets for ladies or gentlemen, should communicate with the Secretary before July 1. The price of the tickets will be 21*s*.

The Council desire to draw the attention of all Fellows of the Society to the more extended use which the Scientific Committee might be to them if they availed themselves more freely of their privileges in submitting instances of diseases of or injuries to plants caused by insects or otherwise. The Scientific Committee is composed of gentlemen qualified to give the best advice on all such subjects, either in respect to the prevention or cure of disease. The Committee are also glad to receive specimens of any subjects of Horticultural or Botanical interest.

That Fellows, whether near or at a distance, may derive as much benefit as possible from their connection with the Society, the Council last year appointed Dr. J. Augustus Voelcker, M.A., Consulting Chemist to the Society. They have renewed their arrangement with him whereby all Fellows who are Amateurs or *bona fide* Gardeners may obtain at very small cost Analyses of Manures, Soils, &c., or advice as to what description of Chemical Manure will be most suitable and profitable for application to any particular soil. The Council wish again to draw particular attention to the following points, viz. :—

(i.) That Fellows desiring an Analysis must follow explicitly and exactly the directions laid down in the Book of Arrangements, 1899 ; and

(ii.) That Fellows who are in any way commercially interested in any Artificial Manure Trade or Horticultural business cannot claim Dr. Voelcker's assistance as Fellows, but if they wish to consult him must do so in the ordinary way of business.

The Society's Great Show held in May (by the continued kindness of the Treasurer and Benchers) in the Inner Temple Gardens was as successful as ever, and it is a matter of satisfaction to the Council to find that this Meeting is now universally acknowledged to be the leading Horticultural Exhibition of this country. The best thanks of the Society are due to all who kindly brought their plants for exhibition, or otherwise contributed to the success of this Show.

The Exhibition of British-grown Fruit held by the Society at the Crystal Palace on September 29, 30, and October 1 was, considering the very unfavourable season, most satisfactory. Full particulars will be found in vol. xxii., part 4, of the JOURNAL, which will be issued in the course of a few weeks.

As an object-lesson in British Fruit cultivation this Annual Show stands unrivalled, and is of national importance. The Council invite Fellows and their friends to support it, for it cannot be too widely known that the continuance of the Show is absolutely dependent on at least £100 being raised by subscription each year towards the Prize Fund. The Show involves the Society in a very large expenditure without the pos-

sibility of any return. The Council have therefore established the rule that they will not continue it unless sufficient interest in it is taken by Fellows and their friends to provide £100 towards the Prize Fund. Subscriptions for this purpose should be sent at once to the Secretary, 117, Victoria Street, Westminster, and if the list prove satisfactory the Schedule will be issued in April, and the Show held on September 28, 29, and 30, 1899. The list of subscribers for 1898 will be published in part 4 of vol. xxii. of the Society's JOURNAL.

A Deputation was sent by the Council, at the invitation of the local authorities, to attend the Great Summer Show of the Northumberland, Durham, and Newcastle-on-Tyne Botanical and Horticultural Society in July. Full particulars of this visit will be found in the Society's JOURNAL, vol. xxii. p. cxiii. The Council desire to record the very great pleasure which this visit gave them, and their appreciation of the great courtesy and hospitality with which they were received.

An invitation has been received and accepted for sending a small Deputation to visit a Show of Daffodils and other early Spring Flowers and Produce, to be held at Truro on March 21 and 22, 1899.

The JOURNAL of the Society has been continued so as to enable Fellows at a distance to enter more fully into, and reap the benefits of, the study and work of those actively engaged at headquarters. Vol. xxi. part 3, and parts 1, 2, and 3, of vol. xxii. were issued during the year, and vol. xxii., part 4, will be ready on April 1.

It is gratifying to record that the enquiry for the Society's Leaflet on Fruits for Small Gardens, Cottagers, and Farmers continues. An entirely new and enlarged edition has been published, and may be obtained at the office at cost price.

The First Edition of the Book of Rules for Judging and Hints to Schedule Makers, which the Society drew up in 1896, has been exhausted. They have therefore been revised and reprinted, and an Appendix on Point-judging and Point-value has been issued. Price 1*s.* 6*d.*

An examination in the principles and practice of Horticulture was held on April 5 concurrently in different parts of the United Kingdom, a centre being established wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations would consent to superintend one on the Society's behalf, and in accordance with the rules laid down for its conduct. No limit as to the age, position, or previous training of the candidates was imposed: 190 candidates presented themselves for examination. The names and addresses of those who succeeded in satisfying the examiners, together with the number of marks assigned to each, will be found in the Society's JOURNAL, vol. xxii. page 94.

It is proposed to hold a similar examination in 1899, on Tuesday, April 11. Candidates wishing to sit for the Examination should make application during February to the Secretary, R.H.S. Office, 117 Victoria Street, Westminster.

The thanks of the Society are also due to all the Members of the Standing Committees—viz. the Scientific, the Fruit and Vegetable, the Floral, the Orchid, and the Narcissus Committees—for the kind and patient attention which they have severally given to their departments.

The thanks of the Society are also due to all those who, either at home or

abroad, have so kindly presented plants or seeds to the Gardens. A list of the donors has been prepared, and will be found in the Society's JOURNAL, vol. xxi., part 4, 1899, which will be issued on April 1.

The Council wish to express, in their own name and in that of the Fellows of the Society, their great indebtedness to all who have so kindly contributed, either by the exhibition of plants, fruits, flowers, or vegetables, or by the reading of papers, to the success of the fortnightly Meetings in the Drill Hall. They are glad to find, by the increased and increasing number of visitors, that the Society's fortnightly Meetings are becoming better appreciated by the Fellows and public in general.

A desire having been expressed that the so-called Fortnightly Meetings should be actually Fortnightly throughout the whole year, it will be found, by referring to the Book of Arrangements, 1899, that the Council have acceded to this request as far as it was possible to do so, having regard to such obstacles to absolute regularity as the Temple and Crystal Palace Shows and the occurrence of Bank Holidays.

The papers read at these Meetings, which have been or will shortly be published in the JOURNAL,* are as follows :—

Mar.	22	"Soils," by Mr. J. J. Willis, F.R.H.S.
April	12	"Insect Blights and Blessings," by Mr. F. Enock.
,,	26	"Sweet-scented Leaves," by Mr. F. W. Burbidge, M.A., V.M.H.
June	14	"Hybrid Orchids," by Mr. J. O'Brien, V.M.H.
July	12	"Garden Peas," by Mr. N. N. Sherwood, V.M.H.
,,	26	"Uses of the Bamboos," by Mr. A. B. Freeman Mitford, C.B.
Aug.	9	"Water Lilies," by M. R. Latour Marliac.
,,	23	"Perpetual Strawberries," by M. Henry de Vilmorin.
Sept.	7	"Disas," by Mr. T. W. Birkinshaw.
,,	20	"Suburban Fruit Growing," by Mr. W. Roupell, F.R.H.S.
Oct.	25	"Experimental Horticulture," by Mr. G. Gordon, V.M.H.
Nov.	22	"Garden Manures," by Mr. A. D. Hall, F.R.H.S.
Jan.	31	"The Orchards of Nova Scotia," by Mr. Cecil Hooper, F.R.H.S.

Besides these Lectures, the Rev. Professor Henslow, V.M.H., has most kindly given six Floral Demonstrations, short accounts of which have appeared in the JOURNAL.

The Council have the sad duty of recording the death of 47 Fellows during the year, and among them they regret to find the names of Baron Ferdinand de Rothschild, M.P., the Lord Newton, Mr. Christopher Sykes, the Earl of Sefton, the Earl of Lathom, Lady Cromer, Lady Repton, Sir Richard Quain, Sir Stuart Knill, Bart., Sir James Bain, Hon. E. S. Parker Jervis, Professor Dr. Allman, Mr. Latimer Clarke, M. C. Bernardin, Dr. Johan Langé, Rev. D. A. Beaufort, Dr. I'Anson, Mr. H. M. Matheson, Mr. G. T. Clarke, Mr. Edmund Tonks, Mr. Chas. Sharpe, Mr. T. B Potter, and others.

The following table will show the Society's progress in regard to numerical strength during the past year :—

* Back Numbers of the JOURNAL can be purchased by Fellows at reduced rates.

DEATHS IN 1898.

		£	s.	d.
Life Fellows	10	0	0	0
4 Guineas	2	8	8	0
2 „	16	33	12	0
1 „	19	19	19	0
	47	£61	19	0

RESIGNATIONS.

		£	s.	d.
4 Guineas	0	0	0	0
2 „	18	37	16	0
1 „	54	56	14	0
	72	£94	10	0
Total Loss	119	£156	9	0

FELLOWS ELECTED, 1898.

		£	s.	d.
4 Guineas	5	21	0	0
2 „	115	241	10	0
1 „	468	491	8	0
Associates	2	1	1	0
Affiliated Societies	17	19	19	0
Commutations = £267. 15*s.*	12			
	619	£774	18	0
Deduct Loss		156	9	0
Net Increase in Income		£618	9	0

New Fellows, &c.	619
Deduct Resignations and Deaths	119
Numerical Increase	500

A scheme for the Affiliation of Local Horticultural Societies was put forward in 1890, and 100 Local Societies have availed themselves of it. The Council express the hope that Fellows will promote the affiliation of Local Horticultural and Cottage Garden Societies in their own immediate neighbourhood.

At the request of some of the Fellows, the Council have arranged to send a reminder of every Show (in the week preceding it) to any Fellow who will send to the R.H.S. Office, 117 Victoria Street, Westminster, twenty-four halfpenny postcards, *fully addressed* to himself, or to whomsoever he wishes the reminder sent.

The Council recommend that (with the exception of the Secretary) the salaries of the principal officers of the Society—the Superintendent, the Cashier, and the Assistant-Superintendent—should continue as heretofore. The Secretary having now completed ten years of service to the Society, the Council recommend that an addition of £50 a year be made to his salary.

The programme for the ensuing year will be found in the *Arrangements for the Year* 1899, lately issued to all Fellows.

Subjoined is the usual Revenue and Expenditure Account with the Balance Sheet for the year ending December 31, 1898.

ROYAL HORTICUL

Dr. ANNUAL REVENUE AND EXPENDITURE

	£ s. d.	£ s. d.
To ESTABLISHMENT EXPENSES—		
Salaries and Wages	471 10 0	
Rent of Office	173 3 0	
Printing and Stationery	231 11 11	
Journal—Printing and Postage	1,041 0 0	
Postages	118 19 3	
Coal and Gas	4 4 7	
Donation to Auricula and Primula Society ...	10 0 0	
Miscellaneous	124 4 1	
Commission on Advertisements, *Journal*, &c.	27 3 1	
Painting Orchid Pictures	17 1 0	
		2,218 16 11
„ VICTORIA MEDAL (Diploma)		34 14 0
„ LINDLEY LIBRARY		169 4 1
„ SHOWS and MEETINGS—		
Rent of Drill Hall and Cleaning	108 10 0	
Temple Show	663 3 2	
Crystal Palace Fruit Show	316 4 11	
		1,087 18 1
„ PRIZES and MEDALS—		
Rose Show	50 10 0	
Committee Awards, &c....	220 3 9	
Expenses, Floral Meetings and Conferences...	36 14 4	
Labour	83 8 4	
		390 16 5
„ CHISWICK GARDENS—		
Rent, Rates, Taxes, and Insurance	231 12 4	
Superintendent's Salary	200 0 0	
Pension, late Superintendent	180 0 0	
Labour	779 5 7	
Implements, Manure, Soil, Packing, &c. ...	166 14 0	
Coal and Coke	208 8 9	
Repairs	55 12 9	
Water and Gas	16 13 11	
Miscellaneous	70 19 8	
		1,909 7 0
		5,810 16 6
BALANCE TO GENERAL REVENUE ACCOUNT		1,293 7 4
		£7,104 3 10

TURAL SOCIETY.

ACCOUNT for the YEAR ending 31st DECEMBER, 1898. Cr.

	£ s. d.	£ s. d.
By ANNUAL SUBSCRIPTIONS		4,249 16 6
„ SHOWS AND MEETINGS—		
Temple Show	1,408 16 11	
Crystal Palace Fruit Show	242 15 6	
Drill Hall Meetings	37 17 0	
		1,689 9 5
„ ADVERTISEMENTS IN *JOURNAL*		400 6 4
„ SALE OF *JOURNAL*		60 7 4
„ MISCELLANEOUS RECEIPTS		34 3 4
„ DIVIDENDS—		
Davis Bequest and Parry's Legacy	56 18 4	
Consols, £1,750	46 0 8	
Local Loans, £1,700	49 6 0	
		152 5 0
„ INTEREST ON DEPOSIT		27 11 9
„ PRIZES and MEDALS		53 4 3
„ CHISWICK GARDENS—		
Produce sold	358 16 10	
Students' Fees	31 10 0	
Admissions	3 9 6	
Miscellaneous Receipts	43 3 7	
		436 19 11
		£7,104 3 10

We have examined the above Accounts, and find the same correct.

(Signed) HARRY TURNER,
ALFRED H. PEARSON,
JAMES H. VEITCH, } *Auditors.*

HARPER BROS., *Chartered Accountants*,
10 Trinity Square, Tower Hill, E.C.

January 9, 1899.

ROYAL HORTICULTURAL SOCIETY.

BALANCE SHEET, 31st DECEMBER, 1898

	£	s.	d.	£	s.	d.
To SUNDRY CREDITORS				36	16	5
„ SUBSCRIPTIONS, 1899, paid in Advance ...	130	14	6			
„ ADVERTISEMENTS, 1899, paid in Advance	4	7	0			
„ CRYSTAL PALACE SHOW, 1899, paid in Advance	2	2	0			
„ ROSE PRIZES, 1899, paid in Advance ...	5	5	0			
				142	8	6
„ LIFE COMPOSITIONS, 31st Dec., 1897 ...	548	14	0			
Do. do. do. 1898 ...	333	18	0			
				882	12	0
„ GENERAL REVENUE ACCOUNT—						
Balance, 1st January, 1898...	4,575	5	10			
Less Loss on (unpaid) Subscriptions, 1897	11	11	0			
	£4,563	14	10			
„ Balance for the Year 1898, as per Revenue and Expenditure Account	1,293	7	4			
				5,857	2	2
				£6,918	19	1

	£	s.	d.	£	s.	d.
By SUNDRY DEBTORS—						
Annual Subscriptions outstanding, estimated at	5	5	0			
Garden Produce	10	1	7			
Advertisements	131	11	4			
Rates and Taxes (Chiswick) paid in advance	20	15	5			
Interest on Local Loans	12	6	6			
				209	19	10
„ INVESTMENTS—						
2¾ % Consols £2,122. 8*s.* 9*d.*... ... *cost*	1,892	11	3			
(£2,022. 8*s.* 9*d.* of this sum is held by the Society subject to the provisions of the will of the late J. Davis, Esq.)						
2¾ % Consols £1,750 ... ... *cost*	1,768	5	0			
3 % Local Loans £1,700 ... ... „	1,922	12	0			
				5,583	8	3
„ CASH AT LONDON AND COUNTY BANK—						
On Current Account	121	7	9			
On Deposit Account	1,000	0	0			
„ PETTY CASH IN HAND—	4	3	3			
				1,125	11	0
				£6,918	19	1

We have examined the above Accounts, and find the same correct.

(Signed) HARRY TURNER,
ALFRED H. PEARSON,
JAMES H. VEITCH,
Auditors.

HARPER BROS, *Chartered Accountants*,
10 Trinity Square, Tower Hill, E.C.

January 9, 1899.

GENERAL MEETING.

FEBRUARY 28, 1899.

Sir JOHN T. D. LLEWELYN, Bart., M.P., in the Chair.

Fellows elected (33).—Mrs. C. E. Baxter, Robert Birkbeck, Frank Bouskell, A. W. Bush, Marmaduke Cowper, Col. H. W. H. Fox, Mrs. Cranfield, Miss Edmonds, G. Ewens, H. W. Hardy, G. W. Hayes, J. R. Hewitson, A. J. Hubbard, A. Hughes, R. Humphrey, F. Bowreman Jessett, Miss E. Keen, Col. C. T. Lane, Mrs. H. Lascelles, Geo. Marsh, C. E. Montague, W. H. Palmer, Miss Reeves, W. Bruce Reid, jun., Miss Nellie Roberts, Mrs. Rose Link, Col. E. C. Sandford, R. F. Sawford, Robert Stafford, Edward Tennant, Mrs. Weatherly, Edward Webb, J.P., Lieut.-Col. W. G. Webb.

Associate (1).—F. H. Kettle.

Societies affiliated (2).—Silsoe and Ampthill Horticultural Society, Suggside and District Horticultural Society.

A lecture on "The Colours of Insects: Their Meaning and Use" (illustrated by limelight) was given by Mr. H. L. T. Blake. (See p. 21.)

GENERAL MEETING.

MARCH 14, 1899.

Mr. HARRY J. VEITCH, F.L.S., in the Chair.

Fellows elected (37).—Lady Ashburnham, B. Ashton, J. Bannatyne, Charles C. Beardsley, Malcolm H. Bell, Basil W. Bennett, Mrs. Bodkin, R. C. Bovill, Mrs. Boyd, Mrs. R. Bullock, H. Bury, William Camm, G. G. Cattlow, L. J. Ching, William Deal, jun., Mrs. Denison, Miss Deverell, James Goldie, Canada, Lord Harlech, E. F. Hawes, Alex. Henderson, M.P., Mrs. Latter, J. Leemann, Mrs. Logan, C. Maron (France), Miss M. Mitchell, William T. Mobsby, Howard F. Norton, Llewelyn E. S. Parry, Rev. W. H. Peers, Mrs. Thomas Potter, Mrs. Price, W. M. Sarel, A. Telford Simpson, Mrs. William Walters, Mrs. R. Whitting, Miss Frances Woodcock.

A lecture on "The Duke of Bedford's Experiments at Woburn: Their Object and Method" was given by Mr. Spencer Pickering. (See p. 29.)

GENERAL MEETING.

MARCH 28, 1899.

Mr. HARRY J. VEITCH, F.L.S., in the Chair.

Fellows elected (26).—Charles Brown, Cyril Butler, R. Lewis Castle, Philip Chubb, Robert Cooper, Countess of Dartrey, E. Davidson, A. G. Dew-Smith, M.A., Victor N. Gauntlett, John W. Hartley, Miss Hodgson, J. Holmes, John Idiens, William Idiens, Andres Jensen, W. H. Keary, Alexander McPherson, Miss M. L. Milne Redhead, Sir Richard Musgrave, Bart., James Neighbour, Hon. Charles North, Mrs. S. Randall, Miss

Gertrude Smith, Hon. Mrs. Murray Smith, Hon. Mrs. Walker, Mrs. Ward.

Associate (1).—Miss Jessie Smith.

Societies affiliated (2).—Child's Hill and Cricklewood Horticultural Society, Mortimers Cross and District Floral, Horticultural, and Cottage Garden Mutual Improvement Society.

A lecture on "Some of the Plants Exhibited" was given by the Rev. Prof. G. Henslow, M.A. (See p. 38.)

GENERAL MEETING.

April 18, 1899.

Mr. Harry J. Veitch, F.L.S., in the Chair.

Fellows elected (40).—Mrs. Briggs Bury, W. G. Brook, George S. Bunbury, Rev. John Burdon, Mrs. G. A. Burnett, Lady Susan Byng, Frank Clayton, W. A. Cochrane, Bishop of Ely, James Craik, Miss A. M. Crellin, K. Drost, Rev. J. G. W. Ellis (New Zealand), Mrs. A. E. Franklin, W. Green, Felix Hamel, Charles R. Hamilton, J. J. Heath, Henry Hilliar, Capt. Hincks, John R. Jefferies, Edward Kromer, Lady A. Gordon Lennox, Thomas Parkes Smith, Mrs. R. Pilkington, G. W. Piper, William A. Pye, T. Gurney Randall, J. M. Reed, H. G. Regnart, Patrick Riddell, Julian Stephens, Samuel Taylor, Robert Thomson, Henry E. Tillman, T. Townsend, Mrs. Ussher, Mrs. Ward, William Whitelaw, Edgar T. Willis.

A lecture on "Asparagus, Forced and Outdoors," which was to have been given by Mr. G. Norman (see p. 40), was compelled to be taken as read owing to the inconveniently crowded state of the hall.

GENERAL MEETING.

May 2, 1899.

Mr. George Paul, V.M.H., in the Chair.

Fellows elected (38).—Mrs. J. N. Acheson-Gray, Henry Backhouse, T. Batson, Mrs. C. Bevan, W. G. Blackham, E. C. Bliss, John C. Clapham, Mrs. T. E. Collcutt, Charles Dawson, Miss Doulton, Mrs. D. Evans, T. A. Fison, Major Gordon Gilmour, Reginald Hargreaves, J.P., Mrs. Arthur Hay, John A. Heathcote, Arthur R. Lloyds, E. John Mansfield, Edward Williams Marshall, G. A. Maull, J. G. Mills, Mrs. Wyndham Murray, Ralph Neville, Q.C., C. R. Nugent, R. J. Nutman, Charles Page, Samuel P. Page, W. H. Sedgwick, P. C. G. Shaw, Lady Esther Smith, Mrs. J. F. Stitwell, Herbert S. Stoneham, Rev. Townsend Storrs, C. Marcus Westfield, A. Moresby White, Mrs. Leonard Williams, Thomas Williams, William E. Young.

A lecture on "The British and Swiss Alpine Floras" was given by Mr. E. A. Newell Arber, B.A. (See p. 46.)

DEPUTATION TO TRURO.

March 21, 1899.

A small Deputation was appointed by the Council, at the invitation of the Executive of the Cornwall Daffodil and Spring Flower Society, to visit their Exhibition held at Truro, representative of the spring flower industry of the county.

The Deputation consisted of—

Charles E. Shea, Esq., member of Council.

John T. Bennett-Poë, Esq., member of Council.

The Rev. George H. Engleheart, M.A., member of the Floral Committee.

Mr. George Bunyard, V.M.H., member of the Fruit and Vegetable Committee.

The Rev. W. Wilks, M.A., Secretary R.H.S.

The Deputation arrived in Truro or the neighbourhood on Monday, March 20, and were most kindly welcomed and hospitably entertained by different members of the Cornish Society: J. C. Williams, Esq., President; the Hon. John Boscawen, Secretary; A. Blenkinsop, Esq., Assistant Secretary, one of the hardest workers in the promotion of the Show; and other prominent citizens.

On Tuesday 21 the Deputation were conducted to the Great Concert Hall, Truro, in which, and in adjacent rooms, the Exhibition was held.

After the Deputation had made their awards, they were (together with the judges of the Show) entertained at luncheon at 1.30 p.m. at Mount Charles, Truro, the residence of A. P. Nix, Esq.

The Deputation brought away with them from Truro the liveliest recollections of the beauty and extent of Cornwall's spring flowers, and also of the nature of true Cornish hospitality.

AWARDS AT TRURO.

Gold Medal.

To D. H. Shilson, Esq., of Tremough, Penryn, for a collection of Rhododendrons.

To T. Algernon Dorrien Smith, Esq., of Tresco Abbey, for a collection of more than 100 varieties of Daffodils, representative of the invaluable work done by him for the Cornish flower industry.

Silver-gilt Flora Medal.

To Messrs. R. Veitch, of Exeter, for a collection of rare Shrubs suitable for outdoor cultivation in Devon and Cornwall, &c.

Silver Flora Medal.

To Mr. John Nicholl, of Redruth, for Bamboos, &c.

To Howard Fox, Esq., of Rose Hill, Falmouth, for Flowering Shrubs.

Silver Banksian Medal.

To Robert Fox, Esq., of Penjerrick, for Flowering Shrubs.

Highly Commended.

A collection of hardy Spring flowers exhibited by D. H. Shilson, Esq., of Tremough, Penryn.

A collection of Flowering Shrubs exhibited by Michael Henry Williams, Esq., of Pencalenick.

A collection of Flowering Shrubs exhibited by J. C. Daubuz, Esq., of Killiow.

An exhibit of Narcissus maximus, having very large, deeply coloured flowers borne on stalks more than 3 ft. high, exhibited by Captain Pinwell, of Trehane.

A collection of Market Daffodils exhibited by Mr. Andrew Laury, of Varfell, Mounts Bay.

The Rhododendrons exhibited by Mr. Shilson, of Tremough (gr. Mr. R. Gill), consisted of the following varieties:—

Præcox
Barbatum
Cinnamoneum
Arboreum 'Mrs. Hy. Shilson' (a most glorious pink, of immense size and substance)
Cunninghamii
Williamsii
Ciliatum
Arb. roseum
,, 'Ellie Noon'
Altaclerense
Albescens (like an enormous Azalea, pure white with a yellow throat)
Arb. 'Mrs. Richard Gill'
,, crispiflorum
Argenteum
'Countess of Haddington'
Arb. 'Henry Shilson' (a wonderfully glowing scarlet)
Arb. album
,, 'Mrs. Noon'
Arboreum
Arb. 'William Shilson'
Arb. 'Florence Gill'

and ten at present unnamed seedlings of the highest merit.

The Daffodils exhibited by Mr. Dorrien Smith, of Tresco Abbey (gr. Mr. J. Jenkins), were the finest and brightest collection possible, each bunch of blossoms being shown in absolute perfection. There was only one fault—they required at least three times the space into which, by the necessities of the accommodation, they were crowded. They consisted of the following varieties:—

Sir Watkin
Amabilis
Duchess of Westminster
Consul Crawford
Goliath
General Murray
Harpur Crewe
Duchess of Brabant
Beauty
John Stephenson
Miriam Barton
Incomp. maximus
Maurice Vilmorin
Circe
Edward Hart
Burbidgei Dandy
Nora
Imogene
Beatrice
Fair Ellen
Cynosure
Frank Miles
Mary Anderson
Figaro
C. J. Backhouse
Duchess of Albany
Aladdin
Humei albidus

Glow
Romeo
Queen of England
Albert Victor
Backhousei
Triandrus albus
Poeticus præcox
Emperor
M. J. Berkeley
Cernuus
Horsfeldii
Spurius
T. A. Dorrien Smith
Queen of Spain
Victoria
Glory of Leiden
W. P. Milner
Variiformis
Princeps
Corbularia Bulbocodium
Corb. citrina
F. W. Burbidge
Michael Foster
Empress
Golden Spur
Hume's Giant
Lusitanicus
Rugilobus
Odorus trilobus
Odorus rugulosus
Incomp. plenus
Telamonius
Incomp. sulph. plenus
Princess Mary
Dr. Gorman
Falstaff
Ethel
Etta
Little John
Boy
Mary
Constance
Vanessa
Agnes Barr
Orphée
Sensation
John Bain
Burbidgei
Robin Hood
Ellen Barr
Incomp. aurant. plenus
Barri conspicuus
Bernardi
Poeticus
Ornatus
Odorus
Burbidgei conspicuus

and twenty-one distinct varieties of Tazettas.

The plants exhibited by Messrs. Robert Veitch, of Exeter, included :—

Anopterus glandulosus
Magnolia Fraseri
,, stellata
,, stellata rosea
,, obovata variegata
Gerbera Jamesoni, very fine
Conandron ramondioides
Lotus peliorhynchus
Senecio Heritieri
,, Greyi
Hamamelis Zuccariniana
,, arborea
Eurya angustifolia
Rhaphithamnus cyanocarpus
Aralia pentaphylla
Olearia nummularifolia
Griselinia macrophylla
Azalea obtusa alba
Oxalis Ortgiesi
Musa Basjoo
Phormium alpinum
Primula imperialis
Tetrandra californica
Prunus triloba
Manettia bicolor
Primula floribunda Isabella
Senecio Petasitis
Illicium floridanum
Ribes speciosum
Edwardsia grandiflora

Messrs. Veitch also exhibited a miniature rock garden studded with small plants of the choicest Alpines.

The collection of fifty-two varieties of Bamboos shown by Mr. John Nicholl, of Green Lane, Redruth, included, amongst others :—

Phyllostachys Castillonis
,, Henonis
,, Marliacea
,, sulphurea
,, heterocycla
,, viminalis
,, nigro-punctata
Arundinaria aristata
,, nobilis
,, Falconeri
Arundinaria anceps
,, nitida
,, spathiflora
,, Hindsii graminea
Bambusa agrestis
,, fastuosa
,, marmorea
,, marmorea variegata
,, quadrangularis
,, palmata

Mr. Nicholl had also a number of rare flowering shrubs and Himalayan Rhododendrons, amongst them being—

Rhododendron Thompsoni
,, Falconeri
,, barbatum
,, Aucklandii
,, campylocarpum
,, argenteum
,, triflorum
,, arboreum
,, Nuttallii
,, cinnamoneum
,, campanulatum
Berberis Fremontii
,, rubicaulis
Buddleia variabilis
Ceanothus rigidus
,, asteroides
Camellia reticulata
Cytisus variegatus
Carpenteria californica
Cercocarpus ledifolius
,, parviflorus
Cydonia japonica Simoni
Corylopsis pauciflora
Edwardsia microphylla
Eucalyptus Gunnii
,, coccifera
,, urnigera
,, filifera
Olearia nitida
Aster argophyllus
Hamamelis arborea
Ilex cornuta
Laurus nobilis regalis
Fremontia californica
Drimys Winteri
Metrosideros floribunda
Musa japonica
Philesia buxifolia
Philadelphus mexicanus
Panax sessiliflorum
Senecio Grayii
Tetranthera californica
Weigela Montesquien

Mr. Howard Fox's splendid exhibit of hard-wooded flowering plants from the open air included the following :—

Acacia melanoxylon
,, Wynbergi
Amygdalus macrocarpa
Azalea amœna
Berberis Aquifolium
,, Darwinii
Cestrum elegans
Clematis balearica
,, cirrhosa
Clianthus puniceus
Cornus Mas
Coronilla glauca
,, juncea
,, viminalis
Cyphomandra betacea
Citrus Madras Citron
Daphne Laureola
,, Mezereum
Desfontainia spinosa
Erica mediterrane

Eupatorium Weinmannianum
Forsythia viridissima
Genista in var.
Grevillea rosmarinifolia
Ilex dipyrena
Leptospermum baccatum
Lupinus arboreus
Magnolia speciosa
Melianthus major
Olearia Gunniana
Pittosporum Mayi
,, Tobira
Prunus Pissardi
Ribes fuchsioides
,, sanguineum
Salvia splendens
Senecio Petasitis
Skimmia japonica
,, longifolia
Solanum crispum
Sparmannia africana
Spiræa ilicifolia
,, prunifolia fl. pl.
Viburnum lucidum
,, rugosum

Amongst other more or less rare flowering shrubs exhibited at this Show were :—

Erica arborea
Magnolia conspicua
Clianthus Dampieri
Olearia Haastii
Cephalotaxus Fortunei (in fruit)
Embothrium coccineum
Acacia Wynbergi
,, melanoxylon
Melianthus major
Solanum crispum
Clematis cirrhosa
Sparmannia africana
Grevillea rosmarinifolia
Viburnum rugosum
Desfontainia spinosa (in fruit)
Illicium religiosum
Azara microphylla
Staphylea colchica
Prumnopitys elegans
Rosmarinus officinalis
Exochorda quadrifolia
Acacia longifolia
Edwardsia microphylla
Hakea oleifolia
Genista Philippi
Rhododendron argenteum
Antholyza præalta

SCIENTIFIC COMMITTEE.

Scientific Committee, January 10, 1899.

Dr. Masters, F.R.S., in the Chair, and eight members present.

Bigeneric Orchid.—Mr. Veitch exhibited a flowering plant of Epi-Cattleya, 'Mrs. Jas. O'Brien': its male parent was Cattleya Bowringianum, and its female parent Epidendrum × O'Brienianum, the latter being from E. evectum × E. radicans. It has been stated that in these bigeners the result generally resembled the female parent almost entirely, but in this case there was a decided inclination towards Cattleya in the form of the lip and foliage. (Fig. 25.)

Mildness of the Season.—Mr. Wilks brought a spray of Oakleaves, still partially green, and mentioned that Blackberries had been lately gathered ripe—an unusual occurrence in Surrey in early January.

Thuia gigantea (*plicata*), *Barked.*—Dr. Masters showed a stem which had been nearly stripped of its bark, exposing the central axis as an almost cylindrical rod. The young wood had made renewed efforts to surround the latter, which appeared to be dead. It was received from Mr. Croucher, of Auchstertyre, near Crieff.

Scientific Committee, January 31, 1899.

Dr. M. T. Masters in the Chair, and nine members present.

Potato-grafting.—Mr. A. W. Sutton exhibited the results of his experiments, which were of a very interesting character. They had reference to the grafting of a scion from the Tomato on to the haulm of a Potato stock, and a similar engrafting of Solanum nigrum and of Solanum esculentum. The Potato in each case was grown in a pot, the haulm cut back and worked with the Tomato or the Solanum. Further experiments were made in fertilising the flowers of a Potato borne on a Potato-scion engrafted on a Tomato-stock, and *vice versa*. Tubers of uncrossed and of crossed Solanum Maglia were also shown, together with tubers of Solanum etuberosum and other varieties. The following details refer to the specimens exhibited :—

Potato Grafts.

No. 1.—Typical sample of the old Paterson's Victoria Potato.

Potato Victoria grafted with a scion of Tomato.

No. 2.—In 1895 a plant of Victoria Potato was grafted with a scion from the Tomato (variety Maincrop), and all the Potato stems other than the one grafted with Tomato were carefully removed. The graft was made about 3 inches above the soil. The tubers produced by this plant in 1895, 1896, and 1897 were certainly small, and in striking contrast to the typical Victoria. The tubers now sent marked No. 2 are a fair sample of those grown last season for comparison with type No. 1. They were very small.

Potato Victoria grafted with scion of Solanum nigrum.

No. 3.—In the same year (1895) another plant of Potato Victoria was grafted in the same manner, but the graft in this case was Solanum nigrum. The tubers marked No. 3 of crop 1898 do not differ from the type No. 1 (ordinary Paterson's Victoria).

Potato Supreme grafted with a scion of the Egg-plant, (Solanum esculentum).

No. 4.—In 1895 a typical sample of Potato Supreme was grafted with a scion from the Egg-plant. In this case also the character of the Potato has been unaffected by the graft.

No. 4A are tubers grown in 1898 from the grafted plant.

Experiments in Cross-fertilising Potato-flowers borne upon the Tomato-plant grafted with Potato.

No. 5.—A typical sample of the old Potato Woodstock Kidney.

No. 5A.—In 1895 a stock of Tomato, Earliest-of-All, was grafted with a scion of Potato Woodstock Kidney. The Potato-flowers produced on the scion were fertilised with pollen from the Tomato Earliest-of-All, and seed saved in the summer 1895. The seed sown in March, 1896, produced tubers mostly small and diseased. In 1897 the crop again was very small and diseased. In 1898 the crop was a good one, the

tubers being almost or quite round, not unlike a handsome Tomato; but this contrast to the shape of Woodstock Kidney is not greater than is constantly seen in seedling Potatos, where no cross-fertilisation has taken place. There is no apparent difference between the foliage of 5A and that of many other Potatos.

No. 5A was the only seedling considered worth keeping in the autumn of 1896. All the other seedlings were discarded as very unpromising.

No. 5B.—Tomato Earliest-of-All was grafted with a scion of Potato Woodstock Kidney in 1895. The Potato-flowers in this case were fertilised with their own pollen. The seed was sown in 1896, and the tubers were very similar in type to Woodstock Kidney. In 1898 the trial report on the seedling was "a medium crop of tubers resembling Woodstock Kidney." In this case also only one seedling was kept in the autumn of 1896.

From a comparison of 5A and 5B it would certainly appear that the Tomato pollen had affected the seedling resulting from the cross.

Solanum Maglia Hybrids.

No. 6.—Typical tubers of Solanum Maglia grown from the Kew stock.

No. 6A.—In 1887 some hundreds of flowers of Solanum Maglia were fertilised with pollen from cultivated Potatos, but the only cross effected was with pollen taken from an unnamed Potato seedling, and this cross resulted in two seedlings, but one of these was so weak that, notwithstanding every care, it was lost. The other produced tubers the first year corresponding to sample 6A; and as the result of careful cultivation it has increased in size during recent years, as shown by sample 6B. The general constitution of the seedling is weak, and as a variety of Potato, it will not for a moment compare with the ordinary Potatos of commerce.

Solanum etuberosum.

No. 7.—Solanum etuberosum, received in 1887 from Mr. Lindsay, of the Royal Botanical Gardens, Edinburgh, which have been grown each successive year. The tubers when received were very small, about the size of No. 7, but flatter, and have increased in size during the intervening years, until they have now reached the size of marketable Potatos, as represented by the sample 7A.

Curious Varieties of Potatos or distinct Species.

No. 8.—In 1888 Mr. Sutton received from a correspondent a distinct variety of Potato from Africa, the shape being somewhat similar to the Fir-apple Potato, but mottled in colour. The foliage is exceedingly dark in colour, and distinct from any other with which I am acquainted. The stems are erect and very bushy, and the leaves are so round as to appear at first sight entirely unlike those of the Potato, and rather resemble those of the Urtica dioica, the common Stinging-nettle. At a distance one would hardly think the foliage could be that of a Potato.

No. 8A.—The tubers, as received, were about the size of sample No. 3,

but as a result of good cultivation they have now reached the size represented by sample 8A.

No. 9.—Specimens of the large white Fir-apple Potato.

No. 10.—Specimens of the small white Fir-apple Potato.

No. 11.—Specimens of the red Fir-apple Potato. These three Potatos produce flowers, but no berries. The foliage, generally speaking, corresponds with that of other Potatos, and is quite unlike No. 8.

Results of Sowing Tomato Seed saved from Potato Plant grafted with Tomato.

1895.—In this year a scion of Potato Victoria was grafted with Tomoto Maincrop. Seed was saved in the autumn of 1895.

1896.—Seed sown, several plants raised, and seed again saved.

1897.—Seed from last year's trials sown in the spring, and ten or twelve plants put out in the open in June. It was evident on comparing these plants with several trials of the true Maincrop Tomato growing alongside that the graft had materially affected the variety, which happens to have very distinctive characteristics, the leaves of Maincrop being exceptionally large, massive, and almost entire in outline, generally at least three times the size of those of the ordinary Tomato; the plants of the seedling appeared quite distinct from the true Maincrop; there were many more fruits on each plant, and these fruits were decidedly smaller and earlier, and more corrugated. The leaves, however, were similar in character, but decidedly smaller. Seed was again saved from these plants.

1898.—Seed sown again, and the same number of plants put out in June. The 1897 notes were entirely confirmed, but the contrast between these plants and those of the true Maincrop Tomato growing alongside was perhaps more marked than in the preceding year.

Hollyhock Disease.—Leaves attacked by Puccinia malvacearum, a fungus which has proved fatal to these plants for many years, were received from Mr. Molyneux.

Eucalyptus sp.—Dr. Masters showed a flowering specimen of E. cordatus, growing in the open air in co. Down; and of E. globulus, grown for forty years in Leicestershire. Professor Balfour observed that on the coast of Ross-shire several plants characteristic of the Riviera thrive well, in consequence of the amelioration of the climate by the proximity of the Gulf Stream.

Cypripedium.—Dr. Masters exhibited a blossom of a Cypripedium in which the two normally coherent sepals were free.

Fasciated Cyclamen.—Dr. Masters exhibited specimens of this not unusual phenomenon of several flowers with leaves on the same stem.

Scientific Committee, February 14, 1899.

Mr. McLachlan, F.R.S., in the Chair, and four members present.

Diseased Apple-twigs.—These were received last December from Rev. A. Foster-Melliar. Dr. W. G. Smith, after a prolonged and difficult investigation, has pronounced the disease to be due to bacteria, and forwarded the

following interesting report :—" The portions of branches of Apple sent show a disease with the following characters. The wood is sound, except where in contact with the bark ; the bark is completely disorganised, with the exception of the hard fibres and the dry outer corky layer. Investigations for signs of fungi or insects made on arrival of the material (December 19) gave no result. Portions were placed in a moist chamber and examined during January. The bark became soft and spongy, no fungus-growth appeared, but bacteria were found in numbers. Amongst other bacterial forms, a bacillus was common which agreed with that figured by Duggar (*Cornell University Bulletin*, 145, 1898). Other symptoms, as far as presented by the material sent, agreed with American descriptions of the bacterial disease ' fire-blight.' We have, however, no record of the tree having blackened twigs or leaves during last summer —an important symptom of this disease. ' Fire-blight ' was proved, chiefly by the work of Burrill, in 1880, to be due to the action of bacteria. A good general account, based on further research, is given by Waite (*Year-book of the U.S. America Department of Agriculture*, 1895). The

Fig. 7.—Lourya campanulata. (*Gardeners' Chronicle.*)

disease appears in America on Pear and Quince oftener than on Apple, and is also known on allied species. It attacks chiefly vigorous well-fed trees with much soft young wood, similar, in fact, to this Apple-tree as described by your correspondent. A warm moist season or situation favours the disease ; dry weather checks it ; and during winter it makes little progress. The remedy is to prune off thoroughly all parts which show discoloured or destroyed bark, and to carefully burn them. Pruning is best done in autumn or spring. The cuts must be made well below diseased parts, and large wounds should be painted with tar. If the pruning be severe, it may induce a large growth of young wood next season : this must be carefully watched, as it is an excellent starting point for a reappearance of the disease. The bacteria are propagated by insects, which visit a gummy fluid containing bacteria, which is given out

from diseased parts of the bark. Then they visit a similar fluid exuded from the bark where exposed by cutting, boring insects, or other agents, and they infect this with bacteria. A similar fluid in the flowers also tempts insects there, and the bacteria thus introduced destroy the fruit crop." A unanimous vote of thanks was given to Dr. Smith for his valuable report.

Lourya campanulata.—Mr. Jas. Hudson exhibited a specimen of this rare plant in blossom. It is a Cochin-China plant, described by the late Prof. Baillon. Its foliage has much of the general appearance of

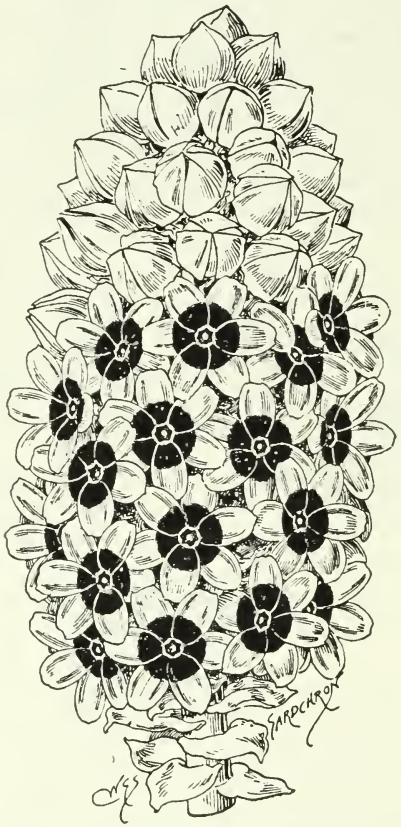


Fig. 8.—Lourya campanulata. (*Gardeners' Chronicle.*)

an Aspidistra (fig. 7), but the inflorescence is more elongated. The perianth resembles that of the Lily of the Valley, but has a purple blotch at the base. The structure of the flower, as described by Baillon, is very curious, and shows that the plant must be placed among the Peliosantheæ, near to Ophiopogon. The dense raceme of flowers (fig. 8) is followed by a cluster of bright blue berries, each oblong, ovate, about 1 inch in length by $\frac{3}{4}$ inch in breadth. While the plant will serve the same purposes as the Aspidistra, it will be seen that the flowers, and especially the fruit, render it still more attractive.

Pear-tree with Caterpillar.—Mr. McLachlan showed a twig with the interior eaten away by the caterpillar of the wood leopard moth, Zeuzera

Æsculi. It was received from Mr. N. Nutter, of Leigham Cottage, St. Julien, Old Streatham. The best remedies for this and boring-beetles is to run a stout wire up the gallery, and so pierce the grubs. Petroleum or spirits of turpentine poured down the hole would also probably be effective in destroying them.

Richardia, two-spathed.—Rev. H. F. Goffe, Thoresway, Caistor, forwarded a specimen in which the uppermost leaf had assumed the form of an additional spathe—a not uncommon phenomenon. It was suggested that experiments might be made, if thought desirable, to fix this peculiarity.

Cedar with Aërial Roots.—The following communication was received from Mr. J. W. Odell, The Grove, Stanmore, together with photographs of the tree described, and a large mass of aërial roots:—"During the recent heavy gales considerable damage was done to one of the large Cedars of Lebanon in Mrs. Brightwen's grounds here: a huge branch was torn from the parent trunk, and revealed a very curious growth of aërial roots. I forward to you with this letter photographs showing the broken branch in two positions, and also a part of the very large growth of adventitious roots. You will observe on photograph (marked *A*) a large scar, corresponding in size and shape to the base of the branch on photograph marked *B*. The roots sent were growing from the edges of the contiguous portions of the trunk and broken branch, and grew downwards from this position towards the base of the tree, but had only penetrated so far as is indicated by a small branch at the base of the scar (seen on both photographs). Both on the branch and on the scar left on the trunk the wood is very much splintered, and the roots were found not only in a large mass as sent, but also growing in between the splintered portions of the wood. The appearance of the fracture indicates, I think, some previous injury (perhaps by lightning), and as a consequence some moisture may have penetrated into the union between the trunk and the branch. I have once or twice before seen similar roots in broken pollarded Willows, but have never observed the formation of such adventitious roots in a Conifer, and thought perhaps it would have some little interest for your Committee of the R.H.S."

SCIENTIFIC COMMITTEE, FEBRUARY 28, 1899.

Dr. MÜLLER, F.R.S., in the Chair, and five members present.

Celery, &c., attacked by Grubs.—This was sent by Mrs. Barnet, of Bilton Hall, Rugby, and proved to be much infested by millepedes (vegetable eaters) and centipedes (insectivorous), but not wireworm. The best remedy for these troublesome grubs is gas-lime or ordinary slaked lime (builder's second quality), well mixed and dug in. It may possibly injure the next year's crop to some extent.

Sweet Pea Seed.—Mr. Sutton described specimens of the seed of certain varieties grown at Reading, remarkable for the skins becoming wrinkled like a Marrowfat Pea; while in one or two cases the Peas were so small that customers had thought they must be defective, whereas the

smallest seeds really gave rise to plants bearing the largest and best type of flowers. In another variety the skin is invariably split. With none of these peculiarities, however, is there the slightest deterioration in the quality or character of the blossoms.

Shirely Poppy Seed.—Mr. Wilks observed that the seeds of these Poppies are becoming of a pale grey colour, instead of being nearly black, as was originally the case with the old type of the cultivated Papaver Rhœas bearing black anthers.

Apple Graft Variation.—Mr. Wilks showed samples of the Mannington Pearmain Apple sent by Mr. Peter Veitch, and taken from the original tree which supplied the fruit described by Dr. Hogg fifty years ago. It is a medium-sized Apple, russet in appearance and rugose, with raised lines, though the sample has scarcely a trace of bright coloration, as stated in Hogg's description. The "improved" form was devoid of all roughness, and brightly coloured with yellow and red. It is now widely distributed by grafting, and this improved form is the present recognised Mannington though widely different from the original type. Professor Bailey records an analogous case in America, in that since the original Newtown Pippin has been distributed over the United States it has assumed various forms specially characteristic of Apples growing in the different States, and even in Australia it has also acquired local characteristics. (See page xxxvi.)

Scientific Committee, March 14, 1899.

Dr. M. T. Masters in the Chair, and three members present.

Dahlias Diseased.—Some roots were received from a nursery firm, with the following communication:—"First we started our roots in the manner we have done for years with the best results—namely, on a hot bench, taking cuttings within three weeks of their insertion, and gradually lessening the heat as time went on. Secondly, the first batch this season was somewhat soft, and all failed; not, however, by damping off, but from the effects of the disease. Thirdly, last season we had magnificent strikes, but near the close of the season, the 'spot'—as on the specimen sent—made its appearance, but was very limited. Fourthly, the bottom heat was maintained at about 70°, while the top was about 15° less. Fifthly, can the Tomato-disease have become incorporated with the soil, as Tomatos had been grown there; and has this any relation to the disease or cause of the trouble? Sixthly, all the roots were placed in comparatively new soil, although some of the old may have been mixed with it. Seventhly, the house is well aired, and the cuttings were firm when taken off. As to remedies, we have applied sulphur with satisfactory results—so far as it killed the fungus at the root and allowed fresh clean growth to be made—but it had no apparent effect on the cuttings. They went off by the score. We have hitherto been most successful in Dahlia cultivation, and have had misfortunes, too, but this disease completely baffles us. The result is the same, both with hard-grown forced exhibition roots and those grown without forcing."

The following valuable report on the preceding was received from Dr.

W. G. Smith, Yorkshire College, Leeds, to whom a vote of thanks was unanimously accorded:—

"The Dahlia cuttings when received showed various stages of blackened discoloration, where they had been in contact with the soil, and also on the older leaves, especially where they joined the stem. Where the blackening was worse the tissues were filled with bacteria, and fungus filaments were present. After a few days in a moist chamber the cuttings became black and rotten, the bacteria were more abundant, and the fungus bore colourless spores of two kinds. Your correspondent suggests infection from Tomato-disease, previously present in the same house. We find that the two forms of fungus conidia (and only two are present) occurring on this Dahlia material are almost (but not exactly) identical in form with those figured by Mr. Massee (*Gardeners' Chronicle*, June 8, 1895) in connection with the Tomato 'sleepy disease.' Whether this is a coincidence or a connection, it is as yet too early to say. There is, however, little doubt that this Dahlia disease affects the cuttings in the same way as the above Tomato-disease. It has its origin in the soil.

"Remedies.—Your correspondent has tried sulphur in the soil with some good effect. No fungicide, however, will be so beneficial as—

"1. Fresh clean soil.

"2. Ventilation, as far as it can be given.

"3. To water the freshly struck cuttings as little as possible till they form roots.

"4. To use boxes or pans which have been thoroughly disinfected, and to have houses and benches washed down with a limewash.

"In addition to these Mr. Massee recommends for the Tomato-disease to mix as much lime in the soil as the plant will stand. How far these measures can be carried out must lie with the discretion of the grower." Dr. Müller suggested sterilising it by baking the soil.

Hybrid Narcissi.—Some specimens were received from Rev. C. Wolley-Dod, with the following remarks:—"I sent a spontaneous hybrid which has come in one of my flower-beds. It is presumably N. pseudo-Narcissus var. minimus × N. cyclamineus. I also enclose specimens of the parents. I consider N. cyclamineus one of the best marked species of the genus. It is the only one which has the perianth almost sessile on the fruit. Mr. G. Maw once suggested to me that it might be produced by N. minimus × N. triandrus, but he overlooked this character—the tube of N. triandrus being very long. In the hybrid sent the tube is intermediate between that of the parents. The trunk of the perinth follows neither parent, being cylindrical, whilst that of N. p. minimus tends to be funnel-shaped, and that of N. cyclamineus is always ventricose and contracted towards the mouth. N. cyclamineus is a profuse pollen-bearer and seed-bearer, but the bulb, with me at least, is short-lived, and requires constant renewal from seed. I have also observed in another bed a hybrid, N. cyclamineus × N. pseudo-Narcissus, of some larger variety. The developed tube and glaucous broad leaf belong with certainty to pseudo-Narcissus, though the perianth is completely reflexed, as in cyclamineus."

SCIENTIFIC COMMITTEE, MARCH 28, 1899.

H. J. VEITCH, Esq., in the Chair, and three members present.

Flow of Sap in a Sycamore during Frost.—Mr. T. R. Bruce, The Old Garrsop, New Galloway, sent the following communication:—"I noticed icicles hanging on a newly-cut branch during the whole of last week, and steadily increasing, although the mean temperature of the week was only 30°. The mean temperature of March 24 was only 25°·7. The cut-branch would be about half-an-inch in diameter, and some pounds' weight of icicles, or pints of sap, have flowed out during the week, and it still continues to flow. The maximum and minimum temperatures were as follows:—19th, 42°·5, 21°; 20th, 42°·5, 23°; 21st, 38°·5, 15°; 22nd, 38°, 21°·5; 23rd, 37°·5, 21°·5; 24th, 40°, 11°·5; 25th, 43°, 23°."

Aberrant Forms of Narcissus.—Mrs. F. M. Cooper sent some flowers—partly fasciated, partly double, and with coherent ovaries, &c., not unusual sports under cultivation.

Carnations and Chrysanthemums attacked by Insects, &c.—Mr. Lees, of Trent Park, New Barnet, exhibited specimens of Pinks and Chrysanthemums, which were forwarded to Mr. McLachan and Mr. Michael for examination.

Hybrid Narcissi.—With regard to the spontaneous hybrid sent to the meeting on March 14 by Rev. C. Wolley-Dod, Mr. Henslow stated that the pollen was quite shrivelled and probably useless, as Mr. Wolley-Dod had found to be the case with other hybrid Narcissi. He sent also a spontaneous hybrid between N. triandrus and the Daffodil. The pollen of this also proved quite effete. He also sent flowers of N. Johnstoni, a supposed species intermediate between N. triandrus and the Daffodil, but it resembled the latter much more closely than the one mentioned above, as the corona was almost exactly that of the Daffodil, but of a paler yellow. The pollen proved to be very bad, but still many grains were apparently quite perfect. Mr. Wolley-Dod says that "it is found in various forms, having established an independent existence over large areas of Portugal and N.W. Spain." He adds that it has never been known to seed. The variety sent is called "Queen of Spain," and is the most abundant.

