PEACHES:

1. ROYAL GEORGE  2. BARRINGTON
PEACHES

A ripe Peach is one of the most beautiful of fruits, and, if a good variety, one of the most delicious. In most parts of the British Islands good Peaches can only be grown against a wall in a sheltered position, or with glass-house protection. Peaches are like Strawberries in their lack of keeping qualities after they are ripe; to enjoy them they must be eaten within a few hours after they are gathered. There are many varieties, the differences as a rule being slight. Some of them are reproduced true from seeds. In this country, however, the varieties are propagated by grafting or budding them on to young seedling plants of the Peach, the Almond, and the Plum used as stocks. The Peach is not a long-lived tree, but it grows quickly, and fruits when two or three years old. Careful pruning and protection from cold during the flowering period are essentials to good Peach culture. The preparation of the border in which the plants are to grow is also a matter requiring careful attention to details. Full directions on all these points are given in Chapter VII.
THE
GARDENER'S ASSISTANT

A PRACTICAL AND SCIENTIFIC EXPOSITION OF THE
ART OF GARDENING IN ALL ITS BRANCHES

BY
ROBERT THOMPSON
OF THE ROYAL HORTICULTURAL SOCIETY'S GARDENS, CHISWICK

NEW EDITION
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ILLUSTRATED BY NUMEROUS ENGRAVINGS IN THE TEXT,
AND A SERIES OF PLATES IN COLOUR, AND OF PLATES IN BLACK-AND-WHITE

Divisional-Vol. V

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STRAWBERRIES
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PRIZE GRAPES EXHIBITED AT CRYSTAL PALACE, 1901
CHINESE BANANA AT PADDOCKHURST, SUSSEX
COLD STORAGE METHODS

COLOURED PLATES

PEACHES—1, Royal George; 2, Barrington.
CHERRIES—1, Early Rivers; 2, Emperor Francis; 3, White Bigarreau.
MELONS—Royal Jubilee; Middlesex Hero.
TOMATOES—Chiswick Peach; Frogmore Selected.
yellow, mottled with dull-red, dark-red next the sun; flesh yellowish, flaked with red at the stone, from which it parts freely, rich, melting, and excellent. Early Sept-
tember. Tree remarkably vigorous; ought to be in every collection.

Byron.—Fruit large, inclined to conical, deep-yellow, dark-red where exposed to the sun; flesh orange-yellow, melting, juicy, and of good flavour. A good grower. September.

Cardinal.—Fruit medium, pale-green, bright-red on the side exposed to the sun, flavour excellent. The earliest of all Nectarines, ripening ten days sooner than Early Rivers. It forces well and bears abundantly, but is not recommended for a cool house or outside.

Downston.—Fruit much resembling the Violette Hâtive, but somewhat larger; flesh melting, rich, and high flavoured. Tree a good bearer and of a good constitution, more vigorous than Elrudge, between which and Violette Hâtive it appears to be a cross. Late August.

Dryden.—Fruit large, green, dotted with red, dark-red on the sunny side; flesh greenish-white, melting, juicy, sweet, and of good flavour. The tree is a sure bearer. One of the very best, pays for extra care in cultivation. Fruits of it grown at Ketton Hall weighed 8 ozs. and measured 10 inches in circumference. Mid-September.

Early Rivers.—Fruit extra large, greenish-white, bright-red where exposed to the sun; flesh white, very tender, sweet, melting, and of excellent flavour. Tree vigorous and bears well. Is not unlike Lord Napier, but ripens three weeks earlier. Early August.

Elrudge (fig. 998).—Fruit middle-sized, roundish, inclining to oval; skin pale-green, dark violet-red next the sun; flesh whitish, tinged with red at the stone, from which it parts freely, melting, juicy, rich, perfumed, and delicious. An abundant bearer and forces well. One of the best. Late August.

Goldont.—Fruit medium to small, round, bright-yellow, streaked and shaded with red where exposed to the sun; flesh yellow, very tender, juicy, and of good flavour. A delicious Nectarine. A healthy grower and an abundant bearer.

Humility (fig. 982).—Fruit very large, round, or inclined to be conical; yellowish-green, dark-red where exposed to the sun; flesh yellow, juicy, and of good flavour. Ripens Mid-September. Bears abundantly, and the fruit hangs well.