SCIENTIFIC COMMITTEE, APRIL 18, 1899.

DR. M. T. MASTERS in the Chair, and four members present.

Alpine Auriculas, Mildewed.—A plant was received from Rev. C. Wolley-Dod infected by a fungus. It was forwarded to Dr. W. G. Smith for examination.

Apple-wood, Diseased.—Some specimens received from Mr. Basham were also sent to Dr. Smith.

Germination of Daphne Mezereum.—Mr. Elwes described some curious differences between the germination of some seeds of this shrub, in which the plumule grew up normally above ground; while in others, from some unaccountable cause, it appeared to be arrested for a long period before appearing, although they sent down roots underground in the usual way.

Hyacinth Stem and Leaves growing downwards.—Mr. Henslow showed a plant the bulb of which had been accidentally inserted upside down. The roots had grown normally downwards; but the shoot, instead of turning upward towards the light, had also grown vertically downwards, the greatest energy of growth being at the base of the leaves. It subsequently elevated the bulb into the air, removing all the roots from the soil, and continued to grow solely at the expense of the nourishment contained in the bulb. The flower-stalk, closely invested by the leaves, was 7 in. in length.

Carnations attacked by Acarus.—Mr. Michael reported upon the specimens sent to the last meeting as follows:—"The Carnation pest is a Tarsonymus. All this genus are destructive and difficult to eradicate, in consequence of their leaf- and stalk-mining habits."

Diseased Carnations.—Dr. W. G. Smith, Leeds, reports as follows:—"On the Carnations sent none of the fungi usually present was found, *e.g.* rust, leaf-spot, fairy ring-spot. The symptoms presented are those of the disease known as 'bacteriosis.' This is the name given by Arthur and Bolley (Purdue Univ. Agric. Exp. Station, *Bulletin*, 59, 1896), because they ascribed the disease to the action of a Bacterium (*B. dianthi*). They were able to infect healthy plants with cultures from diseased specimens. A Belgian investigator, Paul Nypels, published in 1898 (*Notes Pathologiques*) some observations on the disease, which point to some other agent than bacteria as the primary cause. Other workers also hold this view. The disease is well known, and very destructive in the indoor cultivation of Carnations in the United States and in Belgium. The conditions favourable to it are overcrowding, defective ventilation, and the effect of moisture on the foliage, due to overhead watering. Prevention is evident, except for the last item mentioned; but overhead watering must be reduced as much as possible. The structure of the Carnation leaf indicates a plant suited to a dry, open situation, like our native Dianthus, on rocks, old walls, and open pastures. In indoor cultivation means must be adopted to prevent too frequent wetting of the foliage. This has been done by some growers in America, as described by Arthur and Bolley. Pieces of wire netting bent into a $\wedge$ shape are placed between the rows of plants, so as to keep the lower leaves clear of the stages. The water is then applied by means of a hose directed into the $\wedge$, and the water is distributed to the roots by a nozzle, delivering on both sides. Arthur and Bolley give illustrations in the Purdue *Bulletin* The method has been successful against this and other diseases of indoor Carnations. Where this disease has already shown itself it may be checked by spraying the foliage with Bordeaux mixture."

Vines Malformed.—Mr. G. Wythes, of Syon House, sent branches of Vines with malformed flowering bunches, supposed to be due to fog, but they presented a not uncommon condition of being tendrils bearing abortive buds. As Darwin, and many others before him, point out, Vine tendrils are homologous with flowering shoots, and such transitional states between simple tendrils and bud-bearing ones occur on all Vines, and have nothing to do with external climatic conditions.

Effect of Lightning on an Oak.—A specimen received from Dr. Plowright, of Lynn, showed how Oak-wood is sometimes torn into longitudinal

fibres by electricity. "The trunk from which this specimen was taken was that of a tree grown in East Anglia, and purchased for timber by a timber merchant in King's Lynn, from whose wood-yard it was obtained. The amount of injury was comparatively slight, consisting only of a groove cut from top to bottom of the trunk, about 2 inches wide, and extending only a very short distance into the woody tissues, but tearing them up longitudinally into strips several feet in length."

Witches' Broom on a Scotch Fir.—This was received from Dr. Plowright, who writes:—"The specimen is sent by Hamon L'Estrange, Esq., and was found growing upon one of the Fir-trees in his park at Hunstanton Hall, Norfolk. It consists of a mass of hypertrophied 'dormant buds,' measuring a metre in circumference round its widest part, and weighs $2\frac{1}{2}$ kilogrammes. It is borne upon a branch which shows eight angular rings, and springs from a lateral shoot. It is interesting to observe that this shoot is itself hypertrophied, as compared with the corresponding one on the opposite side of the branch, but that this hypertrophy only extends as far as the growth beyond which it is atrophied and dead. The growth itself consists of seven or eight rounded masses, composed of aborted shoots—partially developed buds closely aggregated. The masses are of varying ages, some bearing green leaves, while others are quite dry and dead." The origin is supposed, in some cases, to be due to the attack of a Phytoptus, in others to a fungus, Æcidium.

Malformed Bulbous Plants.—A quantity of decayed and arrested bulbous plants were received, both from St. John's Wood Cemetery, Marylebone, and from Lincoln's Inn Fields. Both cases illustrated the effect of premature growth from the very mild winter, followed by severe check during the week of frost, and subsequently by excessive wet. Mr. Henslow observed that on the high ground and clay soil of Holland Park bulbs have come up exceedingly well, having been planted in September.

Apple Trees affected by Grubs.—Specimens received from the Chiswick Gardens were referred to Mr. McLachlan, who has reported as follows:—"The larvæ in the Apple-twigs are no doubt those of Laverna vinolentella, which was formerly considered a variety of L. atra (the larva of which feeds on the fruit of Hawthorn), but is now regarded as distinct. I am not aware that it has ever been found sufficiently common to occasion serious damage, but as the egg is, no doubt, laid in or on a bud, and the depredation primarily confined to the bud, it is evident that the question of serious damage is only one of degree."

Odontoglossum crispum.—Dr. Masters exhibited a spray on which every flower had three, and sometimes four, stamens instead of one only. It was received from Mr. Young.

Jatropha podagrica.—This scarlet flowered species which had been kindly brought up by Charles H. Cave, Esq., of Durdham Park, Bristol, was awarded a Botanical Certificate. It is a well-known plant in botanical gardens.

SCIENTIFIC COMMITTEE, MAY 2, 1899.

Dr. M. T. Masters in the Chair, and four members present.

Cattleya Malformed.—Dr. Masters exhibited a blossom having only one petal, one sepal, and a straight column. This reduction to a symmetry of "two" is not uncommon in Orchids.

Parasitic Fungi.—Some interesting communications, with specimens of Polyporus ulmarius, showing how it appears to cause the decay of the interior of the tree, and fructifies in the hollow, were sent by Dr. Plowright; also descriptions of parasitic fungi on Alders and Willows. A vote of thanks was given to Dr. Plowright for his communication.

SCIENTIFIC COMMITTEE, MAY 16, 1899.

Dr. M. T. MASTERS in the Chair, and four members present.

Diseased Hemerocallis, &c.—A leaf was received bearing decayed spots, apparently due to fungoid growth. This, together with a Peach

FIG. 9—ÆCIDIUM GROSSULARIÆ. (*Gardeners' Chronicle.*

diseased by a form of mildew, and Apple twigs with knots, were forwarded to Dr. W. G. Smith for examination.

Podisoma on Savin.—Dr. Masters exhibited specimens of this fungus, which gives rise to Rœstelia cancellata on Pear-trees.

Æcidium grossulariæ.—He also brought specimens of the "Gooseberry cluster-cups." It occurs on leaves and fruit of the Gooseberry and Currant. In some seasons it is of frequent occurrence. The leaves and fruit affected should be carefully picked off and burned. (Fig. 9.)

Morel.—Dr. Masters also showed a small Morel, found—as is somewhat rarely the case—growing singly. He recorded the fact that after two Poplars had been blown down in Mr. Masters' garden at Canterbury in 1837 Morels grew every other year round the stumps. Mr. Im Thurn observed that the Morel was a common fungus on the Wiltshire moors among Beeches.

FRUIT AND VEGETABLE COMMITTEE.

Fruit and Vegetable Committee, January 10, 1899.

Philip Crowley, Esq., in the Chair, and eighteen members present.

Awards Recommended:—

Silver Knightian Medal.

To Mrs. Wingfield, Ampthill (gr. Mr. J. Empson), for Apples.

Other Exhibits.

Lord Foley (gr. Mr. J. Miller) sent some excellent Mushrooms.

Messrs. John Christmas & Co., Worplesdon, Surrey, sent samples of British Wine, viz., Champagne, Morello Cherry, Red Currant, Black Currant, Damson, and Grape. As British-made wines they were considered very good.

Mr. Hislop, Bletchly, sent a seedling Apple named 'The Scotsman': it was not considered sufficiently distinct from 'Royal Russet.'

Fruit and Vegetable Committee, January 31, 1899.

Philip Crowley, Esq., in the Chair, and nine members present.

Awards Recommended:—

Silver Knightian Medal.

To Messrs. Rivers, Sawbridgeworth, for Apples and Oranges.

Award of Merit.

To Apple 'Lady Pilkington' (votes, 5 for), from the Southport and Churchtown Botanic Gardens. The tree is described as being a strong grower and great bearer. Fruit of medium size, pale yellow on the shaded side, flushed with red where exposed, eye closed, set in a shallow basin, stalk thick and very short, in a deep cavity, flesh brisk and pleasantly acid, somewhat resembling 'Dumelow's Seedling.' (Fig. 10.)

Other Exhibits.

Mr. F. Calver, Ludlow, sent 'Beurre Rance' Pears, and an Apple named 'Calver's Codlin'; a very long fruit, of large size, eye nearly

closed in a shallow basin, stalk very short, set in a deep cavity, skin a bronzy red, flesh soft and rather sweet.

W. Roupell, Esq., sent Apples 'Annie Elizabeth,' 'Smart's Prince Arthur' (fig. 11), and 'Newton Wonder.'

Mr. T. Canning, Aldenham, Bridgnorth, sent a seedling Apple, which the Committee wished to see again next year in better condition.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 14, 1899.

PHILIP CROWLEY, Esq., in the Chair, and twenty members present.

Awards Recommended :—

Gold Medal.

To Messrs. Bunyard, Maidstone, for Apples.

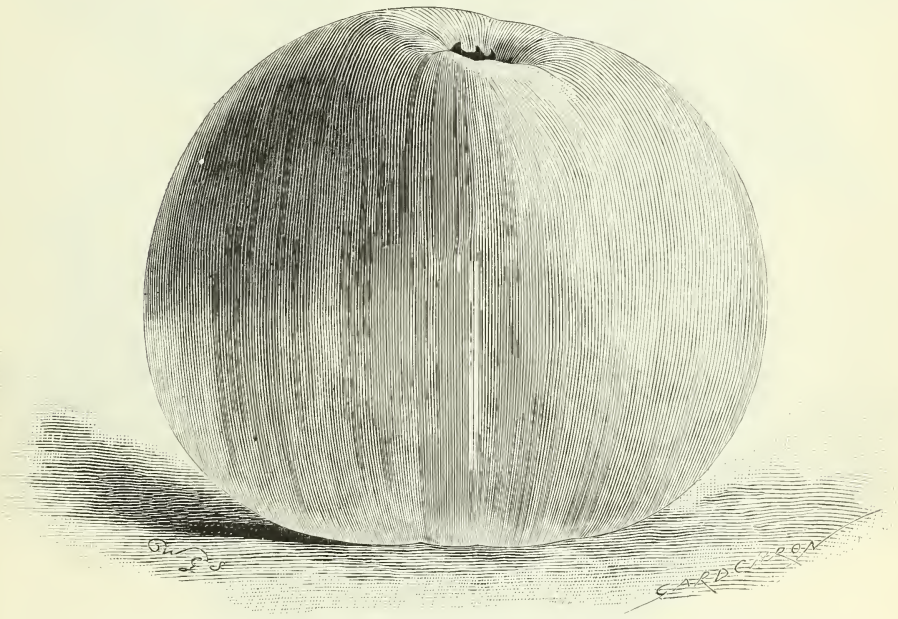


FIG. 10.—NEW APPLE 'LADY PILKINGTON.' (*Gardeners' Chronicle.*)

Silver Knightian Medal.

To the Duke of Northumberland, Syon House (gr. Mr. G. Wythes), for splendid fruiting growths of *Vanilla planifolia.* (Fig. 12.)

To Messrs. Cheal for Apples.

First-class Certificate.

To Apple 'Sanspareil' (votes, unanimous), from Messrs. Bunyard. The fruits are over medium size, conical, yellow flushed with bronze on the exposed side; eye small and open, set in a deep basin, slightly ribbed; stalk thin and very short, inserted in a deep cavity; flesh white, crisp, and of excellent flavour. The tree is a vigorous grower and free bearer. (Fig. 13.)

Award of Merit.

To the Mallett Basket (votes, unanimous), from the Mallett Basket Company, Rotherhithe (see Vol. XXII., page cxx). Mr. Wright reported as follows: "Acting on your instructions of July 5, 1898, the basket before you has had a severe trial. The bottom buckled a little through exposure to wet, but this disappeared in dry weather. One of the greatest advantages is the smooth interior, which does not bruise the

Fig. 11.—Apple 'Smart's Prince Arthur.' (*Gardeners' Chronicle.*)

fruit as in the ordinary wicker basket, and for that reason alone it should prove advantageous to the fruit grower."

To Rhubarb 'The Sutton,' from the Earl of Ancaster, Stamford (gr. Mr. J. Butler) (votes, 8 for, 2 against). An early strong-growing variety, of beautiful colour, which it retains when cooked. The Committee requested that a plant might be sent to Chiswick.

Cultural Commendation.

To Mr. George Wythes, V.M.H. (gr. to the Duke of Northumberland), for wonderful specimens of Vanilla.

Other Exhibits.

Lord Foley, Esher (gr. Mr. J. Miller), sent a basket of Mushrooms.

Dr. R. Sisley, Godalming, sent thirty dishes of Apples.

Messrs. G. Bunyard exhibited Apple 'Chatley's Kernel.' Fruit

Fig. 12.—Vanilla planifolia. (*Gardeners' Chronicle.*)

medium size, flattish, green on the shaded side, dull red where exposed, and covered with small brown spots. A useful late variety.

F. H. Keate, Esq., Colchester, sent Apple 'Stanway Seedling.' A rich golden yellow fruit, in form and texture resembling 'Tower of Glamis.' The Committee wished to see six fruits earlier in the season next year.

Fruit and Vegetable Committee, February 28, 1899.

George Bunyard, Esq., V.M.H., in the Chair, and fifteen members present.

Exhibits.

Lord Poltimore, Exeter (gr. Mr. T. H. Slade), sent Apple 'Brabant Bellefleur.'

Lord Leigh, Stoneleigh Abbey (gr. Mr. H. T. Martin), sent Apple 'Rouen,' but the Committee considered that it resembled 'Cobham' too closely.

Messrs. R. Veitch, Exeter, sent Sandwich Island Salsafy, of which seed was requested for trial at Chiswick.

Mr. Veitch also brought fruits of Apple 'Mannington Pearmain' from the original seedling tree, to compare with fruits of ordinary 'Mannington Pearmain.' The former fruits were small, round, uneven in outline, very russety, often presenting a warty appearance; eye closed, set in a shallow basin, stalk nearly an inch long, thin, and set in a deep cavity; flesh crisp, juicy, and of pleasant flavour. The ordinary 'Mannington Pearmain' has larger fruit, with one side higher than the other, and inclined to be

Fig. 13.—Apple 'Sanspareil.' (*Journal of Horticulture.*)

conical. Skin pale green, covered with a thin russet, flushed with dull red on the exposed side; eye partly closed, and set in a shallow ribbed basin; stalk set in a deep cavity, with a protuberance on one side of it; flesh very juicy and of better flavour than the old seedling. It was suggested that the difference between them was the result of grafting and regrafting for several generations of trees, without going back to the original seedling for scions.

Mr. Notcutt, Woodbridge, sent a stewing Pear under name 'Winter Orange.' The exhibitor was requested to show the variety again at the next meeting, to be compared with other fruits.

Messrs. R. Hartland, Cork, sent Apple 'Ballinora Pippin,' to show its keeping qualities. (See Vol. XXII. p. cxcv).

FRUIT AND VEGETABLE COMMITTEE, MARCH 14, 1899.

GEORGE BUNYARD, Esq., V.M.H., in the Chair, and twelve members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Mr. Watkins, Pomona Farm, Hereford, for Apples.

Silver Knightian Medal.

To A. J. Thomas, Esq., Sittingbourne, for Apples.

First-class Certificate.

To Apple 'Allen's Everlasting' (votes, 7 for, 2 against), from the Earl of Camperdown, Shipston-on-Stour (gr. Mr. J. Masterton). Fruit below medium size, flattish round, skin greenish yellow, flushed faintly with red on the exposed side, eye large and open, set in a shallow basin; stalk thin, short, and inserted in a deep cavity; flesh crisp and of good flavour. An old variety, valuable for its lateness. (Fig. 14.)

FIG. 14.—APPLE 'ALLEN'S EVERLASTING.' (*Gardeners' Chronicle.*)

Award of Merit.

To Apple 'Barnack Beauty,' as a market variety (votes, unanimous), from Mr. Gilbert, Dyke, Bourne, Lincs. Fruit over medium size, 3 in. high and the same in width, very even in form; skin nearly covered with bright red; eye large and open, set in a shallow basin; stalk thin, $\frac{5}{8}$ in. long, and inserted in a shallow cavity; flesh crisp and of fair flavour. The tree is a good bearer on the English paradise stock. (Fig. 15.)

Cultural Commendation.

To Mr. J. Masterton, for wonderful specimens of 'Uvedale's St. Germain' Peas and 'Ailsa Craig' Onions.

Other Exhibits.

Leopold Solomon, Esq., Norbury Park, Dorking (gr. Mr. G. Kent), sent a seedling Potato, which was requested to be tried at Chiswick.

W. H. Evans, Esq., Forde Abbey (gr. Mr. J. Crook), sent Apples that had been stored in boxes. A request was made for further information.

Mr. Watkins sent Apples 'Cowarne Queening,' 'Lord Hindlip,' 'Murfitt's Seedling,' and 'Pine Golden Pippin.'

Mr. Gilbert sent Apples 'Cox's Orange Pippin' and 'Bramley's Seedling,' and Pear 'Bergamot d'Esperen.'

H. A. Blyth, Esq., Stansted (gr. Mr. G. Barker), sent fruits of *Cyphomandra betacea*, the Tree-tomato.

Rev. E. Darnley Smith, Landscove Vicarage, Ashburton, sent patent

Fig. 15.—Apple 'Barnack Beauty.' (*Gardeners' Chronicle.*)

Fruit Protectors. These are made of perforated celluloid, ingeniously constructed in the form of the fruit to protect it from birds and insects. The Committee considered them very promising, and hoped they might prove to be the fulfilment of a long felt want. They desired them to be tested at Chiswick and reported upon. (Fig. 16.)

Mr. J. Russell, Richmond, sent Seakale 'Solid Ivory,' and the ordinary variety for comparison.

Mr. J. Cocks, Peterborough, sent Leeks, said to be a sport from 'Musselborough.'

FRUIT AND VEGETABLE COMMITTEE, MARCH 28, 1899.

PHILIP CROWLEY, Esq., in the Chair, and fifteen members present.

Awards Recommended :—

Award of Merit.

To Pear 'Winter Orange' (votes, unanimous), from Mr. R. C. Notcutt, The Nursery, Woodbridge. This is an excellent stewing Pear, in form rather like 'Beurre Hardy,' with a rich orange skin. The trees growing in the neighbourhood of Woodbridge and Croydon are said to be fifty or sixty years old, and great bearers. The name of 'Winter Orange' is given to this Pear because its original name is unknown, but it may very possibly be identified next year with one of the old but excellent French

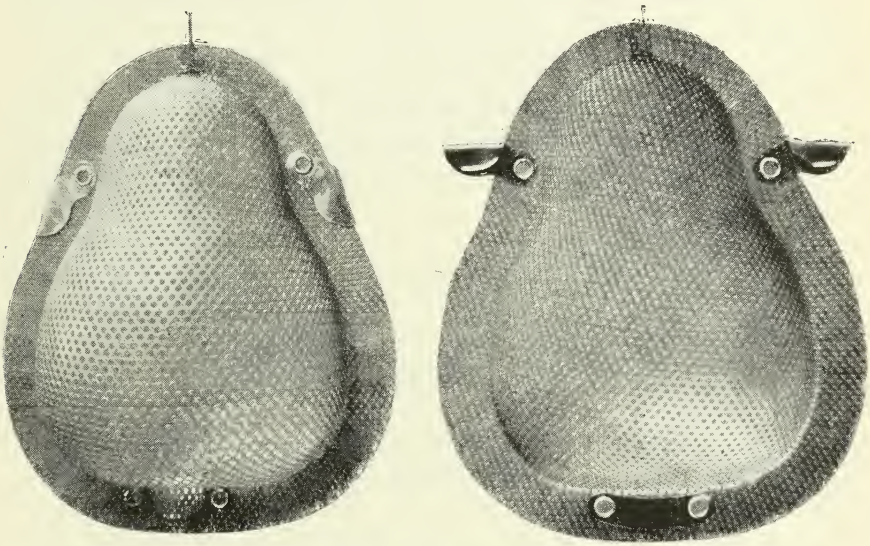


FIG. 16.—THE DARNLEY SMITH FRUIT PROTECTOR.

stewing Pears, of which there were a large number of varieties introduced into this country in the early years of this century. It may, for instance, prove to be 'Double de Guerre' figured in the Society's *Transactions*, 2nd series, Vol. I., p. 328, February 19, 1833.

Other Exhibits.

Mr. Thomas, Sittingbourne, sent Apple 'Diamond Jubilee,' raised from pips sown ten years ago. The Committee desired to see it next year before the fruit commenced to shrivel.

Messrs. R. Hartland, Lough, Cork, sent a pretty Apple named 'Drought's Favourite' which was past its best.

Messrs. Walker, 36 Basinghall Street, sent Grapes received from the Cape. In appearance they resembled 'Grizzly Frontignan' when well grown; the flavour was very good indeed, and they arrived in excellent condition.

From the Society's garden came 24 stocks of Onions to show their keeping qualities.

FRUIT AND VEGETABLE COMMITTEE, APRIL 18, 1899.

PHILIP CROWLEY, Esq., in the Chair, and twenty-two members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. Bunyard, Maidstone, for Apples.

Award of Merit.

To Onion 'Ne Plus Ultra' (votes, 16 for), from Mr. L. J. Dunbar, Hemel Hempstead. Bulbs very large, some weighing 3 lb. 12 oz. each, similar in form to 'Ailsa Craig,' but the flesh deeply tinged with red.

To Tomato 'Winter Beauty' (votes, 14 for), from Mr. Mortimer, Farnham. Of medium size, flattish round, smooth, solid, and of good flavour. The plant is described as dwarf, very prolific, and distinct.

To Pea 'Early Morn,' as a forcing variety (votes, 12 for), from Mrs. Wingfield, Ampthill (gr. Mr. W. J. Empson). The seed was sown about the second week in February, and the plants kept close to the glass in a temperature of about 65°. The pods were of medium size, and well filled with large sweet Peas.

Cultural Commendation.

To Mr. G. Wythes, Syon House, for very fine forced Asparagus.

Other Exhibits.

Mr. G. Farmer, Beckford Hall, Tewkesbury, sent Apple 'Beauty of Dumbleton.'

Messrs. Brown, of Stamford, sent Apple 'April Beauty.' It was past its best, and the Committee wished to see it earlier next year with particulars as to its cropping, &c.

FRUIT AND VEGETABLE COMMITTEE, MAY 2, 1899.

PHILIP CROWLEY, Esq., in the Chair, and eighteen members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To the Duke of Northumberland, Syon House (gr. Mr. G. Wythes, V.M.H.), for vegetables and salads.

Cultural Commendation.

To Mr. Ryder, Hawkswick, St. Albans, for Peaches.

To F. W. Campion, Esq., Colley Manor, Reigate (gr. Mr. J. Fitt), for Strawberry 'Royal Sovereign.'

Other Exhibits.

Mr. Mortimer, Farnham, sent Tomato 'Winter Beauty.'

Mr. Wythes sent Rhubarb 'Victoria,' from seed sown in April 1897.

Her Majesty the Queen, Windsor (gr. Mr. O. Thomas, V.M.H.), sent Pea 'Harbinger'; and Tomato 'Epicure,' a cross between 'Frogmore Selected' and 'Sutton's Dessert.' Fruit rather small, handsome, deep oval, smooth, and produced very freely in good clusters; skin red, thick, and the flesh of excellent flavour. A delicious Tomato for those who like small uncooked fruits.

Mr. J. Russell, Richmond, sent Seakale 'Russell's Improved Giant.'

The Council of the Society having received a letter from Her Majesty's Customs respecting the use of the bushel as a unit of measure for all importations of fruit, and having referred the matter to the Fruit Committee for their opinion, the Committee suggested that it would be better for the Council to appoint a small committee of five to report on the question. (See page 73.)

FRUIT AND VEGETABLE COMMITTEE, MAY 16, 1899.

PHILIP CROWLEY, Esq., in the Chair, and eighteen members present.

Awards Recommended:—

Cultural Commendation.

To Messrs. Rivers, of Sawbridgeworth, for magnificent fruits of Nectarine 'Cardinal.'

To Mr. C. J. Salter, gardener to T. B. Haywood, Esq., Woodhatch, Reigate, for remarkably large and highly coloured fruits of Strawberry 'Royal Sovereign.'

Other Exhibits.

Sir Humphrey de Trafford (gr. Mr. A. Bishop) sent Strawberries 'Monarch' and 'Leader.'

Lord Foley (gr. Mr. J. Miller), Ruxley Lodge, Esher, sent Strawberry 'Royal Sovereign' and Apple 'French Crab.'

T. B. Haywood, Esq., Reigate, sent a plant bearing clusters of 'Hepper's Goliath' Tomatos and a box of very large fruits of the same variety, showing its value for early crops.

Leopold de Rothschild, Esq. (gr. Mr. J. Hudson, V.M.H.), sent Cherry 'Guigne Annonay,' growing in pots. This is a valuable early variety, ripening at the same time as 'Early Rivers.' Fruit deep black, richly flavoured, and with a very small stone.

Lord Aldenham (gr. Mr. E. Beckett), Aldenham House, Elstree, sent Turnip 'New Early Forcing.' The Committee desired it to be grown at Chiswick with other varieties of a similar character.

Philip Crowley, Esq., Waddon House, Croydon, brought fruits of the so-called 'Melon Pear,' a species of Passiflora fruit, oval to heart-shaped, greenish-yellow, with a few streaks of violet, smooth in outline, flesh pale yellow, and possessing a distinct Melon flavour. They were believed to have come from the Canaries.

The Rev. W. Wilks, M.A., after speaking in feeling terms of the sudden death of Mr. Malcolm Dunn, V.M.H., of Dalkeith Palace Gardens,

and the great loss to horticulture, proposed the following resolution, viz., 'The Fruit Committee of the Royal Horticultural Society have heard with great regret of the sudden death of Mr. Malcolm Dunn, V.M.H., for many years a member of this Committee. Whilst recording the

Fig. 17.—The Late Malcolm Dunn, V.M.H. (*Gardeners' Chronicle.*)

great loss they themselves feel, they also desire to express their deepest sympathy with the immediate friends of Mr. Dunn." This was supported by Mr. John Wright, V.M.H., and Mr. Philip Crowley, and carried unanimously, and ordered to be entered on the Minutes of the Committee.

FLORAL COMMITTEE.

January 10, 1899.

W. Marshall, Esq., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Banksian Medal.

To Mr. Miller, Fulham Road, S.W., for forced Flowers.

Other Exhibits.

The Duke of Sutherland, Trentham (gr. Mr. P. Blair), sent some fine plants of Saintpaulia ionantha alba.

F. W. Moore, Esq., Botanic Garden, Glasnevin, sent flowers of Cyrtanthus intermedius.

E. Speyer, Esq., Boxhurst, Dorking (gr. Mr. H. Squelch), brought specimens of a white decorative Chrysanthemum, named 'Elaine Squelch.'

R. B. Leech, Esq., The Cottage, Wood Hall, Dulwich, sent sprays of Asparagus deflexus bearing berries.

Messrs. J. Veitch, Chelsea, sent a group of hardy flowering and berry-bearing Shrubs.

Messrs. Barr, Covent Garden, sent Chinese Primulas.

FLORAL COMMITTEE, JANUARY 31, 1899.

W. MARSHALL, Esq., in the Chair, and twenty-two members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Hill, Lower Edmonton, for Ferns.

To Messrs. Cannell, Swanley, for Primulas.

To Messrs. Cripps, Tunbridge Wells, for Rogeria cordata.

Silver Banksian Medal.

To Messrs. Collins, Hampton, for Daffodils.

To Mr. F. Miller, South Kensington, for cut flowers.

Bronze Flora Medal.

To Mr. Owen, Maidenhead, for Primulas.

Award of Merit.

To Lapageria rosea 'The Knoll Variety' (votes, unanimous), from Sir Trevor Lawrence, Bart., Dorking (gr. Mr. W. Bain). A very large and shapely flower, deep red, mottled with white in the throat. Exceptionally free-flowering.

To Acalypha Godseffiana (votes, 10 for, 1 against), from Messrs. Sander, St. Albans. An ornamental foliage plant, of bushy habit, with ovate pale green leaves, irregularly bordered with creamy white.

Other Exhibits.

Messrs. Laing, Forest Hill, sent a group of foliage and flowering plants.

Messrs. Sander, St. Albans, sent a group of plants.

Messrs. Barr, Covent Garden, sent spring-flowering bulbs.

FLORAL COMMITTEE, FEBRUARY 14, 1899.

W. MARSHALL, Esq., in the Chair, and twenty-four members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. W. Paul, Waltham Cross, for a splendid group of Camellias.

Silver-gilt Banksian Medal.

To Messrs. Hill, Lower Edmonton, for Ferns.

To Mr. J. May, St. Margaret's, Twickenham, for Cyclamen.

Silver Flora Medal.

To Messrs. Cannell, Swanley, for Primulas.

Silver Banksian Medal.

To Mr. H. B. May, Upper Edmonton, for Adiantum Farleyense and Begonia 'Gloire de Lorraine.'

To Messrs. Veitch, Chelsea, for Primulas.

To Messrs. Collins, Hampton, for Tulips.

Award of Merit.

To Hippeastrum 'Sir William' (votes, unanimous), from the Director, Royal Gardens, Kew. The plant exhibited was raised from seed sown in June 1896. The flowers are very distinct and meritorious by reason of their great size and rich crimson-scarlet colour.

To Narcissus 'Trimon' (votes, 17 for), from Messrs. Barr, Covent Garden. The small milk-white flowers of this charming variety are intermediate in character between its parents N. triandrus and N. monophyllus.

Other Exhibits.

Sir Trevor Lawrence, Bart., Dorking (gr. Mr. Bain), sent Helleborus 'Stephen Olbrich.'

J. I. Rogers, Esq., Raggleswood, Chislehurst, sent Helleborus 'Dawn.'

Leopold de Rothschild, Esq., Gunnersbury House, Acton (gr. Mr. J. Hudson), sent Lourya campanulata, a plant with Aspidistra-like leaves and short spikes of campanulate flowers, creamy white blotched with violet-purple in the centre. The flowers are sometimes succeeded by pretty blue berries. The plant is rare, and was introduced from Cochin China ten years ago. (Figs. 7 and 8.)

A. Kingsmill, Esq., The Holt, Harrow Weald, brought sprays of Skimmia Foremani with berries of the last and previous years' growth.

Sir Robert Wright, Headley Park, Hants, sent a flower of Arum dracunculus.

From Lord Suffield, Gunton Park (gr. Mr. Allan), came magnificently flowered specimens of Lachenalia Nelsoni.

The Marquis of Downshire, Easthampstead Park, Wokingham (gr. Mr. Lowe), sent a highly-coloured Codiæum (Croton) named 'Lord Hillsborough.'

Mrs. Cazalet, Greenhurst, Ockley (gr. Mr. Shepherd), brought a new white Primula.

Messrs. Wallace, Colchester, sent Irises.

Messrs. Barr, Covent Garden, sent Daffodils.

Mr. Turner, Slough, sent Malmaison Carnation 'Princess May.'

Messrs. Miller, South Kensington, sent cut flowers.

Mr. Ware, Tottenham, sent hardy flowers.

FLORAL COMMITTEE, FEBRUARY 28, 1899.

W. MARSHALL, Esq., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To St. George's Nursery Co., Hanwell, for Cyclamen.

To Messrs. W. Paul, Waltham Cross, for hardy flowering shrubs, amongst which were the two beautiful hardy Corylopsis. (Figs. 18 and 19.)

Silver Flora Medal.

To Purnell Purnell, Esq., Woodlands, Streatham Hill, for Daffodils and Cinerarias.

Silver Banksian Medal.

To Messrs. Miller, South Kensington, for Cinerarias.

First-class Certificate.

To Prunus persica vulgaris alba flore-pleno (votes, 8 for, 4 against), from Messrs. W. Paul. A remarkably fine double form of the white-flowered Peach. It is quite hardy, free in growth, and exceptionally free-flowering. (Fig. 20.)

Award of Merit.

To Rhododendron 'Exquisite' (R. Javanicum × R. Teysmanni) (votes, 9 for), from Messrs. J. Veitch, Chelsea. This beautiful greenhouse Rhododendron is conspicuous for its large clusters of rich canary-yellow flowers and prominent crimson anthers.

To Rhododendron 'Hercules' (votes, 11 for), from Messrs. Veitch. This belongs to the Javanicum group of hybrids, and is interesting by reason of its flowers very frequently having as many as seven petals instead of the usual five. The flowers are borne in dense clusters, and the colour is apricot-yellow suffused with rose-pink, deepening towards the edges of the petals.

Cultural Commendation.

To Lady Margaret Boscawen, Tregye, Cornwall, for bunches of remarkably fine 'Marie Louise' and 'Neapolitan' Violets.

To Mr. J. Hudson, gr. to Leopold de Rothschild, Esq., Gunnersbury House, Acton, for berried sprays of Asparagus Sprengeri.

Other Exhibits.

Mrs. Bonham Carter, Petersfield, sent a flower of the Black Calla, *Arum sanctum.*

Messrs. R. Veitch, Exeter, sent small plants of Primula floribunda 'Isabella' bearing an abundance of cream-white flowers. The Committee asked to see this again.

Messrs. Barr, Covent Garden, brought Daffodils.

From Messrs. J. Veitch, Chelsea, came a group of Prunus (Amygdalus) persica magnifica.

Messrs. Paul, Cheshunt, sent Hellebores and Lilacs.
Messrs. Ware, Tottenham, sent hardy plants.

Fig. 18.—Corylopsis pauciflora. (*Gardeners' Chronicle.*)

Mr. Russell, Richmond, sent hardy flowering and berry-bearing shrubs.

Messrs. Sander, St. Albans, sent Hippeastrum procerum.

FLORAL COMMITTEE, MARCH 14, 1899.

C. E. SHEA, Esq., in the Chair, and twenty-one members present.

Awards Recommended :—

Gold Medal.

To Captain Holford, Westonbirt, Tetbury (gr. Mr. Chapman), for a marvellous collection of seedling Hippeastrums raised at Westonbirt.

Silver-gilt Flora Medal.

To Messrs. W. Paul, Waltham Cross, for Camellias.

FIG. 19.—CORYLOPSIS SPICATA. (*Gardeners' Chronicle.*)

Silver-gilt Banksian Medal.

To Mr. Mount, Canterbury, for Roses.

Silver Flora Medal.

To Mr. May, Upper Edmonton, for Clematis.
To St. George's Nursery Co., Hanwell, for Cyclamen.
To Messrs. Cuthbert, Southgate, for hardy Azaleas.

Silver Banksian Medal.

To Messrs. Hill, Lower Edmonton, for Ferns.

Bronze Flora Medal.

To Mr. Box, Croydon, for Cinerarias.
To Messrs. Cripps, Tunbridge Wells, for Clematis.

Award of Merit.

To Hippeastrum 'Virginia' (votes, 7 for, 4 against), from Captain Holford, Westonbirt, Tetbury (gr. Mr. Chapman). The flowers are of excellent shape, flesh colour, streaked and suffused with red.

To Hippeastrum 'Murillo' (votes, unanimous), from Captain Holford.

Fig. 20.—Prunus persica, Double White. (*Journal of Horticulture.*)

The broad reflexed segments of this flower are very substantial and of a rich crimson-maroon shade.

To Hippeastrum 'Apple Blossom' (votes, 12 for), from Captain Holford. Flowers of very good shape, the segments are nearly white in the centre and salmon scarlet towards the margins. The throat is white.

To Hippeastrum 'Robin' (votes, 9 for, 7 against), from Captain Holford. The large and shapely flowers, with broad overlapping segments of great substance, are rich orange scarlet and white in the throat.

To Azalea mollis 'Purity' (votes, unanimous), from Messrs. Cuthbert, Southgate. An exceptionally free-flowering variety, with large clusters of very delicate sulphur-coloured flowers, spotted with a deeper shade of yellow on one of the upper segments.

Other Exhibits.

W. H. Evans, Esq., Forde Abbey, Chard (gr. Mr. Crook), sent a box of Primroses.

Messrs. J. Veitch, Chelsea, sent Hippeastrums and hardy shrubs.

Mr. W. Pfitzer, Stuttgart, sent a flowering plant of Calla 'Perle von Stuttgart,' which the Committee considered to be identical with C. 'Little Gem.'

Messrs. Wallace, Colchester, sent Irises and Erythroniums.

FLORAL COMMITTEE, MARCH 28, 1899.

W. MARSHALL, Esq., in the Chair, and twenty-two members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Mr. May, Edmonton, for 40 species and varieties of Blechnums and Lomarias.

Silver Flora Medal.

To Purnell Purnell, Esq., Woodlands, Streatham Hill, for Alpine plants.

To Mr. Mount, Canterbury, for Roses.

To Messrs. W. Paul, Waltham Cross, for flowering shrubs.

To Messrs. Balchin, Hassocks, for Boronias.

Silver Banksian Medal.

To Mr. Rumsey, Waltham Cross, for Roses.

To Messrs. Cuthbert, Southgate, for Azaleas.

First-class Certificate.

To Erica propendens (votes, unanimous), from Messrs. J. Veitch, Chelsea. This is a beautiful and uncommon Cape Heath introduced nearly a century ago. In habit it bears some resemblance to E. hyemalis, and is exceptionally free in blossom; the small drooping bell-shaped pale pink flowers are borne at the tips of the slender growths along the entire length of the shoots. (Fig. 21.)

Award of Merit.

To Azalea mollis 'Betsy Bruin' (votes, unanimous), from Messrs. Cuthbert, Southgate. The medium-sized flowers are borne in compact

trusses, orange-yellow, freely spotted with dull crimson on the upper segment and suffused with rosy salmon.

Cultural Commendation.

To Messrs. J. Veitch, Chelsea, for a Hippeastrum carrying 39 flowers and buds.

Fig. 21.—Erica propendens. (*Journal of Horticulture.*)

Other Exhibits.

Messrs. Veitch also sent a group of flowering Cherries, Chionanthus virginicus, and Loropetalum chinense.

Messrs. Hill, Edmonton, sent a collection of greenhouse Ferns.

Messrs. Williams, Holloway, sent Clivias.

Messrs. Sander, St. Albans, sent Dracænas and Acalyphas.

Messrs. Wallace, Colchester, brought a collection of Irises and Erythroniums.

From Messrs. F. Cant, Colchester, came Roses and amongst them a plant of R. polyantha 'Thalia.' The Committee asked to see this again.

Mr. Russell, Richmond, sent plants of Dracæna Russelli, which received an Award of Merit, September 21, 1897. The Committee now consider that D. Russelli is synonymous with D. lentiginosa, and requested Messrs. Russell to submit plants of each at the next meeting for confirmation or otherwise.

FLORAL COMMITTEE, APRIL 18, 1899.

W. MARSHALL, Esq., in the Chair, and thirty members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Mr. May, Edmonton, for Roses, Hydrangeas, Spiræas, and Acers.

To Messrs. Laing, Forest Hill, for flowering and foliage plants.

Silver Flora Medal.

To Messrs. Sutton, Reading, for Cineraria stellata.

Silver Banksian Medal.

To Wilberforce Bryant, Esq., Stoke Park, Slough (gr. Mr. D. Kemp), for Hippeastrums.

To Messrs. Cutbush, Highgate, for greenhouse and flowering plants.

To Messrs. Carter, High Holborn, for single and double Cinerarias.

Bronze Banksian Medal.

To Sir Francis T. Barry, Bart., M.P., St. Leonard's Hill, Windsor (gr. Mr. R. Brown), for Camellias grown out of doors.

First-class Certificate.

To Anthurium Andreanum 'Perfection' (votes, 17 for, 1 against), from Sir Trevor Lawrence, Bart., Dorking (gr. Mr. Bain). The large, bright scarlet, slightly wrinkled, heart-shaped spathes are of good form and quite distinct.

To Anemone blanda cypriana (votes, unanimous), from the Duke of Rutland, Belvoir Castle, Grantham (gr. Mr. Divers). A charming and very rare dwarf-growing, free-flowering Windflower from Cyprus, with white Daisy-like flowers, the exterior of the petals deeply stained with blue. The flowers are thrown well above the foliage, and last a long time in good condition. It is admirably adapted for the rock-garden.

Award of Merit.

To Erythronium Johnsoni (votes, 17 for), from Messrs. Wallace,

Colchester. A fine Dog's-tooth Violet, bearing rose-coloured flowers marked with yellow in the centre. (Fig. 22.)

Cultural Commendation.

To Mr. D. Kemp, gardener to Wilberforce Bryant, Esq., Slough, for Hippeastrums.

Other Exhibits.

Sir Trevor Lawrence, Bart. (gr. Mr. Bain), sent a group of Anthuriums

Fig. 22.—Erythronium Johnsoni. (*Gardeners' Chronicle.*)

and four double-flowered varieties of Begonia semperflorens. The Committee asked to see the Begonias later in the season.

C. J. Lucas, Esq., Warnham Court, Horsham, brought seedling Clivias.

Dr. Stuart, Hillside, Churnside, N.B., sent flowers of his 'Rayless

Strain' of Tufted Pansies. The Committee requested that plants might be sent to Chiswick for trial.

W. E. Ledger, Esq., Wimbledon, brought a pot of Erythronium denscanis semiplenum.

The Duchess of Cleveland, Battle Abbey, Sussex (gr. Mr. Camm), sent beautiful flowering sprays of Bougainvillea glabra lateritia named B. speciosa.

W. M. Bullivant, Esq., Eden Park, Beckenham (gr. Mr. Cresswell), sent a new seedling Carnation.

Mrs. E. Powys Rogers, Burncoose, Perranwell, Cornwall, sent specimens of Myosotidium nobile.

J. H. Arkwright, Esq., Hampton Court, Leominster, sent a group of Primrose 'Evelyn Arkwright,' and J. S. Arkwright, Esq., sent a very interesting collection of Primulas.

Lord Wantage, Lockinge Park (gr. Mr. Fyfe), sent a beautiful group of 'Fortune's Yellow' Rose.

Lord Aldenham, Elstree (gr. Mr. Beckett), sent Deutzia crenata variegata grown under glass. The Committee asked to see it again at a later period from the open ground.

Major Thurlow, Buckham Hill House, Uckfield, sent a plant of Lotus Bertholetii.

From H. J. Elwes, Esq., Colesborne, came a group of rare hardy flowers.

Mr. Eckford, Wem, Salop, sent Cinerarias.

Messrs. Cuthbert, Southgate, sent several varieties of Azalea indica.

Messrs. Wallace, Colchester, brought hardy bulbous plants.

Messrs. Williams, Upper Holloway, sent New Holland and other plants.

From Messrs. Collins & Gabriel, 39 Waterloo Road, S.E., came a large group of Polyanthus.

Messrs. Sander, St. Albans, sent Dianthera illustris, a plant very similar to and probably identical with Porphyrocoma lanceolata, figured in *Bot. Mag.* t. 4176.

Mr. Rumsey, Waltham Cross, sent Roses.

Messrs. Paul, Cheshunt, sent Roses and hardy flowers.

Messrs. W. Paul, Waltham Cross, sent Tulips and hardy shrubs.

Messrs. Jackman, Woking, sent hardy flowers.

Mr. Porter, Abbeystead, Lancaster, sent a specimen of the variegated Ground Ivy under the impression that it was a sport from Pelargonium 'Flower of Spring.'

Messrs. Peed, West Norwood, sent flowering and foliage plants.

Mr. Piper, Uckfield, Sussex, sent Tea Rose 'Sunrise.'

Mr. Russell, Richmond, sent hardy flowering shrubs.

Messrs. Veitch, Chelsea, sent flowering shrubs.

Mr. Lye, Easterton, Market Lavington, sent flowers of a new Fuchsia named 'Challenge.' The Committee asked to see a plant.

FLORAL COMMITTEE, MAY 2, 1899.

W. MARSHALL, Esq., in the Chair, and twenty-four members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Hogg & Robertson, Dublin, for Tulips.
To Messrs. Paul, Cheshunt, for Roses.

Silver-gilt Banksian Medal.

To Mr. May, Edmonton, for Gleichenias and Roses.

Silver Banksian Medal.

To Mr. Mount, Canterbury, for Roses.
To Messrs. Jackman, Woking, for herbaceous flowers and cut shrubs.

Bronze Banksian Medal.

To Messrs. Hill, Edmonton, for Aspleniums.

Award of Merit.

To Richardia suffusa (votes, unanimous), from Lord Rothschild, Tring Park (gr. E. Hill). The sulphur yellow spathes are of medium size and heavily stained with purple at the base of the central portion.

To Richardia Pentlandi 'Tring Park Variety' (votes, 15 for), from Lord Rothschild. This differs from the ordinary form by reason of its intense golden yellow spathes.

Other Exhibits.

Leopold de Rothschild, Esq., Gunnersbury House, Acton (gr. J. Hudson), sent a new Heliotrope, named 'Madame Fillay.'

Mr. J. Ward, Riddings House, Alfreton, Derby, sent a spathe of Calla Elliottiana.

From F. W. Campion, Esq., Colley Manor, Reigate (gr. J. Fitt), came seedling Polyanthus.

Messrs. Barr, Covent Garden, sent Tulips.

Messrs. Veitch, Chelsea, sent Rhododendron balsaminæflorum hybrids, and a Croton named 'Mrs. Iceton.'

Messrs. Cutbush, Highgate, sent flowering and foliage plants.

Messrs. Cannell, Swanley, sent Primrose 'Miss Massey.'

Messrs. Paul, Cheshunt, sent a new H. T. Rose named 'Victoria Melita.' The Committee asked to see flowers from the open ground.

Mr. J. Douglas, Great Bookham, sent Auriculas.

Mr. Gilbert, Dyke, Bourne, Lincs, sent Fritillarias and Anemones.

Messrs. Wallace, Colchester, sent hardy flowers.

At the Committee's request Mr. Russell, of Richmond, Surrey, brought a plant of Dracæna Russelli and one of D. lentiginosa for comparison, as doubts were expressed at the meeting on March 28 as to whether these plants were synonymous. Being now seen side by side the Committee decided that they were identical, and directed that the name of D. Russelli be expunged from the Society's lists of plants certificated, and D. lentiginosa substituted.

FLORAL COMMITTEE, MAY 16, 1899.

C. E. SHEA, Esq., in the Chair, and twenty-four members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Hogg & Robertson, Dublin, for Tulips.

Silver Flora Medal.

To Messrs. Veitch, Chelsea, for bulbous flowers and Richardia Elliottiana.

To Messrs. Barr, Covent Garden, for Tulips and hardy flowers.

To Messrs. W. Paul, Waltham Cross, for Roses.

To Messrs. Cuthbert, Southgate, for hardy Azaleas.

Silver Banksian Medal.

To Mr. May, Edmonton, for 36 species and varieties of Gymnogrammas.

To Messrs. Paul, Cheshunt, for hardy plants and shrubs.

To Messrs. Cutbush, Highgate, for hardy Azaleas.

To Messrs. Ware, Tottenham, for hardy flowers.

Bronze Flora Medal.

To Messrs. Kelway, Langport, Somerset, for Pæonies.

Bronze Banksian Medal.

To F. D. Godman, Esq., F.R.S., South Lodge, Fareham, for Rhododendrons and Irises.

To Mr. Turner, Slough, for Malmaison Carnations.

To Messrs. Jackman, Woking, for hardy plants and shrubs.

First-class Certificate.

To Cerasus pseudo-cerasus ' Jas. H. Veitch ' (votes, unanimous), from Messrs. Veitch, Chelsea. This recently introduced Japanese tree is a welcome addition to hardy spring-flowering trees and shrubs. It is quite a fortnight later in coming into bloom than ' Waterer's Cherry,' from which it differs in its greater floriferousness and its larger and deeper rosy-mauve coloured flowers, which are borne in dense pendulous trusses. The bronze-green foliage harmonises admirably with the peculiar colour of the flowers, and gives the plant great additional beauty.

Award of Merit.

To Lathyrus splendens (votes, unanimous), from the Director of the Royal Gardens, Kew. This is a climbing greenhouse perennial from Southern California, with four-angled stems and pale green pinnate leaves and numerous rosy purple pea-shaped flowers borne on erect axillary peduncles.

Other Exhibits.

Martin R. Smith, Esq., Hayes, Kent (gr. Mr. C. Blick), sent Border Carnation ' Lady Hermione.'

The Director of the Royal Gardens, Kew, sent exquisite flowers of Amherstia nobilis and Clianthus Dampieri, both of which were greatly admired.

The Marquis of Londonderry, K.G., Winyard Park, Stockton-on-Tees, sent a very fine plant of Echium formosum.

From Leopold de Rothschild, Esq., Gunnersbury House, Acton (gr. Mr. Jas. Hudson), came three varieties of Heliotropes. The Committee

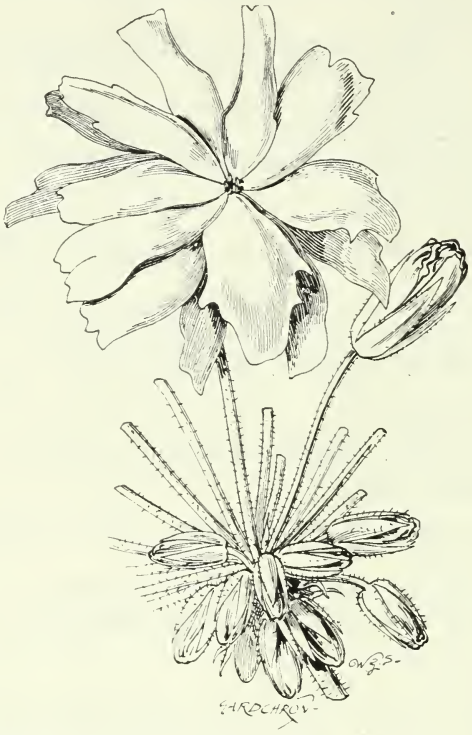


Fig. 23.—'Fire Dragon' Cactus Pelargonium. (*Gardeners' Chronicle*

requested that plants of the variety named 'Picciola' might be sent to Chiswick for trial.

C. T. Druery, Esq., V.M.H., Shaa Road, Acton, sent a plant of Primula Auricula marmorata conspicuous for its variegated foliage.

Mr. Gilbert, Dyke, Bourne, Lincs., sent Tulips and Anemones.

From Mr. Towell, Hampton Hill, came a plant and cut flowers of a hybrid Cactus-flowered Pelargonium named 'Fire Dragon.' (Fig. 23.)

Mr. Paul Hemnell, Winchmore Hill, sent Primula Auricula 'Mrs. Hemnell.'

Mr. Piper, Uckfield, Sussex, sent Tea Rose 'Sunrise.'

Fig. 24.—Angræcum × Veitchii. (*Gardeners' Chronicle.*)

CARDINAL
W. J. S.

ORCHID COMMITTEE.

JANUARY 10, 1899.

HARRY J. VEITCH, Esq., in the Chair, and sixteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for rare hybrid Orchids.

Silver Banksian Medal.

To Messrs. Williams, Holloway, for Cypripediums, &c.

First-class Certificate.

To Angræcum × Veitchii [sesquipedale ♀ eburneum (superbum) ♂] (votes, unanimous), from Messrs. Jas. Veitch. A very remarkable hybrid with thick, ascending, green leaves, and stout inflorescence of three flowers and a bud. Flowers as large as those of A. sesquipedale; spur shorter, and, like the sepals, greenish; petals and lip ivory-white. The first garden hybrid of the genus. (Fig. 24.)

Award of Merit.

To Epicattleya × 'Mrs. James O'Brien' (E. O'Brienianum ♂ C. Bowringiana ♀) (votes, unanimous), from Messrs. Jas. Veitch. Pseudobulbs, stouter than E. O'Brienianum, and clad with thick alternate

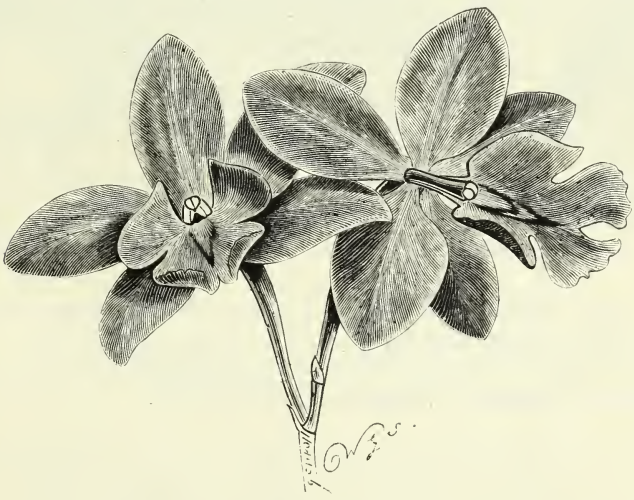


FIG. 25.—EPICATTLEYA × 'MRS. JAMES O'BRIEN.' (*Gardeners' Chronicle.*)

leaves. Inflorescence on nine-inch scape, clad with leafy bracts on the lower half. Flowers about two inches across, of a warm rose-purple. (Fig. 25.)

To Cypripedium × Schofieldianum superbum (bellatulum × ?) (votes, unanimous), from Norman C. Cookson, Esq., Oakwood, Wylam (gr. Mr. Wm. Murray). No record of parentage was definitely given,

but it was agreed that the plant was a good form of C. × Schofieldianum, erroneously recorded as C. bellatulum × C. hirsutissimum. Flower large, ivory white, evenly spotted with purple.

To Sophronitis Rossiteriana (votes, unanimous), from Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. H. White), growth and flower of Sophronitis grandiflora, but the colour of the latter clear yellow.

To Lælia anceps Rosefieldiensis (votes, unanimous), from De B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. S. Cooke). A very dark and brightly coloured form.

To Cypripedium bellatulum, 'Dulcote var.' (votes, 10 for, 4 against), from Walter Cobb, Esq., Dulcote, Tunbridge Wells. Flower large, in colour cream-white, sparsely but distinctly spotted with purple.

To Odontoglossum × Ruckerianum 'Rochford's var.' (votes, unanimous), from Mr. T. Rochford, Turnford Hall, Cheshunt. A fine form, cream white, evenly spotted with reddish brown.

Other Exhibits.

Sir Frederick Wigan, Bart., Clare Lawn, East Sheen (gr. Mr. W. H. Young), showed Phalænopsis amabilis (grandiflora) cultivated in his gardens since 1884, also examples of other Phalænopsis grown for a number of years.

Walter Cobb, Esq., showed Cypripedium 'J. Howes' (Sallieri Hyeanum × villosum aureum).

De B. Crawshay, Esq. (gr. Mr. S. Cooke), showed Lælia anceps 'Titania.'

R. I. Measures, Esq. (gr. Mr. H. J. Chapman), showed Cypripedium × Buchanianum magnificum (Spicerianum × Druryii), and C. insigne Arthurianum.

Henry Tate, Esq., showed three hybrid Cypripediums.

Norman C. Cookson, Esq. (gr. Mr. Wm. Murray), showed hybrid Calanthes.

Messrs. Hugh Low, Enfield, sent a Phaio-Calanthe × as Phaius Tautzianus.

W. P. Burkinshaw, Esq., showed a fine form of Cymbidium Tracyanum.

Sir Wm. Marriott (gr. Mr. T. Denny) showed Lælia × 'Latona' (cinnabarina ♀ purpurata ♂).

F. M. Burton, Esq., sent Lælia anceps Amesiana.

Messrs. F. Sander, St. Albans, showed Orchids.

Orchid Committee, January 31, 1899.

Harry J. Veitch, Esq., in the Chair, and sixteen members present.

Awards Recommended :—

Silver Banksian Medal.

To H. F. Simonds, Esq., Woodthorpe, Beckenham (gr. Mr. Geo. E. Day), for Orchids.

To F. Knight, Esq., Thundersley House, Thundersley, Essex (gr. Mr. E. Marston), for a group of Cattleya labiata Trianæi.

To Mr. Jas. Douglas, Edenside, Great Bookham, for Orchids.

First-class Certificate.

To Lælia anceps Amesiana 'Crawshay's variety' (votes, unanimous), from De B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. S. Cooke). It is much finer in colour, and better in form than the original. *See* Vol. XXII., p. xl.

Award of Merit.

To Masdevallia × Curlei (macrura ♀ Tovarensis ♂) (votes unanimous), from Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. H. White). A fine

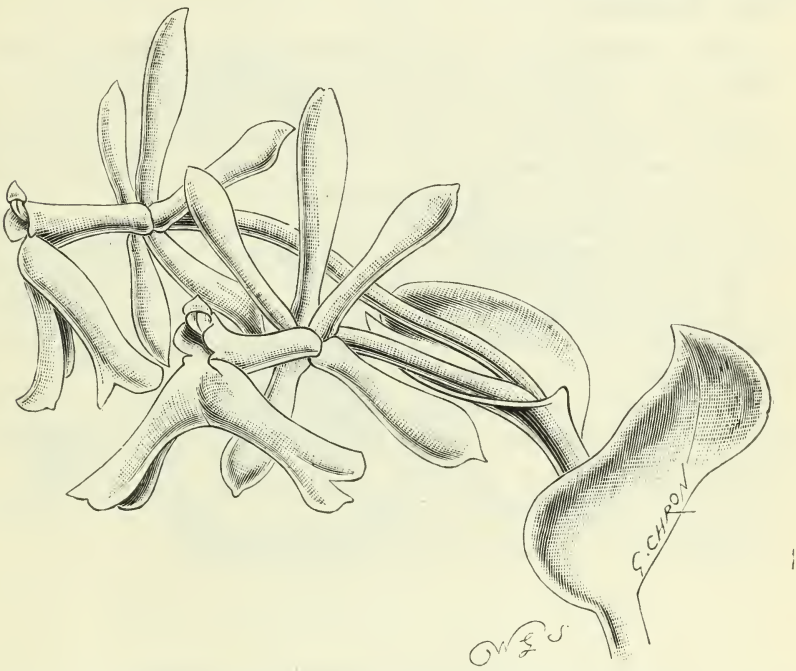


Fig. 26.—Epidendrum latilabrum. (*Gardeners' Chronicle.*)

hybrid with large flowers in form like those of M. macrura, but white in colour.

To Cypripedium × 'Miss Louisa Fowler' (Chamberlainianum × ? insigne variety) (votes, unanimous), from J. Gurney Fowler, Esq. (gr. Mr. Davis). The recorded parentage is doubtless correct. Upper sepal pale green with several lines of dark purple blotches; lower sepal light green with a few dotted purple lines; petals wavy at the edge and ciliate, tinged and veined with reddish purple; face of the lip rose colour.

To Cattleya Trianæi 'Ernest Ashworth' (votes, unanimous), from Elijah Ashworth, Esq., Harefield Hall, Wilmslow (gr. Mr. H. Holbrook). A fine pure white flower, with yellow disc, and rich ruby-purple front to the lip.

To Cattleya Trianæi 'Memoria Lindenii' (votes, unanimous), from Messrs. Linden, Brussels. A dark and richly coloured form with claret-purple front to the lip.

To Cypripedium × Wiertzianum (Rothschildianum × Lawrenceanum) (votes, unanimous), from Messrs. Linden, Brussels. Flowers resembling those of C. × Massaianum and others of its class, but tinted with a darker shade of chocolate-purple.

Botanical Certificate.

To Epidendrum latilabrum, from Messrs. Stanley Mobbs & Ashton, Southgate. A singular species with fleshy leaves and flowers of a semi-transparent green hue. (Fig. 26.)

Other Exhibits.

Elijah Ashworth, Esq. (gr. Mr. Holbrook), showed Cattleya Trianæi albida 'var. E. Ashworth'; a large white form with blush-pink lip.

Norman C. Cookson, Esq. (gr. Mr. Wm. Murray), showed a flower of Calanthe × 'Oakwood Ruby'; a rich ruby-crimson form with small white eye. Evolved by intercrossing with C. vestita rubro-oculata and selecting from the darkest through five generations.

J. Gurney Fowler, Esq. (gr. Mr. Davis), showed varieties of Lælia anceps, and a plant of Cypripedium × Chamberlaino-Leeanum.

Messrs. Hugh Low showed Phalænopsis × Wiganiæ, said to be Schilleriana × Stuartiana, a pretty flower with pink-tinted sepals and petals, the lip and lower halves of the lateral sepals being spotted with reddish crimson.

Philip Crowley, Esq., Waddon House, Croydon (gr. Mr. J. Harris), showed Cattleya Trianæi 'Waddon House variety,' with Peach-blossom coloured flowers.

De B. Crawshay, Esq. (gr. Mr. S. Cooke), sent Odontoglossum crispum 'Imperatrix.'

Messrs. Linden, Brussels, showed some rare Orchids.

Orchid Committee, February 14, 1899.

Harry J. Veitch, Esq., in the Chair, and sixteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. H. White), for Orchids, amongst which were many Burford hybrid Cypripediums and Dendrobiums, amongst which D. × Juno (fig. 27) was specially noteworthy.

Silver Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for Orchids.

To J. Bradshaw, Esq., The Grange, Southgate (gr. Mr. Whiffen), for rare varieties of Cattleya Trianæi and other Orchids.

Silver Banksian Medal.

To F. Knight, Esq., Thundersley House, Essex (gr. Mr. E. Marston), for Cattleya Trianæi varieties.

To Messrs. Hugh Low, Enfield, for Orchids.

To Messrs. B. S. Williams, Holloway, for Cypripediums, &c.

Bronze Banksian Medal.

To C. H. Feiling, Esq., Southgate House, Southgate (gr. Mr. Canham), for Orchids.

First-class Certificate.

To Cattleya Trianæi 'Amy Wigan' (votes, unanimous), from Sir

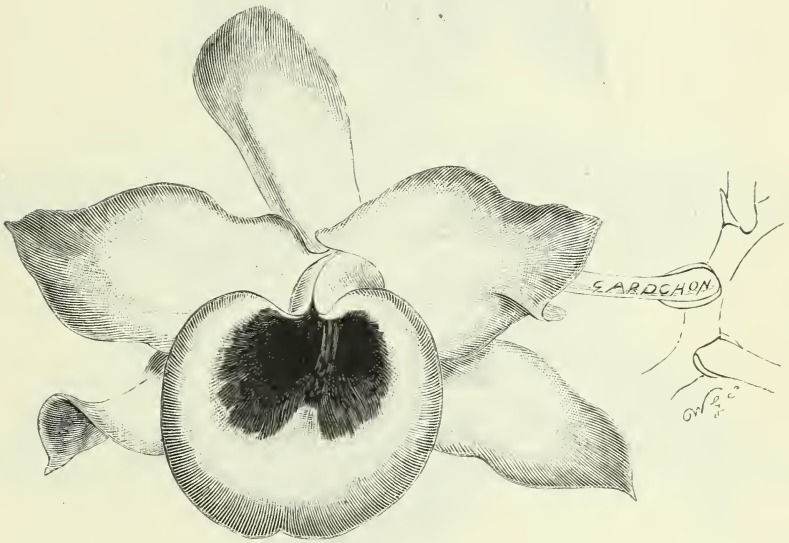


Fig. 27 — Dendrobium × Juno. (*Gardeners' Chronicle.*)

Frederick Wigan, Bart., Clare Lawn, East Sheen (gr. Mr. W. H. Young). A handsome variety, with claret-purple labellum and a broad feather of the same colour on the petals.

Award of Merit.

To Masdevallia × falcata (Coccinea Lindeni ♀ Veitchiana ♂) (votes, 7 for, 4 against), from Sir Trevor Lawrence, Bart. (gr. Mr. W. H. White). A showy hybrid with orange-coloured flowers.

To Phalænopsis × 'Mrs. Jas. Veitch' (Sanderiana ♀ Luddemanniana ♂) (votes, unanimous), from Messrs. Jas. Veitch, Chelsea. Flowers intermediate between the species used, cream-white with pale brown spots. Foliage dark green. (Fig. 28.)

To Cypripedium × 'Orion' (insigne ♀ concolor ♂) (votes, unanimous), from Messrs. Jas. Veitch. A distinct hybrid, with pale yellow flowers

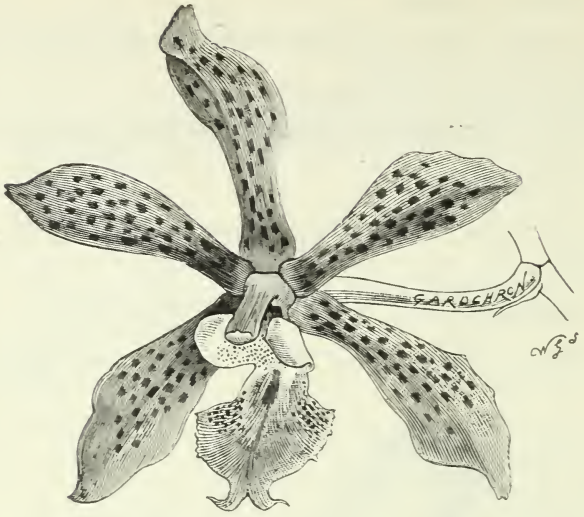


Fig. 28.—Phalænopsis × 'Mrs. Jas. Veitch.' (*Gardeners' Chronicle.*)

profusely spotted with small purple spots, the upper part of the dorsal sepal being white. (Fig. 29.)

To Phaio-Calanthe × 'Niobe' (C. × gigas ♂ P. grandifolius ♀) (votes,

Fig. 29.—Cypripedium × 'Orion.' (*Journal of Horticulture.*)

unanimous), from Messrs. Jas. Veitch. Flowers white, with the faces of the sepals and petals and the front of the lip bright rose-pink.

To Lælio-Cattleya × Warnhamensis 'Hypatia' (L. cinnabarina × C. Trianæi Normani) (votes, unanimous), from Messrs. Charlesworth, Heaton. Sepals and petals yellow; front of lip claret-crimson.

Botanical Certificate.

To Catasetum discolor, from Sir Trevor Lawrence, Bart. (gr. Mr.

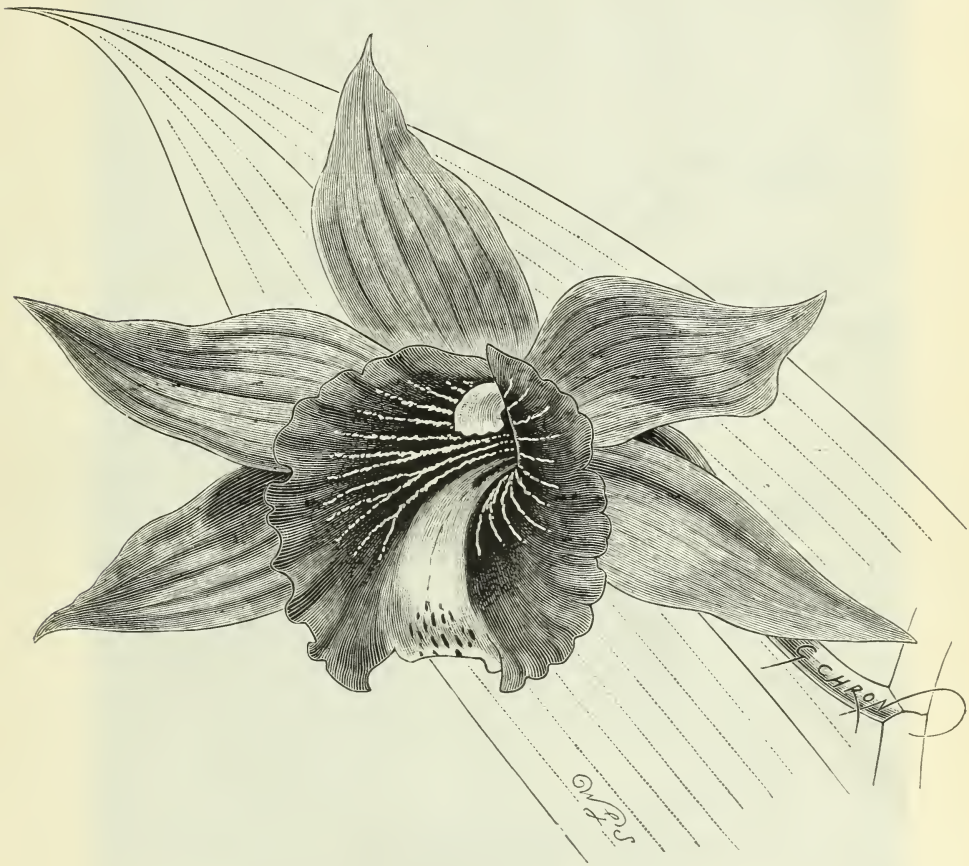


Fig. 30.—Phaius ×. (*Gardeners' Chronicle.*)

W. H. White). Flowers pale green, with a purple fringe round the labellum.

To Restrepia leopardina, from R. I. Measures, Esq., Camberwell (gr. Mr. H. J. Chapman). Flowers yellow, spotted with dark purple.

Cultural Commendation.

To Mr. W. H. White, gr. to Sir Trevor Lawrence, Bart., for a very large and well-grown Odontoglossum × Andersonianum.

To Mr. J. Howes, gr. to Walter Cobb, Esq., Tunbridge Wells, for Odontoglossum maculatum anceps, with many spikes.

Other Exhibits.

Elijah Ashworth, Esq., Wilmslow (gr. Mr. Holbrook), showed Cypri-

Fig. 31.—Angræcum sesquipedale.

pedium × villoso-œnanthum and Dendrobium Domi-cassio (Dominianum × 'Cassiope') and other Orchids.

Mr. Owen Thomas, The Royal Gardens, Frogmore, showed a good light form of Cattleya Trianæi.

Messrs. Sander, St. Albans, showed a handsome hybrid Phaius (P. Manni × P. tuberculosus). (Fig. 30.)

F. M. Burton, Esq., showed a hybrid Epidendrum out of E. × O'Brienianum.

G. F. Moore, Esq., showed Cypripedium × Beeckmani.

H. J. Elwes, Esq., sent varieties of Bletia hyacinthina and a hybrid Calanthe.

De B. Crawshay, Esq., showed Odontoglossum triumphans 'Mrs. De B. Crawshay' and two forms of Lælia anceps.

Herbert Harris, Esq., sent a good form of Cattleya Trianæi, and Lælia anceps Schröderiana.

Messrs. Fisher, Son & Sibray, Sheffield, showed Cypripedium insigne 'Eveline,' with whitish petals spotted with purple, and C. i. Hardsworthiensis of a similar class.

The Rev. F. Paynter, Stoke Hill, Guildford (gr. Mr. Cook), sent flowers of Odontoglossum crispum 'Brilliant' and Dendrobium Phalænopsis hololeucum.

J. T. Gabriel, Esq. (gr. Mr. Ranson), sent Cattleya Trianæi, 'Gabriel's variety.'

Richard Blake, Esq., The Elms, Winterbourne, sent a photograph of a very fine plant of Angræcum sesquipedale with twelve fully expanded blossoms. (Fig. 31.)

Orchid Committee, February 28, 1898.

Harry J. Veitch, Esq., in the Chair, and fifteen members present.

Awards Recommended :—

Silver Banksian Medal.

To W. Thompson, Esq., Walton Grange, Stone (gr. Mr. W. Stevens), for rare Odontoglossums.

To Messrs. Hugh Low, Enfield, for Orchids.

To M. Jules Hye Leysen, Coupure, Ghent (gr. Mr. Coen), for Odontoglossum crispum Masereelianum, showing the good effects of good cultivation.

Bronze Banksian Medal.

To F. Knight, Esq., Thundersley House, Essex (gr. Mr. Marston), for Cattleya Trianæi, &c.

First-class Certificate.

To Lælio-Cattleya × Ernesti 'Princess Olga' (Cattleya Percivaliana ♀ Lælia flava ♂) (votes, unanimous), from M. Charles Maron, Brunoy, France. A beautiful hybrid of the habit of Lælia flava. Flowers nearly as large as those of C. Percivaliana, bright chrome yellow, with dark red markings on the lip. The plant bore two spikes, each of three flowers. (Figs. 32 and 47.)

To Lælio-Cattleya × Callistoglossa 'J. Leemann' (Lælia purpurata var. × Cattleya Warscewiczii imperialis) (votes, unanimous), from M. Chas.

Maron. One of the largest and most beautiful of the Lælio-Cattleyas. Sepals and petals light rose colour, front of lip claret crimson.

Award of Merit.

To Odontoglossum × Wilckeanum 'The Dell Variety' (votes, unanimous), from Baron Sir H. Schröder, The Dell, Staines (gr. Mr. H.

Fig. 32.—Lælio-Cattleya × Ernesti 'Princess Olga.' (*Gardeners' Chronicle.*)

Ballantine). Flowers, except the crest, resembling a canary yellow O. crispum; petals and lip fringed.

To Odontoglossum × Ruckerianum Crawshayanum (votes, unanimous), from De B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. S. Cooke). Flowers large, light yellow, tinged with rose and blotched with dark red colour.

To Odontoglossum × Cookeanum (gloriosum × triumphans) (votes,

8 for, 5 against), from Baron Sir H. Schröder. A natural hybrid, with small yellow flowers blotched with brown. (Fig. 33.)

To Odontoglossum × Coradinei expansum (votes, 7 for), from W. Thompson, Esq., Stone (gr. Mr. W. Stevens). Flower larger than the type, cream white with brown markings.

To Cypripedium × 'Surprise' (Sallieri Hyeanum × Spicerianum) (votes, unanimous), from M. Jules Hye Leysen, Coupure, Ghent (gr. Mr. Coen). A singular seminal variation in which the usual markings are

Fig. 33.—Odontoglossum × Cookeanum. (*Gardeners' Chronicle.*)

suppressed, the flower being greenish-yellow with white upper portion to the dorsal sepal.

Cultural Commendation.

To Mr. W. Stevens, gr. to W. Thompson, Esq., Stone, for a finely grown plant of Odontoglossum × excellens spectabile, with two flower spikes from the leading bulb.

Other Exhibits.

J. T. Bennett-Poë, Esq., Cheshunt (gr. Mr. Downes), sent a collection of Cypripediums.

Baron Sir H. Schröder (gr. Mr. Ballantine), showed a yellow unspotted Odontoglossum Pescatorei.

Messrs. Jas. Veitch, Chelsea, sent four hybrid Phalænopsis.

E. Stanley Clark, Esq., Wrexham (gr. Mr. J. Edwards), showed Odontoglossums, &c.

Sir W. Marriott (gr. Mr. Denny), showed Sophro-Lælia × Marriottii (S. grandiflora × L. flava).

D. M. Grimsdale, Esq., Uxbridge (gr. Mr. Kitwell), showed various Odontoglossums and Cypripediums.

Major Joicey, Sunningdale Park (gr. Mr. F. J. Thorne), showed Lycastes and Dendrobium atroviolaceum.

G. Thompson, Esq., Stamford Hill (gr. Mr. Johnson), showed a good form of Dendrobium nobile.

Mrs. Ball, Cheadle, sent Dendrobium × Ainsworthii.

J. Rutherford, Esq., Beardwood, Blackburn (gr. Mr. J. Lupton), showed Cattleya-Trianæi Rutherfordiana.

H. Shaw, Esq., Birch Vale, Stockport (gr. Mr. J. Cliffe), sent Odontoglossum luteo-purpureum.

W. Gould, Esq., Hyfield, Stockport, sent Lælia glauca.

Messrs. Sander, St. Albans, showed Dendrobium Harveyanum.

ORCHID COMMITTEE, MARCH 14, 1898.

HARRY J. VEITCH, Esq., in the Chair, and eighteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. H. White), for magnificently grown Orchids.

To Messrs. Charlesworth, Bradford, for varieties of Phaius × 'Norman' and other Orchids.

Silver Flora Medal.

To Baron Sir H. Schröder, The Dell, Staines (gr. Mr. Ballantine), for rare Odontoglossums.

To Messrs. Jas. Veitch, Chelsea, for Orchids.

Silver Banksian Medal.

To Messrs. Hugh Low, for Cattleyas and other Orchids.

To Messrs. B. S. Williams, for Orchids.

First-class Certificate.

To Lælio-Cattleya × Digbyano-Mendelii ('Imperatrice de Russie') (C. Mendelii ♀ L. Digbyana ♂) (votes, unanimous), from M. Chas. Maron, Brunoy, France. Resembling L.-C. × Digbyano-Mossiæ. Flowers large, blush white, tinted with rose; lip deeply fringed.

To Odontoglossum crispum 'Sultan' (votes, unanimous), from M. Jules Hye Leysen, Ghent (gr. Mr. Coen). A close ally of O. c. Sanderianum. Flowers heavily blotched with purplish red. (Fig. 34.)

To Odontoglossum crispum 'Duke of York' (votes, unanimous), from W. Thompson, Esq., Walton Grange, Stone (gr. Mr. W. Stevens).

Flowers large, white, tinged with rose and evenly spotted with purple. (Fig. 35.)

Award of Merit.

To Odontoglossum crispum 'Mrs. J. Leemann' (votes, unanimous), from J. Leemann, Esq., West Bank House, Heaton Mersey (gr. Mr. Edge). A singular and pretty form, with French-white flowers, closely spotted, with irregular red-brown markings. (Fig. 36.)

To Odontoglossum × excellens Hyeanum (votes, unanimous), from M. Jules Hye Leysen (gr. Mr. Coen). Flowers large, pale yellow, blotched with light brown.

To Cypripedium × 'Talisman' (Sallieri Hyeanum × Harrisianum superbum) (votes, unanimous), from Mr. Jules Hye Leysen (gr. Mr.

Fig. 34.—Odontoglossum crispum 'Sultan.' (*Journal of Horticulture.*)

Coen). Flowers dark chocolate-purple, with rose-purple upper portion to the dorsal sepal.

To Phalænopsis × 'Hermione' (? Stuartiana × Luddemanniana) (votes, unanimous), from Messrs. Jas. Veitch. Flowers similar to those of P. × 'Mrs. Jas. Veitch,' but spotted and tinged with rose colour.

To Phalænopsis × 'Cassandra' (rosea ♀ Stuartiana ♂) (votes, 8 for) from Messrs. Jas. Veitch. Of the P. × intermedia class. Sepals and petals white, with rose bases; lip bright rose.

To Sophro-Lælia × læta superba (L. Dayana × S. grandiflora) (votes, unanimous), from Messrs. Jas. Veitch. Flowers reddish rose; lip claret red.

To Dendrobium × Wiganiæ xanthochilum (signatum × nobile) (votes, unanimous), from Sir Trevor Lawrence, Bart. (gr. Mr. W. H.

White). Flowers larger and of a much brighter yellow than the original form.

To Masdevallia ignea Boddaertii (votes, 8 for), from Sir Trevor Lawrence, Bart. Flower of the largest of the species, whitish yellow tinged with cherry red.

Botanical Certificate.

To Cœlogyne pulchella, from Sir Trevor Lawrence, Bart. Inflorescence erect. Flowers silver-white with blackish labellum.

To Odontoglossum mirandum, from Sir Trevor Lawrence, Bart.

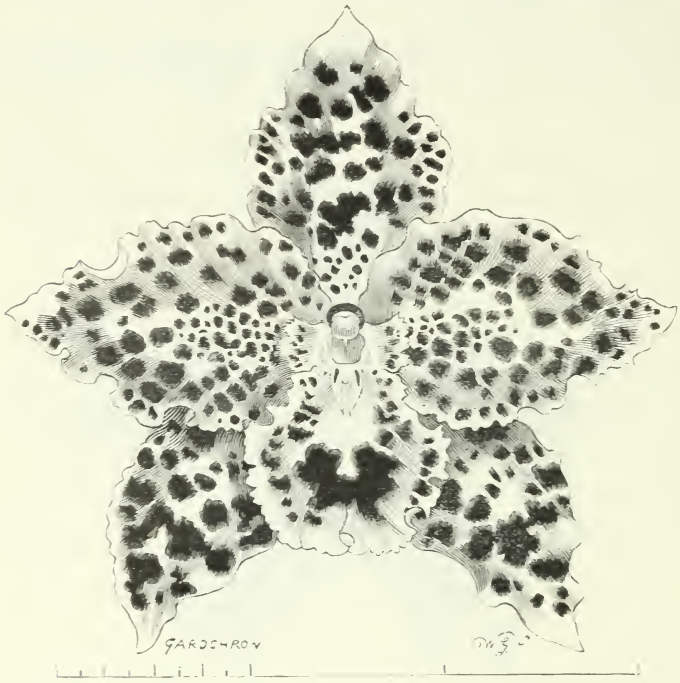


Fig. 35.—Odontoglossum crispum 'Duke of York.' (*Gardeners' Chronicle.*)

Resembling O. Lindleyanum. Flowers yellow, with a brown band up the segments.

Cultural Commendation.

To Mr. W. H. White, gr. to Sir Trevor Lawrence, Bart., for a fine specimen of Cœlogyne conferta with many flower spikes.

Other Exhibits.

De B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. S. Cooke), showed Odontoglossum × excellens Crawshayanum, O. × Andersonianum Bogaerdianum, and fine forms of O. Rossii.

Mr. John Stevens, Twickenham, showed Odontoglossum × Murrellianum Stevensii.

Messrs. Sander, St. Albans, showed various rare Orchids.

Welbore S. Ellis, Esq., Dorking (gr. Mr. Barrell), showed Odontoglossum Pescatorei 'Ellis's var.,' Epidendrum Ellisianum, and Odontoglossum × Andersonianum var.

J. F. Elener, Esq. (gr. Mr. Waite), showed Cypripediums.

J. T. Gabriel, Esq., sent a fine Dendrobium Wardianum.

Fig. 36.—Odontoglossum crispum 'Mrs. John Leemann.' (*Gardeners' Chronicle.*)

W. P. Burkinshaw, Esq., sent a Dendrobium of hybrid origin.

J. Leemann, Esq. (gr. Mr. Edge), showed a grand form of Zygopetalum × Perrenoudii.

Orchid Committee, March 28.

Harry J. Veitch, Esq., in the Chair, and twenty members present.

Awards Recommended:—

Silver Banksian Medal.

To Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. H. White), for rare Orchids.

Bronze Banksian Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for Orchids.

First-class Certificate.

To Lælio-Cattleya × Myra, var. 'Etoile d'Or' (C. Trianæi × L. flava) (votes, unanimous), from M. Jules Hye Leysen, Ghent (gr. Mr. Coen).

Flowers, three or four on each inflorescence, clear chrome colour, differing from the original in the absence of rose-coloured tint.

Award of Merit.

To Dendrobium × 'Euterpe' (nobile × Wardianum) (votes, 10 for, 7 against), from Sir Trevor Lawrence, Bart. (gr. Mr. W. H. White). Of the strong habit and general colouring of D. Wardianum, but intermediate in form between that species and D. nobile.

To Cattleya Trianæi Amesiana (votes, unanimous), from Messrs. Hugh Low, Enfield. A handsome pure white variety, with clear rose-pink front to the labellum.

To Odontoglossum × excellens var. nobilius (votes, unanimous), from M. Jules Hye Leysen, Ghent (gr. Mr. Coen). Flowers 3 in. across, yellow, spotted with light brown, the bases of the petals and blade of the lip being white.

Botanical Certificate.

To Dendrobium canaliculatum, from J. Sparkes, Esq., Heathside, Ewhurst (gr. Mr. Smith). A pretty plant with three spikes of white and rose flowers was shown.

Cultural Commendation.

To Mr. Thurgood, gr. to H. T. Pitt, Esq., Stamford Hill, for a very fine plant of Odontoglossum × Wilckeanum 'Primate.'

Other Exhibits.

Frau Ida Brandt, Riesbach, Zurich (gr. Mr. Schlecht), sent Oncidium Warscewiczii, Cœlogyne Sanderæ, an ally of C. Cumingii, and Phalænopsis 'Aphrodite' var. 'Gloriosa.'

Norman C. Cookson, Esq., Oakwood, Wylam (gr. Mr. Wm. Murray), showed four dissimilar varieties of his Dendrobium × 'Cybele' 'Oakwood var.' (D. nobile Burfordiense × D. Findlayanum).

Messrs. Hugh Low showed Orchids.

Sir Wm. Marriott (gr. Mr. T. Denny), sent Lælio-Cattleya × 'Latona.'

T. B. Haywood, Esq. (gr. Mr. Salter), showed his fine form of Dendrobium × splendidissimum.

Thos. Statter, Esq., Whitefield, Manchester (gr. Mr. Johnson), showed the bright yellow Cypripedium insigne Statteræ.

E. de Q. Quincey, Esq. (gr. Mr. G. B. Lees), showed a fine form of Cattleya Trianæi.

W. C. Walker, Esq. (gr. Mr. Geo. Cragg), showed Eriopsis rutidobulbon with three fine spikes.

Messrs. Linden, Brussels, showed Odontoglossum × cirrho-Halli and other Orchids.

De B. Crawshay, Esq. (gr. Mr. S. Cooke), showed Odontoglossum × Andersonianum and O. × Wilckeanum var.

ORCHID COMMITTEE, APRIL 18, 1899.

HARRY J. VEITCH, Esq., in the Chair, and nineteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for Orchids.

Silver Flora Medal.

To Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. H. White), for Orchids.

To Baron Sir H. Schröder, Staines (gr. Mr. H. Ballantine), for rare Odontoglossums, &c.

To J. Bradshaw, Esq., Southgate (gr. Mr. Whiffen), for Orchids.

To Messrs. B. S. Williams, Holloway, for Vandas, Cypripediums, &c.

FIG. 37.—ODONTOGLOSSUM CRISPUM ASHWORTHIANUM. (*Journal of Horticulture.*)

Silver Banksian Medal.

To Major Joicey, Sunningdale Park (gr. Mr. Fred. J. Thorne), for a group of the fine pure white Diacrium bicornutum cultivated in his gardens for several years.

To Messrs. Hugh Low, Enfield, for Orchids.

To W. A. Bilney, Esq., Weybridge (gr. Mr. Whitlock), for Dendrobiums, &c.

First-class Certificate.

To Odontoglossum crispum Ashworthianum (votes, unanimous), from Elijah Ashworth, Esq., Harefield Hall, Wilmslow (gr. Mr. Holbrook). A magnificent variety in the same section as O. c. 'Frantz Masereel' and O. c. 'Baroness Schröder.' Flowers almost wholly of a purplish rose tint, with a few irregular white lines and margin. (Fig. 37.)

To Masdevallia × Shuttryana 'Chamberlain's variety' (Harryana × caudata Shuttleworthii) (votes, unanimous), from Sir Trevor Lawrence, Bart. (gr. Mr. W. H. White). This fine form, raised in the gardens of the Right Honble. Joseph Chamberlain, differs in colour from the original, the flowers being rosy-mauve with red-yellow tails. The plant bore eleven flowers.

To Odontoglossum × Adrianæ 'Lady Wigan' (votes, unanimous), from Sir Frederick Wigan, Bart., Clare Lawn, East Sheen (gr. Mr. W. H. Young). A pretty form of the supposed natural hybrid between O. crispum and O. Hunnewellianum. Flowers cream-white with numerous brown blotches. (Fig. 38.)

To Dendrobium × 'Clio' 'Vine House variety' (Wardianum × splendidissimum) (votes, unanimous), from A. Warburton, Esq., Vine

Fig. 38.—Odontoglossum × Adrianæ 'Lady Wigan.' (*Gardeners' Chronicle.*)

House, Haslingden (gr. Mr. Lofthouse). The variety showed more of the character of D. Wardianum than those previously exhibited. Sepals and petals white at the base, the remainder bright purplish rose; lip orange, with chocolate-coloured disc and rose apex.

To Odontoglossum × Andersonianum obstupefaciens (votes, unanimous), from C. J. Lucas, Esq., Warnham Court, Horsham (gr. Mr. Duncan). A fine variety, with cream-coloured flowers bearing irregular curved blotches of red-brown.

Botanical Certificate.

To Maxillaria Turnerii, from Walter Cobb, Esq., Dulcote, Tunbridge Wells (gr. Mr. J. Howes). Flowers white and yellow, fragrant.

Cultural Commendation.

To Mr. W. H. White, gr. to Sir Trevor Lawrence, Bart., for Miltonia cuneata, with five fine flower-spikes.

To Mr. Lofthouse, gr. to A. Warburton, Esq., Haslingden, for a splendid plant of the rare Odontoglossum crispum Luciani.

To Mr. S. Cooke, gr. to De B. Crawshay, Esq., Sevenoaks, for Odontoglossum triumphans 'Lionel Crawshay,' with two spikes of ten and seven flowers respectively.

Other Exhibits.

Norman C. Cookson, Esq., Oakwood, Wylam (gr. Mr. Wm. Murray), again showed Dendrobium 'Cybele' 'Oakwood variety.'

W. A. Gillett, Esq., Fairoak Lodge, Bishopstoke, sent a fine selection of Odontoglossums, &c.

Mr. Jas. Douglas, Great Bookham, showed Orchids.

H. T. Pitt, Esq. (gr. Mr. Thurgood), showed Odontoglossum × excellens 'Rosslyn variety,' and other Orchids.

Frau Ida Brandt, Zurich (gr. Mr. Schlecht), sent Orchids.

F. M. Burton, Esq., sent Cypripedium × Tautzianum lepidum.

J. Sparkes, Esq., Ewhurst (gr. Mr. Smith), sent Cymbidium canaliculatum with three spikes.

J. Gurney Fowler, Esq., South Woodford (gr. Mr. J. Davis), showed Cattleya × 'Cecilia' (Lawrenceana × Trianæi) and C. intermedia 'Fowler's variety.'

Mrs. Parr, The Cedars, Tooting, sent Dendrobium macrophyllum.

ORCHID COMMITTEE, MAY 2, 1899.

HARRY J. VEITCH, Esq., in the Chair, and twenty-two members present.

Awards Recommended:—

Silver Flora Medal.

To W. Thompson, Esq., Walton Grange, Stone (gr. Mr. W. Stevens), for rare Odontoglossums.

To De B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. S. Cooke), for varieties of Odontoglossum × Andersonianum.

Silver Banksian Medal.

To Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. H. White), for Orchids.

To Messrs. Hugh Low, Bush Hill, Enfield, for Cattleya-Mendelii, &c.

Award of Merit.

To Dendrobium × 'Nestor' (Parishii × superbum anosmum) (votes, 8 for, 7 against), from Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. H. White). Flowers resembling those of D. Parishii, but larger.

To Odontoglossum × excellens McBeanianum (votes, unanimous), from Messrs. McBean, Cooksbridge. Flower large, sepals and petals

bright yellow, heavily blotched with red-brown; lip pale yellow, with orange crest and dark reddish blotches.

To Odontoglossum triumphans 'Dulcote variety' (votes, unanimous), from Walter Cobb, Esq., Dulcote, Tunbridge Wells (gr. Mr. J. Howes). Flower segments broad, yellow, heavily blotched with brown.

To Epidendrum × elegantulum luteum (Endresio-Wallisii ♂ Wallisii ♀) (votes, unanimous), from Messrs. Jas. Veitch, Chelsea. Habit of growth similar to E. Wallisii. Flowers yellow, the sepals and petals unspotted. (Fig. 39.)

To Odontoglossum × Andersonianum 'Mrs. De B. Crawshay' (votes, unanimous), from De B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. S. Cooke). A large cream-white variety, with very few spots.

Fig. 39.—Epidendrum × elegantulum luteum. (*Journal of Horticulture.*)

To Odontoglossum × Ruckerianum Rosefieldiense (votes, unanimous), from De B. Crawshay, Esq. A fine, bright rose-tinted flower, prettily marked with chestnut-brown.

To Odontoglossum × Andersonianum 'Raymond Crawshay' (votes, unanimous), from De B. Crawshay, Esq. A showy variety, with cream-white flowers, densely spotted in the middle of the segments with brown.

Cultural Commendation.

To Mr. W. Stevens (gr. to W. Thompson, Esq.), for Odontoglossums.

Other Exhibits.

W. A. Gillett, Esq., Bishopstoke, sent Orchids.

R. G. Fletcher, Esq., Brighton, sent Cypripedium caudatum, and its variety Lindenii.

R. I. Measures, Esq., Camberwell (gr. Mr. H. J. Chapman), sent Cypripedium × 'Thyades' (superbiens × Chamberlainianum).

F. A. Rehder, Esq., showed Cypripedium × 'Mrs. Rehder' ('Argus' × Rothschildianum).

F. M. Burton, Esq., Gainsborough, showed Cypripedium × Porphyrites and Odontoglossum polyxanthum.

C. L. N. Ingram, Esq., Godalming (gr. Mr. T. W. Bond), showed Lælio-Cattleya × 'Sir Wm. Ingram.'

Messrs. Jas. Veitch sent Dendrobium × crepidato-nobile.

Orchid Committee, May 16.

Harry J. Veitch, Esq., in the Chair, and sixteen members present.

Award Recommended :—

Silver Flora Medal.

To Baron Sir H. Schröder, The Dell, Staines (gr. Mr. H. Ballantine), for rare Odontoglossums, &c.

To Messrs. Jas. Veitch, Chelsea, for Orchids.

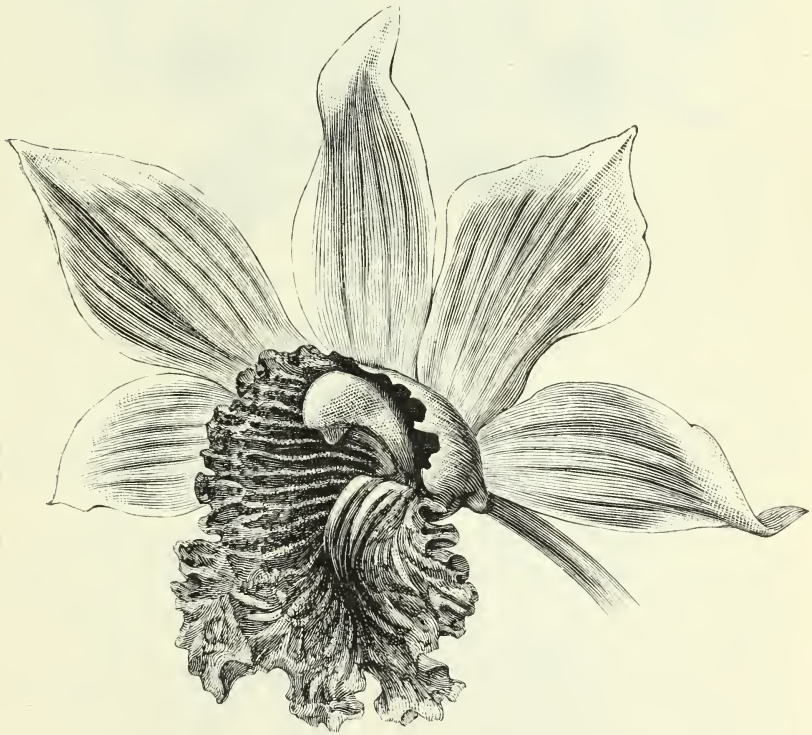


Fig. 40.—Phaius × 'Phœbe.' (*Journal of Horticulture.*)

Silver Banksian Medal.

To Jeremiah Colman, Esq., Gatton Park, Reigate (gr. Mr. King), for Orchids.

First-class Certificate.

To Phaius × 'Phœbe' (Sanderianus × Humblotii) (votes, unanimous), from Norman C. Cookson, Esq., Oakwood, Wylam (gr. Mr. Wm. Murray). The largest and best of the hybrid Phaius. Sepals and petals broad, pale pink tinged with nankeen yellow except the margins; lip yellow at the base, with dark red lines running into the finely displayed rose-coloured front lobe. (Fig. 40.)

To Odontoglossum × Coradinei mirabile (votes, unanimous), from Baron Sir H. Schröder (gr. Mr. Ballantine), formerly shown as O. crispum mirabile. The flowers somewhat resemble a narrow-petalled

Fig. 41.—Odontoglossum × Coradinei mirabile. (*Journal of Horticulture.*)

form of O. crispum, but the column and lip distinctly exhibited O. × Coradinei. Flowers white with large light-brown blotches. (Fig. 41.)

Award of Merit.

To Odontoglossum luteo-purpureum sceptrum 'The Dell Variety' (votes, unanimous), from Baron Sir H. Schröder. Flowers of the typical form, but very large; light yellow spotted with brown; lip crimped and fringed.

To Odontoglossum crispum 'Purity' (votes, unanimous), from T. B. Haywood, Esq., Woodhatch, Reigate (gr. Mr. C. J. Salter). A fine pure white flower with chrome-yellow base to the lip. (Fig. 42.)

To Odontoglossum polyxanthum 'Gatton Park Variety' (votes, unanimous), from Jeremiah Colman, Esq., Gatton Park, Reigate (gr. Mr. King). A very large form, the colouring being bright yellow heavily blotched with chestnut brown.

Fig. 42.—Odontoglossum crispum 'Purity.' (*Journal of Horticulture.*)

Fig. 43.—Odontoglossum crispum 'Raymond Crawshay.' (*Journal of Horticulture.*)

Other Exhibits.

J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. J. Davis), showed Cattleya Mendelii 'J. Gurney Fowler.' A large highly coloured flower with a heavy crimson feather up the middle of the petals.

T. B. Haywood, Esq. (gr. Mr. C. J. Salter), showed Masdevallia Veitchiana grandiflora.

Malcolm S. Cooke, Esq. (gr. Mr. Buckell), sent a spotted form of Odontoglossum crispum.

Walter C. Walker, Esq., Winchmore Hill (gr. Mr. Geo. Cragg), showed Cattleya Walkeriana nobilior with four-flowered inflorescence.

From De B. Crawshay, Esq., Sevenoaks, came Odontoglossum crispum 'Raymond Crawshay.' Flowers of fine form and substance; white, tinged with rose, and each segment bearing several orange-tinted brown spots: petals fringed. (Fig. 43.)

Messrs. Hugh Low, Enfield, showed Odontoglossum × Andersonianum giganteum. A fine form with cream-white flowers spotted with red-brown, and differing from the type chiefly in size. Flower 4 in. across the petals, 4½ in. across the sepals.

NARCISSUS COMMITTEE.

March 14, 1899.

The Rev. G. H. Engleheart in the Chair, and nine members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Barr, of Covent Garden, for Daffodils.

Other Exhibits.

Messrs. Barr sent an interesting series of Dutch-raised hybrids between poeticus ornatus and various Polyanthus Narcissi, their main value being said to be that of greater hardiness than N. Tazetta, derived from the poeticus. One of the best had trusses of three flowers approaching poeticus in size. As the plants were in pots and had been grown under glass, the Committee desired to see them again from the open ground.

Narcissus Committee, March 28, 1899.

The Rev. E. S. Bourne in the Chair, and seven members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Barr, of Covent Garden, for Daffodils.

First-class Certificate.

To Narcissus 'King Alfred' (votes, unanimous), from Mr. Kendall.

Newton Poppleford. A very fine Ajax, said to be a cross between Maximus and either Emperor or Golden Spur. (Fig. 44.)

Fig. 44.—Narcissus 'King Alfred.' (*Gardeners' Chronicle.*)

Other Exhibits.

R. O. Backhouse, Esq., Hereford, sent some very interesting seedlings from Cyclamineus crossed with Obvallaris.

The Rev. G. H. Engleheart, Appleshaw, sent several good hardy hybrid Tazettas.

Messrs. Ware, Hall Farm, Tottenham, sent Daffodils.

NARCISSUS COMMITTEE, APRIL 18, 1899.

J. T. BENNETT-POË, Esq., in the Chair, and fifteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Barr, of Covent Garden, for Daffodils.

Silver Flora Medal.

To Messrs. James Veitch, of Chelsea, for Daffodils.

Silver Banksian Medal.

To Messrs. Bath, of Wisbech, for Daffodils.

First-class Certificate.

To Narcissus 'Edmund's White' (votes, 13 for), from the Rev. G. H. Engleheart, Appleshaw. Perianth pure white, with a wide open and very deep cup of lemon colour beautifully fringed. A very lovely flower of the Leedsii class.

Award of Merit.

To Narcissus intermedius 'Sunset' (votes, 10 for), from Messrs. Barr, said to be a hybrid between Tazetta and Jonquilla: yellow perianth, orange cup, clustered. (Fig. 45.)

To Narcissus bicolor 'Duke of Bedford' (votes, 9 for), from Messrs. Barr.

To Narcissus 'Pope's King' (votes, unanimous), from Messrs. Pope, King's Norton. An improvement on 'Golden Spur.'

To Narcissus poeticus 'Cassandra' (votes, 8 for), from the Rev. G. H. Engleheart. Perianth very wide and white, with deep crimson eye.

To Narcissus 'Strongbow' (votes, 9 for), from the Rev. G. H. Engleheart. A flower of the Nelsoni class, with unusual substance in both perianth and crown: white segments, very broad and flat, rich yellow crown, much expanded.

To Narcissus Incomp. 'Flambeau' (votes, 10 for), from the Rev. G. H. Engleheart. A glorious flower with yellow perianth and glowing orange crown.

To Narcissus Incomp. 'Brigadier' (votes, 9 for), from the Rev. G. H. Engleheart. Not unlike 'Sir Watkin,' but with a white perianth.

Other Exhibits.

Messrs. Pearson, of Chilwell, showed Daffodils.

Messrs. G. S. Ware, Tottenham, sent Triandrus pulchellus and other Daffodils.

Dr. Stuart, Chernside, sent N. obvallaris minor, which appeared to be simply a seminal variety of N. minor.

Messrs. Bath, of Wisbech, sent Daffodils.

Prizes:—Group of Daffodil Blossoms (Polyanthus varieties excluded); must include some of each section, Magni-, Medii-, and Parvi-Coronati; must contain at least forty varieties, distinct, of thirty of which at least three blooms each must be shown. Not more than nine blooms of any one variety. To be staged in bottles, vases, or tubes, not exceeding

Fig. 45.—Narcissus intermedius 'Sunset.' (*Journal of Horticulture.*)

three inches in diameter at the top (inside measurement), and all the stems must touch the water. Quality of flower will count more than quantity, and correct naming and tasteful arrangement will be given due weight. Any foliage may be used, Daffodil or otherwise. No prize will be awarded unless there are two competitors at least. Open to amateurs and gentlemen's gardeners only. First Prize a £7. 7*s*. Silver Cup, presented to the Society by Messrs. Barr & Sons, won by J. T. Bennett-Poë, Esq.; Second Prize, Silver Flora Medal, won by J. W. Jones, Esq., Invermore, Woking.

NARCISSUS COMMITTEE, MAY 2, 1899.

J. T. BENNETT-POË, Esq., in the Chair, and eleven members present.

Awards recommended :—

Silver-gilt Flora Medal.

To Messrs. Bath, of Wisbech, for Daffodils.

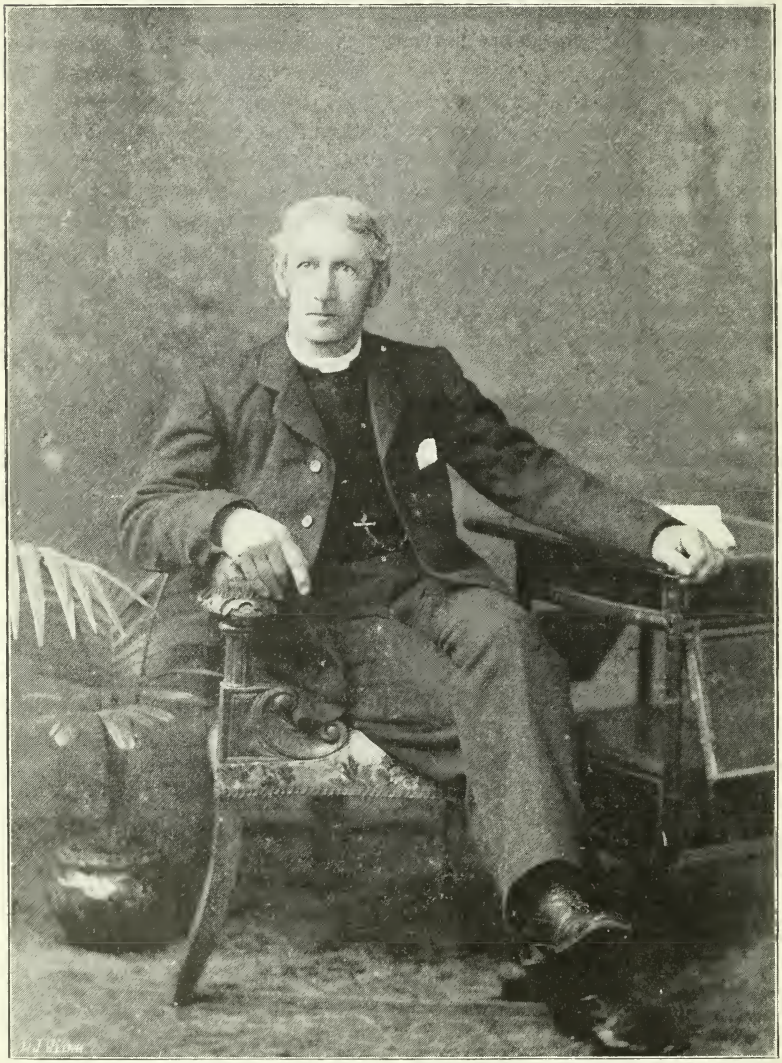


FIG. 46.—REV. GEORGE H. ENGLEHEART. (*Gardeners' Chronicle.*)

Silver Flora Medal.