Lord Napier.—Fruit extra large, round; skin pale-green, bright-red where exposed to the sun; flesh white, very tender, juicy, sweet, and of excellent flavour. One of the very best Nectarines. Late August. The fruit is easily burnt by the sun when ripening, especially if it is wet, it should therefore be shaded in very hot weather. Fruits grown at Ketton Hall measured $\frac{3}{4}$ inches in circumference, and weighed 8 ozs.

Pine Apple (fig. 998).—Fruit large, roundish, inclined to conical; skin yellow, dark-red where exposed to the sun; flesh deep-yellow, red near the stone, sweet, juicy, and of excellent Pine-Apple flavour. One of the best. Late September.

Pitmaiston Orange (fig. 999).—Fruit large, globular or almost heart-shaped, terminating in a small point or nipple; skin deep-purple, spotted with brown next the sun, orange on the shaded side; flesh rich-yellow, red about stone, from which it parts freely, melting, juicy, sweet, and of good flavour. Late August. The tree is hardy, and an abundant bearer.

Rivers' Orange.—Fruit medium, round; skin yellow, dark-red where fully exposed; flesh yellow, very tender, juicy, sweet, and of good flavour. Early September.

Spenor (fig. 989).—Fruit of the largest size, roundish, somewhat elongated; skin green, dull-red where exposed to the sun; flesh greenish-white, tender, melting, and juicy. Mid-September. One of the best for exhibition.

Stanwick Elrudge (fig. 1000).—Fruit large, roundish, often elongated; skin pale-green, bright-red on sunny side; flesh white, flecked with red next the stone, exceptionally tender and melting, juicy, sweet, and of good

flavour. A great improvement on the old Elrudge for size and colour. Mid-August.

Victoria (fig. 1001).—Fruit similar in every respect to Stanwick, but does not crack, and consequently preferable to it. One of the highest flavoured and best Nectarines. Raised by Mr. Rivers from Stanwick. Late August.
**CHAPTER VIII.**

**THE APRICOT.**

**Cultivation out-of-doors—Pruning and Training—Disbudding—Thinning the Fruit—General Treatment—Protection—Forcing—Propagation—List of Varieties.**

The Apricot (Prunus Armeniaca) is now regarded as indigenous in Dahuria, Mongolia, Mandshuria, and Northern China. It is said to have been cultivated by the Chinese two or three thousand years before the Christian era, at the beginning of which the Greeks and Romans are supposed to have first received it. It has long been cultivated in the north of India and Thibet, and in these and other regions it has become more or less naturalized, hence the statement that it is a native of the temperate parts of Central Asia. Dr. Bretschneider found it wild in the mountains of Pekin, where it grew in abundance, and produced red and yellow fruit \( \frac{3}{4} \) inch in diameter, with salmon-coloured, sour, but edible flesh. This may therefore be accepted as the wild progenitor of our garden Apricots, which show a considerable range of variation, and yet are reproduced true from seeds.

"The Apricot is very distinct in foliage and wood from all the other species of Prunes, and the granular pulp of the fruit is another distinction. Its leaves, indeed," more resemble those of the Lombardy Poplar than any of its own allies, but its near relationship to the Plum and the Peach and Almond is proved by the fact that it succeeds perfectly when grafted on the Mussel or common Plum as a stock, and either Peaches, Almonds, or Nectarines may be grafted on the Apricot as a stock" (Barbidge).

Apricots appear to have been first introduced into England from Italy in 1524 by Wolff, gardener to Henry VIII.

**Cultivation Out-of-doors.**

The Apricot will succeed in any good free garden soil or loam that is rather sandy than otherwise; strong clay soils do not suit it, neither does it thrive so well in heavy, close loams as it does in those that are friable. In any case the soil ought to be well drained. The tree will grow rapidly in moist seasons; but when it has attained a considerable size it is apt to suffer from dryness at the roots; the leaves then become weak for want of sap, mildew ensues, and the tree is soon ruined.
THE APRICOT.

The soil should be trenched; and in so doing, if the soil, or part of it, is clayey and rather adhesive, it should be turned up to the top, where it will be rendered permeable by the weather. Turf which contains much fibre is excellent for mixing with heavy soils; lime rubble, brick rubbish, old plaster, road sidings, turf parings, burnt soil, and wood ashes also may be added to the soil with benefit.

Borders for Apricots should be from 8 to 10 feet wide, 2 feet 6 inches deep, and with a base of 9 inches of drainage. If the locality is damp and low-lying, the bottom of the border had better be concreted.