To Messrs. Barr, of Covent Garden, for Daffodils.

Silver Banksian Medal.

To Messrs. Ware, of Tottenham, for Daffodils.

Award of Merit.

To Narcissus 'Dorothy Kingsmill' (votes, unanimous), from A. Kingsmill, Esq., Harrow Weald. A most beautiful flower raised some years ago by the Rev. G. H. Engleheart, from 'Grandis' crossed with 'Triandrus.' The flower is of the most delicate creamy white, as large as Grandis, but gracefully drooping.

To Narcissus 'Hesperus' (votes, 6 for), from the Rev. G. H. Engleheart. Perianth creamy-buff, with a deep apricot-orange eye.

To Narcissus 'Marina' (votes, unanimous), from the Rev. G. H. Engleheart. Wide-spreading creamy perianth, with a large shallow open crown of pale lemon.

Other Exhibits.

Messrs. Jas. Veitch, of Chelsea, sent Daffodils.

Mr. John Waller sent some seedlings.

Mr. Gilbert, Bourne, Lincolnshire, sent Daffodils.

A. L. Melville, Esq., Branston Hall, Lincolnshire, sent an interesting flower supposed to be a sport from Barri conspicuus, the perianth being of the palest yellow, almost white.

R. O. Backhouse, Esq., Hereford, brought some most interesting and promising seedlings.

Mr. J. Walker, of Thame, sent two flowers of a very beautiful double soft yellow-coloured Incomparable, reminding one of a monster double Odorus.

Fig. 47.—Lælio-Cattleya × Ernesti 'Princess Olga.' (*Journal of Horticulture.*)

NOTICES TO FELLOWS.

JULY 21, 1899.

Grapes.—Fellows can obtain Black Hamburgh Grapes from early in July and onwards at 2*s.* 6*d.* to 1*s.* per lb., according to season and quality. Muscats from early in August and onwards at from 3*s.* to 2*s.* per lb. Carriage will be charged extra as follows: 1 lb., 4*d.*; 2 lbs., 5*d.* 3 lbs., 6*d.*; 4 lbs., 7*d.*; 5 lbs., 8*d.*

Orders for Fruit should be addressed—*Superintendent, R. H. S. Gardens, Chiswick*—and must be accompanied by Cheque or Postal Order to secure attention.

Letters.—*All* letters on *all* subjects (save above) should be addressed —Secretary, R. H. S. Office, 117 Victoria Street, Westminster.

Telegrams.—"HORTENSIA, LONDON," has been registered for the convenience of Fellows sending telegrams.

Dracænas.—The Superintendent, R. H. S. Gardens, Chiswick, would be greatly obliged for any old plants of Dracænas, however old and long. Please shake all earth out and send direct.

"Fruits for Small Gardens."—Fellows are particularly requested to assist in the widespread circulation of this Pamphlet. Price, 2*s.* per 50; 3*s.* per 100 copies.

Great Show of British-Grown Fruit, September 28, 29, and 30.—The Schedule has now been published, and two entirely new Divisions have been added this year—one for Market Growers, and the other for groups of Counties—so that Northern gardeners shall not have to compete against Southern, and so on. Fellows are particularly requested to subscribe a small sum towards the Prizes, as £100 at least must be raised for that purpose. Send at once to the Secretary.

New Fellows.—The Secretary of the Society will feel very grateful to all Fellows who will endeavour to enlarge the scope of the Society by the introduction of New Fellows.

Lectures, &c.—Any Fellows willing to Lecture or to communicate Papers on interesting subjects are requested to communicate with the Secretary.

Meetings and Shows, 1899.—July 25; August 15, 29; September 12, 26; Fruit Show, 28, 29, 30; October 10, 24; November 7, 21; December 5, 19; 1900—January 9, 23.

Notice of Meetings and Shows.—A reminder of every Show will be sent, in the week preceding, to any Fellow who will send to the R.H.S. Office, 117 Victoria Street, Westminster, S.W., 22 halfpenny post cards, *ready addressed* to himself.

Subscriptions.—All Subscriptions fall due on January 1 of each year. To avoid the inconvenience of remembering this, Fellows can now *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by application to the Society, obtain a form of instruction to their bankers to pay for them every January 1. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

Plants.—Fellows are particularly requested to note that a list of Plants available for Distribution is sent to every Fellow, enclosed in the Report of the Council, on or about January 20 in each year. The distribution begins on March 1, and ends on May 1. Fellows having neglected to fill up their application form before May 1, must be content to wait till the next year.

Journal.—The Secretary of the Society would feel greatly indebted to anyone who could supply the following :—

Transactions of the Horticultural Society of London.
Vols. II. and III., 1835–48, 4to.

Journal of the Horticultural Society of London.
Vol. I., parts 1, 2, 3, 1845–6, 8vo.
Vol. III., part 2, 1847–8.
Vol. VI., parts 2 and 3, 1851.

Journal of the Royal Horticultural Society. New Series.
Vol. IV., part 14, 1873–4.
Vol. V., part 1, 1878.

Proceedings of the Society.
Any Numbers, Volumes, or Parts *previous* to 1866.

INDEX TO ADVERTISEMENTS IN THE PRESENT ISSUE.

THE FIGURES REFER TO THE PAGES, WHICH ARE NUMBERED AT THE BOTTOM.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

May 16, 1899.

Dr. Maxwell T. Masters, F.R.S., in the Chair.

Fellows elected (54).—Dr. B. J. Baron, John Barry, F. Bates, C. G. Bentfield, Mrs. A. Berthoud, Miss O. Brooke, Hon. G. Browne-Guthrie, H. P. Bulmer, F. Burnes, Mrs. E. Byng, E. Carlisle, R. Cleasby, Mrs. R. Cleasby, Mrs. Collyer-Bristow, Wm. Conolly, Dr. H. C. Cuff, A. Dawkins, Mrs. Neston Diggle, Hubert McD'Edelsten, Hon. Mrs. C. Egerton, Rev. H. P. Fitzgerald, F.L.S., Basil R. Fleming, Mrs. F. R. Gamwell, John T. Gilbert, Lady Graham, Mrs. E. Hamersley, W. F. Henderson, Miss H. Heywood, Mrs. Daisy Hoare, John H. Holland, Henry Johnson, Mrs. T. E. Kemp, Countess of Kintore, Jos. Lansdell, F. J. Marriott, Mrs. Master, Mrs. Metcalfe, F. L. Mizen, Percy Noble, Rev. W. H. Oxley, W. B. Prosser, Countess of Ravensworth, M. N. Rhodes, Leopold Salomons, H. W. Sillem, Earl Stanhope, Hon. Mrs Stanhope, Hon. Mrs. Tennant, Edward P. Towell, Miss C. Townshend, E. A. Tucker, Henry Warren, W. P. Winter, and Miss A. Young.

Associate (1).—A. Bede-Tourle.

Societies affiliated (2).—Dunedin (New Zealand) Horticultural Society, Edgware and Little Stanmore Horticultural Society.

A lecture on "Some of the Plants Exhibited" was given by the Rev. Prof. G. Henslow, M.A., V.M.H. (See p. 62.)

THE TEMPLE SHOW, 1899.

May 31, June 1 and 2.

JUDGES.

Orchids.

Messrs. Jas. Douglas, V.M.H.
G. W. Law-Schofield.
E. Ashworth.
J. Gurney Fowler.
F. J. Thorne.

Pot Plants in Bloom. (Orchids, Roses, and Begonias excluded).

Messrs. John Jennings.
Chas. E. Shea.
W. Howe.
R. P. Ker.

Foliage Plants, Palms, &c.

Messrs. Owen Thomas, V.M.H.
E. Beckett.
J. H. Fitt.
E. Molyneux, V.M.H.

Cut Flowers.

Messrs. E. Hill.
Geo. Paul, V.M.H.
Jas. Hudson, V.M.H.
J. F. McLeod.

Roses and Begonias.

Rev. J. H. Pemberton.
Messrs. E. B. Lindsell.
W. Bain.
C. R. Fielder.

Fruit and Vegetables.

Messrs. Geo. Norman.
W. Crump, V.M.H.
J. Cheal.
Jas. Smith, V.M.H.

AWARDS GIVEN BY THE COUNCIL AFTER CONSULTATION WITH THE JUDGES.

The order in which the names are entered under the several medals and cups has no reference whatever to merit, but is purely accidental. The Awards given on the recommendation of the Fruit, Floral, and Orchid Committees will be found under their respective Reports.

Gold Medal.

To Sir Trevor Lawrence, Bart., Burford (gr. Mr. White), for Orchids.

To Monsieur Jules Hye Leysen, Coupure, Ghent (gr. Mr. Coen), for Orchids.

To Messrs. J. Veitch, Chelsea, for Phyllocactus, Caladiums, Gloxinias, Shrubs in flower, and Bamboos.

To Messrs. Fisher, Son & Sibray, Sheffield, for shrubs and foliage plants.

To Messrs. T. S. Ware, Tottenham, for Begonias.

Silver Cup.

To Monsieur L. Linden, Brussels, for Orchids.

To Sir Frederick Wigan, Bart., Clare Lawn, East Sheen (gr. Mr. Young), for Orchids.

To Messrs. Sander, St. Albans, for Orchids and new and rare plants.

To Messrs. Charlesworth, Bradford, for Orchids.

To Messrs. Hugh Low, Enfield, for Orchids.

To Messrs. Paul & Son, Cheshunt, for Roses and hardy plants.

To Mr. George Mount, Canterbury, for Roses.

To Messrs. Wm. Paul, Waltham Cross, for Roses.

To Mr. H. B. May, Edmonton, for Ferns.

To R. I. Measures, Esq., Camberwell (gr. Mr. Chapman), for Insectivorous plants.

To Messrs. Wills & Segar, South Kensington, for foliage plants.

To Messrs. Geo. Bunyard, Maidstone, for Apples and fruit trees.

To Lord Wantage, Lockinge (gr. Mr. Fyfe), for fruit.

To Messrs. Rivers, Sawbridgeworth, for fruit trees.

To Messrs. Laing, Forest Hill, for Streptocarpus, Caladiums, and Begonias.

To Messrs. Sutton, Reading, for vegetables and Calceolarias.

To Messrs. Backhouse, York, for miscellaneous plants and Alpines.

To W. Thompson, Esq., Walton Grange, Stone (gr. Mr. Stevens), for Orchids.

To J. Rutherford, Esq., M.P., Blackburn, for Orchids.

To Messrs. Cypher, Cheltenham, for Orchids.

To Messrs. Turner, Slough, for Roses, Azaleas, and Carnations.

Silver-gilt Flora Medal.

To Messrs. Stanley Mobbs & Ashton, Southgate, for Orchids.

To Messrs. Cuthbert, Southgate, for Azaleas.

To Martin R. Smith, Esq., Hayes (gr. Mr. Blick), for Carnations.

To Messrs. Jackman, Woking, for Clematis.

To Messrs. R. Smith, Worcester, for Clematis.

To the Guildford Hardy Plant Co., for Alpines.

To Messrs. Kelway, Langport, for Pæonies.

To Messrs. Cutbush, Highgate, for flowering shrubs, &c.

To Messrs. Hill, Edmonton, for Ferns. (Fig. 64.)

To Messrs. Fromow, Chiswick, for Maples.

To Messrs. Wallace, Colchester, for Lilies, &c.

To Messrs. J. Waterer, Bagshot, for Rhododendrons and shrubs.

To Messrs. Cannell, Swanley, for Cannas, Gloxinias, and Begonias.

To Pantia Ralli, Esq., Ashstead (gr. Mr. Hunt), for Caladiums.

To Messrs. Peed, West Norwood, for Caladiums and Gloxinias.

Silver-gilt Knightian Medal.

To A. Henderson, Esq., M.P., Faringdon (gr. Mr. Bastin), for fruit. (Fig. 57.)

To Sir J. Pease, Bart., M.P., Guisboro' (gr. Mr. McIndoe), for fruit.

To Mrs. Wingfield, Ampthill (gr. Mr. Empson), for fruit and vegetables.

To Mr. S. Mortimer, Farnham, for fruit and vegetables.

Silver-gilt Banksian Medal.

To W. A. Gillett, Esq., Bishopstoke (gr. Mr. Carr), for Orchids.

To W. Walker, Esq., Winchmore Hill (gr. Mr. Cragg), for Orchids.

To Messrs. B. S. Williams, Holloway, for Orchids.

To Mr. A. Perry, Winchmore Hill, for herbaceous plants.

To Mr. Bull, Chelsea, for Dracænas.

To Messrs. Birkenhead, Sale, for Ferns.
To Mr. W. Iceton, Putney, for Palms, &c.
To Swanley College, for vegetables.
To Mr. J. Russell, Richmond, for hardy shrubs and Azaleas.
To Messrs. Cheal, Crawley, for herbaceous plants and shrubs. (Fig. 65.)
To Messrs. Barr, Covent Garden, for herbaceous plants.
To Messrs. Carter, Holborn, for Calceolarias, vegetables, &c.

Silver Flora Medal.

To Malcolm S. Cooke, Esq., Kingston (gr. Mr. Buckle), for Orchids.
To Messrs. Cripps, Tonbridge Wells, for Maples.

Silver Banksian Medal.

To Ludwig Mond, Esq., Regent's Park (gr. Mr. Clarke), for Orchids.
To Messrs. Webb, Stourbridge, for Calceolarias and Gloxinias.
To Mr. Prichard, Christchurch, for herbaceous plants.
To Messrs. House, Bristol, for Violas.
To Mr. Jannoch, Dersingham, for Lilies of the Valley.
To Messrs. Van Waveren, Haarlem, for Astilbes.
To Mr. W. Poupart, Twickenham, for Lilies of the Valley.
To Messrs. Storrie, Dundee, for Auriculas.
To Mr. T. Perkins, Northampton, for Sycamores.
To R. Hoffman, Esq., Dulwich, for Caladiums.
To Mr. H. J. Jones, Lewisham, for Begonias.
To the Countess of Limerick, St. Albans (gr. Mr. Ryder), for fruit and vegetables.
To Mr. Godfrey, Colchester, for Asparagus.

GENERAL MEETING.

June 13, 1899.

Rev. W. Wilks, M.A., in the Chair.

Fellows elected (90).—W. M. Acworth, F. W. Ashton, R. Ashworth, Mrs. G. Banbury, Mrs. Barrow, Countess of Bathurst, Thos. Baxter, Gerard L. Bevan, W. Bolton, Mrs. Oscar Boret, Lady Idina Brassey, Lord Brougham and Vaux, B. de Bruin (Holland), H. Charrington, E. Clark, Percy Clarke, R. P. Cooper, Major F. Cooper, Mrs. O. Crichton, John Cuff, Robt. A. Danvers, Jules Hye De Crom (Belgium), Edmund P. Dixon, Robt. Doe, Miss M. Drage, Mrs. A. Duncombe, Mrs. Durham, Frank M. Elgood, L. J. Endtz (Holland), Lady K. E. Farrer, Chas. E. Fison, W. F. Forwood, H. T. L. Freshwater, A. B. H. Goldschmidt, Panmure Gordon, Miss M. K. Grey, Mrs. Gurney, G. Hanbury, A. J. Harwood, Mrs. Neave Hill, B. Howson, W. Hyde, Frank Idiens, W. J. Iliffe, Charles Ilott, Rev. T. Jeffcoat, Earl of Jersey, R. Sumner Jones, H. P. Kelsey, J. Knowles, E. H. Kruyff (Holland), W. Lawrense, Earl of Leven and Melvile, Col. Somers Lewis, Major M. J. C. Longfield, Miss A. Macartney, Mrs. F. C. Mathieson, Edward Matthews, Mrs. H. Maxwell, A. G. Meissner, Mrs. E. Mellin, Mrs. H. G. Moore, Mrs. J. Murray, F. Needham, M.D., Thomas W. Noad, O. Philippe, A. C. Ray, R. H. Reast, Mrs. Percy Reid, Rev. E. Rodda (Australia), Miss L. A. Rogers,

E. J. Sell, C. Simmons, Edward Smith, H. J. Spooner, W. H. Spring, Mrs. Stock, Duchess of Sutherland, Lord Ventry, F. Adam Walker, Lord Wantage, G. H. Van Waveren (Holland), E. A. B. Wearing, W. Whittenburg, W. Wicker, Mrs. I. van Wisselingh, Edward W. Woods, Col. C. Wynne Finch, C. F. Yeomans.

Associate (1).—Miss Gertrude Cope.

A lecture on "Rock-gardens, Ponds, and Rivulets in Gardens" was given by Mr. F. W. Meyer. (See p. 78.)

GENERAL MEETING.

June 27, 1899.

Mr. A. H. Pearson in the Chair.

Fellows elected (24).—Mrs. Arbuthnot, Countess of Arran, C. Bailey, J. D. Botterill, Earl of Carysfort, G. Gatehouse, E. Henderson, Mrs. G. M. Hulbert, Thomas B. Jones, T. Basil P. Levett, Countess of Lindsey, F. S. Lucey, Mrs. Peel, W. Pretty, H. Raincock, Miss Rowley, L. L. Sander, C. F. Sander, F. K. Sander, J. H. Taylor, J.P., E. Tovey, H. Weeks, Mrs. C. H. Wingfield, Hon. Mrs. E. Yorke.

Associate (1).—A. Brüün (Denmark).

Societies affiliated (2).—Kenilworth Horticultural Society, Battle Horticultural Society.

A lecture on "Some of the Plants Exhibited" was given by the Rev. Prof. G. Henslow, M.A., V.M.H. (See p. 100.)

GENERAL MEETING.

July 11, 1899.

Chiswick Gardens.

Dr. Maxwell T. Masters, F.R.S., in the Chair.

Fellows elected (20).—Henry A. Barthorp, Joseph Bickerton, George J. Braikenridge, L. Clifford Brown, William A. Burge, Colonel J. Bury, Mrs. Choate, Mrs. Courthope, John B. Cooper, William F. Crutch, E. J. Deal, Roland Green, H. Markham, Reginald C. Mount, Mrs. R. S. Newall, Mrs. Smith, George Stratton, Captain W. E. Thomson, J. Viner-Leeder, Alfred O. Walker.

Conference on Hybridisation and Cross-breeding opened at 2.15 p.m. The report of the Conference will be published as a separate volume, and will (it is hoped) be ready by the end of the year.

SPECIAL GENERAL MEETING.

July 21, 1899.

Sir Trevor Lawrence, Bart. (President of the Society), in the Chair.

A Special General Meeting to receive the draft of an amended Charter for the Society, and (if approved) to adopt the same, was held at the Society's offices, pursuant to notice sent to every Fellow.

The President explained (1) the reason for seeking a new Charter, namely, to remove all possible doubt as to the legality of the method of the election of Council; and (2) the object the Council had had in view in framing it, namely, to make it as short and simple as possible and leaving all details to be dealt with in Bye-laws.

The Society's lawyer then read the proposed petition to be presented to Her Majesty, and the proposed supplemental Charter.

Miss Lonsdale suggested that if the strict legality of the method of electing the Council under the present Charter had been questioned, it would be better to hold two Annual Meetings at the Temple Gardens instead of one.

Dr. Masters asked if the present Bye-laws would have to be altered if the meeting adopted the proposed petition and Charter.

The Society's lawyer said they would have to be recast.

Mr. Gordon said that he would prefer that retiring members of the Council should never be re-eligible for election, but added that he did not feel sufficiently strongly on the point to take a division.

Sir Trevor Lawrence assured Mr. Gordon that the point had been most carefully considered, and that provision could be made in the Bye-laws for the exclusion of unsatisfactory members of Council from re-election. He then moved the following resolution:—

"That the draft petition for a supplemental Charter and the draft of the proposed Charter, as submitted and read to the meeting, be approved, and that the petition be sealed by the Society and presented to Her Majesty the Queen."

This was seconded by Sir John T. D. Llewelyn, Bart., and, having been supported by Dr. Masters, F.R.S., and put to the meeting, was declared by the President to be carried unanimously.

A vote of thanks to the President brought the meeting to a conclusion.

GENERAL MEETING.

JULY 25, 1899.

Rev. Prof. GEO. HENSLOW, M.A., V.M.H., in the Chair.

Fellows elected (14).—Benj. Burchell, S. Cutler, A. Deane, A. A. Fabius, A. G. Gardner, Mrs. Goddard, Viscountess Halifax, F. Hovenden, F.Z.S., Major Milne-Redhead, Mrs. Newton, Lady Pearce, W. H. Staff, Harry Williams, J. R. Yorke.

A lecture on "Seed Dispersal" was given by Prof. G. S. Boulger. (See p. 106.)

GENERAL MEETING.

AUGUST 15, 1899.

Mr. WILLIAM MARSHALL in the Chair.

Fellows elected (16).—Clement B. Broad, Mrs. Bulmer, Countess Amelie de Bylandt, Cyril S. Carey, Countess Cowper, George Geen, Charles Lawrence, William G. Lobjoit, W. G. Martin, Walter S.

Nicholson, W. K. Pettigrew, Mrs. A. W. Ruggles-Brise, Miss Frances C. Sewell, Mrs. K. G. Smith, Mrs. Hamlet Thompson, B. Wisonvuski.

Associate (1).—Harry F. Easton.

A paper on "Pruning," by Mr. R. P. Brotherston, was read in his unavoidable absence by Mr. James Douglas, V.M.H. (See p. 119.)

GENERAL MEETING.

August 29, 1899.

Mr. Harry J. Veitch, F.L.S., in the Chair.

Fellows elected (14).—Thomas Barnett, O. R. Bean, Frederick E. Belcher, James Brydon (U.S.A.), J. M. Coppen, Howell P. Edwards, James Garside, Miss R. Hurst, Matthew Horan, Miss G. A. Parker, S. Balen Rao (India), Rev. E. Darnley Smith, Osbert J. Spinks, Frederick Stone.

A paper by Mons. Georges Truffaut, on "The Soil considered as Plant Food, and its Exhaustion by Vegetation," was to have been read, but the Chairman said that it had not been received in time to be translated into English, but that it would appear in a few weeks in the Society's Journal. (See p. 140.)

GENERAL MEETING.

September 12, 1899.

Mr. George Bunyard, V.M.H., in the Chair.

Fellows elected (6).—Countess of Dysart, Wm. H. Gordon, Llewelyn Lloyd, Mrs. J. C. Straker, C. W. W. Topham, R. A. H. Topham.

A lecture on the "Lessons from the Great Drought of 1898" was given by Mr. Edward Mawley, F.R.M.S. (See p. 127.)

GENERAL MEETING.

September 26, 1899.

Mr. A. H. Pearson in the Chair.

Fellows elected (9).—W. R. Alderson, Francis Crawley, Alfred Gray, H. C. E. Lohrman, W. F. Parsons, Edmund Royds, T. H. Solomon, W. J. Woods, H. T. Wright.

Society affiliated (1).—Llanelly and District Horticultural Society.

A lecture on "Instructional Fruit Stations," by Mr. E. Luckhurst, F.R.H.S., was read by the Secretary. (See p. 151.)

SCIENTIFIC COMMITTEE.

June 13, 1899.

Dr. M. T. Masters, F.R.S., in the Chair, and six members present.

Panax Mastersianum.—Dr. Masters exhibited a flowering spray of this plant, which had probably come from New Guinea. The inflorescence appeared to be all male; and as the plant had never been thoroughly described, no flowers having been seen hitherto, Dr. Masters undertook to examine them and report upon them.

Cattleya Mossiæ.—Dr. Masters exhibited a blossom of this Orchid strangely malformed, which he also undertook to examine.

Lilac with Central (Terminal) Bud Aborted.—Dr. Masters brought sprays to show the presence of this bud lying between two opposite fully-formed buds. It is always said to be aborted by frost; but as this invariably happens, it would be more likely to be atrophied, in consequence of all the nourishment being conveyed to the two opposite buds.

Hemerocallis Leaf Diseased.—Dr. Smith reports as follows upon leaves sent to the last meeting:—"The reddish spots on the leaf sent are caused by a fungus. Each spot is quarter to half-inch diameter, and consists of a patch of cavities (pycnidia) sunk in the leaf tissue. From these, tiny conidia are given off to disperse the fungus. In addition to the internal pycnidia, another form of pycnidium is formed on the surface, when a portion of the leaf with spots is kept in a moist chamber: these latter also give off tiny conidia. The forms of pycnidia and their structure refer the fungus to the genus Asteroma. Farlow, in his 'Host Index for U.S. America,' gives a form *Asteroma lineola*, the pycnidial stage of *Dothidea lineola*. The ascospore or Dothidea stage is not present, as far as I can see, on the leaf sent."

Diseased Peach.—Dr. W. G. Smith reports:—"The fruit sent showed a large patch of fungus mycelium with conidia. Two forms of conidia occurred, by which the rot might be referred either to black spot disease (*Cladosporium carpophilum*) or to the fruit-rot (*Monila fructigena*). In transit the fungus spot appears to have enlarged enormously, and it looked quite unlike what one generally sees in either of the above Peach diseases. In any case it is a distinct fruit-rot, and controllable by spraying methods."

Peridermium Plowrighti (Kleb).—The following communication was received from Dr. Plowright, with illustrative specimens:—"The specimens of Peridermium sent herewith were produced by artificial culture, and afford an illustration of how easy a matter it is to unravel a mystery when once one has the clue to it. It is just twenty-five years ago since Wolff showed that *Coleosporium senecionis* was connected with *Peridermium pini* on *Pinus sylvestris*. This Peridermium is frequent upon the Fir trees near King's Lynn, so that I had ample opportunity of confirming Wolff's observations. As a matter of fact, between the years 1881 and 1888, on ten separate and distinct occasions, I did apply the spores of

Peridermium pini to *Senecio vulgaris*. Once, and once only, did I succeed in producing the uredo on the last-named plant. My non-success I attributed to some error in manipulation, and, as I was engaged with other species, I did not follow the research up. Dr. Klebahn, of Hamburg, however, set about the problem, and soon cleared the matter up. He showed that the species of Coleosporium had their æcidiospores on *Pinus sylvestris*, and not *C. senecionis* alone. The species on *Tussilago Farfara*, which is exceedingly common all over England, was one of the forms to which Dr. Klebahn directed his attention, and he gave the above name to its æcidiospores. The specimens sent herewith were produced by artificial culture. On October 16, 1898, a leaf of Coltsfoot, with the teleutospores of *Coleosporium Tussilaginis* abundantly upon it, was fastened upon a young *Pinus sylvestris*; on February 20 suspicious spots began to show, but it was not until April 22 that an abundant development of the Peridermium was observed. On that date the Coltsfoot leaf was still attached to the Fir, and the most abundant development of Peridermium was seen to be immediately beneath it. As this experiment was performed some three miles from my house, the plants were not visited so often as they otherwise would have been. On April 25 two young plants of *Tussilago Farfara* were infected with the above æcidiospores, and on May 13 each was found to be abundantly affected with the uredo of *Coleosporium Tussilaginis*; they were gathered, and are also sent herewith. I have to thank Mr. Walter Scott, of the Golden Ball Nurseries, for the material employed in these cultures, and Mr. Rodgers for his assistance in looking after the plants." Experiment No. 1,243: —*Coleosporium Tussilaginis* placed on a young plant of *Pinus sylvestris* (infecting): Material wired on to the tree October 16, 1898; Spermogonia observed February 20; *Peridermium Plowrighti* abundantly produced and fully developed April 22, 1898. Experiments 1,264, 1,265:—Two young plants of *Tussilago Farfara*, infected on April 25, 1899, with æcidiospores of *Peridermium Plowrighti* from Experiment 1,243; perfect uredo gathered May 15.

Scientific Committee, June 27, 1899.

Dr. M. T. Masters, F.R.S., in the Chair; four other members present, and Mr. H. J. Webber, of the Agricultural Department, Washington, U.S.A.

A Monstrous Cattleya.—Dr. Masters observed that the specimen brought to the last meeting was characterised by having a sepal in a petaloid condition; but the same feature occurred in three flowers on the spike.

A Malformed Catasetum rostrianum.—A spray bearing two flowers, with the lateral petals having the characters of the lip, was sent by Sir Trevor Lawrence.

Diseased Carnations.—Specimens were sent by Mrs. E. Mackay, which proved to be attacked both by bacteria and *Puccinia dianthi*. Mr. Webber observed that the disease known as bacteriosis is now generally regarded

in America as a result, and not a cause ; that it follows upon some lesion in the foliage, as by punctures, &c., by insects. The same observation might apply to the presence of the Puccinia. No remedy could be suggested. It is best to destroy the plants entirely.

Scientific Committee, July 25, 1899.

Dr. M. T. Masters, F.R.S., in the Chair, and four members present.

A Monstrous Begonia.—Mrs. G. Soames, of Welton House, Daventry, sent a peculiar blossom, with white petals and a large tuft of stigmas, apparently a male flower, with the stamens stigmatiferous. Dr. Masters undertook to examine it further and report upon it.

A Proliferous Helenium autumnale.—Mr. Veitch sent specimens of this peculiarity in which the heads had given rise to pedicillate smaller ones, the corollas being more or less virescent as well. It is remarkable that this species is peculiarly liable to this malformation.

Grapes with Mildew—Cypripediums and Apple-trees Diseased.—The three following communications, on specimens sent to a previous meeting, were received from Dr. W. G. Smith, of the Yorkshire College, Leeds. A special and unanimous vote of thanks was rendered to him for his valuable reports. *Grapes with Mildew.*—"The mildew is undoubtedly caused by the fungus *Oïdium Tuckeri*, so well known in this country as the common Grape mildew. On treating the Grapes and leaves sent in various ways, the mildew continued to spread on the fruits, but never appeared on the leaves, which on receipt were very healthy. This supports Mr. Wright's opinion. Most of the authorities state that a dry heat is the chief predisposing cause. In the present case the sender believes that the outbreak was in some way related to the raffia fibre used in tying. A sample sent had a white scurf here and there upon it, but, under favourable conditions, this did not produce any fungoid growth. On examination with the microscope it was found to consist of fragments of plant tissues agreeing with the tissues of the fibre itself, and no doubt the dried remains of parts of the plant partially destroyed in the maceration and drying processes by which the raffia is prepared for market. The dry fibre is an unlikely source of infection, but, if any doubt existed, it could easily be sterilised by boiling, or by steeping for a time in a 2 per cent. solution of corrosive sublimate or otherwise. The universal remedy for mildews of the Oïdium kind is sulphur. A discussion on a hot-water method of treatment of the Vine mildew has been going on in recent numbers of the *Gardeners' Chronicle.*"

Diseased Cypripediums.—"Some flowers were recently sent which were checked in opening, apparently due to a collapse of the lower part of the flower-stalk. There were distinct signs of the presence of fungi, but it was not easy to say whether a mycelium was present or not. A request was made to the sender for portions of affected plants. These arrived in excellent condition, and at first sight looked as hardy as one might wish. The older leaves were very fine, and showed no weak points. The older roots looked rather more dried up than one might wish, but

new roots in various stages were coming on, and quite healthy. The younger leaves, however, seemed weak, with a tendency to become discoloured. Acting on previous experience, these were allowed to dry up, and, as on some other occasions, they produced groups of tiny points—the 'pycnidia' of a fungus. It is from the rosettes of young leaves that the flowers arise, so that there may be a connection. On one of the specimens sent the flower-stalk did not collapse, and the weakly younger leaves were absent from the shoot bearing this flower, though present elsewhere on the same plant. The fungus requires further investigation, but spores obtained were of the Glœosporium or Colletotrichum type. *Glœosporium cinctum* was described by Berkeley and Curtiss from Orchid material. The same species was recently worked through by Miss Stoneman, and placed amongst the Ascomycetes (*Botanical Gazette*, August 1898). Mr. Massee described another Orchid fungus on the Vanilla (*Kew Bulletin*, 139, 1892). I have received various cases from the *Gardeners' Chronicle* of diseased Orchids, all indicating the presence of some form of fungus nearly related to Glœosporium. The disease is known as an 'Anthracnose,' and seems common enough, but we still lack reliable methods of prevention."

Diseased Apple-trees.—"Twigs of Apple with leaves and flowers were received in June. After being kept for twenty-four hours in a moist chamber, abundant conidia of the fungus *Monilia* (*Oïdium*) *fructigena* were produced. This fungus is well known, and at present the subject of much investigation, since it causes a widespread disease of the fruit (also to a less extent on the leaves and twigs) of Cherry, Plum, and Peach, less commonly of Apple and Pear. All the parts sent were affected. The flowers were checked and withered; the leaves reddish-brown, abnormally hairy, and somewhat crumpled. The young twigs were dry and brittle, with occasional patches of brown bark marked with darker bands running round the twig. Internal examination showed the mycelium in every part. In the twigs, the region just under the bark was killed and full of mycelium, which could be traced from old to young shoots, and into the flower-stalks and leaves. In the absence of information we cannot suggest how the fungus gained access to the Apple-trees. The fungus is generally regarded as the same form so common on Cherry and Plum, causing the fruits to shrivel up and remain hanging to the tree in a mummified condition. Keeping this in view, it would be well to pay attention to the trees already mentioned, to gather any dried-up fruits, and to burn them. Careful pruning and destruction of diseased twigs is also an excellent check. Spraying with Bordeaux Mixture seems a likely mode of treatment, but the results as yet are not conclusive. A monograph on the fungus and disease is promised by Woronin in a recent note (*Botan. Centralblatt*, lxxvi. p. 145)."

Stratiotes aloides.—A large specimen of this rare plant was sent by Mr. J. G. Rudd, of Copgrove Grange, Copgrove, Yorkshire, with the following observation:—"This plant grows in a pond on my farm, and is smothering the Water Lilies. One of my horses has eaten freely of it, and died, apparently from its effects; so I shall be glad to know if it is poisonous." It is not known to be at all poisonous, as it is a very rare British plant; but it is possible that the sharp-pointed projections down

the edges of the leaf, such as occur on Aloes, &c., may have had a mechanically deleterious effect on the intestine.

Campanula, Species and Hybrids.—The Rev. C. Wolley-Dod sent specimens of the flowers of *C. rotundifolia*, *C. rhomboidalis*, and their hybrid progeny; as well as of *C. lactiflora*, both the typical flowers, and with an abnormal sub-polypetalous form. The following communication was also received from him:—"The form of corolla with narrow separated lobes, described and illustrated by De Candolle, *Monograph of Campanula*, pp. 11, 12, &c., and figured, plate ii. A, and also described by the late Professor J. S. Henslow (see De C., *Monograph*, p. 12), is commonest in *C. lactiflora* (M. Bieb), in which it is always accompanied by narrow leaves. In *C. rotundifolia* it is commonest in broad-leaved forms, which I take to be hybrid, or are at least intermediate between *C. rotundifolia* and *C. rhomboidalis*. These abnormal forms of *C. rotundifolia* are fertile, and the seedings come in part true, but always include many of the soldanelloid form—*i.e.* with a duplex corolla—which are also fertile. A study of *C. rotundifolia* and *C. rhomboidalis* (apparently quite distinct and good species), and their variously-named intermediate forms, which Godron in his *Flore de France* calls 'a little chaos of species,' leads me to think that *C. rotundifolia* may be a species gradually crawling into new species which are not yet sufficiently defined. In my garden the two species are united by imperceptible gradations, all of which are fertile. Forms having the characters of all the so-called species intermediate between these two may be picked out of them."

Sweet Peas Malformed.—A curiously-flowered spray of Sweet Pea was sent by Mr. Pratt, Lion Gate, Richmond, every flower on the plant being similarly affected. An examination showed that the petals had remained crumpled up without having attained the usual subsequent expansion on blossoming. The stamens were twisted, but the anthers polliniferous, so that the stigmas were pollinated by "self-fertilisation," the flowers being, in fact, cleistogamous. The flowers were arrested in growth, but it was impossible to assign a cause for their abnormal condition.

Foliaceous Geranium.—A specimen of (apparently) *G. sanguineum* was received from Mr. Bunyard, in which the petals of the flowers were replaced by green leaves the segments of which had remained conduplicate.

SCIENTIFIC COMMITTEE, AUGUST 15, 1899.

Dr. M. T. MASTERS, F.R.S., in the Chair.

Grafted Potatos.—Mr. A. W. Sutton sent some specimens of the haulm and tubers of various Potatos upon which he had been experimenting. It will be remembered that on January 31 Mr. Sutton (see page xx) exhibited numerous tubers the character of which appeared to have been modified in consequence of the plants from which they were grown having been grafted with Tomatos, &c. The plants now exhibited show that the modifications alluded to were not confined to the tubers alone, but were noticeable in the plants generally, and that there had been no reversion to the original form. The specimens exhibited were the following:—

No. 1.—Potato 'Victoria,' typical plant, showing normal growth and produce.

No. 2.—Plant grown from tubers which were the result of grafting, in 1895, Tomato 'Maincrop' on Potato 'Victoria.' Each year since 1895 a crop has been grown, and the tubers resulting from the graft saved.

Notes.—All the plants of No. 2 are alike, but the growth is only about one-third the height of No. 1, and the tubers few and small. Haulm much dwarfed and produce diminished, form of leaf not altered.

No. 3.—A similar experiment to the last, except that in 1895 another variety of Tomato, viz., Sutton's 'Perfection,' was grafted on to 'Victoria' Potato.

Notes.—All these plants also are very uniform, exactly corresponding with one another, but they are rather stronger than No. 2, and more bushy, and yet quite distinct from No. 1.

No. 4.—A similar experiment to Nos. 2 and 3 but in this case, instead of a Tomato, the common garden weed, *Solanum nigrum*, which produces seed-berries so plentifully, was grafted on the Potato 'Victoria,' in 1895.

Notes.—The plants correspond more nearly to those of No. 1, but whereas in neither No. 1, 2, nor 3 are there any seed-berries, in No. 4 the plants produce seed-berries abundantly. Three plants of No. 4 are sent to show its seed-bearing tendency. (*N.B.*—It will be seen that the tubers vary little, if at all, from those of No. 1, and this was the case also when shown in January last.) The 'Victoria' foliage is unaltered, but the haulms bear numerous berries of the size of marbles.

A very similar experiment was made in 1895 with another Potato, Sutton's 'Supreme,' the character and constitution of which appear to have been modified by Tomato grafts, just in the same way as 'Victoria' Potato was.

No. 5.—Typical plant of Potato 'Supreme.'

No. 6.—Plant grown from tubers which were the result of grafting, in 1895, Tomato 'Ham Green Favourite' on Potato 'Supreme.' Each year since 1895 a crop has been grown and tubers saved from this graft, as in the case of plants Nos. 2 and 3.

It will be seen that here also the plants are much dwarfer, though the tubers do not differ much except in their smaller size.

Axillary Tubers.—No. 7.—An interesting experiment was made in 1895 as follows:—Tomato 'Earliest of All' was grafted with Potato 'Woodstock Kidney.' The Potato-foliage produced axillary tubers, nourished, of course, by the Tomato roots. The axillary tubers were planted, and a crop has since been grown annually. No. 7 represents the ordinary plant of Potato 'Woodstock Kidney.' No. 8 represents the plants grown from the axillary tubers of 1895 and successive years.

Notes.—Perhaps No. 8 is stronger and taller and more upright in growth, but there is no very marked difference between the two as regards foliage; the tubers of No. 8, however, are very poor in every way, and very few in number, and the quantity of fibrous roots relatively large.

CONFERENCE ON HYBRIDISATION.

CHISWICK, JULY 11.

List of Awards made by the Council on the Report of a Committee of Experts.

Gold Flora Medal.

To Messrs. James Veitch, of Chelsea.

Gold Medal.

To Monsieur Duval, of Versailles.
To Monsieur Maron, of Brunoy.
To Sir Trevor Lawrence, Bart., Burford Lodge.
To Leopold de Rothschild, Esq., Gunnersbury House.
To Messrs. H. B. May, of Edmonton.

Silver-gilt Flora Medal.

To Monsieur Morel, of Lyons.
To Messrs. Jackman, of Woking.

Silver-gilt Banksian Medal.

To C. T. Druery, Esq., V.M.H., Acton.

Silver Banksian Medal.

To Professor Macfarlane, of Philadelphia.
To Herr Van Tubergen, of Haarlem.
To Dr. Wilson, of St. Andrews.
To Sir Frederick Wigan, Bart., East Sheen.
To de Barri Crawshay, Esq., of Sevenoaks.
To Messrs. Wallace, Colchester.
To Messrs. Paul & Son, Cheshunt.

Other Awards.

Veitch Memorial Medal.

To Monsieur Duval, of Versailles (Class No. 6).

Williams Memorial Medal.

To Leopold de Rothschild, Esq. (Class No. 9).

First-class Certificate.

F. Kalanchoe flammea.

FRUIT AND VEGETABLE COMMITTEE.

Temple Gardens, May 31, 1899.

Philip Crowley, Esq., in the Chair, and twenty-two members present.

Exhibits.

The list of Cups and Medals awarded by the Council will be found on page xc.

Mr. S. Mortimer, Farnham, sent Melon 'Beau Ideal,' Cucumber 'The Keeper,' and Tomato 'Winter Beauty.' The Committee wished to see a fruiting plant of the latter in March.

A. Henderson, Esq., Buscat Park, Berks (gr. Mr. W. L. Basten), sent Melon 'Buscat Park Hero.'

Messrs. Laxton Bros., Bedford, sent fruiting plants of Strawberry 'Fillbasket.'

Col. Lee, Aylesbury (gr. Mr. W. Robins), sent a dish of Peaches.

W. H. Evans, Esq., Ford Abbey, Chard (gr. Mr. J. Crook), sent French Beans, Tomatos, and Apples.

Lord Suffield, Gunton Park, Norwich (gr. Mr. W. Allan), sent Strawberry 'Lady Suffield' in pots. Fruit conical, deep scarlet in colour, and flesh of rich flavour and a strong perfume.

Mr. R. E. Addey, Ealing Road, Brentford, sent Mushrooms in various stages of growth, and also Mushroom spawn.

Fruit and Vegetable Committee, June 13, 1899.

Philip Crowley, Esq., in the Chair, and thirteen members present.

Awards Recommended:—

Silver Banksian Medal.

To Mr. S. Mortimer, Farnham, for a group of Melons.

Bronze Banksian Medal.

To Lord Foley, Esher (gr. Mr. J. Miller), for a group of Melons.

Other Exhibits.

Messrs. Harrison & Sons, Leister, sent Broccoli 'New Late White,' a variety with close compact heads of good colour.

Mr. Chandler, Bexley, sent a supposed sport from Pea 'Early Morn.' The Committee considered it a reversion.

F. C. Stoop, Esq., Byfleet, sent a box of Purslane. This is an annual of Indian origin, which has become naturalised in Europe. The leaves and stems are fleshy and rather small, and may be used as a salad or cooked in the same manner as Spinach, to which it is stated to be superior in flavour. The seed should be sown on rich soil in a sunny position from early in May to early in August, the leaves and stems being ready for use in about two months from the time of sowing.

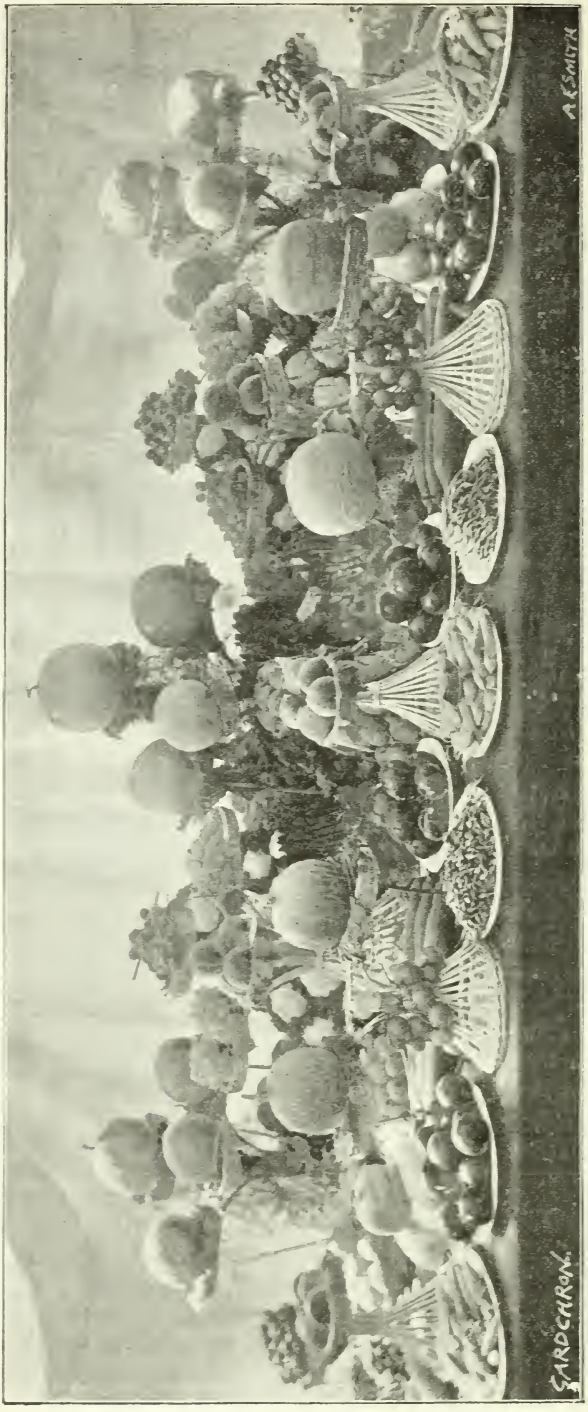


Fig. 57.—An Exhibit of Fruit at the Temple Show, from A. Henderson, Esq., M.P. (*Gardeners' Chronicle.*)

Geo. Bunyard, Esq., V.M.H., proposed, and Mr. A. Dean seconded, that a letter of sympathy be sent to the family of Mr. T. J. Saltmarsh, who died on June 2, and was for many years a valued member of the Fruit Committee, which was carried unanimously.

FRUIT AND VEGETABLE COMMITTEE, JUNE 27, 1899.

PHILIP CROWLEY, Esq., in the Chair, and nineteen members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To Messrs. T. Rivers & Sons, Sawbridgeworth, for Peaches in pots and a collection of fruit.

Silver Knightian Medal.

To Lord Llangattock, Monmouth (gr. Mr. Coomber), for fifteen magnificent 'Queen' Pineapples.

Silver Banksian Medal.

To C. A. Pearson, Esq., Farnham (gr. Mr. Prewett), for a collection of fruit.

Other Exhibits.

Lord Suffield, Gunton Park (gr. Mr. Allan), sent Melon 'Gunton Scarlet,' which received an Award of Merit, October 11, 1898.

H. W. Buddecomb, Nannerch (gr. Mr. Taylor), sent Tomato 'Klondyke.' The Committee desired that seed be sent to Chiswick for trial.

Lord Windsor, Hewell Grange, Redditch (gr. Mr. Pettigrew), sent two Melons, viz. 'Rigmaden Park,' a large round fruit with scarlet flesh; and 'Hewell Grange,' a large oval yellow fruit with green flesh. The Committee wished to see the first-named again.

Messrs. Jas. Veitch sent plants and fruit of Strawberry 'Veitch's Prolific,' which received a First-class Certificate July 12, 1898.

Mr. T. Hague, Carlton, Yorks., sent Cucumber 'Sir Roger'—very large and past its best.

FRUIT AND VEGETABLE COMMITTEE AT CHISWICK, JUNE 29, 1899.

PHILIP CROWLEY, Esq., in the Chair, and seven members present.

The Committee inspected 25 stocks of Peas, 7 stocks of Lettuce, and a variety of Chicory.

Awards Recommended:—

Highly Commended.

Pea 'Duke of Cornwall' (votes, unanimous), grown from seed sent by Messrs. Toogood, Southampton.

Pea 'Alderman Selected' (votes, unanimous), grown from seed sent by Mr. W. Deal, Kelvedon.

FRUIT AND VEGETABLE COMMITTEE AT CHISWICK.

HYBRID CONFERENCE, JULY 11, 1899.

PHILIP CROWLEY, Esq., in the Chair, and twenty-three members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Leopold de Rothschild, Esq. (gr. Mr. J. Hudson), Gunnersbury House, for a splendid collection of Cherries.

First-class Certificate.

To Raspberry 'Golden Queen' (votes, unanimous), from Messrs. J. Veitch, Chelsea. This is the result of crossing Raspberry Superlative ♀ with Rubus laciniatus ♂, the former red and the latter dark-fruited. The foliage is in three divisions, instead of five, as in the ordinary Raspberry, and the growth is thickly studded with spines, as in R. laciniatus. The fruit is large, rich yellow, of delicious flavour, and borne in great clusters in the same manner as R. Superlative. (Fig. 58.)

Award of Merit.

To Strawberry 'Lord Kitchener' (votes, unanimous), from Messrs. J. Veitch, Chelsea. Fruit large, firm, deep round in shape, dark red in colour, and of excellent flavour. This variety originated by using S. 'Waterloo' ♀ with S. 'British Queen' ♂, and combines the good qualities of both parents.

Cultural Commendation.

To Mr. John Basham, Bassaleg, Newport, Mon., for very fine dishes of Peas.

Other Exhibits.

Messrs. Laxton Bros., Bedford, sent Strawberry 'Climax,' a cross between S. 'Waterloo' and S. 'Latest of All.' Fruit large, round, bright red, and only moderate in flavour.

Messrs. Paul, Waltham Cross, sent large fruiting trees of Apricots 'Early Boulbon' and 'Domozan.'

Sir Trevor Lawrence (gr. Mr. Bain) sent Pea 'Nero,' a variety with blue pods and green seeds.

Lord Suffield (gr. Mr. Allan) sent Melon 'Gunton Scarlet,' which received an Award of Merit, October 11, 1898; also Strawberry 'Lady Suffield,' which received an Award of Merit, July 12, 1898.

W. Nicholson, Esq. (gr. Mr. Smythe), Basing Park, Hants, sent a White Currant which had sported from 'Raby Castle' (red).

Mr. F. W. Cross, Wisbech, sent Apple 'Early Victoria,' a cross between 'Lord Grosvenor' and 'Keswick Codlin.' The Committee wished to see the fruit later, when more fully developed.

Later in the day the Committee, with H. Balderson, Esq., in the Chair, and twenty-three members present, inspected the Peas and Lettuces growing in the Gardens.

Awards Recommended:—

Award of Merit.

To Pea 'Nobleman' (votes, unanimous), from Mr. W. Dale, Kelvedon.

Fig. 58.—Raspberry 'Golden Queen.' (*Gardeners' Chronicle.*)

To Pea 'Winifred' (votes, unanimous), from Mr. W. Deal, Kelvedon.

To Pea 'Alderman Selected' (votes, unanimous), from Mr. W. Deal, Kelvedon.

To Pea 'Dalby's Prolific' (votes, unanimous), from Messrs. J. Veitch, Chelsea.

To Pea 'Duke of Cornwall' (votes, unanimous), from Messrs. Toogood, Southampton.

To Pea 'Glory of Devon' (votes, unanimous), from Messrs. R. Veitch, Exeter.

Highly Commended (× × ×).

To Pea 'Dwarf Triumph' (votes, unanimous), from Messrs. Toogood, Southampton.

Fruit and Vegetable Committee at Chiswick, July 24, 1899.

H. Balderson, Esq., in the Chair, and eight members present.

The Committee inspected twenty-five stocks of Tomatos, fifty-seven stocks of Dwarf French Beans, and twenty-eight stocks of Potatos, of which nine were so prolific and good in appearance that the Committee ordered some of each to be cooked, viz.—

Early Peter	Leader
Eynsford Castle Kennedy	Norbury Park
Caradoc Seedling	Prolific
Hibberd's Seedling	Ringleader

St. Lawrence

Award Recommended :—

Highly Commended (× × ×).

Potato 'Caradoc Seedling' (votes, unanimous), grown from tubers sent by E. W. Caddick, Esq., Caradoc, Ross-on-Wye.

Potato 'Early Peter' (votes, unanimous), grown from tubers sent by Mr. F. M. Bradley, Church Street, Peterborough.

Potato 'Hibberd's Seedling' (votes, unanimous), grown from tubers sent by Mr. H. Hibberd, Botley, Hants.

Potato 'Norbury Park' (votes, unanimous), grown from tubers sent by L. Solomon, Esq., Norbury Park, Dorking.

Potato 'Prolific' (votes, unanimous), grown from tubers sent by Messrs. Johnson & Sons, Boston, Lincs.

Tomato 'Cherry Ripe' (votes, unanimous), from seeds sent by Messrs. Dobbie & Co., Rothesay, N.B.

Tomato 'The Comet' (votes, unanimous), from seeds sent by Messrs. Wrench & Sons, London.

Dwarf French Bean 'Covent Garden Early Negro' (votes, unanimous), grown from seeds sent by Messrs. Watkins & Simpson, Exeter Street, W.C.

Dwarf French Bean 'Everbearing' (votes, unanimous), grown from seeds sent by Mr. A. Dean, Kingston; Messrs. Hurst, Houndsditch; and Messrs. Dickson, Chester.

Dwarf French Bean 'Perfection' (votes, unanimous), grown from seeds sent by Mr. A. Dean.

Dwarf French Bean 'Progress' (votes, unanimous), grown from seeds sent by Messrs. Veitch, Chelsea.

Dwarf French Bean 'Ne Plus Ultra' (votes, unanimous), grown from seeds sent by Messrs. Hurst, Messrs. Cooling, Bath; Messrs. Watkins & Simpson, Mr. A. Dean, Messrs. J. Veitch, and Messrs. Dickson.

Dwarf French Bean 'Stringless' (votes, unanimous), grown from seeds sent by Messrs. Watkins & Simpson.

FRUIT AND VEGETABLE COMMITTEE, JULY 25, 1899.

PHILIP CROWLEY, Esq., in the Chair, and seventeen members present.

Awards Recommended:—

Gold Medal.

To Messrs. J. Veitch, Chelsea, for a magnificent collection of Gooseberries.

Silver-gilt Knightian Medal.

To the Marquis of Salisbury, Hatfield (gr. Mr. S. Norman), for a collection of fruit.

Silver Knightian Medal.

To Messrs. Harrison, Leicester, for 80 dishes of Peas.

First-class Certificate.

To Strawberry 'Lady Suffield' (votes 8 for, 3 against), from Lord Suffield, Gunton Park, Norwich (gr. Mr. W. Allan). This variety was raised from Lord Suffield × Empress of India, and received an Award of Merit, July 26, 1898. Fruit large, wedge-shaped, rich dark crimson in colour, and firm flesh of excellent flavour.

To Grape 'Lady Hastings' (votes, unanimous), from Lord Hastings, Melton Constable, Norfolk (gr. Mr. J. Shingles). A vigorous sport from Muscat Hamburgh, with the exquisite flavour of the parent. Bunches large and heavily shouldered, berries large, roundish oval, covered with a deep blue-black bloom, and the fruit is said to hang well without shrivelling or decaying. (Fig. 59.)

To Cherry 'Noble' (votes, unanimous), from Messrs. Ray & Co., Teynham, Kent. Fruit large, firm, deep blood-red in colour, flesh firm and refreshing in flavour. A branch was also staged bearing a great crop of fruit.

Award of Merit.

This award was unanimously recommended for all the Potatos, Tomatos, and Dwarf French Beans which had been highly commended at Chiswick on July 24.

Other Exhibits.

Mr. W. Palmer, Andover, Hants, sent a seedling Grape named 'Andover Muscat.' Bunches long and tapering, berries a greenish white, small, firm, and possessing a distinct Frontignan flavour. The Committee requested that a plant be sent to Chiswick.

Messrs. J. Veitch sent fruits and jam of the Logan Berry. The

fruits are large and somewhat similar to a Raspberry. of a pleasant flavour when fully ripe ; the jam was also good, but too sweet.

Mrs. C. Jennings, Walk House Gardens, Hull, sent fruits of Raspberry

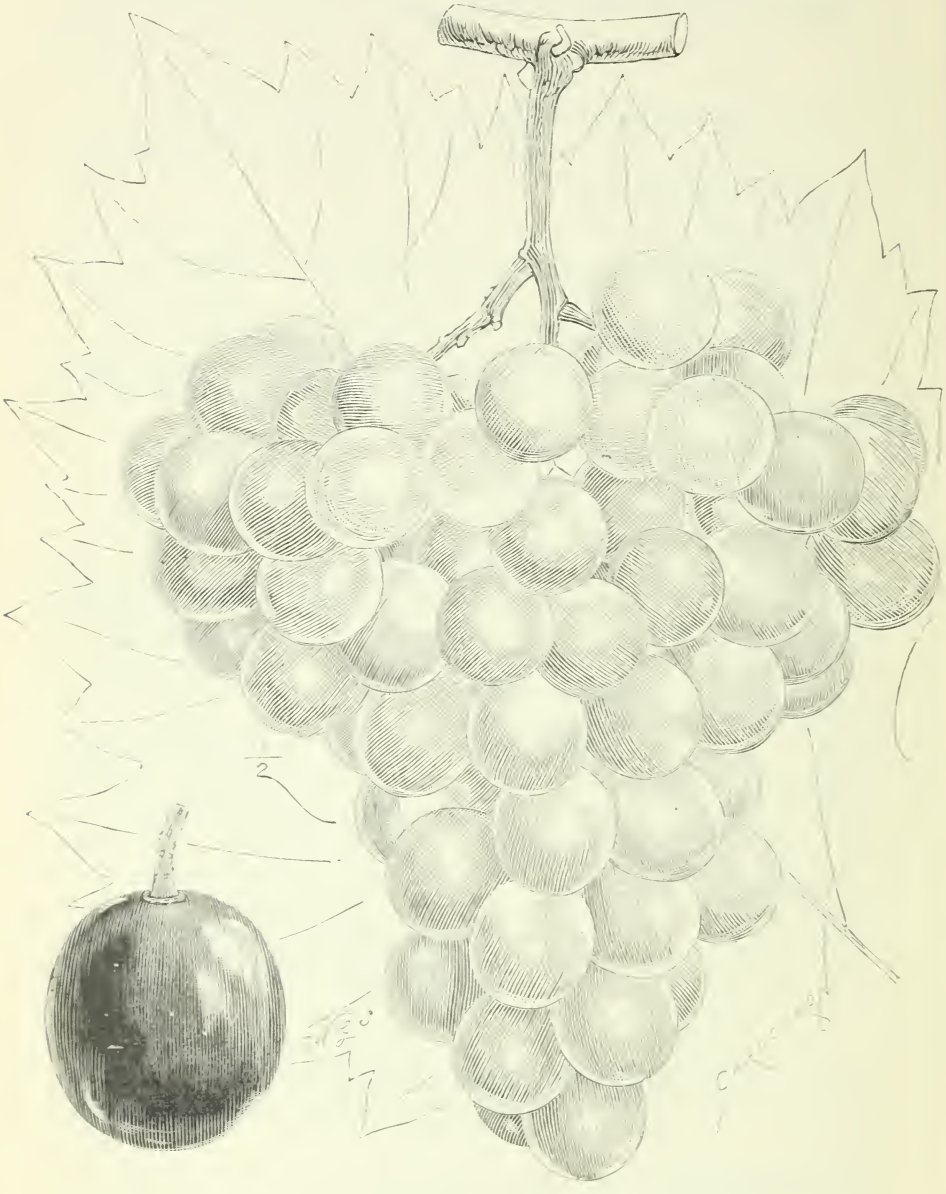


Fig. 59.—Lady Hastings, Black Muscat Grape. (*Gardeners' Chronicle.*)

'Eclipse' and Pea 'Competitor.' The Committee requested seed of the latter to be sent to Chiswick.

The Duke of Northumberland, Syon House (gr. Mr. G. Wythes. V.M.H.), sent Melons 'Lord Kitchener,' 'The Duchess,' and 'The Sirdar.'

FRUIT AND VEGETABLE COMMITTEE, AUGUST 15, 1899.

PHILIP CROWLEY, Esq., in the Chair, and thirteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mrs. Abbott, Regent's Park (gr. Mr. G. Kelf), for a collection of fruit.

Silver Knightian Medal.

To Messrs. J. Veitch, Chelsea, for a collection of fruit.

To Messrs. G. Bunyard, Maidstone, for Apples.

To Lord Foley, Ruxley Lodge (gr. Mr. J. Miller), for a collection of hardy fruit.

To Lord Gerard, Ashford (gr. Mr. J. Walters), for a collection of fruit.

Silver Banksian Medal.

To Messrs. S. Spooner & Son, Hounslow, for Apples.

First-class Certificate.

To Tomato 'Chiswick Peach' (votes, unanimous), from the R.H.S. Gardens. Fruit rather small, round, smooth, covered with a Peach-like bloom; lemon colour, occasionally with a blush shade; averaging seven fruits in a cluster. A free bearer, and of delicious flavour.

Award of Merit.

To Raspberry Blackberry Hybrid 'Mahdi' (votes, unanimous), from Messrs. J. Veitch. This is the result of hybridising Raspberry 'Belle de Fontenay' with the ordinary Blackberry. In appearance it is like a very large red-violet Blackberry, and the foliage is almost exactly midway between the two parents. The plant is a great bearer, and ripening after Raspberries, and before Blackberries, should prove an acquisition.

To Apple 'Early Victoria,' as a market variety (votes unanimous). (Lord Grosvenor × Keswick Codlin), from Mr. F. C. Cross, Wisbech. Fruit rather large, conical; eye prominent and closed, stalk nearly an inch long and deeply inserted, and midway in appearance to both parents. The tree is stated to be a strong grower and free bearer.

To Melon 'Hardy Scarlet' (votes, unanimous), from Mr. D. Harrison, Merrow House, Guildford. Fruit rather small; skin green, ribbed, and well netted; flesh scarlet, melting, and of delicious flavour. The sender stated that he originally had the seed from Canada, and the fruit exhibited was cut from a plant grown in the open air, which had received no protection whatever since the middle of June.

Cultural Commendation.

To Mr. A. H. Gibson, gr. to J. Rickett, Esq., Pinner, for Tomato 'A. H. Gibson,' raised from 'King's Champion' × 'Duke of York'; fruits very fine, and closely resembling the latter parent.

Other Exhibits.

Mr. A. A. Fabius, Emsworth, Hants, sent Tomato 'Wonder of Italy,' which proved to be synonymous with 'King Humbert.'

J. Thompson, Esq. (gr. Mr. A. Corps), Hawkhurst, Kent, sent seedling Raspberries and Currants of no special merit.

Mrs. Evans, Forde Abbey, Chard (gr. Mr. J. Crook), sent Pea haulm of several varieties, to show the effect of spraying with 'Improved Spimo.' The growth was very clean, and entirely free from insect of fungoid pests.

The Hon. E. Hubbard, M.P., Down, Kent (gr. Mr. E. S. Wiles), sent Melons 'Rookery Hero,' 'Wile's Perfection,' and 'Down Hero,' all from 'Blenheim Orange' × 'Dickson's Exquisite'; flesh scarlet in each variety, and only fair in flavour.

Mr. S. C. Lamb, Forest Hill, S.E., sent some immense Oranges received from California. The rind was very thick, and the flavour moderately good.

Mr. T. R. Bruce, The Old Garrock, New Galloway, sent a collection of Gooseberries, Currants, and Peas, which were all smashed in transit.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 29, 1899.

PHILIP CROWLEY, Esq., in the Chair, and fourteen members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. Harrison, Leicester, for Onions.

Cultural Commendation.

To Mr. G. Neville, gardener to Lord Chesham, Latimer, Bucks, for magnificent Jargonelle Pears.

Other Exhibits.

Mr. F. W. Cross, Wisbech, sent large fruits of Apple 'Early Victoria,' which received an Award of Merit on August 15, 1899.

Mr. J. Hurford, Catel, Guernsey, sent Melon 'Hurford Seedling,' a large, handsome, yellow fruit, freely netted, and oval shape: flesh white but not quite ripe.

Messrs. Harrison sent fruit and jam of Rubus palmatus: the latter was very good—some of the Committee considered it too sweet.

Mr. W. Mitchell, Fir Cottage, Slough, sent Blackberry 'Mitchell's Seedling,' which received an Award of Merit, September 7, 1897; also Cob Nut 'Mitchell's Seedling.' Nut long and half covered with husk; shell thin, and kernel of good flavour.

Mr. H. Broom, gardener to F. Lucas, Esq., New Barnet, sent Tomato 'Chemin Rouge.'

Mr. J. Escombe, Penshurst, Tunbridge, sent a collection of Potatos grown in different manures, and all more or less covered with scab. It was suggested that the land be dressed with horse manure this autumn, and again in the spring with lime, followed by a crop of Potatos, and a report of the result sent next year.

The Countess of Selkirk (gr. Mr. W. McGuffog) sent large handsome fruits of Peach 'Hale's Early,' grown at Balmae, Kirkcudbright, N.B., in the open air.

Messrs. Cheal, Crawley, sent fruiting plants of Tomato 'Cheal's

Prolific.' Seed was requested to be sent to Chiswick, for trial with other varieties outside, next year.

Messrs. Bunyard, Maidstone, sent Apple 'Lady Sudeley,' from trees twenty years old, and the first of the variety grafted. The fruit was very large and highly coloured; also fruit and jam of Rubus Phœniculasius, the latter very sweet, with too many seeds in it.

R. Neverson, Esq., Tenterden Hall, Hendon (gr. Mr. S. Foster), sent Melon 'Foster's Seedling,' overripe.

Mr. R. Fife, Orpington, sent two pots of red and yellow Tomato jam, made with one pound of sugar to each pound of fruit, which caused the jam to be much too sweet; otherwise it was excellent.

Death of F. T. Rivers, Esq., V.M.H.

Geo. Bunyard, Esq., V.M.H., proposed, and Philip Crowley, Esq., seconded, that the following resolution be sent to Mrs. Rivers and family, and be also entered on the Minutes of the Committee, viz.

1st. Resolved that this Committee begs to express its deep sympathy with Mrs. Rivers and family on the lamented death of her esteemed husband.

2nd. That this Committee, where Mr. Rivers has for so many years given his valuable assistance as a member and Vice-President, cannot let this occasion pass without expressing a deep sense of the obligation which they and all horticulturists owe to the good work accomplished by the late Mr. Rivers in the manifest improvement he effected in our British fruits, for which they and posterity will ever be grateful, feeling that the name of Rivers will rank amongst the foremost of those who have advanced the science of pomology.

The above was read with heads uncovered, and passed unanimously.

Fruit and Vegetable Committee, Chiswick, August 31, 1899.

Philip Crowley, Esq., in the Chair, and six members present.

The Committee inspected thirty-eight stocks of Potatos, of which seven varieties were so good in appearance and cropping that the Committee ordered some of each to be cooked, viz.:—

Ellington's Seedling	Queen of July
Devonian	Ridgewell Invincible
Laxton's No. 3	St. Lawrence
The Sirdar.	

Awards Recommended:—

Highly Commended.

Potato 'Ellington's Seedling' (votes, unanimous), grown from tubers sent by Mr. W. Ellington, West Row Gardens, Mildenhall, Suffolk.

Potato 'The Sirdar' (votes, unanimous), grown from tubers sent by Messrs. Hurst, Houndsditch.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 12, 1899.

PHILIP CROWLEY, Esq., in the Chair, and fifteen members present.

Awards Recommended:—

Gold Medal.

To Lord Aldenham, Aldenham House, Elstree (gr. Mr. E. Beckett), for a superb collection of vegetables.

Silver-gilt Knightian Medal.

To Messrs. Paul, Waltham Cross, for a collection of Apples and fruit-trees in pots.

Silver Knightian Medal.

To Messrs. J. Veitch, Chelsea, for a collection of Tomatos grown out of doors.

To C. Bayer, Esq., Forest Hill (gr. Mr. W. Taylor), for a collection of fruit.

Silver Banksian Medal.

To F. Walker, Esq., Balcombe, Sussex (gr. Mr. J. Coles), for a collection of fruit.

To Mr. S. Mortimer, Farnham, for a collection of Melons.

To R. Leigh, Esq., Barham Court, Maidstone (gr. Mr. G. Woodward), for very fine Pears and outdoor Peaches.

Award of Merit.

To Apple, 'Ben's Red' (votes, 9 for, 2 against), from Messrs. Bunyard, Maidstone. Fruit of medium size, flattish round, nearly covered with deep scarlet, eye closed in a shallow basin; stalk short and deeply inserted, handsome and even in form; flesh firm, and of good flavour. (Fig. 60.)

To Apple 'Venus' Pippin' (votes, unanimous), from Mr. W. J. Godfrey. Fruit of medium size, deep, round, pale-green changing to yellow, eye closed, and in a shallow basin; stalk $\frac{3}{4}$ inch long, and deeply inserted; flesh almost melting and very sweet. (Fig. 61.)

To Apple 'Charles Ross' (votes, unanimous), from Mr. C. Ross, Welford Park, Newbury. A seedling from Peasgood Nonsuch × Cox's Orange Pippin. Fruit over the average size for dessert, round and of beautiful shape, eye large and open in a very shallow basin; stalk short and thick, not deeply inserted; flesh very crisp and of excellent flavour. Very similar in appearance to a highly-coloured, medium-sized, Peasgood Nonsuch. (Figs. 62, 63.)

To Cucumber 'Achievement' (votes, 10 for), from Mr. E. Beckett. Fruits 18 to 20 inches long, of beautiful shape and colour, with a very short neck.

Cultural Commendation.

To Mr. W. Miller (gr. to Lord Foley), Ruxley Lodge, for very fine Peaches, 'Princess of Wales.'

Other Exhibits.

Messrs. R. Veitch, Exeter, sent Melon 'Taunton Hero,' of beautiful appearance and excellent flavour.

Mr. W. Heath, 3, Vamburgh Fields, Blackheath, S.E., sent a seedling Tomato.

From the Society's Gardens came very large fruits of Solanum

Fig. 60.—Apple 'Ben's Red.' (*Gardeners' Chronicle.*

Melongena (the 'Marrow Aubergine' of Delhi), grown from seed sent by Dr. Bonavia.

Messrs. Hobbins', Dereham, sent Tomato 'Wonder of Italy,' very

Fig. 61.—Apple 'Venus' Pippin.' (*Gardeners' Chronicle.*)

similar to 'Semper Fructifera.' It was suggested that seed be sent to Chiswick for trial outdoors next year.

Mr. W. J. Browne, Stanford, sent Apple 'Stanford Beauty.' Fruit

large and highly coloured, with small dark dots over the whole fruit, deep round shape, with the eye and stalk deeply inserted; flavour acid.

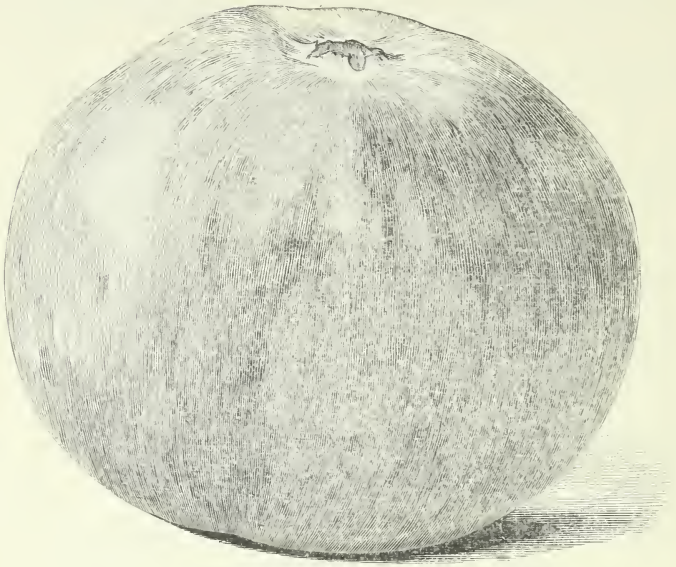


Fig. 62.—Apple 'Charles Ross.' (*Gardeners' Chronicle.*

Mr. J. Rutter, Wisbech, sent Apple 'Lord Kitchener,' a large fruit past its best.

Messrs. G. Bunyard sent Apple 'Bielo Boradawka,' a Russian variety

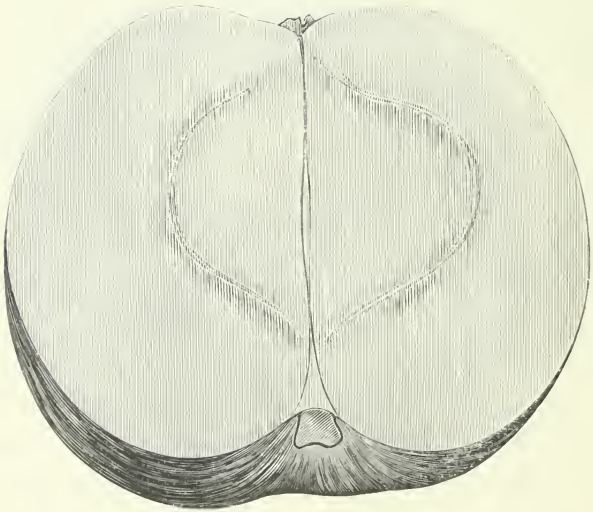


Fig. 63.—Section of Apple 'Charles Ross.' (*Gardeners' Chronicle.*

that crops well at Chiswick; fruit rather large, and equally good for cooking or dessert. They also sent Apple 'Farleigh Beauty,' a cross

between 'Warner's King' and 'Devonshire Quarrenden.' Fruit large and highly coloured, flat round, eye closed in a ribbed basin; stalk short, and deeply inserted; flavour fair, but more suited for cooking than dessert.

Mr. E. Holden, Grosvenor Cottage, Bath, sent an Apple raised from pips of 'Devonshire Quarrenden,' similar, but inferior in flavour, to the parent.

Mr. C. Ross (gr. to Capt. Carstairs) sent Melon 'The Captain,' a red-fleshed variety of only fair flavour: he also sent Apple 'Marguerita,' a small fruit of no special merit.

Mr. S. Wythes (gr. to the Duke of Northumberland), Syon House, sent large heads of Indian Corn sown on May 17 in the open ground.

Mr. Bowerman, Basingstoke, sent very fine Runner Beans 'Ne Plus Ultra.'

A letter from Mrs. Rivers was read, thanking the Committee for their letter of sympathy, and for the resolution passed at their last meeting, on the death of her lamented husband.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 26, 1899.

PHILIP CROWLEY, Esq., in the Chair, and seventeen members present.

Awards Recommended:—

Silver Knightian Medal.

To the Earl of Galloway, Garlieston (gr. W. J. Day), for a very interesting collection of Apples grown in Scotland.

Award of Merit.

To Potato 'The Sirdar,' from Messrs. Hurst, Houndsditch.

To Potato 'Ellington's Seedling,' from Mr. W. Ellington, Mildenhall, Suffolk. Both of these Potatos were highly commended at Chiswick on August 31.

To Pear 'Triomphe de Vienne,' from R. Leigh, Esq., Barham Court, Maidstone (gr. Mr. G. Woodward). Fruit very large, long, skin yellow colour when ripe, heavily mottled with russet; flesh melting and excellent in flavour. The tree is a strong sturdy grower and a free bearer, and does well as a bush on Quince stock.

Other Exhibits.

Mr. W. Beswick, Walton-on-Thames, sent Melon 'Salmon Queen.' A large oval golden fruit, well netted, with scarlet flesh. The Committee wished to see it again riper, as it promised to be a good variety.

Mr. R. Bacon, Romford, sent Apples 'Bacon's Seedling' and 'Wheatsheaf Russet.'

Messrs. D. & W. Buchanan, Forth Vineyards, Kippen, N.B., sent a bunch of Grapes named 'Diamond Jubilee.' Very handsome both in bunch and berry, and covered with a blue-black bloom. The Committee considered that it so closely resembled 'Black Morocco' as to be practically indistinguishable from that variety.

The Rev. Darnley Smith, Landsgrove Vicarage, Ashburton, sent his patent 'Fruit-protectors.' These had been tested at Chiswick and found very useful for protecting choice Apples and Pears. After being enclosed for two months no difference could be found in the size, colour, or flavour of the fruits when compared with those grown without protection. The Committee considered that they would be very useful for amateurs, and where a comparatively small number of fruits required protection. They would, however, require to be made in various sizes. (See Vol. XXIII., p. xxxix.)

Capt. C. Shepherd, Trosley, Maidstone, sent Peach 'Princess May,' raised from a stone of Nectarine 'Victoria.' A large fruit with a pale skin and fine flavour, reminding one of a very late Alexandra Noblesse.

Mr. R. W. Green, Wisbech, sent Apple 'Emmeth Early,' syn. 'Early Victoria.' (See p. cxi.)

Messrs. R. Hartland, Cork, sent Apples 'Stone Peach' and 'Hartland's Pearmain.'

Lord Suffield, Gunton Park (gr. Mr. W. Allen), sent Melon 'Gunton Scarlet,' which received an Award of Merit October 11, 1898.

B. Ruys, Esq., Dedemsvaart, Holland. sent Runner Beans 'Moerheim Stringless White.' The specimens sent were too old to judge fairly of. The Committee hoped they might have seed of them at Chiswick next year.

Earl of Derby, Knowsley, Prescot (gr. R. Doe), sent Melon 'Countess of Derby.'

Messrs. J. R. Pearson, Chilwell, sent a seedling Grape Bowood Muscat ♂ × Gros Colmar ♀, grown on a pot vine. Bunch of medium size, berries roundish oval, amber, flesh crisp and of good flavour. It was requested that it be sent again at a later meeting.

R. R. Taylor, Esq., Westbury, sent specimens of grafting, in which the union is covered with a band of indiarubber, or American cloth. The method appeared very cleanly, and to have been a decided success.

C. Curtis, Esq., F.L.S., sent fruits of the Mangosteen, from Penang. Some had been waxed over, and others not, but unfortunately none of them had kept.

Mr. W. Iggulden, Frome, sent Apple 'Winter Hillary.'

Prize.

The Sherwood Silver Cup, value £10. 10*s*., offered to the exhibitor who, being an amateur or a gentleman's gardener, shall obtain the highest total number of marks at the meetings on June 13 and September 26 for collections of vegetables, was awarded to the Right Hon. Lord Aldenham, Aldenham House, Elstree (gr. Mr. E. Beckett). The Judges were Mr. W. Bates, Mr. Geo. Norman, Mr. Poupart, Mr. Wythes, V.M.H., and Mr. John Wright, V.M.H.

FLORAL COMMITTEE.

Temple Gardens, May 31, 1899.

Edward Mawley, Esq., in the Chair, and nineteen members present.

Awards Recommended :—

The list of Cups and Medals awarded by the Council will be found on p. xc.

First-class Certificate.

To Polystichum angulare divisilobum plumosissimum (votes, unanimous), from Messrs. Birkenhead, Sale, Manchester. A handsome hardy Fern, with stout drooping fronds, densely clothed with small rich green pinnæ, the tips of which are touched with greenish-yellow.

To Heliconia Sanderi (votes, 5 for), from Messrs. Sander, St. Albans. A variegated stove-plant, with oblong-elliptic leaves set on long petioles; colour olive-green, streaked and shaded with creamy-white and greenish-yellow.

To Acer pseudo-platanus elegantissima variegata (votes, 8 for), from Messrs. Perkins, Northampton. A Sycamore with conspicuously variegated foliage, shaded with bronze-pink, with a few splashes of green.

To Ilex Wilsonii (votes, 8 for), from Messrs. Fisher, Son, & Sibray, Sheffield. A seedling Holly which bears some resemblance to I. Hodginsi. The large, oval, shining, green leaves are leathery and supplied with long marginal spines. It is free in growth, very ornamental, and said to be an abundant berry-bearer.

Award of Merit.

To Phyllocactus 'J. T. Peacock Improved' (votes, 8 for, 2 against), from Messrs. J. Veitch, Chelsea. Large and shapely scarlet-crimson flowers, touched with orange-scarlet on the margins of the inner petals.

To Phyllocactus 'Nysa' (votes, unanimous), from Messrs. J. Veitch. Orange-scarlet flowers shaded with magenta, of good form and substance.

To Phyllocactus 'Admiration' (votes, unanimous), from Messrs. Veitch. Flowers pale pink, suffused with rose pink.

To Tree Pæony 'Cecil Rhodes' (votes, unanimous), from Messrs. Kelway, Langport. Rosy salmon marked with crimson at the base of the petals.

To Tree Pæony 'Miss Beatrice Jones' (votes, 8 for, 2 against), from Messrs. Kelway. Large white flowers stained with rose pink at the base of the petals.

To Dracæna cannæfolia variegata (votes, 5 for, 2 against), from Messrs. Laing, Forest Hill. The oblong leaves of this Dracæna are set on long petioles, and are green, striped and streaked with pale yellow, margined with cream colour.

To Juniperus Sanderi (votes, 8 for), from Messrs. Sander, St. Albans. A very compact growing Juniper with glaucous foliage.

Fig. 64.--Group of Ferns Exhibited at the Temple Show by Messrs. Hill. (*Gardeners' Chronicle.*)

To Double Begonia 'Duke of Devonshire' (votes, unanimous), from Messrs. Ware, Tottenham. Crimson-scarlet flowers of good form and substance.

To Double Begonia 'Miss Bella Tait' (votes, 5 for), from Messrs. Ware. Flowers very large and shapely, buff, shading to salmon-rose towards the crimped edges of the petals.

To Double Begonia 'Miss Mary Pope' (votes, 10 for, 1 against), from Messrs. Ware. Large white Camellia-like flowers touched with green in the centre. The petals are beautifully crimped at the edges. (Fig. 66.)

To Double Begonia 'Miss Barbara Ray' (votes, unanimous), from Messrs. Ware. Flowers very large and handsome, rich apricot shading to salmon.

To Anemone sylvestris flore pleno (votes, unanimous), from Messrs.

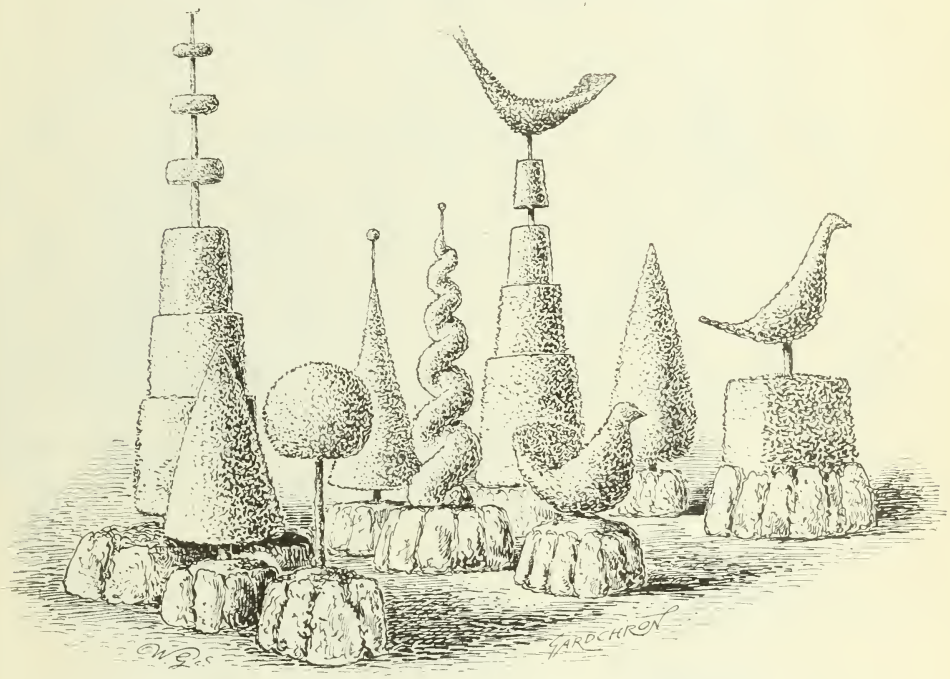


Fig. 65.—Topiary Work Exhibited at the Temple Show by Messrs. Cheal. (*Gardeners' Chronicle.*)

Jackman, Woking. A double form of the old 'Snowdrop Anemone,' quite hardy, dwarf in habit, and very free flowering. Its small white flowers are shaded with green in the centre and borne on stout stems well above the foliage. (Fig. 67.)

Other Exhibits.

Sir Trevor Lawrence, Bart., Burford (gr. Mr. Bain), sent Lilacs.

R. H. Fremlin, Esq., Wateringbury, Maidstone, sent specimens of Myosotidium nobile.

Captain Holford, C.I.E., Westonbirt, Tetbury (gr. Mr. Chapman), sent five magnificent new Hippeastrums.

Captain Torrens, Baston Manor, Hayes, Kent, sent three Tree Pæonies having enormous and beautiful flowers.

W. Goodliffe, Esq., Worthing, sent an unnamed Utricularia, probably U. capensis.

A. de Rothschild, Esq., Halton House, Tring (gr. Mr. Sanders), sent Carnations.

Mr. A. Perry, Winchmore Hill, sent Geum montanum aurantiacum—

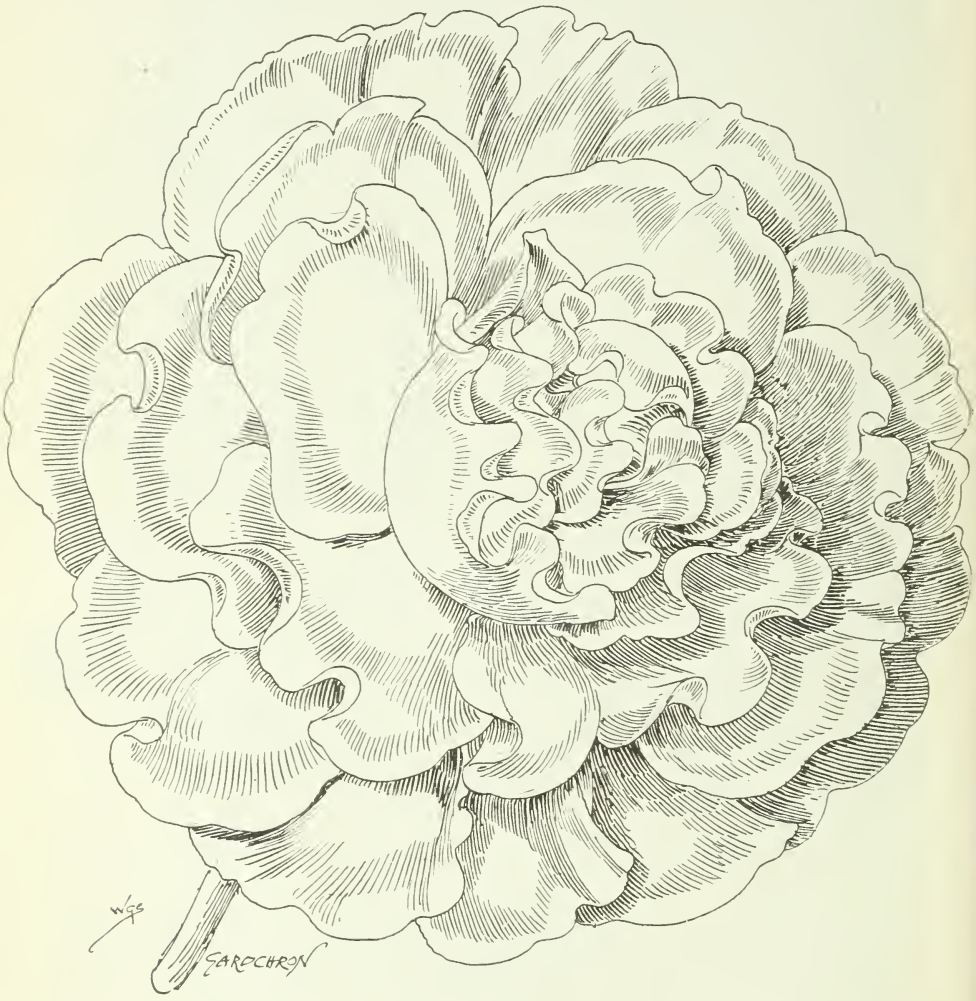


Fig. 66.—Double White Begonia 'Mary Pope.' (*Gardeners' Chronicle.*)

a hybrid between G. montanum and G. Heldreichi. The Committee asked to see this again.

Mr. Godfrey, Exmouth, sent Oriental Poppies.

Mr. Cowell, Hampton Hill, sent hybrid Cactus-flowered Pelargonium 'Fire Dragon.' (Fig. 23.)

Mr. Barratt, Radcliffe-on-Trent, sent a seedling Petunia.

FLORAL COMMITTEE, JUNE 13, 1899.

W. Marshall, Esq., in the Chair, and twenty-five members, with H. M. Arderne, Esq., South Africa, and S. A. de Graaff, Esq., Holland (visitors).

Awards Recommended :—

Silver-gilt Flora Medal.

To Martin R. Smith, Esq., Warren House, Hayes (gr. Mr. C. Blick), for a group of Malmaison Carnations.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. Cannell, Swanley, for Cannas.

Silver Flora Medal.

To Mr. J. Russell, Richmond, for Tree Ivies.

To Messrs. Ware, Tottenham, for hardy flowers.

To Mr. H. B. May, Edmonton, for British Ferns.

Silver Banksian Medal.

To Messrs. Paul & Son, Cheshunt, for Alpine plants, Roses, and Rhododendrons.

To Messrs. Wallace, Colchester, for hardy flowers.

To Messrs. J. Veitch, Chelsea, for Irises.

To Mr. M. Prichard, Christchurch, for hardy plants.

To Messrs. Sander, St. Albans, for foliage and flowering plants.

To Messrs. Barr, Covent Garden, for hardy plants.

Bronze Banksian Medal.

To Messrs. Jackman, Woking, for herbaceous plants and Roses.

Award of Merit.

To Malmaison Carnation 'Florizel' (votes 14 for, 2 against), from Martin R. Smith, Esq., Warren House, Hayes, Kent (gr. Mr. C. Blick). Flowers of perfect shape, bright rose touched with salmon. The plant is dwarf in habit.

To Malmaison Carnation 'Lady Rose' (votes 13 for, 8 against), from M. R. Smith, Esq. Large, well formed, pale rose-pink flowers. The plant is dwarf, with broad glaucous leaves.

To Border Carnation 'Don Carlos' (votes, 20 for), from M. R. Smith, Esq. A distinct variety with large handsome flowers, yellow ground, striped and edged with rose pink.

To Lupinus arboreus albus 'Snow Queen' (votes, 17 for), from Mr. B. Ladhams, Southampton. The pure-white flowers are produced on long slender spikes with great freedom.

To Rhododendron 'Essex Scarlet' (votes, 13 for), from Messrs. Paul & Son, Cheshunt. Medium-sized compact trusses of crimson-scarlet flowers, the upper petals spotted with dark purple.

To Border Carnation 'Ossian' (votes, 11 for, 3 against), from Mr. Turner, Slough. Flowers of medium size, yellow ground, flaked with purple and heavily shaded with bright rose.

To Border Carnation 'Goldfinch' (votes, 15 for), from Mr. Turner. Flowers canary-yellow, of good form and substance.

To Border Carnation 'Falcon' (votes, 12 for), from Mr. Turner. Flowers of excellent form, the colour being slightly deeper than the last-named.

To Border Carnation 'Galatea' (votes, 9 for, 3 against), from Mr. Turner. Flowers pale yellow, edged and flaked with red.

Fig. 67.—Anemone sylvestris fl. pl. (*Journal of Horticulture.*)

To Border Carnation 'Galileo' (votes, 13 for), from Mr. Turner. Flowers large and shapely, yellow, flaked and bordered with rosy purple.

To Border Carnation 'Agnes Sorrel' (votes, 15 for, 1 against), from Mr. Turner. Flowers crimson-maroon shaded with scarlet.

To Decorative Rose ' Purity ' (votes, 19 for), from Messrs. Cooling, Bath. A charming variety of vigorous constitution and very free flowering. The pure-white flowers are of excellent shape, but only slightly scented.

To Rose ' Cooling's Yellow Noisette ' (votes, unanimous), from Messrs. Cooling. A free-flowering and sweet-scented Rose, particularly beautiful in the bud state. With age it becomes rather loose. The colour is rich yellow.

Other Exhibits.

The Right Hon. Lord Leigh, Stoneleigh Abbey, Kenilworth (gr. Mr. H. Martin), sent plants of Abutilon Sawitzii, which the Committee considered to be similar to A. ' Silver Queen,' which received an Award of Merit on August 11, 1896. The exhibitor was requested to show plants of the last-named at the next meeting for comparison with A. Sawitzii.

From F. W. Moore, Esq., V. M. H. Glasnevin, Dublin, came flowers of Pæonia Emodi and Fremontia californica.

Mrs. E. Powys Rogers, Burncoose, Cornwall, sent specimens of Chrysobactron Hookeri, now known as Anthericum Hookeri.

Grantham Fish, Esq., St. Albans (gr. Mr. F. Brewer), sent seedling Gloxinias.

J. T. Bennett Poë, Esq., Cheshunt (gr. Mr. Downes), sent a well-grown plant of Ochna multiflora.

Messrs. Dains, Brixton Hill, sent Pelargonium ' Royal Sovereign.'

Mr. Butler, Normanton Gardens, Stamford, sent a box of Pansies.

Mr. W. Simpson, Morpeth, sent a patent plant stand.

Messrs. Carter, High Holborn, sent a group of Gloxinias.

Messrs. Young, Cheshunt, sent a new Viola. It was requested that plants be sent to Chiswick for trial.

Floral Committee, June 27, 1899.

W. Marshall, Esq., in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Right. Hon. Lord Aldenham, Aldenham House, Elstree, Herts (gr. Mr. E. Beckett), for foliage and flowering plants.

Silver-gilt Banksian Medal.

To Sir Charles Pigott, Bart., Wexham Park, Slough (gr. Mr. J. Fleming), for Codiæmus (Crotons) and Humeas.

Silver Flora Medal.

To Messrs. W. Paul, Waltham Cross, for Roses.

To Messrs. J. Veitch, Chelsea, for Campanulas, Pæonies, and Gladioli.

To Messrs. Wallace, Colchester, for Lilies and hardy plants.

Silver Banksian Medal.

To Messrs. Kelway, Langport, for Pæonies and Delphiniums.

To Mr. May, Edmonton, for Selaginellas.
To Messrs. Cutbush, Highgate, for Carnations.
To Mr. Prichard, Christchurch, for hardy plants.
To Messrs. Barr, Covent Garden, for hardy plants.

Bronze Flora Medal.

To Messrs. Watkins & Simpson, Exeter Street, Strand, for a new dwarf strain of Hybrid Lantanas.
To Mr. Foster, Havant, for Sweet Peas.
To Messrs. Jackman, Woking, for hardy plants and Roses.
To Messrs. Cannell, Swanley, for Aquilegias and Stocks.
To Messrs. Dobbie, Rothesay, for Sweet Peas.

Bronze Banksian Medal.

To Messrs. Paul & Son, Cheshunt, for Pæonies, Delphiniums, and hardy flowering shrubs.
To Mr. Russell, Richmond, for flowering and ornamental shrubs.

First-class Certificate.

To Dracæna indivisa Schneideri (votes, 7 for, 3 against), from Messrs. J. Veitch, Chelsea. A very beautiful Dracæna, compact in habit, with long narrow, arching, sharply pointed, deep glossy green leaves, the basal portion of which is heavily stained with rose. The midrib is touched with brown, and is very conspicuous.

To Davallia illustris (votes, 13 for), from Messrs. J. Veitch. A vigorous Fern, bearing some resemblance to D. Mooreana, with long, graceful, light green, much-divided fronds.

Award of Merit.

To Malmaison Carnation 'Lady Gerard' (votes, 11 for), from Lord Gerard, Eastwell Park, Ashford, Kent (gr. Mr. H. Walters). Flowers large, with broad, undulating petals, very pale yellow, and almost scentless.

To Delphinium 'Sir Walter Scott' (votes, unanimous), from Messrs. Kelway, Langport. A remarkably fine variety, with large semi-double flowers arranged on stout branching spikes; colour rich violet-purple, the outer petals shaded with deep blue.

To Border Carnation 'Trojan' (votes, 6 for, 4 against), from Mr. Douglas, Great Bookham, Surrey. Large pure-white flowers of fine form and substance.

To Zonal Pelargonium 'Fire Dragon' (votes, 9 for, 3 against), from Mr. E. S. Towell, Llewot, Hampton Hill. This is said to be a cross between Zonal Pelargonium 'Raspail' and Lychnis chalcedonica. The foliage is very similar to an ordinary green-leaved Zonal Pelargonium, and the single Cactus-like flowers, with blunt petals, are bright scarlet in colour (fig. 23, p. lvi.).

Cultural Commendation.

To Mr. F. Webber, Tonbridge, for Adiantum cuneatum Showerianum.

Other Exhibits.

F. W. Moore, Esq., V.M.H., Glasnevin, Dublin, sent flowering sprays of Lonicera Hildebrandti.

Lord Rendlesham, Woodbridge, sent Carnations.

The Countess of Lonsdale, Barley Thorpe, Oakham, sent flowers of a seedling Pink named 'Barley Thorpe Rose,' which the Committee considered to be the same as 'Souvenir de Sale.'

Mr. G. Foster, Glendaragh, Teignmouth, sent flowers of Tree Carnation 'Mrs. G. Foster.' The Committee asked to see a plant.

Mr. T. Jenkinson, Wellington House, Ealing, brought Bedding Pelargonium 'Thomas Jenkinson.'

Mr. Foster, Havant, showed fine varieties of Sweet Peas, which were referred to Chiswick for trial.

Messrs. Dobbie, Rothesay, also sent Sweet Peas, which were referred to Chiswick.

Mr. J. Lamb, Burton Joyce, sent a large bunch of Pink 'Albino,' which received an Award of Merit on June 15, 1897.

Messrs. W. Mauger, Guernsey, sent Gladiolus cardinalis 'General Scott.'

Messrs. Wood & Ingram, Huntingdon, brought bedding Pelargonium 'Lady Marshall.'

Mr. J. Douglas, Great Bookham, sent a choice selection of Border Carnations.

Messrs. B. S. Williams, Upper Holloway, sent Tree Carnations.

Messrs. Hugh Low, Enfield, brought a plant of Anthurium Andreanum Lowiæ.

ROSE SHOW, JUNE 27, 1899.

JUDGES.

OPEN CLASSES.—Rev. A. Foster-Melliar, Rev. J. H. Pemberton, Mr. Linsdell.

AMATEUR CLASSES.—Mr. C. E. Cant, Mr. George Paul, Mr. J. D. Pawle.

GARDEN ROSES.—Mr. Girdlestone, Mr. Mawley, Mr. Arthur Paul.

MIXED VARIETIES.

Class 1.—Twenty-four Single Trusses, distinct (Open).

First Prize, £3; Second, £2; Third, £1.

1. Mr. B. R. Cant, Colchester.
2. Messrs. Prior, Colchester.
3. Messrs. Frank, Cant, Colchester.

Class 2.—Eighteen Single Trusses, distinct (Amateurs).

First Prize, £3; Second, £2; Third, £1.

1. O. G. Orpen, Esq., West Bergholt.
2. T. B. Haywood, Esq., Reigate (gr. Mr. C. J. Salter).
3. E. M. Bethune, Esq., Denne Park, Horsham.

Class 3.—Eighteen Single Trusses, distinct (Open).

First Prize, £2; Second, £1. 10*s.*; Third, 15*s.*

1. Mr. C. Turner, Slough.
2. Messrs. J. Burrell, Cambridge.
3. Messrs. G. Cooling, Bath.

Class 4.—Twelve Single Trusses, distinct (Amateurs).

First Prize, £2; Second, £1; Third, 10*s*.

1. G. W. Cook, Esq., North Finchley.
2. W. Kingston, Esq., Bedford.
3. R. W. Bowyer, Esq., Haileybury College.

Class 5.—Six Single Trusses, distinct (Amateurs).

First Prize, £1; Second, 15*s*.

1. Miss B. H. Langton, Hendon.
2. John Bateman, Esq., Archway Road, N.

Class 6.—Nine Single Trusses of any one variety of H.P., H.T., or H.B. (Amateurs).

First Prize, £1; Second, 15*s*.; Third, 10*s*.

1. Percy Burnard, Esq., Reigate.
2. T. B. Haywood, Esq. (gr. Mr. C. J. Salter).
3. Rev. F. Page-Roberts, Scole.

Class 7.—Six Single Trusses of any one variety of H.P., H.T., or H.B. (Amateurs).

First Prize, 15*s*.; Second, 10*s*.; Third, 7*s*. 6*d*.

1. G. W. Cook, Esq.
2. E. M. Bethune, Esq.
3. Ernest Wilkins, Sidcup.

TEAS AND NOISETTES.

Class 8.—Eighteen Single Trusses, not less than 12 varieties or more than 2 trusses of any one variety (Amateurs)

First Prize, £3; Second, £1. 10*s*.

1. Rev. F. Page-Roberts.
2. O. G. Orpen, Esq.

Class 9.—Eighteen Single Trusses, distinct (Open).

First Prize, £2. 10*s*.; Second, £1. 10*s*.

1. Messrs. Prior.
2. Mr. Prince, Oxford.

Class 10.—Twelve Single Trusses, not less than 9 varieties or more than 2 trusses of any one variety (Amateurs).

First Prize, £1. 10*s*.; Second, £1.

1. Conway Jones, Esq., Hucclecote, Gloucester.
2. Rev. A. Foster-Melliar, Sproughton.

Class 11.—Six Single Trusses, not less than 4 varieties (Amateurs).

First Prize, £1; Second, 15*s*.

1. Rev. F. R. Burnside, St. Margaret's Bay, Dover.
2. H. P. Landon, Esq., Shenfield, Brentwood.

Class 12.—Nine Single Trusses of any one variety (Amateurs).

First Prize, £1.

1. { O. G. Orpen, Esq.
   { J. C. Trueman, Esq., Swanley, Kent.

Class **13**.—Six Single Trusses of any one variety (Amateurs).

First Prize, £1 ; Second, 15*s*.

1. H. P. Landon, Esq.
2. Miss H. B. Langton.

GARDEN ROSES.

Class **14**.—Thirty-six distinct varieties, not less than three trusses of each (Open).

First Prize, £3 ; Second, £2.

1. Messrs. G. Cooling.
2. Messrs. Paul & Son, Cheshunt.

Class **15**.—Eighteen distinct varieties, not less than three trusses of each (Amateurs).

First Prize, £1. 10*s*. ; Second, £1 ; Third, 10*s*.

1. Alfred Tate, Esq., Downside, Leatherhead.
2. F. W. Campion, Esq., Colley Manor, Reigate.
3. Rev. J. H. Pemberton, Havering, Essex.

FLORAL COMMITTEE, JULY 11, 1899.

Hybrid Conference at Chiswick.

CHARLES E. SHEA, Esq., in the Chair, and twenty-one members present.

Awards Recommended :—

Award of Merit.

To Caladium 'A. Siebert' (C. Rufus × C. Albanense) (votes, 10 for, 7 against), from Messrs. Sander, St. Albans. Of dwarf compact habit, with small ovate lanceolate deep pink leaves with narrow deep-green crenate margins.

To Delphinium 'Michel Lando' (votes, 12 for, 2 against), from Messrs. J. Veitch, Chelsea. A strong growing variety producing long spikes, closely packed with large deep purplish-blue semi-double flowers.

To Sweet William 'Elizabeth' (votes, 7 for, 4 against), from Viscountess Enfield, Dancer's Hill, Barnet. A very free-flowering variety, growing about 18 inches high, and bears salmon-pink flowers, somewhat resembling those of 'Salmon Queen.'

To Decorative Tea Rose 'Madame Cadeau Ramey' (votes, unanimous), from Messrs. W. Paul, Waltham Cross. Buds rather long and pointed. The colour when expanded is cream-white, touched with pink in the centre.

To Tea Rose 'White Maman Cochet' (votes, unanimous), from Messrs. W. Paul. This is a charming white form of the well-known 'Maman Cochet.'

To Border Carnation 'The Baron' (votes, 6 for, 3 against), from Mr. J. Douglas, Edenside, Great Bookham. Handsome cream-white flowers heavily striped with deep crimson.

To Border Carnation 'Heather Bell' (votes, unanimous), from Mr.

Douglas. Flowers very large, petals closely packed in the centre, colour clear yellow-flaked and edged with bright pink.

To Border Carnation 'Rosalind' (votes, unanimous), from Mr. Douglas. Flowers deep crimson, large, and sweet-scented.

Other Exhibits.

W. Nicholson, Esq., Basing Park (gr. Mr. W. Smythe), sent a small plant of Polystichum vestitum venustum, which the Committee asked to see again when more developed.

Mr. F. W. Moore, Sompting, sent Carnations.

Mr. W. Pfitzer, Stuttgart, brought Tuberous Begonias with large fringed flowers.

Messrs. Barr, Covent Garden, sent four new Delphiniums.

Mr. Shoesmith, Woking, sent Border Carnation 'Mrs. Shoesmith.'

Messrs. R. Veitch, Exeter, sent specimens of Notospartium Carmichaeliæ, a distinct and pretty New Zealand shrub bearing racemes of small Pea-shaped pink flowers. Messrs. Veitch also sent flowering branches of Robinia neo-mexicana.

Messrs. Paul & Son, Cheshunt, brought flowers of a hybrid Bourbon Rose called 'Rev. J. B. M. Camm'; but as there is already a variety (H.P.) of the same name, which received a First-class Certificate in 1875, the exhibitor was requested to rename and submit it again at a subsequent meeting.

From Messrs. Pearson, Chilwell, came a plant of Pelargonium 'Henry Jacoby' with variegated leaves.

Mr. Whitfield, Eastbourne, sent cut flowers of an Ivy-leaved Pelargonium. The Committee asked to see a plant.

Sweet Peas were shown by the undermentioned, and requested to be tried at Chiswick:—

1. Messrs. Laxton, Bedford, 15 varieties.
2. Mr. Eckford, Wem, Salop, 6 ,,
3. Messrs. Dobbie, Rothesay, 2 ,,

The following Awards were recommended to plants growing in the gardens:—

Award of Merit.

To Caladium mitjana (votes, unanimous), from Mr. McLeod, Roehampton. A very showy variety with medium-sized bright-red leaves shaded with bronze. The midrib and veins are crimson.

To Zonal Pelargonium 'Cassiope' (votes, unanimous), from Messrs. Pearson, Chilwell. Plant of vigorous habit, with distinctly zoned leaves; very free flowering; flowers large, salmon-pink.

To Zonal Pelargonium 'Countess of Derby' (votes, unanimous), from Messrs. Cannell, Swanley. Plant of sturdy habit, with slightly zoned leaves; very free flowering, flowers salmon with a deeper centre, the edges of the petals touched with flesh colour.

To Viola 'Archibald Grant' (votes, unanimous), from Messrs. Dobbie, Rothesay, and Mr. Forbes, Hawick. Plant of compact, vigorous growth, bearing a wonderful profusion of large deep blue flowers on stout stems borne well above the foliage.

To Viola 'Jackanapes' (votes, 10 for, 9 against), from Mr. Forbes. Plant of bushy habit; very free flowering; flowers small golden-yellow with dark rays, upper petals brownish-crimson edged with yellow. A continuous bloomer.

To Viola 'J. B. Riding' (a sport from 'William Neil') (votes, unanimous), from Messrs. Dobbie and Mr. Forbes. Plant of spreading habit; very free flowering; flowers purplish-rose with pale mauve centre and deep rays.

To Viola 'Pencaitland' (votes, unanimous), from Messrs. Dobbie. Plant of compact bushy habit; very free flowering; flowers white, of excellent shape and substance.

Highly Commended (× × ×).

To Viola 'Charm' (votes, 10 for, 7 against), from Messrs. Dobbie. Plant of rather straggling habit; free flowering; flowers warm lilac suffused with rose.

To Viola 'Lord Salisbury' (votes, unanimous), from Mr. Forbes. Plant of vigorous habit; very free flowering; flowers large, sulphur yellow, with deep rays and golden eye.

FLORAL COMMITTEE, JULY 25, 1899.

GEORGE PAUL, Esq., V.M.H., in the Chair, and eighteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Sir Charles Pigott, Bart., Wexham Park, Slough (gr. Mr. J. Fleming), for foliage and flowering plants.

To Messrs. Hill, Edmonton, for Ferns.

To Messrs. Cutbush, Highgate, for Ivies.

Silver Flora Medal.

To Messrs. J. Veitch, Chelsea, for greenhouse Rhododendrons, hardy herbaceous plants, and flowering trees and shrubs.

To Messrs. Cannell, Swanley, for cactaceous plants and dwarf Antirrhinums.

To Messrs. Wallace, Colchester, for bulbous plants.

To Messrs. Kelway, Langport, for Gladioli.

Silver Banksian Medal.

To Mr. Rumsey, Waltham Cross, for Roses.

To Messrs. Hartland, Cork, for Begonias.

To Mr. May, Edmonton, for Campanulas.

To Messrs. Cooling, Bath, for Roses.

To Messrs. Paul & Son, Cheshunt, for Roses and hardy plants and shrubs.

Bronze Flora Medal.

To Messrs. Barr, Covent Garden, for hardy plants.

First-class Certificate.

To Pseudotsuga (Abies) Douglasii pumila (Colorado var.) (votes, unanimous), from Mr. A. Waterer, Knaphill, Woking. A compact dwarf-growing form of the 'Douglas Fir' discovered by Mr. D. Douglas, one of the Society's collectors on the north-west coast of America upwards of seventy years ago. The variety *Pumila* is well adapted for planting on the fringe of the lawn, where the more vigorous Conifera would be inadmissible.

Award of Merit.

To Nicotiana sylvestris (votes, unanimous), from Leopold de Rothschild, Esq., Gunnersbury House, Acton (gr. Mr. J. Hudson, V.M.H.). A new species of more sturdy growth than N. affinis, and superior to it from a floral point of view. It forms an erect stem about four feet high, furnished with stout substantial light green leaves, and bears abundantly in terminal and axillary corymbs long-tubed, drooping, fragrant, pure-white flowers, resembling those of Bouvardia corymbiflora. It should prove an excellent plant for sub-tropical bedding.

To Campanula 'Warley' (votes, unanimous), from Miss Willmott, V.M.H., Warley Place, Essex. This lovely Campanula is said to be a spontaneous hybrid. It is an abundant blossomer: the small semi-double blue flowers are borne on slender stems. The plant is of dwarf habit with small lanceolate and cordate leaves, not unlike those of C. rotundifolia.

To Caladium 'Madame Jean Dybowski' (votes, 7 for, 6 against), from Messrs. Laing, Forest Hill. The deep-red leaves are very large, splashed and edged with bronze-green.

To Delphinium 'Jose Maria de Heredia' (votes, 8 for, 1 against), from Messrs. J. Veitch, Chelsea. A distinct and handsome variety with beautifully shaped double flowers arranged on medium-sized spikes. The colour is pale blue or mauve, with a deeper shade on the outer petals.

To Acer californica aurea (votes, 8 for), from Messrs. Low, Enfield. The habit of this ornamental hardy tree is similar to that of the well-known A. negundo, but differs from it by reason of the foliage being a lovely shade of yellow, intensifying in colour with full exposure to the sun. The long stems, covered with a glaucous hue, afford additional beauty.

To Double Begonia 'M. Wannot' (votes, 10 for, 3 against), from Messrs. Hartland, Cork. Large salmon-pink flowers of excellent form and substance.

To Double Begonia 'Mr. John Caulfield' (votes, 6 for, 5 against), from Messrs. Hartland. Large bright scarlet flowers suffused with rose.

To Cornus macrophylla (votes, unanimous), from Messrs. J. Veitch, Chelsea. This is a very free growing Japanese Cornus of spreading habit. It bears an abundance of creamy-white flowers in corymbs, and its deep green leaves turn to brilliant shades of crimson in autumn.

To Vitis Thunbergi (votes, 8 for, 6 against), from Mr. A. Waterer, Woking. A very uncommon hardy ornamental Japanese Vine, bearing some resemblance to, but much more vigorous than, V. Coignetæ, a lovely

autumn-tinted shrub. The very large wrinkled leaves are bright green above and brown below. The decaying foliage is very showy in autumn.

To Arundo Donax macrophylla (votes, unanimous), from Mr. A. Waterer. This is an exceptionally vigorous and handsome form of 'The Great Reed,' with broad glaucous leaves. A splendid sub-tropical bedding plant, and useful also for planting near lakes and streams.

To H. B. Rose 'J. B. M. Camm' (Madame Gabriel Luizet (H.P.) × Mrs. Paul (B.)) (votes, unanimous), from Messrs. Paul & Son, Cheshunt. In shape the deliciously scented flowers bear some resemblance to 'La France.' The colour is delicate pink or blush touched with rose-pink at the edges of the petals.

To Phlox 'Fiancée' (votes, unanimous), from Messrs. Paul & Son. A magnificent variety, with immense panicles of large pure-white flowers.

To Campanula isophylla Mayi (votes, unanimous), from Mr. H. B. May, Upper Edmonton. A charming free-flowering variety, suitable either for growing in pots or hanging baskets. It is free in growth, with long shoots clothed with small soft woolly glaucous leaves, and bears an abundance of blue or mauve flowers, larger than those of C. isophylla. The specimens exhibited were grown from cuttings, and only five months old.

Other Exhibits.

Sir Trevor Lawrence, Bart., Burford (gr. Mr. Bain), sent specimens of Cannas, Gladiolus, Pentstemons, and Michauxia campanuloides.

T. B. Haywood, Esq., Woodhatch, Reigate (gr. Mr. C. J. Salter), sent some remarkably fine Border Carnations.

A. W. Porter, Esq., Waltham Cross, sent Border Carnations.

Mrs. B. Currie, Coombe Warren, Kingston Hill (gr. Mr. Allen), sent Begonia floribunda 'Mrs. B. W. Currie,' a dwarf-habited, free-flowering variety.

G. C. Whitfield, Esq., Monk Sherborne, Eastbourne, sent a sport from Ivy-leaf Pelargonium 'Souvenir de Charles Turner' named 'Beauty of Eastbourne.' It has large flowers, is very floriferous, and has somewhat the appearance of a miniature Carnation.

Mr. R. C. Notcutt, Woodbridge, brought a collection of Sweet Peas.

Messrs. Dobbie, Rothesay, sent Pansies.

From Mr. G. Pratt, Kingsbrook House, Bedford, came Border Pinks.

Mr. R. Robinson, Whitby Road, Fallowfield, sent flowers of Chrysanthemum leucanthemum laciniata Robinsoni. The Committee asked to see a plant.

Mr. M. Cuthbertson, Rothesay, sent Œnothera Cuthbertsoni, a variety with very large flowers.

Mr. F. Tapper, Sundridge Park, Bromley, sent Carnations.

Mr. Potten, Cranbrook, Kent, sent a seedling Carnation.

FLORAL COMMITTEE, AUGUST 15, 1899.

W. MARSHALL, Esq., in the Chair, and fifteen members present.

Awards Recommended :—

Silver Gilt Flora Medal.

To Mrs. Abbott, South Villa, Regent's Park (gr. Mr. G. Kelf), for a beautifully arranged group of flowering and foliage plants.

Silver Flora Medal.

To Mr. Mortimer, Farnham, for Cactus and show Dahlias.

To Messrs. Laing, Forest Hill, for Caladiums.

To Messrs. Hill, Lower Edmonton, for 60 species and varieties of Adiantums.

To Messrs. Kelway, Langport, for Gladioli.

To Messrs. W. Paul, Waltham Cross, for Roses and Phloxes.

Silver Banksian Medal.

To Messrs. Paul & Son, Cheshunt, for hardy flowers.

To Messrs. Ware, Tottenham, for Begonias and Dahlias.

To Mr. H. B. May, Upper Edmonton, for Campanula isophylla Mayi.

To Messrs. Webb & Brand, Saffron Walden, for Hollyhocks.

To Messrs. Wallace, Colchester, for hardy plants.

Bronze Banksian Medal.

To Purnell Purnell, Esq., Streatham Hill, for flowering plants.

First-class Certificate.

To Nepenthes Balfouriana (N. Mastersiana ♂ N. mixta ♀) (votes, unanimous), from Messrs. J. Veitch, Chelsea. A handsome pitcher plant, partaking largely of the first-named parent. It is sturdy in growth, with deep-green leaves touched with bronze-green towards the edges. The large deep-red pitchers are slightly spotted with green and irregularly splashed with crimson-brown.

Award of Merit.

To Gladiolus nanceianus 'Henri Vaudrier' (votes, 9 for), from Messrs. J. Veitch. A variety with large spreading purple flowers, the lower segments feathered with white and striped with violet.

To Cupressus Lawsoniana Wisselii (votes, unanimous), from Messrs. J. Veitch. An elegant plant with erect growths close to the main stem, the points of which droop gracefully. It is neat in growth, somewhat like C. L. erecta viridis, and should prove serviceable for small gardens. The foliage is a lovely shade of glaucous grey.

To Double Hollyhock 'Black Knight Improved' (votes, 11 for), from Messrs. Webb & Brand, Saffron Walden. Large and shapely deep maroon flowers.

To Gladiolus Lemoinei 'Jane Dieulafoy' (votes, unanimous), from Messrs. Wallace, Colchester. Medium-sized salmon-pink flowers blotched with scarlet-crimson on the lower segments.

To Gladiolus 'F. Paynter' (votes, 7 for, 5 against), from Messrs. Kelway, Langport. A large spike of medium-sized, well formed, orange-coloured flowers, blotched with deep crimson on the lower segments.

To Gladiolus 'Lady Montagu' (votes, unanimous), from Messrs. Kelway. A handsome variety, with canary-yellow flowers, blotched with crimson on the lower segments.

To Gladiolus 'Burne Jones' (votes, unanimous), from Messrs. Kelway. A grand spike of large, shapely, rosy-salmon flowers, the lower segments marbled with grey.

To Hybrid Decorative Tea Rose 'Gruss au Töpletz' (votes, unanimous), from Messrs. W. Paul, Waltham Cross. The double crimson, sweet-scented, medium-sized flowers are borne with great freedom.

To Phlox 'Le Mahdi' (votes, unanimous), from Messrs. W. Paul. Compact trusses of deep violet-purple flowers, freely produced, bearing some resemblance to P. 'Iris,' but superior to it.

To Cactus Dahlia 'Ajax' (votes, unanimous), from Messrs. Burrell Cambridge. A handsome large-flowered variety with narrow pointed florets, orange colour suffused with salmon.

To Cactus Dahlia 'Antler' (votes, unanimous), from Messrs. Burrell. Medium-sized, rosy-crimson flowers, with incurving florets.

To Cactus Dahlia 'Sylph' (votes, unanimous), from Messrs. Burrell. A charming variety, with long, narrow, orange-coloured recurving florets, deepening towards the centre.

To Centaurea americana alba (votes, 7 for, 1 against), from Messrs. Cannell, Swanley. Large creamy-white fragrant flowers, with much-divided ray florets.

Other Exhibits.

Messrs. de Rothschild, Gunnersbury Park, Acton (gr. Mr. G. Reynolds), sent a small group of Carnation 'Leopold de Rothschild.'

Lord Leigh, Stoneleigh Abbey, Kenilworth (gr. Mr. T. Martin), sent plants of an Abutilon named 'Sawitzi,' which was considered to be identical with A. 'Silver Queen,' which received an Award of Merit on August 11, 1896.

Mr. E. J. Sell, Wellington Street, Luton, sent flowers of Petunia 'White Empress.'

F. W. Campion, Esq., Reigate (gr. Mr. J. Fitt), sent three varieties of Neriums.

Mr. F. W. Bradley, Peterborough, sent flowers of a seedling Carnation.

From Messrs. Cheal, Crawley, came Cactus Dahlias, ornamental Grasses, and sprays of hardy flowering shrubs.

Messrs. J. Veitch, Chelsea, sent hardy shrubs and a collection of Pentstemons.

Mr. H. J. Jones, Lewisham, sent flowers of Tuberous-rooted Begonias.

FLORAL COMMITTEE, AT CHISWICK, AUGUST 25, 1899.

W. MARSHALL, Esq., in the Chair, and six members present.

Awards Recommended:—

Highly Commended (× × ×).

To Pompon Dahlias:—

(1) Annie Holton, (2) Bacchus, (3) George Brinckman, (4) Grace, (5) Hilda, (6) Irene (as a border flower), (7) Iseult, (8) Little Sweetheart, (9) Nancy, (10) Opal, (11) Phœbe, (12) Sunny Daybreak, (13) Vulcan.

A descriptive report on Dahlias will be found on p. 175.

FLORAL COMMITTEE, AUGUST 29, 1899.

W. MARSHALL, Esq., in the Chair, and twelve members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. J. Veitch, Chelsea, for Nepenthes.

Silver-gilt Banksian Medal.

To Messrs. Wills & Segar, Onslow Crescent, for foliage plants.

Silver Flora Medal.

To Messrs. Paul & Son, Cheshunt, for Roses.

To Messrs. Ware, Tottenham, for Dahlias and hardy flowers.

Silver Banksian Medal.

To Mr. May, Edmonton, for flowering plants.

To Messrs. Barr, Covent Garden, for hardy flowers.

Award of Merit.

To Canna 'Beauté Poitevine' (votes, 9 for, 3 against), from Messrs. Ware. Medium-sized scarlet flowers borne with great freedom on stout spikes. The plant is dwarf in habit, and should prove useful for bedding.

To Robinia inermis alb. var. (votes, 7 for, 2 against), from Messrs. Cripps, Tunbridge Wells. A very ornamental, silver-leaved variety, quite hardy, constant in character, and of good growth.

To Gladiolus 'James H. Veitch' (votes, unanimous), from Messrs. J. Veitch, Chelsea. A very fine variety, with large spreading rosy-scarlet flowers striped with white down the centre of each segment, the basal portion of the lower ones spotted with crimson on a creamy ground.

To Cactus Dahlia 'Mrs. Stephenson Clarke' (votes, 9 for), from Messrs. Cheal, Crawley. Flowers large and of excellent form; yellow, heavily tipped and shaded with orange-scarlet.

To Cactus Dahlia 'Mrs. J. H. Luscombe' (votes, 8 for), from Messrs. Cheal. Flowers with rather broad recurving rose-pink florets, paler towards the centre.

To Polygonum Baldschuanicum (votes, 8 for), from Messrs. Barr and Messrs. Ware. A new sub-shrubby hardy climber discovered in Turkestan in 1882. It grows about 16 feet high, and bears a great profusion of loose trusses of small blush-white flowers, which are succeeded by showy fruits. It is a good plant for training up pillars, arbours, verandahs, &c.

Other Exhibits.

Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. Bain), sent 18 varieties of Lobelias (Cardinalis type), 3 of Gladiolus, and a remarkably well-grown plant of Crowea latifolia.

D. Campbell-Brown, Esq., The Croft, Oban, sent a malformed flower of African Marigold.

From Mr. Philip Fry, Addington, West Malling, came 4 varieties of Hybrid Fuchsias.

Mr. R. Robinson, Fallowfield, sent a plant of Chrysanthemum cucanthemum laciniata Robinsonii.

Messrs. Cripps, Tunbridge Wells, sent a specimen of Retinospora obtusa aurea Crippsii. The Committee asked to see this again with a plant of R. o. aurea for comparison.

Messrs. Sander, St. Albans, sent specimens of Calla leucoxantha and Dipladenia Sanderi.

From The Clive House Vineries, Clayport, Alnwick, came several unnamed Carnations and Picotees.

Messrs. J. Veitch, Chelsea, sent plants of Diplopappus vauvilliersii and D. leptophyllus.

Floral Committee, September 12, 1899.

W. Marshall, Esq., in the Chair, and seventeen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. W. Paul, Waltham Cross, for Roses.

Silver-gilt Banksian Medal.

To Messrs. Cheal, Crawley, for Dahlias and hardy shrubs.

Silver Flora Medal.

To Mr. Witty, Nunhead Cemetery, for early flowering Chrysanthemums.
To Mr. Green, Dereham, for Dahlias.
To Mr. Prince, Oxford, for Roses.
To Messrs. Ware, Tottenham, for hardy flowers.

Silver Banksian Medal.

To Leopold de Rothschild, Esq., Gunnersbury House, Acton (gr. M J. Hudson, V.M.H.), for a group of Acalypha Sanderiana.
To Mr. West, Tower Hill, Brentwood, for Dahlias.
To Messrs. Jones, Shrewsbury, for Dahlias.
To Messrs. Peed, West Norwood, for Dahlias and Asters.
To Messrs. Paul & Son, Cheshunt, for Cannas and hardy flowers.

Bronze Flora Medal.

To Messrs. Barr, Covent Garden, for hardy flowers.

First-class Certificate.

To Eucharis Burfordiensis (E. Mastersii × E. Sanderii) (votes, unanimous), from Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. Bain). This new hybrid is exceptionally free in blossom, the large pure-white tubular flowers are usually borne in threes on stout scapes, and are almost scentless. (Fig. 68.)

To Retinospora obtusa aurea Crippsii (votes, unanimous), from Messrs. Cripps, Tunbridge Wells. A particularly graceful variety, with long pendant thread-like growths, having much the same habit and general appearance as R. O. gracilis aurea. The colour of its foliage varies from pale sulphur to bright yellow.

Award of Merit.

To Begonia 'Mrs. Leopold de Rothschild' (votes, unanimous), from Leopold de Rothschild, Esq., Gunnersbury House, Acton (gr. Mr. J. Hudson, V.M.H.). This is a very fine sport from B. 'Gloire de Lorraine,' with large bright pink flowers borne with wonderful profusion. The plant is of a bushy, compact habit, and free in growth.

To Bedding Tea Rose 'Corallina' (votes, 11 for), from Messrs. W.

Fig. 69.—Vanda Kimballiana. (*Journal of Horticulture.*)

Paul, Waltham Cross. A very free-flowering Rose, with pretty flesh-pink coloured buds, which colour is well sustained in the full-blown flowers.

To Single Dahlia 'Flame' (votes, unanimous), from Messrs. Cheal, Crawley. Bright orange-scarlet flowers striped and splashed with scarlet.

To Single Dahlia 'Veronica' (votes, unanimous), from Messrs. Cheal. Clear scarlet flowers, faintly speckled and tipped with orange-yellow.

To Single Dahlia 'Daisy' (votes, unanimous), from Messrs. Cheal. Rich rosy-crimson flowers speckled with white.

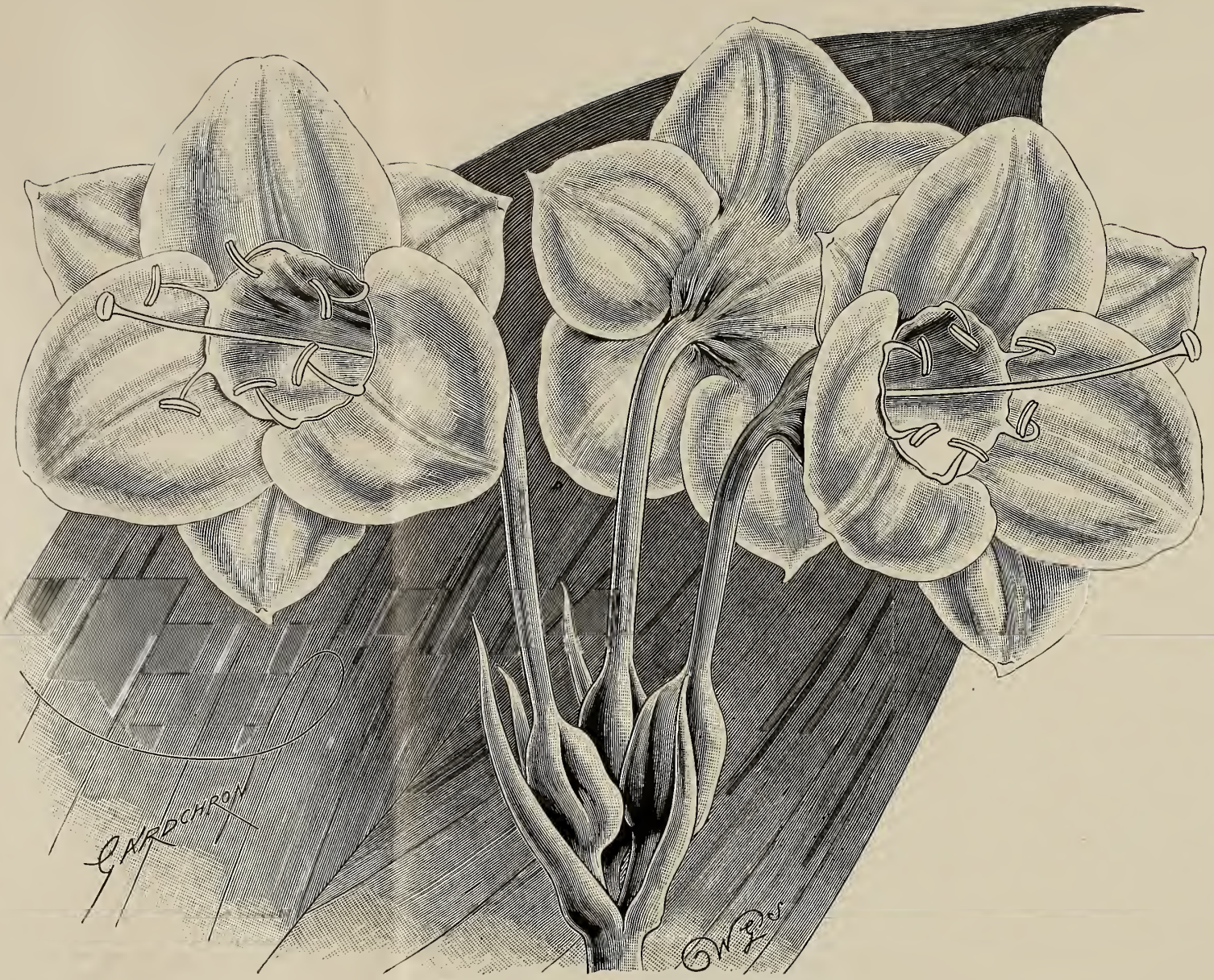


Fig. 68.—Eucharis × Burfordiensis. (*Gardeners' Chronicle.*)

To Cactus Dahlia 'Red Rover' (votes, unanimous), from Mr. Green, Dereham. Very large rich crimson flowers of good form and substance.

To Cactus Dahlia 'Green's White' (votes, unanimous), from Mr. Green. A lovely pure-white variety with incurving florets.

To Show Dahlia 'Empress' (votes, unanimous), from Mr. St. Pierre

Fig. 70.—Saccolabium cœleste. (*Journal of Horticulture.*)

Harris, Orpington. Large lilac-purple flowers flaked and splashed with crimson.

To Cactus Dahlia 'Mayor Tuppeney' (votes, unanimous), from Mr.

Stredwick, St. Leonards. Large well-formed flowers with long, narrow recurving yellow florets, the outer ones flushed with red.

To Cactus Dahlia 'Major Weston' (votes, unanimous), from Mr. Stredwick. Rich purplish-crimson flowers of excellent form.

To Cactus Dahlia 'Uncle Tom' (votes, unanimous), from Mr. Stredwick. This is an improvement on the popular variety named 'Night.' The flowers are of good outline, with sharply pointed deep maroon florets.

To Cactus Dahlia 'Maurice T. Walsh' (votes, unanimous), from Mr. Stredwick. Flowers rich canary-yellow touched with chrome.

To Single Dahlia 'Nellie Nicholson' (votes, unanimous), from Mr. Seale, Sevenoaks. Medium-sized flowers, white bordered with rosy-red.

To Single Dahlia 'Edie Oblein' (votes, unanimous), from Mr. Seale. Flowers rosy-mauve shading to yellow.

To Cactus Dahlia 'Mrs. J. J. Crowe' (votes, unanimous), from Mr. West, Brentwood, and Messrs. Keynes, Williams, Salisbury. A clear yellow self of excellent form and substance.

To Cactus Dahlia 'Loadstone' (votes, unanimous), from Messrs. Keynes, Williams. Bright orange-red flowers with twisted florets.

To Cactus Dahlia 'Innovation' (votes, unanimous), from Messrs. Keynes, Williams. Bright scarlet flowers tipped with white.

To Cactus Dahlia 'Emperor' (votes, unanimous), from Messrs. Keynes, Williams. Large well-formed purplish rose flowers, with incurving florets.

To Pompon Dahlia 'Cheerfulness' (votes, unanimous), from Messrs. Keynes, Williams. Small well-formed scarlet flowers, the basal portion of the petals stained with yellow.

Other Exhibits.

Leopold de Rothschild, Esq., Acton (gr. Mr. J. Hudson, V.M.H.), sent specimens of Dahlias and Salvia splendens compacta.

Miss Aldersey, Chester, sent flowers of Cactus Dahlia 'Kaiser.'

Sir Trevor Lawrence, Bart., Burford (gr. Mr. Bain), sent Lobelias and Asters.

Mr. J. Frankland, Warley, Halifax, sent a seedling Carnation.

F. W. Moore, Esq., V.M.H., Glasnevin, sent flowering specimens of Bignonia Chamberlayni and Lagerströmia indica.

Mr. J. Lye, Easterton, Devizes, sent six varieties of Fuchsias.

Messrs. R. Veitch, Exeter, sent Hibiscus californicus.

Messrs. Sander, St. Albans, exhibited six varieties of Sonerilas.

Messrs. Low, Enfield, sent a malformed flower of Calla Elliottiana.

Messrs. Cutbush, Highgate, sent Hydrangea paniculata grandiflora and Citrus sinensis, alb. var.

From Mr. Weathers, Isleworth, came specimens of Callistephus chinensis.

Messrs. Wells, Redhill, sent early flowering Chrysanthemums.

FLORAL COMMITTEE, SEPTEMBER 26, 1899.

W. MARSHALL, Esq., in the Chair, and sixteen members present, with H. M. ARDERNE, Esq., Cape Town.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Sir Henry Tate, Bart., Park Hill, Streatham (gr. Mr. W. Howe), for foliage plants.

To Mr. May, Edmonton, for a collection of Codiæums (Crotons).

Silver Flora Medal.

To Messrs. Hill, Edmonton, for Ferns.

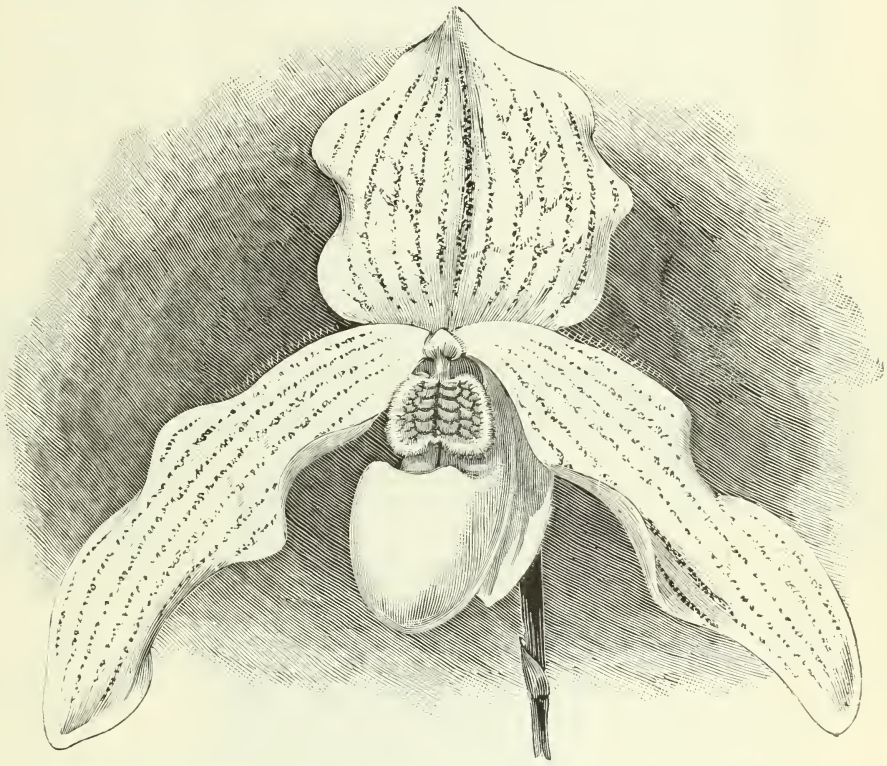


FIG. 71.—CYPRIPEDIUM VIPANI. (*Journal of Horticulture.*)

To Mr. Mortimer, Farnham, Surrey, for Dahlias.

To Messrs. Ware, Tottenham, for Pompon Dahlias and hardy flowers.

Bronze Banksian Medal.

To Mr. Stredwick, St. Leonards, for Cactus Dahlias.

Award of Merit.

To Cactus Dahlia 'Madame Medora Henson' (votes, 9 for, 3 against), from Messrs. Ware, Tottenham. Large well-formed flowers with narrow pointed recurving florets; scarlet faintly suffused with orange.

To Cactus Dahlia 'Augustus Hare' (votes, unanimous), from Mr.

Stredwick, St. Leonards. Flowers large and of good form; orange scarlet suffused with crimson near the margins of the petals.

To Caryopteris mastacanthus (votes, 11 for, 3 against), from Messrs. Barr, Covent Garden. An uncommon but distinct and ornamental Chinese and Japanese shrub of bushy spreading habit. Its pale blue flowers are borne in axillary clusters along the entire length of the current year's fully ripened wood. It delights in a sunny spot and copious supplies of water while growth is being made. It is somewhat doubtfully hardy.

Other Exhibits.

Mrs. Wakefield, Belmont, Uxbridge, sent a new seedling Aster (Michaelmas Daisy), named 'Mrs. Wakefield.'

From T. H. O. Pease, Esq., Skaigh, Okehampton, came eight varieties of unnamed seedling Cactus Dahlias.

W. Pearson, Esq., Redgrove, Epping, sent a spray of Kalreuteria paniculata bearing a quantity of its interesting seed-pods.

Messrs. Rogers, Bassett, Southampton, sent hardy shrubs and conifers.

From Mr. Godfrey, Exmouth, came Chrysanthemums and Carnations.

The Dowager Lady Freake, Fulwell Park, Twickenham (gr. Mr. A. H. Rickwood), sent a collection of Cannas.

From Messrs. Wells, Redhill, came early flowering Chrysanthemums, amongst them being two varieties named 'Madame Liger Ligneau' and 'Crimson Marie Masse,' which the Committee asked to see again.

Mr. Bland, Fordham, Soham, sent a new seedling Lobelia named 'White Eye.'

Messrs. Low, Enfield, sent a group of Statices.

ORCHID COMMITTEE.

TEMPLE GARDENS, May 31, 1899.

Harry J. Veitch, Esq., in the Chair, and twenty-five members present.

Awards Recommended:—

The list of Cups and Medals awarded by the Council will be found on page xc.

First-class Certificate.

To Lælia purpurata 'Annie Louise' (votes, unanimous), from Capt. G. W. Law-Schofield, Rawtenstall, Manchester (gr. Mr. Shill). A very brightly coloured variety, having the petals veined and feathered with rose-purple, front of lip claret veined rose. (Fig. 72.)

To Lælio-Cattleya × Aphrodite 'Ruth' (L. purpurata × C. Mendelii) (votes, unanimous), from J. Rutherford, Esq., M.P., Beardwood, Blackburn. A fine flower, clear white, with the tube of the lip tinged with yellow, the front lobe rich rose-crimson.

To Lælio-Cattleya × Aphrodite 'Me. Albert Hye' (votes, unanimous),

from M. Jules Hye Leysen, Coupure, Ghent (gr. Mr. Coen). Flower delicate rose-colour with purplish-crimson lip.

To Odontoglossum crispum 'Arthur Briscoe' (votes, unanimous), from W. Thompson, Esq., Walton Grange, Stone, Staffordshire (gr. Mr. W. Stevens). Flowers large, white tinged with lilac, the sepals and petals bearing distinct brownish blotches. (Fig. 73.)

To Cattleya Mossiæ 'Beauty of Bush Hill' (votes, unanimous), from

Fig. 72.—Lælia Purpurata 'Annie Louise.' (*Journal of Horticulture.*)

Messrs. Hugh Low, Enfield. A large and brightly coloured flower, the petals veined with rose-purple. (Fig. 74.)

Award of Merit.

To Cattleya Mossiæ Goossensiana (votes, unanimous), from Sir Trevor Lawrence, Bart. (gr. Mr. W. H. White). A beautiful blush-white flower, the front of the lip vivid violet tinted rose, with broad white margin.

To Cattleya Mendelii 'Burford variety' (votes, unanimous), from Sir Trevor Lawrence, Bart. Flower large and fine in form, white tinged pink, front of the lip purplish mauve.

To Thunia Bensoniæ superba (votes, unanimous), from Sir Trevor Lawrence, Bart. Flowers much larger than any others of the type, warm rose-purple.

To Cattleya Mossiæ gloriosa (votes, unanimous), from J. Rutherford, Esq., M.P., Beardwood, Blackburn. A very large and perfect flower, the front of the lip being extraordinarily expanded, and marked with dark purple.

To Odontoglossum triumphans 'King Alfred' (votes, unanimous), from W. Thompson, Esq., Stone (gr. Mr. W. Stevens). A peculiar form with segments of equal breadth; sepals yellow, blotched with tawny

Fig. 73.—Odontoglossum crispum 'Arthur Brisco.' (*Journal of Horticulture.*)

brown; petals and lip whitish, with similar blotches to those on the sepals.

To Phalænopsis Sanderiana 'Wigan's variety' (votes, unanimous), from Sir Frederick Wigan, Bart. (gr. Mr. W. H. Young). A fine and perfectly circular flower of a bright, pure pink tint. The most perfectly shaped Phalænopsis according to florists' standard.

To Miltonia vexillaria Dulcotensis (votes, 9 for, 8 against), from Walter Cobb, Esq., Tunbridge Wells (gr. Mr. Howes). Flowers bright rosy mauve.

To Cattleya intermedia 'Rosslyn variety' (votes, unanimous), from

H. T. Pitt, Esq., Stamford Hill (gr. Mr. Thurgood). This would be C. i. 'Parthenia' if pure white, but it has a slight blush-white tint.

To Cattleya Mendelii 'Perfection' (votes, unanimous), from Messrs.

Fig. 74.—Cattleya Mossiæ 'Beaut of Bush Hill.' (*Journal of Horticulture.*)

Hugh Low. Flowers large, petals broad, blush-white; front of lip purplish crimson.

To Cattleya Mossiæ 'Mrs. C. H. Feiling' (votes, unanimous), from

Messrs. Stanley Mobbs & Ashton, Southgate. A very large flower, richly coloured.

To Odontoglossum Hallii Lairesseanum (votes, 9 for, 7 against), from M. Jules Hye Leysen, Ghent (gr. Mr. Coen). A colour suppression, the whole of the flower being greenish-yellow without brown blotches.

To Odontoglossum crispum 'Perle du Congo' (votes, unanimous), from M. Jules Hye Leysen (gr. Mr. Coen). A singular form with rather narrow-petalled blush-white flowers, the upper petal bearing a brown band up the centre and the other segments some brownish spots.

To Miltonia vexillaria Lindeniæ (votes, unanimous), from Messrs. Linden, Brussels. Flowers very large, veined with bright rose.

To Odontoglossum crispum 'Miss Linden' (votes, unanimous), from

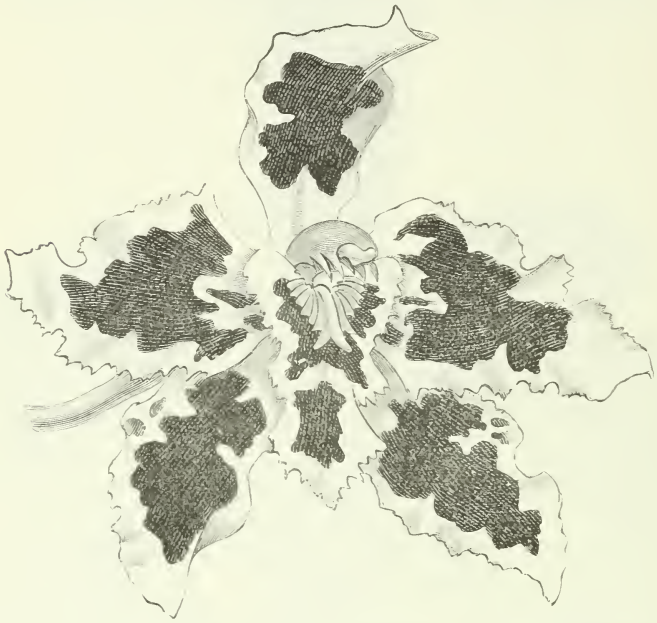


Fig. 75.—Odontoglossum crispum augustum. (*Journal of Horticulture.*)

Messrs. Linden, Brussels. A finely-shaped flower, with brown blotches on white ground.

Botanical Certificate.

To Campanemia uliginosa, from Sir Trevor Lawrence, Bart. A singular pigmy, with short racemes of small white flowers.

To Cypripedium glanduliferum, from Sir Trevor Lawrence, Bart. A distinct, well-known, but still rare Eastern species.

Cultural Commendation.

To M. Jules Coen, gr. to M. Jules Hye Leysen, for a splendidly grown Odontoglossum crispum augustum. (Fig. 75.)

To Mr. W. H. Young, gr. to Sir Frederick Wigan, Bart., for Odontoglossum Oerstedii with some sixty flowers.

To Mr. F. J. Thorne, gr. to Major Joicey, Sunningdale, for Ludde-

mannia Lehmannii with four developed spikes of fifty to sixty orange-coloured flowers each, and two other racemes in formation.

To Mr. F. J. Thorne for Anguloa Clowesii with nineteen large flowers.

Other Exhibits.

Monsieur Ragot showed Lælia × Ragotiana (grandis × cinnabarina).

T. B. Haywood, Esq. (gr. Mr. C. J. Salter), sent Lælia purpurata 'Bacchus' and Cattleya Mossiæ 'Ajax.'

Messrs. Backhouse, York, showed forms of Odontoglossum crispum.

A. Warburton, Esq. (gr. Mr. Lofthouse), sent Lælia × cinnabrosa.

Thos. Statter, Esq., Manchester (gr. Mr. Johnson), showed as Lælia purpurata Statteriana what was stated to be imperfectly grown L. p. 'Annie Louise.'

C. L. N. Ingram, Esq. (gr. Mr. T. W. Bond), showed Lælio-Cattleya × 'Amazone' (C. maxima × L. purpurata).

ORCHID COMMITTEE, JUNE 13, 1899.

HARRY J. VEITCH, Esq., in the Chair, and sixteen members present.

Awards Recommended :—

Gold Medal.

To Messrs. James Veitch, Chelsea, for an exceptionally fine group of rare Orchids.

Silver-gilt Flora Medal.

To Sir Frederick Wigan, Bart., Clare Lawn, East Sheen (gr. Mr. W. H. Young), for a fine group of Orchids.

Silver Banksian Medal.

To J. Bradshaw, Esq., Southgate (gr. Mr. Whiffen), for a group of Cattleyas and other Orchids.

To Messrs. Hugh Low, Enfield, for a group of Orchids.

To De B. Crawshay, Esq., Sevenoaks (gr. Mr. S. Cooke), for a group of fine forms of Odontoglossum crispum.

To Messrs. Stanley Mobbs & Ashton, Southgate, for a group of Orchids.

First-class Certificate.

To Odontoglossum × Adrianæ Ashworthianum (votes, unanimous), from Elijah Ashworth, Esq., Harefield Hall, Wilmslow (gr. Mr. Holbrook). Flower of fine form, white with numerous cinnamon-brown blotches. (Fig. 76.)

Award of Merit.

To Cattleya Mossiæ 'Victoria' (votes, unanimous), from J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. Davis). A very large and handsome form with white flowers, the petals slightly veined

in the centre with rose; the base of the lip orange, the front lobe bearing a slight reticulation of purple colour.

To Cattleya Eldorado 'Glebelands' variety (votes, 9 for, 4 against), from J. Gurney Fowler, Esq. (gr. Mr. Davis). A fine advance on C. Eldorado splendens. Flowers fragrant, bright rose, with orange base to the lip and dark claret front.

To Cattleya Mendelii albescens (votes, unanimous), from Sir Frederick Wigan, Bart. (gr. Mr. W. H. Young). Flower white with a slight rose tint on the sepals and petals, base of the lip dark yellow.

To Lælio-Cattleya × 'Lucilia' (Cattleya Dowiana ♂ Lælio-Cattleya × Schilleriana ♀) (votes, unanimous), from Messrs. James Veitch, Chelsea. Flowers cream-white, the petals slightly tipped with purple; lip yellow at the base, changing to cream-white towards the margin, the front portion veined purple.

To Epidendrum × Langleyense (pseudepidendrum ♀ Wallisii ♂) (votes, unanimous), from Messrs. James Veitch. An interesting cross with

Fig. 76.—Odontoglossum Adrianæ Ashworthianum. (*Journal of Horticulture.*)

the scarlet-lipped E. pseudepidendrum which it resembles in habit. Sepals and petals yellow; lip orange, streaked with purple around the callus.

To Odontoglossum × Coradinei Crawshayanum (votes, unanimous), from De B. Crawshay, Esq. (gr. Mr. S. Cooke). A fine form with yellow flowers blotched with brown.

Botanical Certificate.

To Bartholina pectinata, from Leopold de Rothschild, Esq. (gr. Mr. J. Hudson). A pretty Cape terrestrial with pale blue laciniate flowers. (Fig. 77.)

To Eria extinctoria, from Sir Frederick Wigan, Bart. (gr. Mr. W. H. Young). A very small species with slender flower spikes bearing two or three whitish flowers.

To Bulbophyllum nutans, from A. H. Smee, Esq. (gr. Mr. W. E.

Humphreys). Raceme nodding; flowers greenish, the lip and petals tinged with claret colour; petals thread-like, with ovate thickened extremities.

To Bulbophyllum modestum, from A. H. Smee, Esq. Plant small; flowers small; white.

Cultural Commendation.

To Mr. W. H. Young, gr. to Sir Frederick Wigan, Bart., for Miltonia vexillaria 'Memoria G. D. Owen,' with two flower spikes.

Fig. 77.—Bartholina pectinata. (*Gardeners' Chronicle.*)

To Mr. R. B. Leech, Woodhall Gardens, Dulwich, for a very fine specimen of Epidendrum Wallisii.

To Mr. T. Rochford, Broxbourne, for Odontoglossum × Adrianæ Rochfordianum.

Other Exhibits.

Mr. W. Bolton, Wilderspool, showed Cattleya Mendelii 'Blue Queen.'

R. G. Fletcher, Esq., Brighton, sent Odontoglossum × Adrianæ, and other varieties.

T. B. Haywood, Esq. (gr. Mr. C. J. Salter), showed Odontoglossum crispum 'Woodhatch variety.'

Messrs. F. Sander & Co. showed Lælio-Cattleya × Ingramii superba, and other Orchids.

Baron Sir H. Schröder sent Phalænopsis × 'John Seden.'

Norman C. Cookson, Esq. (gr. Mr. Wm. Murray), showed Cattleya × C. G. Roebling 'Cookson's variety.'

W. P. Burkinshaw, Hessle, Hull (gr. Mr. Barker), showed Lælio-Cattleya × Canhamiana 'Amelia.'

H. T. Pitt, Esq. (gr. Mr. Thurgood), sent Lælia tenebrosa Pittiana and other Orchids.

Messrs. Jas. McBean & Sons, Cooksbridge, showed the nearly white Cattleya Mendelii Protheroeana.

F. W. Moore, Esq., Glasnevin, Dublin, sent Eulophia Guineensis and Epidendrum porphyreum.

H. F. Simonds, Esq., Beckenham (gr. Mr. G. E. Day), sent Lælia purpurata Simondsii.

Orchid Committee, June 27, 1899.

Harry J. Veitch, Esq., in the Chair, and twenty members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. James Veitch, Chelsea, for a fine group of hybrid Lælio-Cattleyas and other Orchids.

To J. Bradshaw, Esq., Southgate (gr. Mr. Whiffen), for a group of Orchids.

To Messrs. Hugh Low for a group of Orchids.

Bronze Banksian Medal.

To Messrs. Stanley Mobbs & Ashton, Southgate, for a group of Orchids.

First-class Certificate.

To Lælio-Cattleya × Dominiana 'Fire King' (L. purpurata × C. Dowiana) (votes, unanimous), from Mrs. Briggs-Bury, Bank House, Accrington (gr. Mr. Wilkinson). Flowers large, sepals and petals bright rose, front of lip velvety ruby red.

To Lælio-Cattleya × Aphrodite eximia (L. purpurata ♀ C. Mendelii ♂) (votes, 9 for, 2 against), from Messrs. James Veitch. Flowers dark rose, lip claret crimson.

To Odontoglossum × Harryano-crispum, from Sir F. Wigan, Bart., East Sheen (gr. Mr. W. H. Young) (votes, 10 for, 1 against). Said to be the reverse cross of the original. Sepals and petals French white, tinged and blotched rose-purple. (Figs. 78 and 83.)

To Odontoglossum crispum 'Seraphim' (votes, unanimous), from De B.

Crawshay, Esq., Sevenoaks (gr. Mr. S. Cooke). One of the finest of the pure-white forms; disc of lip bright yellow.

Award of Merit.

To Cattleya Mossiæ Lawrenciæ (votes, unanimous), from Sir Trevor Lawrence, Bart. (gr. Mr. W. H. White). A charming white form, with slight pencilling of rose colour in the centre of the lip, and the usual yellow throat.

To Odontoglossum crispum purpurescens (votes, unanimous), from Sir Trevor Lawrence, Bart. The nearest approach to O. c. 'Starlight.' Flowers of fine form, rose-tinted, densely spotted with purple.

To Masdevallia × Rushtonii (racemosa ♂ ignea Eeckhautei ♀) (votes,

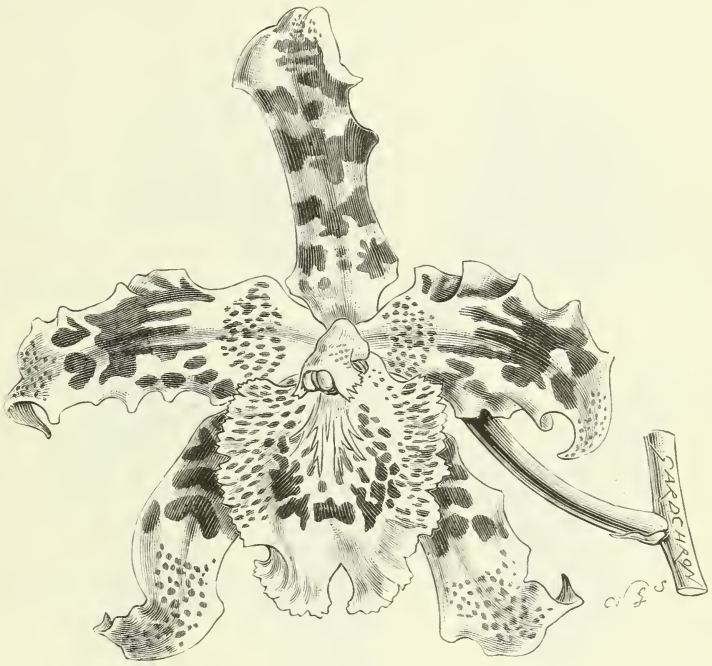


Fig. 78.—Odontoglossum × Harryano-crispum. (*Gardeners' Chronicle.*)

8 for, 3 against), from Captain T. C. Hincks, Richmond, Yorks. (gr. Mr. Rushton). Resembling M. racemosa in form, but much more robust. Flowers orange, tinged scarlet.

To Lælia tenebrosa 'Victor Warburton' (votes, unanimous), from A. Warburton, Esq., Vine House, Haslingden (gr. Mr. Lofthouse). Sepals and petals yellow, lip blush-white, with clear rose-coloured markings.

To Cattleya Gaskelliana formosa (votes, unanimous), from Messrs. Jas. Veitch. Flowers white with slight blush tint, and cowslip-yellow disc to the lip.

Botanical Certificate.

To Gongora gratulabunda, from F. W. Moore, Esq., Glasnevin. Flowers whitish, speckled with rose colour.

To Eria acervata, from Sir F. Wigan, Bart. (gr. Mr. W. H. Young). A pretty white species.

Cultural Commendation.

To Messrs. Charlesworth & Co., Heaton, Bradford, for Cattleya Mossiæ Wagenerii, with seventeen flowers.

To Mr. W. H. Young, gr. to Sir F. Wigan, Bart., for Cattleya Mossiæ excellens, with six fine flowers on one spike.

Other Exhibits.

Baron Sir H. Schröder (gr. Mr. H. Ballantine), showed Cypripedium Stonei platytænium, with three flowers on a spike.

The Right Hon. Lord Burton (gr. Mr. W. Bennett) showed Cattleya Mendelii, with five flowers on a spike.

W. P. Burkinshaw, Esq., Hessle (gr. Mr. Baker), showed Odontoglossum crispum 'Amelia.'

R. I. Measures, Esq. (gr. Mr. H. J. Chapman), sent the rare Masdevallia angulata.

W. A. Bilney, Esq., sent a finely coloured Cattleya labiata Gaskelliana.

Mrs. Temple, Groombridge (gr. Mr. Bristow), showed Cœlogyne Dayana, finely grown.

Lieut.-Col. Shipway, Chiswick (gr. Mr. Walters), staged a group of Orchids.

Messrs. B. S. Williams showed a good group of Orchids.

Mr. C. Walker, Esq., Winchmore Hill (gr. Mr. Geo. Cragg), showed a fine Burlingtonia fragrans.

CHISWICK.

ORCHID COMMITTEE, JULY 11, 1899.

HARRY J. VEITCH, Esq., in the Chair, and sixteen members present.

Awards Recommended:—

First-class Certificate.

To Cattleya Harrisoniana alba (votes, unanimous), from the Rev. F. Paynter, Stoke Hill, Guildford (gr. Mr. Cooke). A true albino of the species. (Fig. 79.)

To Lælio-Cattleya × Duvaliana (Lælia purpurata × Cattleya labiata Luddemanniana) (votes, 10 for), from M. Chas. Maron, Brunoy, France. Flowers defective in the sepals and petals, which were white, tinged with lilac: lip deep claret-purple in front, shading to yellow at the base.

Award of Merit.

To Lælia tenebrosa gigantea (votes, unanimous), from Sir Frederick Wigan, Bart., East Sheen (gr. Mr. W. H. Young). A large form of the ordinary darkly coloured variety.

To Cypripedium Stonei candidum (votes, unanimous), from Sir F. Wigan, Bart. A light-coloured form, in which the face of the dorsal sepal is almost entirely white.

To Cypripedium × Shillianum (Gowerianum × Rothschildianum) (votes, unanimous), from G. W. Law-Schofield, Esq., New-Hall-Hey, Rawtenstall (gr. Mr. Shill). One of the finest of the Rothschildianum crosses; petals resembling those of C. Rothschildianum, tint broader, greenish white, blotched purplish-chocolate; dorsal sepal white with purple lines; lip brownish-rose on the face, greenish at the base.

To Lælio-Cattleya × 'Adolphus' (L. cinnabarina × C. Acklandiæ) (votes, unanimous), from the Rev. F. Paynter, Stoke Hill, Guildford (gr. Mr. Cooke). Flowers Indian yellow, the sepals and petals bearing a few purple spots; front of the lip claret colour.

To Epilælia × Charlesworthii (E. radicans × L. cinnabarina) (votes, unanimous), from Messrs. James Veitch, Chelsea. Flowers deep orange, the base of the lip lighter yellow.

Fig. 79.—Cattleya Harrisoniæ alba. (*Journal of Horticulture.*)

To Lælio-Cattleya × Martinetii (C. Mossiæ ♀ L. tenebrosa ♂) (votes, unanimous), from M. Chas. Maron, Brunoy, France. Flowers pale lilac, lip veined purple.

Other Exhibits.

Sir Trevor Lawrence, Bart., Burford (gr. Mr. W. H. White), staged an extensive and interesting collection of hybrid Orchids, together with the species from which they were derived.

Messrs. James Veitch, Chelsea, arranged a fine group of their hybrid Orchids, and in most cases the parents.

Messrs. Hugh Low, Enfield, showed a collection of Orchids.

Messrs. F. Sander, St. Albans, showed several hybrids of Cypripedium Rothschildianum, &c.

Mr. De B. Crawshay, Sevenoaks (gr. Mr. S. Cooke), showed Odontoglossum × crispo-Hallii, var. Crawshayanum; O. crispum Crawshayanum, and O. crispum 'Mrs. De B. Crawshay.'

Mr. C. C. Hurst, Burbage, Hinckley, showed a number of seedlings of Cypripedium × 'Pluto,' showing remarkable variation in the foliage.

M. Chas. Maron, Brunoy, France, exhibited seventeen hybrid Cattleyas and Lælio-Cattleyas.

Sir F. Wigan, Bart., showed hybrid Lælio-Cattleyas, &c.

C. L. N. Ingram, Esq., Godalming (gr. Mr. T. W. Bond), showed Cattleya × 'Firebrand' (Schilleriana × Lawrenceana).

Walter Cobb, Esq., Tunbridge Wells (gr. Mr. J. Howes), sent Catasetum callosum bearing male and female flowers; also Cypripedium × l'Ansonii.

A. H. Smee, Esq. (gr. Mr. Humphreys), showed Microstylis congesta.

Mr. Geo. Hansen, Berkeley, California, very kindly sent his work on Hybrid Orchids.

ORCHID COMMITTEE, JULY 25, 1899.

HARRY J. VEITCH, Esq., in the Chair, and fifteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. James Veitch, Chelsea, for a group of Orchids.

First-class Certificate.

To Sophro-Cattleya × 'Queen Empress' (Cattleya Mossiæ ♀ Sophronitis grandiflora ♂) (votes, unanimous), from Messrs. James Veitch, Chelsea. The finest of the Sophronitis grandiflora hybrids. Sepals bright rosy crimson; petals rosy crimson with darker veining; lip yellow at the base, with purple lines; front lobe and edges of the side lobes bright reddish rosy crimson, the side lobes having a narrow yellow margin. (Fig. 80.)

To Disa × Diores, var. Clio superba (Veitchii × grandiflora) (votes, unanimous), from Messrs. James Veitch, Chelsea. Flowers bright magenta-crimson, with yellow and purple markings in the centre.

Award of Merit.

To Vanda teres 'Gunnersbury Park var.' (votes 8 for, 4 against), from Messrs. de Rothschild, Gunnersbury (gr. Mr. George Reynolds). A pretty light form, with some resemblance to the hybrid V. × 'Miss Joaquim.'

Other Exhibits.

Sir Trevor Lawrence, Bart. (gr. Mr. W. H. White), showed Stanhopea aurantiaca, a fine flower of the S. Wardii class. Orange-yellow, with blackish spots on the hypochile.

Elijah Ashworth, Esq., Harefield Hall, Wilmslow (gr. Mr. H. Holbrook), showed Dendrobium × formoso-Lowii, with yellowish-white flowers having brownish-orange lines on the lip.

F. A. Rehder, Esq., Gipsy Hill (gr. Mr. Norris), sent Cypripedium × 'Miss Rehder' (Argus × hirsutissimum).

Frau Ida Brandt, Riesbach, Zurich (gr. Mr. Schlecht), sent Zygopetalum (Bollea) Lalindei, and Phalænopsis 'Esmeralda.'

T. B. Haywood, Esq., Woodhatch, Reigate (gr. Mr. Salter), sent the

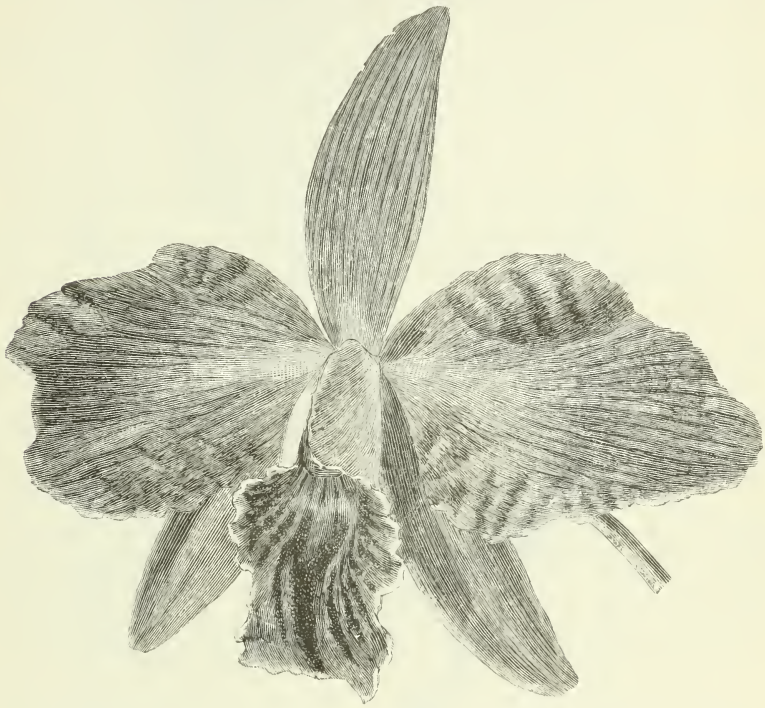


Fig. 80.—Sophro-Cattleya 'Queen Empress.' (*Journal of Horticulture.*

fine white Miltonia vexillaria 'Daisy Haywood,' and some good coloured forms.

Messrs. Sander showed hybrids of Cypripedium Rothschildianum.

Messrs. Hugh Low showed a collection of Orchids.

J. Gurney Fowler, Esq. (gr. Mr. Davis), showed Renanthera Storiei.

Orchid Committee, August 15, 1899.

Harry J. Veitch, Esq., in the Chair, and fourteen members present.

Awards Recommended.

Silver Flora Medal.

To Messrs. Hugh Low, Enfield, for a fine group of Cattleya 'Eldorado' and other Orchids.

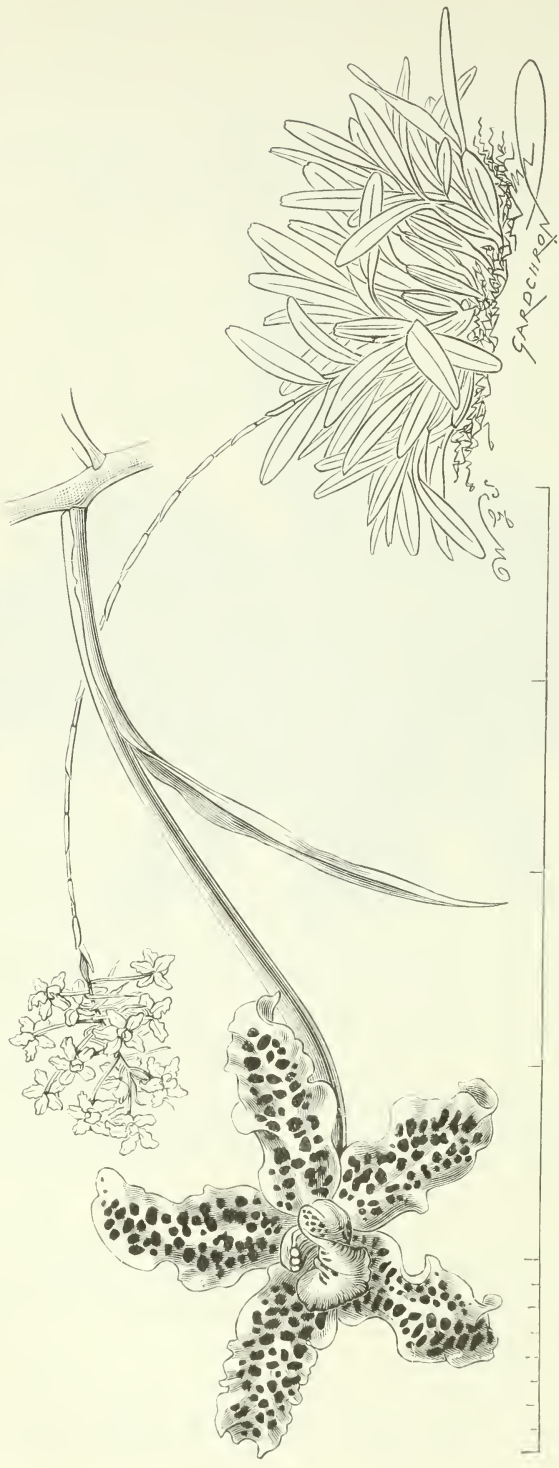


Fig. 81.—Schomburgkia Lyonsii. (*Gardeners' Chronicle.*)

First-class Certificate.

To Lælio-Cattleya × Wiganiana (? L. purpurata × L.-C. × Dominiana) (votes, unanimous), from Sir Frederick Wigan, Bart., Clare Lawn, East Sheen (gr. Mr. W. H. Young). Flowers of the largest of its class. Sepals and petals pale rose veined and tinged with purple. Lip almost entirely of a deep claret-purple.

Award of Merit.

To Schomburgkia Lyonsii (votes, unanimous), from the Right Hon. Lord Rothschild, Tring Park (gr. Mr. E. Hill). A rare old species with white flowers marked with purple. Imported from Jamaica. (Fig. 81.)

To Stauropsis lissochiloides var. (votes, unanimous), from the Right Hon. Lord Rothschild. The variety shown had an inflorescence of twenty-seven flowers. Yellow blotched with red, the reverse of the younger flowers, and buds being bright rose colour.

To Cattleya × Whitei 'Wigan's var.' (nat. hyb. Schilleriana × labiata) (votes, unanimous), from Sir Frederick Wigan, Bart. (gr. Mr. W. H. Young). Flowers larger than the original, rose colour, the blade of the lip and tips of the side lobes darker than the other parts.

To Lælio-Cattleya × 'Berthe Fournier' (L.-C. × elegans var.? × C. Dowiana aurea) (votes, 6 for, 5 against), from Mrs. Mason, the Firs, Warwick (gr. Mr. Lambert). Sepals and petals cream-white with a lilac tint; lip reddish-purple with some orange lines at the base. Parentage doubtful.

Cultural Commendation.

To Mr. Norman, gr. to the Marquis of Salisbury, Hatfield, for a grand plant of Aërides Sanderianum with thirty-five leaves and four flower spikes, each about 3 ft. in length.

To Mr. W. H. Young, gr. to Sir Frederick Wigan, Bart., for a fine plant of Cattleya × 'Atlanta' (Leopoldii × Warscewiczii).

Other Exhibits.

M. Jules Hye Leysen, Coupure, Ghent (gr. Mr. Coen), sent Cypripedium × Massaianum.

The Rev. F. Paynter, Stoke Hill, Guildford (gr. Mr. Cooke), sent Cattleya × (velutina × labiata Warnerii) and some cut spikes of Orchids.

Captain Thos. A. Julian, Plymouth, sent Cattleya Harrisoniana violacea and C. Warscewiczii.

W. Macdonald, Esq., Pitlochry, N.B., sent a hybrid Cypripedium.

C. E. Chrimes, Esq., Selwood, Rotherham (gr. Mr. Mark Watts), showed Cattleya × Hardyana 'Mrs. C. E. Chrimes.'

Mrs. Mason, The Firs, Warwick (gr. Mr. Lambert), showed cut spikes of Orchids.

De B. Crawshay, Esq., Sevenoaks (gr. Mr. S. Cooke), showed Odontoglossum Uroskinnerii and varieties of O. crispum.

ORCHID COMMITTEE, AUGUST 29, 1899.

HARRY J. VEITCH, Esq., in the Chair, and fourteen members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Jas. Veitch, Chelsea, for hybrid Lælio-Cattleyas.

Award of Merit.

To Cypripedium × 'Captain Holford' (hirsutissimum ♂ superbiens ♀), (votes, 6 for, 5 against), from Messrs. J. Veitch, Chelsea. A showy hybrid, equal in size to C. Curtisii, and with the markings of C. superbiens. Dorsal sepal greenish, with obscure chocolate markings; petals white, tinged with green on the lower half and rose on the outer part, the whole spotted with dark purple: lip dull rose.

Other Exhibits.

Sir F. Wigan, Bart. (gr. Mr. W. H. Young), showed Cattleya × Hardyana and other Orchids.

H. S. Leon, Esq., Bletchley Park (gr. Mr. Hislop), sent Lælio-Cattleya × Bletchleyensis (L. tenebrosa × C. Warscewiczii), bearing a general resemblance to L.-C. × Gottoiana.

Jeremiah Colman, Esq., Gatton Park (gr. Mr. King), showed Cattleya × Hardyana 'Mrs. J. Colman,' and Houlletia odoratissima.

H. S. Simonds, Esq., Woodthorpe, Beckenham (gr. Mr. G. E. Day), showed two forms of Cattleya × Hardyana.

Walter Cobb, Esq., Tunbridge Wells (gr. Mr. J. Howes), sent Zygopetalum Protheroeanum and Epidendrum prismatocarpum.

Mr. A. J. Keeling, Bingley, Yorks., sent Cypripedium × Bingleyense (Charlesworthii × Harrisianum).

Mrs. Mason, Warwick (gr. Mr. Lambert), showed Cattleya superba splendens and C. Harrisoniana.

Captain G. W. Law-Schofield (gr. Mr. Shill) sent Cypripedium × Juno 'Schofield's var.'; and C. × superbiens-Morganiæ.

Mr. Ed. Kromer, Bandon Hill, West Croydon, showed Miltonia Regnellii with six flower spikes.

Messrs. F. Sander showed Lælia × pulcherrima (Boothiana [lobata] × purpurata).

Messrs. Jas. Veitch showed for the first time Cypripedium × 'Janet' (glanduliferum × Spicerianum).

ORCHID COMMITTEE, SEPTEMBER 12, 1899.

HARRY J. VEITCH, Esq., in the Chair, and fourteen members present.

Awards Recommended :—

First-class Certificate.

To Cattleya labiata Luddemanniana alba (votes, unanimous) from W. Duckworth, Esq., Shawe Hall, Flixton (gr. Mr. H. H. Tindale). A fine albino. Flowers pure white, with a chrome-yellow disc to the lip. (Fig. 82.)

Award of Merit.

To Lælio-Cattleya × callistoglossa, 'Leon's variety' (L. purpurata Leoniæ × C. Warscewiczii) (votes, unanimous), from H. S. Leon, Esq. Bletchley Park (gr. Mr. Hislop). Flower richly coloured; labellum almost wholly claret-purple.

To Cattleya × Kienastiana 'Aurore' (Luddemanniana × Dowiana aurea) (votes, unanimous), from C. L. N. Ingram, Esq., Elstead House, Godalming (gr. Mr. T. W. Bond). Flower resembling a light-coloured

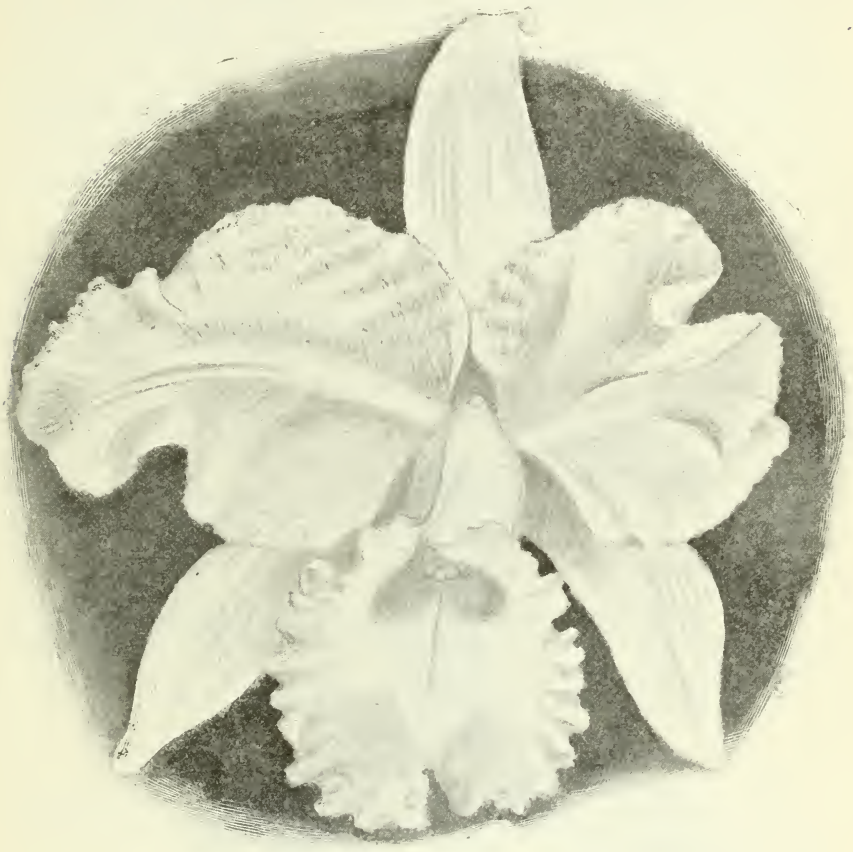


Fig. 82.—Cattleya labiata Luddemanniana alba. (*Journal of Horticulture.*

orm of C. × Hardyana; sepals and petals light rose colour; lip dark yellow, with purple veins and ruby-red blotch in front.

Botanical Certificate.

To Cryptophoranthus hypodiscus, from F. W. Moore, Esq., V.M.H., The Royal Botanic Gardens, Glasnevin. A very remarkable species introduced by Consul F. C. Lehmann. Flowers nearly as large as those of C. Dayanus; in form like a bird's head; the basal portion purple, middle cream-white, and the beak-like front-third brownish-purple.

Other Exhibits.

M. J. Zollinger-Jenny, Villa Gretin, Zurich, sent a fine inflorescence of Vanda Sanderiana, and a spike of Cattleya O'Brieniana.

Sir Trevor Lawrence, Bart., Burford, showed Cypripedium niveum maculatum, with pure white flowers evenly blotched with dark purple.

Fred Hardy, Esq., Tyntesfield, Ashton-on-Mersey (gr. Mr. T. Stafford), again showed Sophro-Cattleya × 'George Hardy' (S. grandiflora × C. Acklandiæ).

C. L. N. Ingram, Esq., Elstead House, Godalming (gr. Mr. T. W. Bond), sent a fine form of Lælio-Cattleya × callistoglossa.

Mrs. Temple, Leyswood, Groombridge (gr. Mr. E. Bristow), showed Cattleya Gaskilliana Templeæ.

Col. R. W. Shipway, Grove House, Chiswick (gr. Mr. W. Walters), sent a good form of Cattleya × Hardyana.

Messrs. F. Sander, St. Albans, showed a group of Dendrobium formosum set up with Acalypha hispida.

Orchid Committee, September 26, 1899.

Harry J. Veitch, Esq., in the Chair, and twelve members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Jas. Veitch Chelsea, for a group of Orchids.

Silver Banksian Medal.

To C. H. Feiling, Esq., Southgate (gr. Mr. Canham), for a well-arranged group of Orchids, in which were many varieties of Dendrobium Phalænopsis Schröderianum.

To Messrs. Hugh Low, Enfield, for a group of Orchids.

Award of Merit.

To Cattleya × Weedoniensis (Mendelii × granulosa Schofieldiana) (votes, unanimous), from T. W. Thornton, Esq., Brockhall, Weedon. A very remarkable hybrid, bearing the general characters of Cattleya granulosa, but with all the parts of the flower broader and handsomer than in that species. Sepals greenish-white tinged with lilac; petals cream-white with a green tinge along the midrib, and a close reticulation of rose colour; labellum with acute side lobes, as in C. granulosa, that portion being pale yellow, darker on the inside, the ample front lobe crimped and toothed at the margin, the blade bright purple, showing lighter between the veining. The inflorescence bore three large flowers.

To Odontoglossum crispum 'Basano' (votes, 6 for, 5 against), from Walter Cobb, Esq., Dulcote, Tunbridge Wells (gr. Mr. J. Howes). A fine white variety with yellowish cast over the sepals and petals, the lip bearing a conspicuous red-brown blotch.

Other Exhibits.

Major Joicey, Sunningdale Park (gr. Mr. F. J. Thorne), again showed the fine bronzy-yellow Dendrobium taurinum Amboinense.

T. B. Haywood, Esq., Reigate (gr. Mr. C. J. Salter), showed Cypripedium × Fowlerianum 'Haywood's variety' (Harrisianum superbum × bellatulum).

H. T. Pitt, Esq., Stamford Hill (gr. Mr. Thurgood), sent Cattleya × Hardyana 'Rosslyn variety,' very large and finely coloured.

Walter Cobb, Esq. (gr. Mr. J. Howes), also showed a distinct form of C. × Hardyana.

W. M. Appleton, Esq., Weston-super-Mare (gr. Mr. J. H. Brooks), sent Cypripedium × 'Julia' (Lawrenceana × exul).

The Rev. F. Paynter, Guildford (gr. Mr. Cook), sent a yellow form of Odontoglossum grande and a hybrid Lælio-Cattleya.

R. I. Measures, Esq., Camberwell (gr. Mr. H. J. Chapman), showed Cypripedium × 'Lachmee.'

Henry Little, Esq., Barons Halt, Twickenham (gr. Mr. Howard), showed Lælio-Cattleya × elegans Littleana. The same plant which was awarded a F.C.C. August 1885.

Messrs. Jas. Veitch showed Cattleya × 'Chloe' (bicolor ♂ Bowringiana ♀).

Fig. 83.—Odontoglossum Harryano-crispum. (*Journal of Horticulture.*)

NOTICES TO FELLOWS.

NOVEMBER 1, 1899.

GRAPES.

Fellows can obtain Black Hamburgh Grapes at 1*s.* 6*d.* and 1*s.* per lb.; Gros Colmar at 2*s.* 6*d.* per lb. Carriage will be charged extra as follows: 1 lb., 4*d.*; 2 lbs., 5*d.*; 3 lbs., 6*d.*; 4 lbs., 7*d.*; 5 lbs., 8*d.* Muscats are all sold.

ORDERS FOR FRUIT

should be addressed—*Superintendent, R. H. S. Gardens, Chiswick*—and must be accompanied by Cheque or Postal Order to secure attention.

LETTERS.

All letters on *all* subjects (save above) should be addressed—Secretary, R. H. S. Office, 117 Victoria Street, Westminster.

TELEGRAMS.

"**HORTENSIA, LONDON,**" has been registered for the convenience of Fellows sending telegrams.

TICKETS.

The 1899 tickets are available for the two meetings in January 1900. Tickets for 1900 will be sent out early in January to all Fellows who have then paid their subscriptions. The *Arrangements* for 1900 and the *Report of the Council* will also be sent in January.

PLANTS.

A List of Plants for Distribution will be sent to *every Fellow*, enclosed in the *Report of the Council*, on or about January 20, and will be the only one issued in 1900. The distribution begins on March 1, and ends on May 1. Fellows having neglected to fill up their Application Form before May 1 must be content to wait till the next year.

SUBSCRIPTIONS.

All Subscriptions fall due on January 1 of each year. To avoid the inconvenience of remembering this, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by application to the Society, obtain a form of instruction to their bankers to pay for them every January 1. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

HYBRID CONFERENCE.

The issue of the Report is unavoidably delayed till the new year.

EXAMINATION.

The Society's Annual Examination in the Principles and Practice of Horticulture will be held on Tuesday, April 17, 1900. Candidates should send in their names not later than March 1. A Scholarship of £25 a year is offered in connection with the Examination.

MEETINGS AND SHOWS.

1899, November 7, 21; December 5, 19; **1900**, January 9, 23; February 13, 27. The following are provisional only—March 13, 27; April 10, 24; May 8, 23, 24, 25 *Temple*; June 5, 19, 27 *at Richmond*; July 3, 17, 31; August 14, 28; September 11, 25; 27, 28, 29 *Crystal Palace*; October 9, 23; November 6, 20; December 4, 18; **1901**, January 15, 29; February 12.

NOTICE OF MEETINGS AND SHOWS.

A reminder will always be sent, in the week preceding, to any Fellow who will send to the Secretary 24 halfpenny post cards, *ready addressed* to himself.

LECTURES, &c.

Any Fellows willing to Lecture or to communicate Papers or Notes on interesting subjects are requested to communicate with the Secretary.

NEW FELLOWS.

The Secretary feels very grateful to all Fellows who endeavour to enlarge the scope of the Society by the introduction of New Fellows.

POPPY SEED.

The Secretary will be pleased to send a pinch of seed from his 1899 crop of Shirley Poppies to any Fellows who like to send to the Rev. W. Wilks, Shirley Vicarage, Croydon, a stamped envelope ready addressed to themselves. The seed should be sown as early as possible in March.

TRIALS AT CHISWICK, 1900.

The following subjects have been decided upon, and Fellows are invited to contribute :—

Tulips, for outdoor decoration. Twelve bulbs of each variety should be sent *at once* to Superintendent, R.H.S. Gardens, Chiswick, W. The colour should be stated, and whether early, mid-season, or late.

Phlox decussata. Two plants of each should be sent before March.

Cactus Dahlias. The 1899 trial will be continued. Of any new varieties two plants should be sent before May.

Potatos. Of new varieties, twenty tubers before February. A trial will also be made of all distinctly *early* Potatos, both old and new varieties.

Tomatos. Those only which are suited to outdoor growth. Seed before February.

Peas. New varieties. Half a pint before February.

Celeriac. Seed before February.

JOURNAL.

The Secretary of the Society would feel deeply indebted to anyone who could give (or sell) the following :—

Transactions of the Horticultural Society of London.
Vols. II. and III., 1835–48, 4to.

Journal of the Horticultural Society of London.
Vol. I., parts 1, 2, 3, 1845-6, 8vo.
Vol. III., part 2, 1847–8.
Vol. VI., parts 2 and 3, 1851.

Journal of the Royal Horticultural Society. New Series.
Vol. IV., part 14, 1873–4.
Vol. V., part 1, 1878.

Proceedings of the Society.
Any Numbers, Volumes, or Parts *previous* to 1866.

ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's publications the more likely others are to advertise also, and in this way they can indirectly benefit the Society.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

October 10, 1899.

Mr. R. McLachlan, F.R.S., in the Chair.

Fellows elected (11).—P. H. Arch, Alfred Cockett, Edward Fisher, M.A., Mrs. Fosbroke, Mrs. W. K. Foster, A. S. Leslie-Melville, C. W. Macbeth, Edw. Parsons, Frank L. Pearson, George Ricketts, Rev. W. P. Schuster.

Society affiliated (1).—The Broughton, North Newington, and Shutford Horticultural Society. A lecture, illustrated by limelight, on "Injurious Scale Insects of the British Isles," was given by Mr. Robert Newstead, F.E.S. (See page 219.)

GENERAL MEETING.

October 24, 1899.

Mr. George Bunyard, V.M.H., in the Chair.

Fellows elected (9).—Charles A. Body, Alex. Cowan, Mrs. John Cutler, Lieut.-Gen. H. M. Evans, C.B., T. Musgrave Francis, Geo. H. Hadfield, Robert Holmes, Thomas Needham, F. W. Tattersall.

A lecture on "Growth of the Fruit Trade" was given by Mr. Geo. Monro, V.M.H. (See page 263.)

GENERAL MEETING.

November 7, 1899.

Rev. W. Wilks, M.A., in the Chair.

Fellows elected (13).—Geo. Adamson (British Central Africa), Chas. T. Barnes, W. Carter, Rev. C. T. Digby, A. W. Edwards, Madame Escourt,

W. Finch, Miss A. H. Hurtley, Rev. H. Jephson, T. Phillips, Hon. Mrs. W. Rowley, Mrs. J. Scott Dick, Mrs. Veal.

A lecture on "Some of the Plants Exhibited" was given by the Rev. Prof. G. Henslow, M.A., V.M.H. (See page 269.)

GENERAL MEETING.

November 21, 1899.

Mr. A. H. Pearson in the Chair.

Fellows elected (17).—Chas. S. Bird, Mrs. W. Bridgman, Bertram A. Bristowe, Dr. Horace T. Brown, Lieut.-Col. R. A. Cartwright, Mrs. A. K. Connell, Thomas Coomber, J. D. Fletcher, A. W. H. Hay, W. H. Lees, Thomas Matthews, Miss L. J. Orrell, Harry L. Paine, W. Partridge, B. C. Wates, W. Whalley, A. Whitelaw.

Societies affiliated (2).—Queensland (Australia) Acclimatisation Society, Westgate-on-Sea Cottage Gardeners' Society.

A lecture on "Fruit in South Wales" was given by Mr. John Basham. (See p. 271.)

GENERAL MEETING.

December 5, 1899.

Mr. Chas. E. Shea in the Chair.

Fellows elected (8).—Henry Bromet, Mrs. P. Clementi-Smith, Edward Deacon, Mrs. C. Park-Yates, Dr. W. Paulson, Lady Beatrice Pretyman, Miss M. Tennant, W. H. Truscott.

A lecture on "Some of the Plants Exhibited" was given by the Rev. Prof. G. Henslow, M.A., V.M.H. (See page 281.)

GENERAL MEETING.

December 19, 1899.

Rev. W. Wilks, M.A., in the Chair.

Fellows elected (25).—Prof. H. E. Armstrong, Ph.D., LL.D., F.R.S., Lady Constance Barne, E. Clarke, Mrs. Dugald Clerk, Hugh Dickson, Miss Anne Dorrance (U.S.A.), Rev. T. J. Edwards, Mrs. T. J. Edwards, J. H. Gair, Walter Gibson, Miss M. A. Gwyer, H. Henkel (Darmstadt), Edward F. Hubbuck, James Jackson, Mrs. R. Jardine, Chas. Last, E. Phipps Lucas, Mrs. J. G. Pilcher, Mrs. Rowden, George Singer, Lady Mabel Kenyon Slaney, Robert V. Smith, Deane Willis, Miss Wood, Aubrey F. Wootten.

Associates (3).—A. Hislop, J. E. Sawyer, Sylvester Selby.

SCIENTIFIC COMMITTEE.

October 10.

Dr. Hugo Müller, F.R.S., in the Chair, and two members present.

Potatos with Scab.—A number of samples were received with the description of the different manures supplied. They were forwarded to Dr. Smith for examination and report.

Fungus on Chrysanthemum Leaves.—Some leaves badly spotted with a brown fungus were received and forwarded to Dr. M. C. Cooke for further examination, who reports as follows :—"The Chrysanthemum disease is the 'rust,' which I refer to *Uredo Hieracei*; but I cannot tell for certain until the Puccinia is found. I had it two or three years ago on leaves sent from Slough. It is capable of spreading, and I should destroy all the infected leaves by burning, if sprinkling with Condy's Fluid prove ineffective. It is better to sacrifice the entire plants than for it to establish itself as a permanent pest, like the Hollyhock disease (*P. Malvacearum*), to which it is allied. It is impossible to give the cause, but probably infection from other plants."

Five-merous Eucharis.—A blossom of this plant, with its whorls regularly arranged in series of fives—most unusual for a monocotyledon —was received from Mr. E. Escombe. An examination revealed the fact that it originated in the coherence of twin flowers. The stem, a short distance below the base of the inferior ovary, contained very numerous and scattered fibro-vascular cords. Nearer the flower they became thirty in number, and so entered the base of the twin ovaries. These were united by a common wall, in which two of the cords normal to the ovaries were suppressed. Hence the superficial cords were now reduced to ten only. This number, therefore, laid the foundation of the supply for the four whorls (perianth and stamens) of five parts each. Apart from the two united ovaries of three cells each, and six rows of ovules in each cell, no trace of the twin origin was visible.

Chrysanthemum arrested.—Mr. E. H. Jenkins, of Hampton Hill, sent branches of the variety Madame Desgranges, in which the majority of the flowers were very small, with yellow petals on short stiff branches. There had been great difficulty in expansion from the bud. This was considered to be due to the excessive drought. The later flowers were nearly normal on slender pedicels. It was remarked that various kinds of Chrysanthemums had behaved in the same manner elsewhere, as well as other Composites, such as Rudbeckias. The cultural care had been quite correct, but while one plant was a failure, another in the same pot was normal. Such cases are not uncommon, some individuals succumbing to a disease; while others, under the same conditions, may resist it. Mr. Jenkins asks if the form represents the original type. It does to some extent, being like the double form of the small *C. indicum* cultivated at the beginning of the century, and figured in the *Transactions of the Royal Horticultural Society*. It shows a tendency to arrest and reversion. The actual cause is obscure, but it would seem to be most probably climatal.

Scientific Committee, November 7.

Dr. M. T. Masters, F.R.S., in the Chair, and seven members present.

Effects of Fog.—Mr. Wright sent some Vine leaves from Chiswick to show the injurious effects of the recent fogs in the gardens of the Royal Horticultural Society. All Grapes of the Muscat class were by far the most severely injured, the foliage being scorched, and the fruit more or less covered with a deposit. It was observed that the fog occurred remarkably early in the season. Prof. Church noticed that it was peculiarly pungent, causing in one instance a hundred buds of a Camellia to fall in a single day. Injury was also done to Orchids at Chelsea and Gunnersbury. The real cause of the injuries is the presence of sulphurous acid and the mechanical accumulation of sooty matter.

Amaryllis Reversion.—Rev. W. Wilks brought an Amaryllis, the flowers of which apparently had more or less reverted to the primitive form of Hippeastrum, from which the modern types have descended through hybridisation.

Foxglove, Hybrid.—A flowering spike of a hybrid between a white-flowered Foxglove and Digitalis lutea was sent by Dr. Wilson, of St. Andrews University. It was remarkable in having much smaller flowers than those of the usual form of *D. purpurea* × *D. lutea*; and though possessing perfect pistils, there were no stamens. Moreover, the flowers were white, but slightly virescent. The white Foxglove was the pollen parent.

French Vineyards injured.—Dr. Masters observed that having lately seen the vineyards of the Champagne country, also those near Neuchâtel and the Lake of Geneva, he did not observe a single perfect bunch of Grapes. They appeared to have rotted through frosts prevailing at the time fertilisation was taking place.

Pinus aristata.—He also exhibited cones of this rare Californian Pine. They are remarkable for bearing a needle-like spine at the back of the thickened end of scales, the so-called apophysis. It was a question whether this be not a variety of *P. Balfouriana*, which grows in the same country and only differs in the smaller spines. It is a good maritime species, bearing dense foliage. They were received from Mr. Croucher, of Crief.

Pelorian Mentha.—Professor Henslow showed a drawing of a regular flower of *Mentha rotundifolia* found wild by the river Wye, near Ross.

Scientific Committee, November 21.

Mr. Michael in the Chair, and four members present.

Hippeastrum Species.—With regard to the specimen exhibited by Mr. Wilks at the last meeting, supposed to be a reversion from the florists' "Amaryllis," which was derived by hybridisations on species of Hippeastrum, it appears to be very close to *H. stylosum* (*Bot. Mag.*, 2278), introduced in 1822. It differs, however, in having white streaks instead of green on the perianth, and the stamens and style are shorter. The

leaves also are narrower Mr. Wilks observed that he has had it for eighteen years, and that it is remarkable for its very vigorous growth, being also very nearly hardy. Mr. Im Thurn remarked that it is very abundant in British Guiana, and is so close to *H. equestre* that it would seem to be a form of that species.

Lilium giganteum, Capsule.—Mr. Wilks brought a ripe capsule of this species, and alluded to the readiness with which it ripens abundance of seed in various localities in this country, and the ease with which it can be raised from seed, giving opportunities for producing varieties.

Canker on Apple Trees.—Dr. William G. Smith sent the following report on specimens received in October, and forwarded to him for examination :—

"A specimen of this canker was received recently with a request for some information on the cause of this common trouble. The case sent I consider a typical form of canker caused by the ascomycete fungus, *Nectria ditissima*. The action of this fungus in causing canker was first described by Robert Hartig (*Untersuchungen auf d. forst-botan. Institut.* (Munich) I. p. 209, 1880). Good descriptions are given in the English translations of Hartig's and Tubeuf's text-books, in G. Massee's recent text-book, in H. Marshall Ward's *Timber Diseases*, and by C. B. Plowright in the *Gardeners' Chronicle*, April 19, 1884. It is unnecessary to repeat here the details given in these works. The reasons for considering Nectria as the chief agent in the present case are :—(1) Near the centre of each of the three canker areas sent is the dead stump of a side twig, which, by being pruned or broken would afford an entrance to Nectria—a wound fungus. From this point the canker has spread, up, down, and round the still living main branch. (2) The presence of two forms of spores of Nectria. In one branch the external canker has passed over into a form of wood-rot, which is passing along the inside of the branch.

"This is one form of Apple-tree canker, but is not the only form. The condition which disposes a tree to canker is a wound deep enough to penetrate the softer tissues of the bark. This may be caused by the pruning of twigs, or by their being broken or gnawed; it might also be due to a deep crack in the bark, such as one sometimes sees on trees as the result of excessive growth or internal pressure ; or it might be a crack in the bark caused by sun or frost, or the killing-back of immature twigs in winter. (The latter case Hartig distinguishes as frost-canker, capable of extending each successive winter without the agency of fungi.) Given, then, an open wound, the soft tissues exposed offer a suitable substratum for the growth of fungi, bacteria, or animal organisms. The tissues of the Apple-tree seem well suited for the growth of Nectria ; and, when one considers the common occurrence of the fungus as a saprophyte, on dead wood, or as a parasite on many kinds of trees, it is not surprising that it is the fungus which generally establishes itself. Hartig and others have proved that, having obtained a footing on a wound, Nectria is able to attack the living tissues, and gradually to bring about a canker. In the same way any other organism with a partiality for the tissues of the Apple-tree may, individually or in company, be an agent in converting a wound into a canker ; for instance, at least three species of Polyporus

and a Hydnum amongst the Hymenomycete fungi, and probably some bacteria.

"Prevention.—No form of spray or wash is likely to give permanent results. Trees badly cankered should be removed and burnt as soon as possible. Where practicable, the canker may be cut out, care being taken to cut well into the healthy parts around; the wound thus produced should be carefully painted over with tar. This must be done in autumn or winter, otherwise the tar will not sink in. Wounds made in pruning, lopping, or otherwise should be tarred. If the orchard is liable to canker, it is safest to tar even small pruning cuts."

Apple Stocks with Caterpillars.—Mr. Ballard, of Colwall, sent some tops of a Lord Suffield stock perforated. They had been attacked by the caterpillar of the "wood-leopard" moth *Zeuzera Æsculi*, some being still within it. A woodpecker had subsequently further injured the shoots by trying to extract the grubs. The best remedy is to insert a stiff wire, and so extract, or kill them *in situ*.

Nests of the Rose-leaf-cutter Bee.—Mrs. Biggs, of Leyton, contributed a large section of a decayed Poplar, perforated by the borings of a caterpillar. These were now occupied by the nests of this species of bee, *Megachile centuncularis*.

Fog Deposit on Glass.—Mr. Hudson sent a sheet of glass from a conservatory to show the large amount of deposit upon it after the late destructive fog described at the last meeting.

Scientific Committee, December 5, 1899.

Dr. M. T. Masters, F.R.S., in the Chair, and four members present.

Chinese Cabbage.—Dr. Masters gave some account of this species, *Brassica chinensis*, which is cultivated in China and also in the tropics, where the Common Cabbage does not succeed. It has a taller stem, but does not appear to form so sound a "heart" as in our Cabbages. It is the custom to protect the heads in pits, frequently turning them over; they thus provide an excellent supply for winter use. The communication was received from Mr. Carles, Consul at Tientsin. [Seed of this Cabbage was sown in March, but it all ran up and blossomed before June.—Editor.]

Chermes Fagi.—This destructive but too common pest of Beech-trees was received, with inquiries as to the best means of destroying or preventing it. If the trees are but slightly attacked, spraying with petroleum and soapsuds in water should be persevered with, repeating the process from time to time. If, however, the trees are too badly attacked, nothing but cutting them down, and burning at least the bark, can prevent it spreading to other trees.

FRUIT AND VEGETABLE COMMITTEE.

October 10, 1899.

Philip Crowley, Esq., in the Chair, and twenty-three members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To R. Leigh, Esq., Barham Court, Maidstone (gr. Mr. G. Woodward), for Apples and Pears.

Silver-gilt Banksian Medal.

To Martin R. Smith, Esq., V.M.H., Warren House, Hayes, Kent (gr. Mr. C. Blick), for Pears.

Silver Knightian Medal.

To F. A. Bevan, Esq., Trent Park, New Barnet (gr. W. H. Lees), for Apples and Pears.

To Mr. R. W. Green, Wisbech, for Potatos.

Bronze Banksian Medal.

To J. Allen, Esq., Bitterne Park, Southampton, for Apples.

First-class Certificate.

To Apple 'Charles Ross' (votes, unanimous), from Capt. Carstairs, Welford Park, Newbury (gr. Mr. C. Ross). At the request of the exhibitor the above name was registered instead of 'Thomas Andrew Knight,' under which name it received an Award of Merit on Sept. 12. (Fig. 62.)

Award of Merit.

To Pear 'Marguerite Marrillat' (votes, unanimous), from R. Leigh, Esq. Fruit very large, of a beautiful golden yellow colour when ripe, flesh melting and of good flavour. Growth sturdy and upright, and a free bearer. (Fig. 88.)

Other Exhibits.

A. Sewell, Esq., Mapleshead, Buckhurst Hill, sent Apples and Pears.

Mr. W. Beswick, Mount Felix, Walton-on-Thames, sent Melon 'Salmon Queen.'

Mr. H. Glover, Orrel Lodge, Wigan, sent a seedling Apple.

Mr. J. Hussey, Hersham, Walton-on-Thames, sent a seedling Apple very similar to 'Early Julien.'

Her Majesty the Queen, Windsor (gr. Mr. O. Thomas), sent Tomato 'Epicure,' a small but pretty fruit, very smooth-skinned and of scarlet colour, freely produced in large clusters.

Mrs. Wingfield, Ampthill House, Ampthill (gr. Mr. W. J. Empson), sent Melon 'Beauty of Ampthill.' Fruit small, yellow, and well netted. It was requested that a fruit be sent next year.

Messrs. Spooner, Hounslow, sent Apple 'The Baron,' a seedling from 'Dumelow's Seedling,' closely resembling the parent in flavour and shape, but beautifully striped with crimson.

The Duke of Northumberland, Syon House (gr. Mr. G. Wythes, V.M.H.), sent Melons 'Syon Queen' and 'The Duchess,' the latter a very promising variety which the Committee wished to see again next year.

Messrs. Laing, Forest Hill, sent Apple 'Dykes' Seedling' and Pear 'Seneca,' the latter of inferior quality.

R. Leigh, Esq., sent Pears grown in the Rev. Darnley Smith's 'Fruit Protectors,' showing how suitable they were for the protection of specially fine fruits.

H. Balderson, Esq., Corner Hall, Hemel Hempstead, sent fine fruiting sprays of Raspberry 'Superlative,' a variety which often produces a crop of fruit in the autumn.

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 24, 1899.

PHILIP CROWLEY, Esq., in the Chair, and sixteen members present.

Awards Recommended:—

Gold Medal.

To Her Majesty the Queen, Windsor (gr. Mr. Owen Thomas), for a collection of Apples and Pears.

To Lord Llangattock, The Hendre, Monmouth (gr. Mr. T. Coomber), for a collection of Apples and Pears.

Silver-gilt Knightian Medal.

To the Duke of Northumberland, Syon House (gr. Mr. G. Wythes), for a collection of Apples and Pears.

To J. Warren, Esq., Handcross Park, Handcross (gr. Mr. A. Offer), for a collection of Apples and Pears.

To Lord Carnarvon, Highclere Castle, Newbury (gr. Mr. W. Pope), for a collection of Vegetables.

To Messrs. Cannell, Swanley, for a collection of Vegetables.

Silver Knightian Medal.

To the Hon. B. Fortescue, Dropmore, Maidenhead (gr. Mr. C. Herrin), for a collection of Apples.

To Messrs. Laing, Forest Hill, for a collection of hardy fruit.

Award of Merit.

To Grape 'Reine Olga' (votes, unanimous), from Mr. W. Taylor, Hampton. An out-door variety with long tapering bunches, having small shoulders, and round red berries, closely resembling 'Grizzly Frontignan' in appearance, but quite distinct in flavour, which is unusually good for a hardy Grape.

To Apple 'Paroquet' (votes, unanimous), from Mr. C. Ross, Welford Park Gardens, Newbury. Fruit of medium size, conical; eye closed in a shallow basin; stalk short and set in a shallow cavity; skin nearly covered with deep red; flesh white and of excellent flavour. (Fig. 141.)

Cultural Commendation.

To T. Barnett, Esq., Knighton Grange, Chichester, for 'Sweetwater' Grapes grown on an east wall, and 'Black Hambro' grown on a south wall: in both cases the fruit was large, well coloured, and of very good flavour.

Other Exhibits.

Mr. C. Webster, Gordon Castle Gardens, N.B., sent Plum 'Princess of Wales.'

Messrs. J. Veitch, Chelsea, sent fruiting plants of Strawberry 'St. Joseph' and Apple 'Royal Late Cooking.'

Mr. Geo. Monro, V.M.H., King Street, Covent Garden, sent a splendid

Fig. 141.—Apple 'Paroquet.' (*Journal of Horticulture.*)

collection of market produce, to illustrate his lecture on "Growth of the Fruit Trade."

Mr. W. J. Godfrey, Exmouth, sent Apple 'Red Cluster.'

Mr. E. Bloxham, Brickhill Manor, Bletchley, sent several dishes of Apple 'Bess Pool.'

Messrs. G. Bunyard, Maidstone, sent Apple 'Mrs. Phillimore' (Cox's Pomona × Mother). The fruit closely resembled 'Cox's Pomona' in form and appearance, but was distinct and superior in flavour.

C. Roberts, Esq., Ipswich, sent Apple 'Ruby.'

Mr. C. Ross, Welford Park Gardens, sent Apples 'Rival' and 'Opal.'

S. T. Halliday, Esq., Mayor of Stamford, sent Currant 'Red Grape.'

Messrs. Brown, Stamford, sent a seedling Apple.

Mr. G. Wythes, V.M.H., Syon House Gardens, sent Melon 'Duchess.'

The following letter received from Messrs. Buchanan, Forth Vineyards, Kippen, was read, together with the Secretary's reply. The Committee requested that both should be entered upon the Minutes.

Dear Sir,—In connection with the samples of our new Grape 'Diamond Jubilee' which we laid before your Fruit Committee on 26th of last month, and the remarks on the post card we had from you afterwards, said remarks being, "Very similar to Black Morocco Grape," we would be obliged to know if it is customary for this Committee not to grant awards to new Grapes when such bear a resemblance to existing varieties; and as the remarks imply a doubt as to this being a new variety at all, is it within the province of the Royal Horticultural Society to make further inquiries on this head, either from the raisers or from independent sources?

For a good many years now we have made a speciality of not only Grape-growing, but the raising of new varieties. At present we have other six new Grapes besides 'Diamond Jubilee,' but before going to any further trouble and expense in placing any of them again before the Fruit Committee we should like to have some guidance as to the qualities essential to procure a First-class Certificate, or if the procedure is different now to what it has been in the past, when First-class Certificates were granted to new varieties of Grapes. We shall feel obliged if you can send us any information on this matter.

Yours faithfully,

D. & W. BUCHANAN.

Dear Sir,—The object of our Committees' recommending, and of our Council making awards, is to encourage the production of, and to mark, *improved* varieties.

If, therefore, a new Flower or Fruit is brought before the Committee which very closely resembles an existing one, and in which the Committee fail to discover any *improvement*, it is obvious they cannot make any award.

The Committee's remark that your Grape is "very similar to Black Morocco" does not imply any doubt, or express any opinion one way or the other, as to its being a new seedling, but simply gives the opinion of the Committee that it is too like "Black Morocco" to deserve any award.

The qualities essential for any fruit to obtain an award are that it should be thoroughly good of its class and distinct, as well as being an improvement in some respect on whatever it most nearly resembles.

The procedure of the Committees is the same as it always has been.

Faithfully yours,

W. WILKS,

Secretary.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 7, 1899.

PHILIP CROWLEY, Esq., in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Mr. A. J. Thomas, Sittingbourne, for Apples and Pears.

To the Duke of Rutland, Belvoir Castle (gr. Mr. W. H. Divers), for Apples and Pears.

First-class Certificate.

To Pear 'Emile d'Heyst' (votes, unanimous), from Mr. G. Woodward, Barham Court Gardens, Maidstone. A Pear of first-class quality, ripe at the end of October and early in November, and now fairly well known in this country. It is a good and constant bearer.

Award of Merit.

To Apple 'Mrs. Phillimore' (votes 11 for, 3 against), from Messrs. G. Bunyard, Maidstone. This is stated to be from 'Cox's Pomona' × 'Mother.' The fruit somewhat resembles a small 'Cox's Pomona' in form and general appearance, with the sweet and peculiarly distinct flavour of 'Mother.' The tree is a sturdy grower and good bearer.

To Cabbage 'St. Martins' (votes, unanimous), from seeds sent to the Society's Gardens by Mr. G. Wythes, V.M.H., Syon House. Plants about 15 inches high, compact, with very firm, medium-sized, and roundish heads. The variety is a cross between Colwort and Christmas Drumhead.

Cultural Commendation.

To Mr. W. Allan (gr. to Lord Suffield), Gunton Park, Norwich, for magnificent fruits of Pear 'General Todleben.'

To Mr. R. Handley (gr. to Miss Breton, Forest End, Sandhurst), for magnificently grown Cardoons.

Other Exhibits.

Mr. E. J. Vokes, Kingsworthy, Winchester, sent a seedling Apple and also a seedling Cob Nut.

From the Society's Gardens were sent the following varieties of Cabbage, viz., 'Early October,' 'Early Eclipse,' 'Perfection,' and 'Jubilant,' all grown from seeds sent for trial.

Mr. R. Morrow, nurseryman, Leominster, sent Apple 'Robert Morrow,' a very handsome fruit but lacking in flavour.

Mr. T. Edington, Tortworth Park Gardens, Glos., sent a seedling Apple exactly resembling 'Peasgood Nonsuch.'

Captain Carstairs, Welford Park, Newbury (gr. Mr. C. Ross), sent Apple 'Tyro' and Pear 'McKinley.'

Mr. E. Knowles, Oaklands Hall Gardens, Huddersfield, sent Tomato 'Oaklands.'

Messrs. J. Veitch, Chelsea, sent Apple 'Leopold de Rothschild,' raised from 'John Downie' Crab ♀ and 'Cox's Orange Pippin' ♂, the quality of the fruit following the former more than the latter.

Mr. Woodward sent two very fine dishes of 'Cox's Orange Pippin,' one dish decidedly smaller than the other, to show that the smaller fruits were quite equal in flavour to the larger ones, and of a far more useful size for dessert purposes.

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 21, 1899.

PHILIP CROWLEY, Esq., in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Mr. J. Basham, Bassaleg, Newport, Mon., for Apples.

FIG. 142.—APPLE 'BASSALEG PIPPIN.' (*Journal of Horticulture.*)

Silver Knightian Medal.

To Messrs. Laing, Forest Hill, for Apples.

Silver Banksian Medal.

To Messrs. Harrison, Leicester, for Vegetables.

Award of Merit.

To Apple 'Bassaleg Pippin' (votes 8 for, 4 against), from Mr. J. Basham. Fruit of medium size, deep round; skin yellow and heavily striped with bright red on the exposed side; eye closed and set in a shallow basin; stalk short, thick, and set in a deep cavity; flesh white, crisp, and juicy. (Fig. 142.)

To Pear 'Double de Guerre' (votes, unanimous), from Frank Lloyd

Esq., Coombe House, Croydon (gr. Mr. M. Mills). Fruit rather large, pyriform, of beautiful form; skin greenish-yellow on the shaded side and mottled with russet, deeply flushed with red on the exposed side; eye open with erect segments and set in a very shallow basin; stalk set in small cavity obliquely at the point. A stewing variety that is stated to keep well until March. (Figs. 143, 144.)

Other Exhibits.

Mr. J. Basham exhibited 100 dishes of Apples collected in South

Fig. 143.—'Double de Guerre.'

Wales to illustrate his lecture on "Fruit-growing" in that district. Also Apple 'Cissy,' a handsome variety, but a little wanting in flavour. (Fig. 116.)

H. C. Moffat, Esq., Goodrich Court, Ross (gr. Mr. T. Spencer), sent a large seedling Apple of fine colour.

From E. J. Vokes, Esq., Kingsworthy, Winchester, came a seedling Cob Nut, which was considered to be identical with the Cosford Cob.

W. H. Evans, Esq., Ford Abbey, Chard (gr. Mr. J. Crook), sent a seedling Apple and also very fine specimens of 'Winter Nelis' Pear.

Mr. R. C. Notcutt, Woodbridge, sent Stewing Pear 'Winter Orange.'

Messrs. Wallace, Colchester, sent very large specimens of Apple 'Allington Pippin.'

Lord Ducie, Tortworth Court, Falfield, Glos. (gr. Mr. T. Edington),

Fig. 144.—'Double de Guerre.'

sent fine fruits of Diospyros Kaki from a tree growing on a south wall at Tortworth Court.

Mr. D. Wilton, Maidenhead, sent Cucumber 'Wilton Prolific,' which the Committee considered to be identical with 'Rochford's Market.'

Mr. G. Wythes, V.M.H., Syon House, sent Beet 'Barkham's Dwarf,' which proved very similar in all respects to Dewar's Northumberland Short-top. (See vol. xxi. page 282.)

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 5, 1899.

PHILIP CROWLEY, Esq., in the Chair, and sixteen members present.

Awards Recommended:—

Silver Banksian Medal.

To the Countess of Limerick, Hawkswick, St. Albans (gr. Mr. J. Ryder), for a collection of Grapes.

Other Exhibits.

Mr. F. R. Bradley, Church Street, Peterborough, sent Apple 'King of the Hollow,' a pretty fruit with a distinct Blenheim Orange flavour.

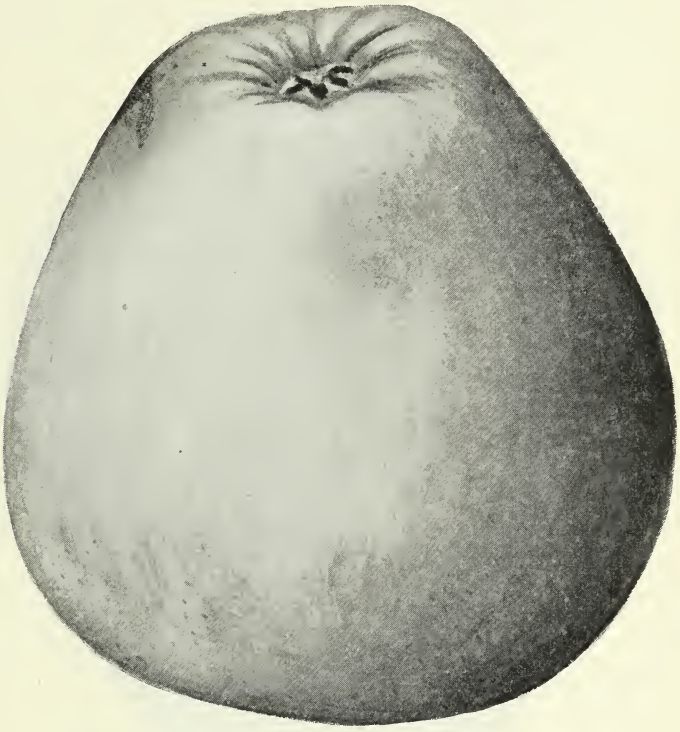


FIG. 145.—'STAINWAY SEEDLING.'

From the R.H.S. Gardens came Salsafy 'The Mammoth,' and the ordinary form, both grown from seed sent by Messrs. Watkins and Simpson. The Committee considered them to be identical.

Messrs. Sutton, Reading, sent a fruiting plant and three trays of fruit of Tomato 'Winter Beauty.' The Committee requested that it might be exhibited again at the end of January 1900 in order to test its winter cropping.

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 19, 1899.

J. CHEAL, Esq., in the Chair, and thirteen members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To C. Bayer, Esq., Tewkesbury Lodge, Forest Hill (gr. Mr. W. Taylor), for a collection of Grapes.

Silver-gilt Banksian Medal.

To Messrs. Cheal, Crawley, for 80 dishes of Apples.

Silver Banksian Medal.

To the Earl of Ancaster, Normanton, Stamford (gr. Mr. J. Butler), for Apples and Potatos.

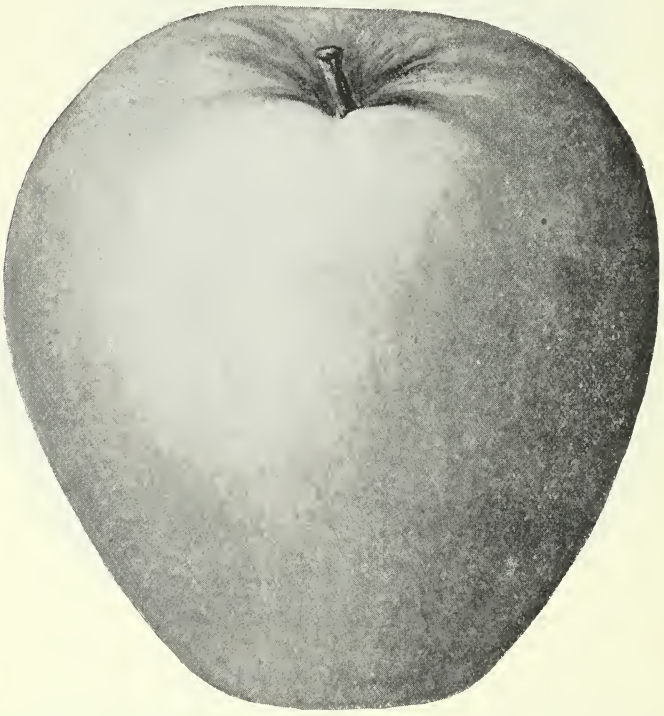


FIG. 146.—'STAINWAY SEEDLING.'

Award of Merit.

To Apple 'Stainway Seedling' (votes 6 for, 2 against); from Mr. T. H. Kettle, King's Ford, Colchester. Fruit large, conical; eye closed and puckered in a very shallow basin; stalk thin, half-inch long, and not very deeply inserted; skin a bright pale yellow; flesh rather soft and somewhat acid in flavour. The tree is described as a good bearer, and the fruit valuable for cooking. (Figs. 145, 146.)

Cultural Commendation.

To Mr. T. Edington, gardener to Lord Ducie, Tortworth Court, Fal-

field, Glos., for very fine fruit of 'Diospyros Kaki,' which were grown on the south wall of Tortworth Court.

Other Exhibits.

Mr. W. F. Parsons, Rusham, Egham, sent Apple 'Brotherii,' a distinct conical yellow fruit, covered with minute brown spots.

Capt. Carstairs, Welford Park, Newbery (gr. Mr. C. Ross), sent very large and highly coloured fruits of Apple 'Old Northern Greening,' also seedling Apples named 'Annie,' 'Elsie,' and 'Berks Russet.' The latter variety the Committee desired to see again next year.

FLORAL COMMITTEE.

October 10, 1899.

C. E. Shea, Esq., in the Chair, and thirteen members present.

Awards Recommended:—

Silver-gilt Fora Medal.

To F. A. Bevan, Esq., Trent Park, New Barnet (gr. Mr. W. H. Lees), for a glorious display of Asters (Michaelmas Daisies).

Silver-gilt Banksian Medal.

To Messrs. Wells, Earlswood, Redhill, for Chrysanthemums.

Silver Flora Medal.

To Messrs. J. Veitch, Chelsea, for Chrysanthemums and sprays of autumn-tinted trees and shrubs.

To Messrs. Paul & Son, Cheshunt, for Roses.

Silver Banksian Medal.

To Messrs. Peed, West Norwood, for hardy shrubs.

To Mr. May, Edmonton, for Salvias.

To Messrs. Cutbush, Highgate, for flowering and foliage plants.

Award of Merit.

To Aster Amellus 'Distinction' (votes, unanimous), from F. A. Bevan, Esq., Trent Park, New Barnet (gr. Mr. W. H. Lees). An early flowering Michaelmas Daisy of compact growth and very free in blossom. The flowers are large and of a violet purple shade.

To Aster N. B. 'Robert Parker' nanus (votes 10 for), from F. A. Bevan, Esq. (gr. Mr. W. H. Lees). This variety differs from the type only in its height, rarely exceeding 2 feet.

Other Exhibits.

Miss E. Armitage, Dadnor, Ross, sent a seedling Gypsophila (*G. paniculata* × *G. elegans*) and Asters. The Committee expressed a wish to see the Gypsophila again, and referred the Asters to Chiswick for identification.

Mrs. Wingfield, Ampthill House, Ampthill (gr. Mr. W. J. Empson), sent a new dwarf-habited Chrysanthemum named 'Mrs. W. Empson.'

Mrs. Wells, Wingfield, Berks, sent two Acalyphas.

Messrs. Sander, St. Albans, sent plants of Dracæna Sanderiana viride.

Messrs. Barr, Covent Garden, sent hardy flowers.

Floral Committee, October 24, 1899.

W. Marshall, Esq., in the Chair, and twenty-three members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Mr. N. Davis, Framfield, Sussex, for a magnificent display of Chrysanthemums.

Silver-gilt Banksian Medal.

To Mr. Jones, Lewisham, for a decorative group of Chrysanthemums, Crotons, and Dracænas.

Silver Flora Medal.

To Mr. Godfrey, Exmouth, for Chrysanthemums.

Silver Banksian Medal.

To Messrs. Ware, Tottenham, for Chrysanthemums.

To Messrs. Cutbush, Highgate, for berry-bearing plants.

To Messrs. Cuthbert, Southgate, for Chrysanthemum 'Mrs. Wingfield.'

To Messrs. Wells, Redhill, for Chrysanthemums.

To Mr. May, Edmonton, for Begonia 'Gloire de Lorraine.'

Award of Merit.

To Japanese Chrysanthemum 'Florence Molyneux' (votes, unanimous), from J. C. Garnier, Esq., Rookesbury Park, Fareham (gr. Mr. N. Molyneux). Flowers very large, globular, of great depth and substance, with broad pure white florets.

To Japanese Chrysanthemum 'Miss Edith Pilkington' (votes 13 for, 6 against), from J. C. Garnier, Esq. (gr. Mr. N. Molyneux). A distinct variety with long drooping canary-yellow florets.

To Japanese Chrysanthemum 'Miss Alice Byron' (votes, unanimous), from Lord Byron, Thrumpton Hall, Derby (gr. Mr. A. Weeks). Large well-formed pure white flowers.

To Adiantum Burnii (votes, unanimous), from Mr. Burn, Cromer. A charming Fern of the *A. amabile* type, with long elegant pale green fronds. It should make a splendid basket plant.

To Japanese Chrysanthemum 'R. Hooper Pearson' (votes 19 for), from Messrs. Wells, Earlswood, Redhill. A magnificent variety with rich yellow flowers.

To Japanese Chrysanthemum 'Le Grand Dragon' (votes 13 for, 3 against), from Mr. Godfrey, Exmouth. Flowers of medium size, deep yellow with drooping guard florets.

Other Exhibits.

F. W. Moore Esq., V.M.H Glasnevin, Dublin, sent flowers of two Nerines.

From J. Warren Esq., Handcross Park, Sussex, came two new seedling Dracænas.

N. R. Hoffmann, Esq., Thurlow Lodge, Thurlow Park Road, West Dulwich (gr. Mr. T. Tomlinson), sent a very interesting collection of seedling Caladiums.

Messrs. Laing, Forest-hill, sent a group of plants.

Messrs. W. Paul, Waltham Cross, sent Roses,

Mr. Forbes, Hawick, N.B., sent Begonia 'Caledonia,' a pure white sport, from B. 'Gloire de Lorraine.' The Committee asked to see this again in better condition.

Messrs. Peed, West Norwood, sent a group of foliage plants.

Messrs. Cheal, Crawley, sent sprays of autumn-tinted trees and shrubs.

Chrysanthemums were exhibited by—

(1) Mrs. Evans, Whitbourne Hall, Worcester (gr. Mr. J. Williams).

(2) Mr. W. Seward, Hanwell.

(3) Messrs. R. Veitch, Exeter.

(4) Messrs. Cannell, Swanley.

FLORAL COMMITTEE NOVEMBER 7, 1899.

W. MARSHALL, Esq., in the Chair and fifteen members present.

Awards Recommended.

Silver-gilt Flora Medal.

To Leopold de Rothschild, Esq., Gunnersbury House, Acton (gr. Mr. J. Hudson, V.M.H.), for a magnificent group of Begonia 'Gloire de Lorraine' and B. 'Mrs. Leopold de Rothschild.'

Silver Flora Medal.

To C. E. Shea, Esq., The Elms, Foots Cray, Kent (gr. Mr. Millen), for 48 very fine Chrysanthemum blooms.

To Messrs. Waterer, Bagshot, for Conifers.

Silver Banksian Medal.

To H. J. Elwes, Esq., F.R.S., Colesborne Park, Andoversford, Gloucestershire (gr. Mr. J. H. Lane), for Nerines.

Bronze Banksian Medal.

To Lord Rendlesham, Rendlesham Hall, Woodbridge (gr. Mr. H. Rogers), for Violets.

Award of Merit.

To Antholyza æthiopica vittigera (votes, unanimous), from J. T. Bennett-Poë, Esq., Homewood, Cheshunt (gr. Mr. J. Downes). A rare

and very beautiful South African plant bearing some resemblance to a Montbretia. Its orange-scarlet tubular flowers are borne on slender erect spikes 2 feet long.

To Violet 'Mrs. T. J. Astor' (votes, unanimous), from Sir Trevor Lawrence, Bart., Burford, Dorking (gr. Mr. W. Bain). A variety with large double mauve-coloured fragrant flowers.

To Nerine 'Miss Willmott' (votes, unanimous), from H. J. Elwes, Esq., F.R.S., Andoversford (gr. Mr. J. H. Lane). A superb variety with large orange-scarlet flowers borne in large trusses.

To Nerine 'Mrs. Godman' (votes, unanimous), from H. J. Elwes, Esq., F.R.S. (gr. Mr. J. H. Lane). Flowers large, with undulated petals, bright rose suffused with magenta.

To Nerine 'Mrs. Berkeley' (votes, unanimous), from H. J. Elwes, Esq., F.R.S. (gr. Mr. J. H. Lane). A distinct variety with pale orange-salmon coloured flowers.

To Begonia 'Caledonia' (votes, 10 for), from Mr. Forbes, Hawick. A pure white sport from the well-known decorative Begonia 'Gloire de Lorraine.'

Other Exhibits.

Lord Hillingdon, Hillingdon Court, Uxbridge (gr. Mr. A. Allan), sent Violets.

Major Joicey, Sunningdale Park, Berks (gr. Mr. Thorne), sent a large, well-flowered plant of Begonia 'Gloire de Lorraine.'

From the Duke of Marlborough, Blenheim Palace, Woodstock (gr. Mr. Whillans), came specimens of a winter flowering carnation named 'Oxford Yeoman.'

Miss Edmonds, Wiscombe Park, Colyton, sent specimens of a green-flowered Anemone.

Messrs. Low, Enfield, sent Aralia Lowæ.

Mr. Treseder, Cardiff, sent a seedling Cactus Dahlia.

Messrs. Cannell sent specimens of Violet 'La France.' The Committee asked to see this again.

Chrysanthemums were exhibited by—

(1) The Hon. W. F. D. Smith, Greenlands, Henley-on-Thames (gr. Mr. H. Perkins).

(2) W. Seward, Esq., The Firs, Hanwell.

(3) Mr. J. Corbett, Mulgrave Castle Gardens, Whitby.

(4) Mr. A. G. Davey, Oakhurst, Burgess Hill.

(5) Messrs. Wells, Earlswood, Redhill.

Floral Committee at Chiswick, November 17, 1899.

W. Marshall, Esq., in the Chair, and five members present.

Awards Recommended :—

Highly Commended (× × ×).

To Chrysanthemums.

1. Adelaide Russell
2. Black Douglas
3. Blanche Chapman
4. Curiosity
5. Emily Rowbottom
6. Emily Wells
7. Frieda
8. Golden Madlle. Martha
9. Irene
10. Made. C. Kratz
11. Made. de Seven
12. Mary Anderson
13. Miss Sarah
14. Mons. Backman
15. Perle Dauphinois
16. Perle des Beautés
17. President Hyde
18. Sidonie

For Report on Chrysanthemums see p. 313.

Floral Committee, November 21, 1899.

W. Marshall, Esq., in the Chair, and nineteen members present.

Awards Recommended :—

Gold Medal.

To F. A. Bevan, Esq., Trent Park, New Barnet (gr. Mr. W. H. Lees), for a very extensive and unusually artistic arrangement of Chrysanthemums.

To Messrs. J. Veitch, Chelsea, for a superb group of winter flowering Begonias.

Silver-gilt Floral Medal.

To Captain Holford, C.I.E., Weston Birt, Tetbury, Gloucestershire (gr. Mr. A. Chapman), for Zonal Pelargoniums.

Silver-gilt Banksian Medal.

To F. W. Flight, Esq., Cornstiles, Twyford, Winchester, for Chrysanthemums.

Silver Flora Medal.

To Lord Aldenham, Aldenham House, Elstree, Herts (gr. Mr. E. Beckett), for Chrysanthemums.

To Messrs. Hill, Lower Edmonton, for Ferns.

To Messrs. Cripps, Tunbridge Wells, for Euphorbia (Poinsettia) pulcherrima.

Silver Banksian Medal.

To Messrs. Peed, West Norwood, for Chrysanthemums.

To Messrs. Low, Enfield, for Cyclamen.

To Mr. Godfrey, Exmouth, for Chrysanthemums.

Award of Merit.

To Japanese Chrysanthemum 'Mrs. Alfred Tate' (a sport from 'Etoile de Lyon') (votes, unanimous), from F. A. Bevan, Esq., New Barnet (gr. Mr. W. H. Lees). Large orange-red flowers touched with old gold on the reverse side of the petals.

To Zonal Pelargonium 'Lilian' (votes 6 for, 2 against), from Capt. Holford, C.I.E., Tetbury (gr. Mr. A. Chapman). Plant of vigorous habit; very free flowering; flowers single, clear pink, large and handsome, borne on stout stalks well above the foliage.

To Dracæna 'The Queen' (votes, unanimous), from Messrs. J. Veitch, Chelsea. A very elegant variety with long narrow arching bronze-green leaves, irregularly bordered with creamy-yellow and rose pink.

To Begonia 'Sylvia' (*B. Socotrana* × Tuberous var.) (votes, unanimous), from Messrs. J. Veitch. An exceptionally free flowering variety with semi-double rose-pink flowers borne on stout stems well above the foliage.

Cultural Commendation.

To Mr. Downes, gardener to J. T. Bennett-Poë, Esq., Homewood, Cheshunt, for Pinguicula caudata.

Other Exhibits.

W. H. Evans, Esq., Forde Abbey, Chard (gr. Mr. J. Crook), sent Violets.

R. G. Hargreaves, Esq., Cuffnells Park, Lyndhurst (gr. Mr. H. Buckland), also sent Violets.

Messrs. G. Bunyard, Maidstone, sent specimens of Gynerium argenteum 'Louis Carrière.'

From the Society's Gardens, Chiswick, came a large flowering specimen of Fatsia Japonica alba variegata which had been grown in an unheated glass-house.

Chrysanthemums were exhibited by—

(1) Lady Byron, Thrumpton Hall, Derby (gr. Mr. H. Weeks).

(2) Sir Henry Tate, Bart., Park Hill, Streatham Common (gr. Mr. W. Howe).

(3) Mr. Witty, Nunhead Cemetery, S.E.

(4) Mr. A. J. Willmott, Exmouth.

(5) H. Staples, Spondon Old Hall, Derby.

Floral Committee, December 5, 1899.

W. Marshall, Esq., in the Chair, and sixteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Mr. Russell, Richmond, for Conifers and Yuccas.

Silver Flora Medal.

To Messrs. Low, Enfield, for Cyclamen.

Silver Banksian Medal.

To Messrs. Clibran, Altrincham, for Chrysanthemums.
To Messrs. Wells, Redhill, for Chrysanthemums.

Bronze Banksian Medal.

To Messrs. Cripps, Tunbridge Wells, for Bouvardias.

Award of Merit.

To Japanese Chrysanthemum 'Madame R. Cadbury' (votes, unanimous), from Lady Byron, Thrumpton Hall, Derby (gr. Mr. H. Weeks). A very fine variety with broad drooping white florets touched with pale sulphur yellow in the centre.

To Single Chrysanthemum 'Oscar' (votes 12 for, 3 against), from Messrs. Clibran, Altrincham. Medium-sized flowers with rather stiff orange red florets the basal portions being stained with yellow.

Cultural Commendation.

To Mr. D. Allan, gardener to Lady Ashburton, the Grange, Alresford, Hants, for Violets 'Marie Louise.'

Other Exhibits.

E. J. Johnstone, Esq., Rougham Hall, Bury St. Edmund's (gr. Mr. J. Riddell), sent Chrysanthemums.

Messrs. Peed, West Norwood, sent a group of Begonia 'Gloire de Lorraine.'

Messrs. Williams, Upper Holloway, also sent a group of Begonia 'Gloire de Lorraine.'

Messrs. Robin, Guernsey, sent flowers of Chrysanthemum 'General Sir William P. Symons,' a promising sport from 'Western King.' The Committee asked to see this again.

FLORAL COMMITTEE, DECEMBER 19, 1899.

GEORGE GORDON, Esq., V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Wells, Redhill, for a group of Chrysanthemum 'Letrier.'

Other Exhibits.

F. W. Campion, Esq., Coley Manor, Reigate (gr. Mr. Fitt), sent Bouvardias.

Messrs. Clibran, Altrincham, sent Chrysanthemum.

ORCHID COMMITTEE.

ORCHID COMMITTEE, OCTOBER 10.

J. GURNEY FOWLER, Esq., in the Chair, and eleven members present.

Awards Recommended :—

Silver Banksian Medal.

To J. Bradshaw, Esq., The Grange, Southgate (gr. Mr. Whiffen), for a group of Orchids.

Award of Merit.

To Cattleya Dowiana aurea 'Little's var.' (votes 5 for, 3 against), from H. Little, Esq., Baronshalt, Twickenham (gr. Mr. Howard). A very

FIG. 147.—ODONTOGLOSSUM CRISPUM 'DAPHNE.' (*Gardeners' Chronicle.*)

richly coloured form in which the labellum more nearly resembles the typical Costa Rica form than the Colombian. Flower large: sepals and petals bright yellow, lip very broad, deep claret-purple with gold veining almost to the margin.

To Odontoglossum crispum 'Daphne' (votes, unanimous), from W. Thompson, Esq., Walton Grange, Stone, Staffordshire (gr. Mr. W. Stevens).

A remarkable form in which the greater part of the surface of the sepals is light purple, their margins and tips white; petals white with a few purple spots; lip with one large brown blotch. (Fig. 147.)

To Odontoglossum grande 'Pitt's variety' (votes 7 for, 2 against), from H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood). Flowers of two shades of yellow, the usual brown colour of the species being replaced by the darker yellow; lip white with a few yellow markings.

Botanical Certificate.

To Spathoglottis Fortunei from the Royal Botanic Gardens, Glasnevin, Dublin. A well-known elegant yellow species.

Other Exhibits.

Messrs. J. Veitch, Chelsea, showed Cattleya × 'Minerva' (Bowringiana ♀ Loddigesii ♂).

Henry Little, Esq. (gr. Mr. Howard), sent Cattleya × Mantinii nobilior and C. granulosa Schofieldiana.

W. Thompson, Esq. (gr. Mr. W. Stevens), sent two fine forms of Odontoglossum crispum.

De B. Crawshay, Esq., Sevenoaks (gr. Mr. S. Cooke), showed Cattleya × Hardyana 'Crawshay's var.' in which the sepals and petals were white freckled with pale lilac; also a very large form of Lælia pumila.

H. T. Pitt, Esq. (gr. Mr. Thurgood), showed Saccolabium calceolare and Bulbophyllum grandiflorum.

Messrs. Hugh Low, of Enfield, staged a good selection of Orchids.

Messrs Sander, St. Albans, showed several plants of Stenoglottis longifolia, and Bulbophyllum grandiflorum.

Fred Hardy, Esq., Tyntesfield, Ashton-on-Mersey (gr. Mr. T. Stafford), showed a pan with three plants of the pretty reddish-scarlet Sophro-Cattleya × 'George Hardy' (S. grandiflora × C. Aclandiæ), and a fine form of Lælia × 'Euterpe.'

ORCHID COMMITTEE, OCTOBER 24, 1899.

HARRY J. VEITCH, Esq., in the Chair, and eleven members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for a group of hybrid Orchids, Cattleyas, &c.

To J. Bradshaw, Esq., The Grange, Southgate (gr. Mr. Whiffen), for a group of varieties of Cattleya labiata and other species.

Silver Banksian Medal.

To F. Knight, Esq., Thundersley, Essex (gr. Mr. E. Marston), for a group of Orchids.

To Mr. Ed. Kromer, Roraima, Beddington, for a group of forms of Cattleya labiata.

Award of Merit.

To Lælia × 'Mrs. M. Gratrix' (cinnabarina ♀ Digbyana ♂) (votes, unanimous), from Messrs. J. Veitch. Flowers 5 inches across. Sepals and petals yellow with a slight rose tint; lip distinctly three-lobed, all the divisions being irregularly fringed; yellow, with a rose-coloured tinge on the front portion. (Fig. 148.)

To Cattleya × 'Princess' (Trianæi ♂ Luddemanniana ♀) (votes, unanimous), from Messrs. Jas. Veitch. Flower large, of the typical C. labiata

Fig. 148.—Lælia 'Mrs. M. Gratrix.' (*Journal of Horticulture.*)

form; sepals and petals pale rose colour; lip reddish-purple, with diverging orange-coloured lines from the base.

To Lælio-Cattleya × Bryan var. 'Duchess of York' (Lælia crispa ♀ Cattleya Gaskelliana ♂) (votes, unanimous), from Messrs. Jas. Veitch. A near approach to L.-C. × Exoniensis. Sepals and petals blush-white; lip white at the base, changing to lemon-yellow in the centre; front lobe ruby-purple.

Other Exhibits.

Sir Frederick Wigan, Bart. (gr. Mr. W. H. Young), showed Lælio-Cattleya × Gottoiana marmorata and Lælia pumila magnifica.

Her Grace the Duchess of Northumberland, Stanwick, Darlington (gr. Mr. Higgie), sent a fine spike of Vanda cœrulea, bearing twenty-two flowers.

E. Stanley Clark, Esq., Oak Alyn, Wrexham (gr. Mr. Edwards), sent Cattleya × Mantinii.

Mr. J. W. Moore, Rawdon, near Leeds, sent a green and white form of Cypripedium Charlesworthii.

Henry Little, Esq., Baronshalt, Twickenham (gr. Mr. Howard), showed two spikes of Cattleya Bowringiana with many flowers.

H. Tate, Esq., Allerton Beeches, Liverpool (gr. Mr. C. Osborne), sent a hybrid said to be between Lælia tenebrosa and Cattleya × Hardyana, but much resembling a small Lælio-Cattleya × Schilleriana.

ORCHID COMMITTEE, NOVEMBER 7, 1899.

HARRY J. VEITCH, Esq., in the Chair, and sixteen members present.

Awards Recommended :—

Silver Banksian Medal.

To R. Brooman-White, Esq., Arddarroch, Garelochead, Dumbartonshire (gr. Mr. King), for a collection of spikes of varieties of Odontoglossum crispum.

To Messrs. Hugh Low, of Enfield, for a group of Orchids.

Bronze Banksian Medal.

To Mr. Jas. Douglas, Great Bookham, for a collection of spikes of Cattleya labiata, &c.

To Mr. Ed. Kromer, West Croydon, for a group of Cattleya labiata.

First-class Certificate.

To Cattleya labiata (votes, unanimous), from Leopold de Rothschild, Esq.; R. I. Measures, Esq., and A. H. Smee, Esq. The typical autumn flowering variety.

To Cattleya labiata Gilmouriæ (votes, unanimous), from Mrs. Briggs-Bury, Bank House, Accrington (gr. Mr. Wilkinson). Flowers pure white with a violet-purple blotch on the lip.

To Cattleya labiata alba 'Princess of Wales' (votes, unanimous), from Messrs. Jas. Veitch, Chelsea. Flowers of fine quality, pure white, with the faint tint of pink in the centre of the lip.

Award of Merit.

To Dendrobium Cœlogyne (votes 5 for, 3 against), from Messrs. Hugh Low, of Enfield. Flowers large, whitish, with purple markings.

Other Exhibits.

R. Brooman-White, Esq., showed Odontoglossum crispum xanthotes, and O. c. 'Geraldine.'

Elijah Ashworth, Esq., Harefield Hall, Wilmslow (gr. Mr. Holbrook), showed hybrid Cypripediums, C. insigne 'Geo. Ashworth,' and Lælia pumila Ashworthiæ, a pale variety with slate-coloured front to the lip.

Sir Frederick Wigan, Bart., Clare Lawn, East Sheen (gr. Mr. W. H. Young), showed Cattleya labiata, C. Bowringiana concolor, and Lælia pumila 'Low's var.'

Norman C. Cookson, Esq., Oakwood, Wylam (gr. Mr. Wm. Murray), sent a hybrid Lælio-Cattleya, resembling L.-C. × 'Decia.'

A. S. Hitchins, Esq., St. Austell, Cornwall, showed Cypripedium × Hitchinsiæ (insigne ♀ Charlesworthii ♂).

Major-General Gillespie, Brynderwen, Usk, sent a fine spike of Odontoglossum × Andersonianum.

ORCHID COMMITTEE, NOVEMBER 21.

HARRY J. VEITCH, Esq., in the Chair, and seventeen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for a fine group of hybrid Lælio-Cattleyas, &c., in which were most of the winter flowering hybrids of Lælia Perrinii.

Silver Flora Medal.

To Captain Holford, Westonbirt, Tetbury (gr. Mr. A. Chapman), for a fine group of Cypripediums.

Silver Banksian Medal.

To J. Bradshaw, Esq., The Grange, Southgate (gr. Mr. Whiffen), for a group of Orchids.

Award of Merit.

To Cattleya × vestalis (Dowiana aurea ♂ maxima ♀) (votes 8 for, 4 against), from Messrs. Jas. Veitch. Flower in form resembling Cattleya maxima, but larger; pale pink, the labellum veined and tinged with purplish rose, the base shaded with orange colour.

To Cattleya × 'Mrs. J. W. Whiteley' (Bowringiana × Hardyana Massaiana), votes 8 for, 5 against), from Sir James Miller, Bart., Manderston, Duns, N.B. (gr. Mr. J. Hamilton). Resembling a light form of C. × Mantinii. Flowers bright-rose with purplish zone on the lip, and yellow base.

To Cypripedium × 'Milo' Westonbirt var. (votes, unanimous), from Captain Holford, Westonbirt (gr. Mr. A. Chapman). A cross between C. insigne Chantinii and C. × œnanthum superbum. Flowers richly coloured, with a shining purple tint. Upper sepal white with rose markings and dark base. (Fig. 149.)

To Odontoglossum × loochristyense 'Canary Bird' (crispum × triumphans) (votes, unanimous), from W. Thompson, Esq., Walton Grange, Stone, Stafford (gr. Mr. W. Stevens). Flowers equal in size to those of O. × excellens, canary yellow with small brown spots, lip crimped, white with brown spots and yellow crest.

Other Exhibits.

Frau Ida Brandt, Zurich (gr. Mr. Schlecht), sent Zygopetalum Gairianum and Z. Dayanum Superbum.

Henry Little, Esq., Twickenham (gr. Mr. Howard), sent Cattleya maxima 'Little's' var.

W. A Bilney, Esq. Weybridge (gr. Mr. Whitlock), showed a collection of Cattleya labiata flowers, Vanda Sanderiana and V. cœrulea.

R. Ashworth, Esq., Ashlands, Newchurch (gr. Mr. Pidsley), showed Cattleya labiata alba 'White Empress,' much resembling C. l. a. Gilmouriæ shown at the last meeting. Also two varieties of Oncidium Forbesii.

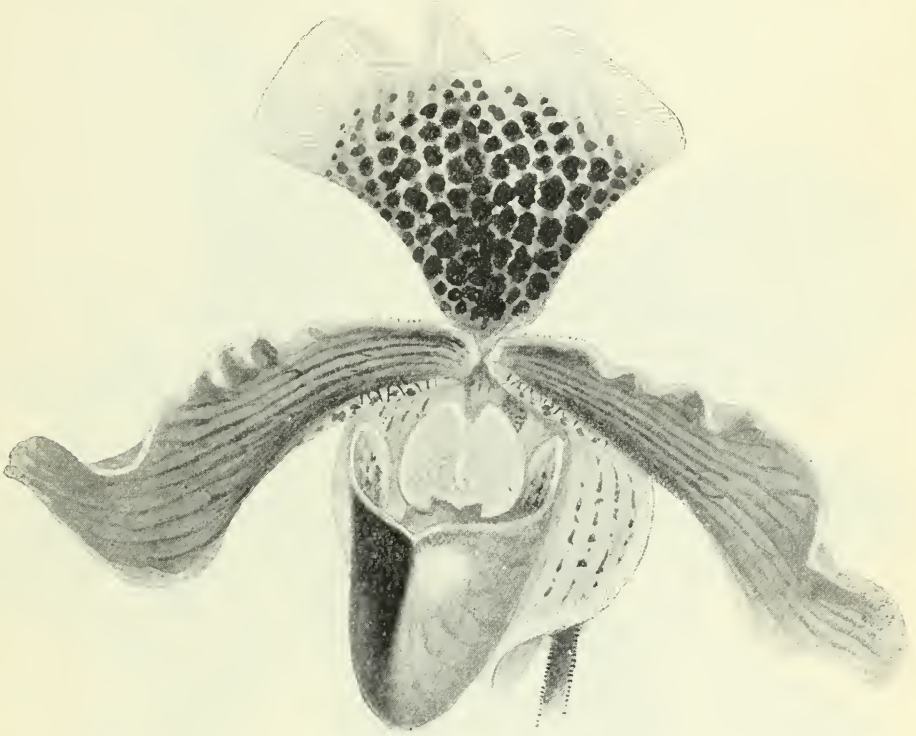


Fig. 149.—Cypripedium 'Milo' Westonbirt var. (*Journal of Horticulture.*)

Messrs. Paul & Son, Cheshunt, showed varieties of Cypripedium insigne, C. Spicerianum, and Masdevallia tovarensis grown in a cool greenhouse.

Messrs. Hugh Low, of Enfield, staged an effective group of Orchids.

Mr. Ed. Kromer, Bandon Hill, Croydon, showed a number of varieties of Cattleya labiata, that named 'Kaiser Wilhelm II.' being a richly coloured form of the C. l. Peetersiana class.

ORCHID COMMITTEE, DECEMBER 5, 1899.

HARRY J. VEITCH, Esq., in the Chair, and thirteen members present.

Awards Recommended:—

Silver Flora Medal.

To Sir Trevor Lawrence, Bart. (gr. Mr. W. H. White), for a group of more than sixty hybrid Calanthes, and some other rare Orchids.

First-class Certificate.

To Cattleya × 'Maggie Raphael' (aurea ♀ Trianæi ♂) (votes, unanimous), from H. S. Leon, Esq., Bletchley Park, Bletchley (gr. Mr. Hislop). Flowers as large as those of either parent; sepals, Indian yellow; petals yellow tinted and veined towards the edge with purple; lip almost entirely of a rich purple colour, lighter towards the margin and apex. (Fig. 150.)

FIG. 150.—CATTLEYA 'MAGGIE RAPHAEL.' (*Journal of Horticulture.*)

To Cypripedium × 'Hera' var. 'Euryades' (Leeanum × Boxallii)

(votes, unanimous), from Messrs. Jas. Veitch, Chelsea. Upper sepal green at the base, white on the upper half, all but the margin heavily blotched with purple; petals and lip greenish yellow tinged with purple, the surface being glossy.

Award of Merit.

To Sophro-Cattleya × Chamberlainiana var. triumphans (C. Harri-

Fig. 151.—Sophro-Cattleya Chamberlainiana var. triumphans. (*Gardeners' Chronicle.*)

soniana ♀ S. grandiflora ♂) (votes, unanimous), from the Right Honble. Joseph Chamberlain, M.P., Birmingham (gr. Mr. J. Smith). An allied cross to S.-C. × Calypso, but a distinct form. Sepals and petals reddish-scarlet with darker veining. Lip formed like Sophronitis grandiflora; bright yellow with the apex of the front and edges of the side lobes purplish-crimson. (Fig. 151.)

To Cymbidium longifolium (votes, unanimous), from J. S. Moss, Esq., Wintershill, Bishop's Waltham. An elegant species allied to C. cyperifolium. Sepals and petals greenish yellow striped with brown; lip white with some dark markings at the base.

To Oncidium varicosum Lindeni (votes 8 for, 2 against), from l'Horticole Coloniale, Parc Leopold, Brussels. A very fine form, the large bright yellow lip having a chestnut brown mask in the centre.

To Oncidium Forbesii moortebeekiense (votes, unanimous), from l'Horticole Coloniale, Brussels. Flower very large for the species; chestnut brown, with yellow markings around the segments. (Fig. 152.)

Other Exhibits.

The Honble. Mrs. Albert Brassey, Heythorpe Park, Chipping Norton (gr. Mr. H. Downing), sent a group of well-grown Calanthes.

The Right Honble. Joseph Chamberlain, M.P. (gr. Mr. J. Smith),

Fig. 152.—Oncidium Forbesii moortebeekiense. (*Journal of Horticulture.*)

showed his fine hybrid Cattleya × 'Mrs. Endicot' (maxima × Loddigesii), a pretty pink flower with the labellum finely veined with purple.

Messrs. Jas. Veitch sent Cypripedium × 'Milo' magnificum.

M. Chas. Vuylsteke, Loochristy, Ghent showed. Odontoglossum × crispo-Harryanum and O. × Harryano-crispum.

Messrs. F. Sander, St. Albans, showed Lælio-Cattleya × Wilsoniæ (C. labiata × L. Dayana), and other Orchids.

Leopold de Rothschild, Esq. (gr. Mr. Hudson), showed Cattleya Harrisoniana and Lælia autumnalis.

R. I. Measures, Esq. (gr. Mr. H. J. Chapman), showed Cypripedium × Leeanum giganteum 'Cambridge Lodge variety.'

Messrs. McBean, Cooksbridge, showed Odontoglossum × Andersonianum 'McBean's var.'

T. W. Thornton, Esq., Brockhall, Weedon, sent Cattleya × 'Euphrasia' (superba × Warscewiczii).

L'Horticole Coloniale, Brussels, sent varieties of Oncidium Forbesii and O. varicosum.

Mr. H. A. Tracy showed a form of Cymbidium Tracyanum.

ORCHID COMMITTEE, DECEMBER 19.

HENRY LITTLE, Esq., in the Chair, and fourteen members present.

Awards Recommended :—

Silver Banksian Medal.

To W. M. Appleton, Esq., Tyn-y-Coed, Weston-super-Mare, for a collection of Cypripediums.

First-class Certificate.

To Dendrobium spectabile (votes,unanimous), from Major Joicey, Sun-

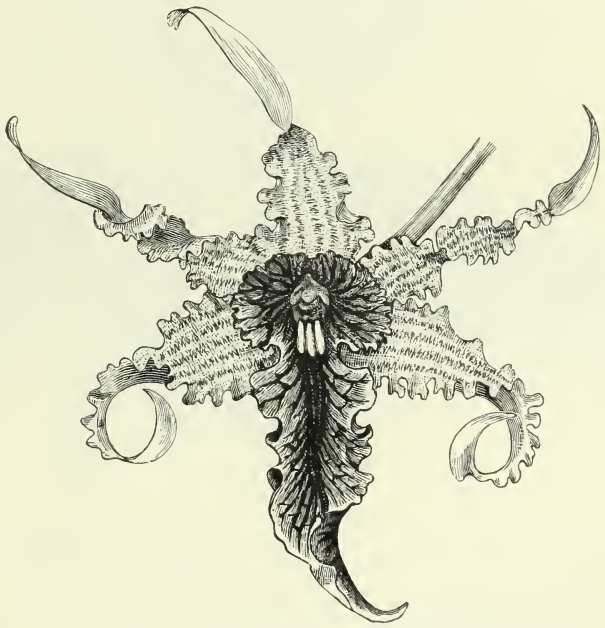


FIG. 153.—DENDROBIUM SPECTABILE. (*Journal of Horticulture.*)

ningdale Park, Sunningdale (gr. Mr. F. J. Thorne). The first appearance of the New Guinea species, known previously only through the figure in Rumphia as Latouria spectabilis. In general appearance the plant has affinity to D. macrophyllum. Flowers produced on upright spikes, all the segments being elongated into apiculate tails, wavy and twisted; sepals and narrower petals yellow, marked with reddish purple; lip white with dark purple veining. (Fig. 153.)

To Cypripedium × 'Lord Roberts' (votes 7 for, 6 against), from Messrs. Charlesworth, Heaton, Bradford. This resulted from crossing C. Charlesworthii and C. Creon (Harrisianum superbum × œnanthum superbum). Upper sepal amethyst purple, darker in the veining, the apex exhibiting a marbling of pure white. Petals rose-purple, with brownish veining; lip surface brownish rose; staminode pale lilac with orange boss in the centre.

To Cypripedium × 'Hera Euryades' splendens (Boxallii ♂ Leeanum ♀) (votes, unanimous), from Messrs. Jas. Veitch, Chelsea. Dorsal sepal white, the lower half almost entirely rose-purple. Petals greenish white tinged with brown-purple on the upper halves and spotted

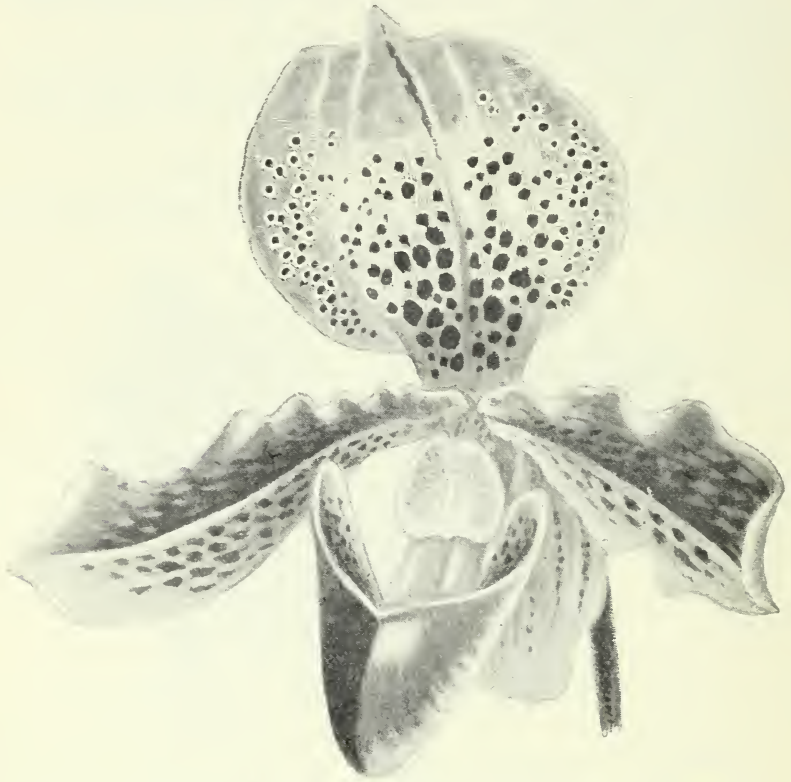


Fig. 154.—Cypripedium Hera var. Euryades. (*Journal of Horticulture.*)

with the same colour on the lower halves. Lip yellow-tinged outside, and spotted inside with purple. (Fig. 154.)

Award of Merit.

To Cypripedium × conco-callosum (concolor × callosum) (votes 6 for, 1 against), from G. W. Law-Schofield, Esq. New-Hall-Hey, nr. Manchester (gr. Mr. Shill). Flowers greenish-yellow suffused with pale rose colour.

To Lælio-Cattleya × Wellsiana ignescens (L. purpurata ♂ C. Trianæi ♀) (votes 8 for), from Messrs. Jas. Veitch, Chelsea. Sepals and petals rosy lilac; lip ruby-purple with pale yellow centre.

To Zygo-Colax × Amesiana (*Z. brachypetalum* × *C. jugosus* (votes 5 for 2 against), from Messrs. F. Sander, St. Albans. Sepals and petals emerald green heavily marked with purple brown ; lip white, with narrow violet lines.

To Cattleya × elatior (Schilleriana × Mossiæ Reineckiana) (votes 6 for, 3 against), from C. L. N. Ingram, Esq., Godalming (gr. Mr. T. W. Bond). Plant resembling C. Schilleriana. Flowers of medium size ; sepals and petals blush white ; lip rose-crimson with dark yellow and brown markings at the base.

Cultural Commendation.

To Messrs. Charlesworth, Heaton, Bradford, for a fine Cypripedium insigne Sanderæ with six flowers.

Other Exhibits.

Reginald Young, Esq., Sefton Park, Liverpool (gr. Mr. Poyntz), showed an interesting collection of hybrid Cypripediums.

W. M. Appleton, Esq., showed Cypripedium × Morteni (Leeanum Masereelianum × Chamberlainianum) ; and the singular Cypripedium insigne 'Oddity' with fixed trilabellia shown in all its six flowers.

J. T. Bennett-Poë, Esq. (gr. Mr. Downes), showed a fine branched spike of Oncidium tigrinum, and a good Lælia anceps.

J. Gurney Fowler, Esq. (gr. Mr. Davis), showed Cypripedium insigne Fowlerianum.

M. Jules Hye, Ghent (gr. M. Coen), sent Cypripedium × 'Madame Jules Hye.'

Messrs. Hugh Low, of Enfield, showed Cypripedium × (niveum × venustum) and C. × 'Wm. Lloyd.'

Major Joicey (gr. Mr. F. Thorne) sent Dendrobium atroviolaceum with four spikes and D. Johnsoniæ.

W. E. Padbury, Esq., Beckenham, sent Cypripedium × Antigone 'Padbury's var.'

NOTICES TO FELLOWS.

JULY 1900.

FRUIT.

Grapes: Fellows can now obtain Black Hamburgh Grapes at 2*s.* 6*d.* to 1*s.* a lb., according to season and quality. Muscats from early in August, 3*s.* to 2*s.* a lb. Carriage will be charged extra as follows: 1 lb. 4*d.*, 2 lb. 5*d.*, 3 lb. 6*d.*, 4 lb. 7*d.*, 5 lb. 8*d.* Peaches, Nectarines, Apples, and Pears may be ordered at prices according to season and quality. Orders for Fruit should be addressed *Superintendent, R.H.S. Gardens, Chiswick, W.*, and must be accompanied by Cheque or Postal Order to secure attention.

LETTERS.

All letters on *all* subjects (save above) should be addressed—Secretary, R.H.S. Office, 117 Victoria Street, Westminster, S.W.

TELEGRAMS.

"**HORTENSIA, LONDON,**" has been registered, and is sufficient address for all telegrams.

FELLOWS' PRIVILEGES OF CHEMICAL ANALYSIS, &c.

Full instructions are contained in "Arrangements 1900," pages 25-32, and an epitome there of will be found on page cciii.

PLANTS CERTIFICATED.

A list of all the Plants, &c., certificated by the Society up to January 1, 1900, has just been published, price 5*s.* The section devoted to Orchids, interleaved with lined foolscap and bound in cloth, can be obtained for Fellows by special order, price 5*s.*

SHOW OF BRITISH-GROWN FRUIT.

Sept. 27, 28, 29, held at the Crystal Palace. Fellows are particularly requested to subscribe a small sum towards the Prizes, as £100 must be raised for the purpose. Send Cheques or Postal Orders to the Secretary, who will gratefully acknowledge them. Schedules of the Prizes, &c., can now be obtained from the Society's Office, 117 Victoria Street, Westminster, S.W.

NEW FELLOWS.

The Centenary of the Society is fast approaching, and the Secretary is most anxious to double the number of Fellows before that eventful date. Will every Fellow assist him by sending in the name of at least one new Fellow?

LECTURES, &c.

Any Fellows willing to Lecture or to communicate Papers on interesting subjects are requested to communicate with the Secretary.

MEETINGS AND SHOWS.

1900 (remaining)—August 14, 28; Sepember 11, 25; 27, 28, 29, Fruit Show at the *Crystal Palace*; October 9, 23; November 6, 20; December 4, 18. **1901,** January 15, 29. A reminder of every Show will be sent in the week preceding to any Fellow who will send to the R.H.S. Office, 117 Victoria Street, S.W., a sufficient number of halfpenny cards *ready addressed* to himself.

SUBSCRIPTIONS.

All Subscriptions fall due on January 1 of each year. To avoid the inconvenience of remembering this, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

PLANTS, &c.

Fellows are requested to note that a list to choose from of all the plants available for distribution is sent every year to every Fellow enclosed in the Report of the Council in the last week in January of each year, and a ballot for order of being served is made on March 1. The distribution begins on March 1 and ends on May 1. Fellows having omitted to fill up their application form before May 1 must be content to wait till the next distribution.

DRACÆNAS.

The Superintendent, R.H.S. Gardens, Chiswick, W., would be greatly obliged for any old plants of Dracænas, however old and long. Please shake out all the earth from the roots and send direct.

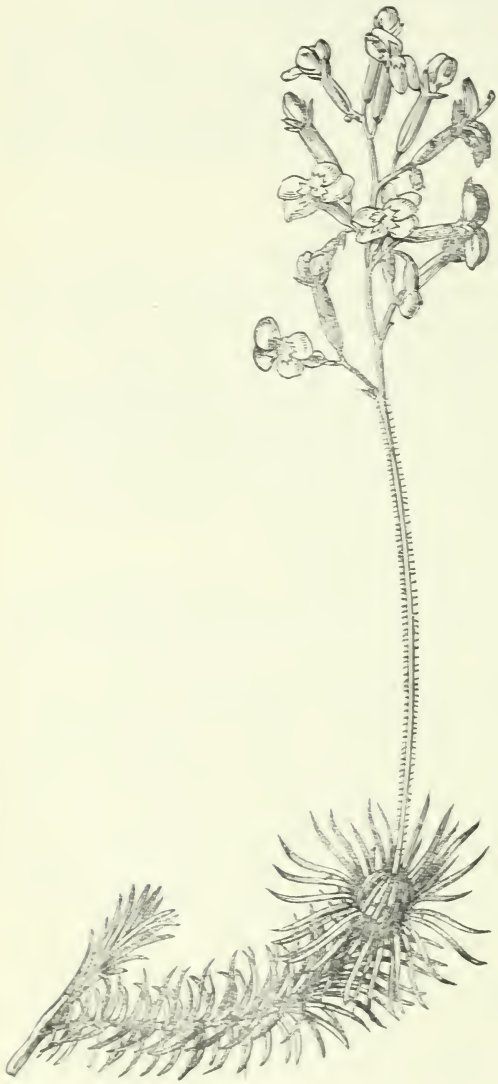
BINDING THE JOURNAL.

There are three separate parts of Vol. XXIII. The Title-page and Table of Contents, which will be found enclosed in the present part, should be placed at the commencement of the whole Volume. Then

should follow all the three parts of the JOURNAL proper, which is paged in figures from 1 to 436. After this should come the three parts of "Extracts from the Proceedings," which are paged in letters from i to ccviii, finishing with the Index.

ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may indirectly be benefited. An Index to the Advertisements will be found on page 32.



FELLOWS' PRIVILEGES OF CHEMICAL ANALYSIS.

(*Applicable only to the case of those Fellows who are not engaged in any Horticultural Trade, or in the manufacture or sale of any substance sent for Analysis.*)

The Council have fixed the following rates of charges for Chemical Analysis to Fellows of the Society being *bonâ fide* Gardeners or Amateurs.

These privileges are applicable only when the Analyses are for *bonâ fide* horticultural purposes, and are required by Fellows for their own use and guidance in respect of gardens or orchards in their own occupation.

The analyses are given on the understanding that they are required for the individual and sole benefit of the Fellow applying for them, and must not be used for the information of other persons, or for commercial purposes.

Gardeners when forwarding samples are required to state the name of the Fellow on whose behalf they apply.

The analyses and reports may not be communicated to either vendor or manufacturer, except in cases of dispute.

When applying for an analysis, Fellows must be very particular to quote the number in the following schedule under which they wish it to be made.

No.		
1.	An opinion on the purity of bone-dust (each sample)	2*s.* 6*d.*
2.	An analysis of sulphate or muriate of ammonia, or of nitrate of soda, together with an opinion as to whether it be worth the price charged	5*s.*
3.	An analysis of guano, showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, together with an opinion as to whether it be worth the price charged	10*s.*
4.	An analysis of mineral superphosphate of lime for soluble phosphates only, together with an opinion as to whether it be worth the price charged	5*s.*
5.	An analysis of superphosphate of lime, dissolved bones, &c., showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime and ammonia, together with an opinion as to whether it be worth the price charged	10*s.*
6.	An analysis of bone-dust, basic slag, or any other ordinary artificial manure, together with an opinion as to whether it be worth the price charged	10*s.*
7.	Determination of potash in potash salts, compound manures, &c.	7*s.* 6*d.*
8.	An analysis of compound artificial manures, animal products, refuse substances used for manure, &c.	from 10*s.* to £1
9.	An analysis of limestone, showing the proportion of lime	7*s.* 6*d.*
10.	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	10*s.*
11.	Complete analysis of a soil	£3
12.	Analysis of any vegetable product	10*s.*
13.	Determination of the "hardness" of a sample of water before and after boiling	5*s.*
14.	Analysis of water of land-drainage, and of water used for irrigation	£1
15.	Analysis of water used for domestic purposes	£1 10*s.*
16.	Consultation by letter	5*s.*

Letters and samples (postage and carriage prepaid) should be addressed to the Consulting Chemist, Dr. J. Augustus Voelcker, 22 Tudor Street, New Bridge Street, London, E.C.

The fees for analysis must be sent to the Consulting Chemist at the time of application.

Instructions for selecting, drawing, and sending samples for analysis will be found on page 30 of "Arrangements, 1900," or can be obtained on application to the Society's Office, 117 Victoria Street, S.W.

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