In the south of England some kinds of Apricots, such as the Breda, bear well as standards if the spring weather is favourable; and although the fruit of such is not so large as from trees on walls, yet it is more juicy and of richer flavour. The trees may be planted as standards at from 20 to 25 feet apart. The Apricot, however, is chiefly cultivated against walls. In the warmer parts of the country east and west aspects are suitable; but an aspect inclined to south-west or south-east is to be preferred; whilst in the northern parts of England, and in Scotland, a south aspect is generally necessary to give the fruit its full flavour.

The distance between trees against walls should be from 15 to 20 feet. Planting may be performed in the end of September, for the buds on the lower part of the shoots are matured early in the season, and growth stops in August, or at least the elongation of the shoots is almost entirely arrested at that period for a short time. The shoots then make a fresh start, and a marked difference may be observed between the portion of the shoot produced before and that after the stoppage.

When the tree is about to be taken up, the older leaves may be cut off from the lower part of the shoots. A few left on the second growth will be sufficient to draw sap and maintain circulation until fresh roots are formed; and having done this before winter, the tree will be ready to push in spring, and in the course of the season will be well established and in a condition to produce vigorous shoots. If the weather should be hot, and the staple dry at the time of planting, settle the soil about the roots with copious supplies of water. Planting may also be done in October, or during the first fortnight of November; but if later than this, fresh roots cannot be expected to be made before spring. If the borders cannot be prepared in the autumn, planting may be performed any time during mild weather in the months of December and January, but not later than the middle of February. As already observed, the Apricot vegetates early, and the trees do not grow so vigorously if transplanted after they have commenced to push. It is a good plan to plant a few maidens each year, so that there may be a stock of nice healthy trees ready to hand for making good deficiencies as they occur. This is preferable to purchasing trained trees, as they can be lifted in good time and with a good ball of soil attached to the roots, so that they may be partly established before winter sets in.

Pruning and Training.—Fan-training is the best for the Apricot, because the branches are apt to die off, and, as explained in treating of the Plum, vacancies can be most readily filled up. Besides, the tree is one of those which do not admit of horizontal branches being taken from an upright stem without the risk of such branches dying.

Commencing the training with a maiden plant, consisting of one upright vigorous shoot, let the latter be cut down in autumn to 10 inches from the ground, and from the buds immediately below the section let three shoots be encouraged, one to be trained upright, and one on each side for the lowest pair of branches. It is of the utmost importance to manage these three shoots so that the two side ones may be as strong as, or even rather stronger than, the upright one, which, if left to themselves, would not likely be the case. The central one should be checked early in June, when the wood will be firm as far up from the base as the place to which it will have to be cut back in autumn, at which time the two side-shoots ought to be of equal thickness and vigour, and stronger than the central one.

The trees should be frequently inspected during the growing season, and if the side-branches are evidently not keeping pace with the central upright, means must be taken to check its progress, and the sooner such means are taken the better. The flow of sap is easily diverted in greater force to any shoot that is on an equality, or nearly so, with those towards which the flow is intended to be in a diminished ratio; but when any shoot or shoots have been drawing an undue share, it is not an easy matter to divert the sap into less vigorous shoots. It can, however, gradually be effected by encouraging an increased breadth of foliage in the weak parts, and diminishing that connected with the strong.
If a branch is slender it will sooner or later become strong, according as it is the medium of communication between a large or small amount of foliage on the shoots, whether that amount is borne immediately by the branch or on lateral branches and shoots originating on it. If, on the contrary, a branch is too strong, it may be made to grow less vigorously by the suppression of most of the side branches.

The main branches ought to diverge equally; when they extend so as to be 15 inches apart, each branch should be subdivided into two; and when the branches resulting have extended so as to be again at the above distance apart, they should be again subdivided. In this way the principal branches will be produced with regularity, and there will be space for laying in young wood for fruiting.

When the Apricot arrives at a bearing state, it produces its fruit on the shoots of the preceding summer's growth, and also on spurs on wood that is two, three, or more years old. The finest fruit is, however, produced on wood one and two years old; therefore a proper supply of such ought to exist in all parts of the tree. Young shoots should be laid in between the principal branches, but rather thinly than otherwise, for it is an error to crowd the tree with more shoots than there is space for, when on half the number of shoots much more fruit would set than the tree could possibly bring to perfection. Young shoots should therefore be laid in at every 10 or 12 inches, and ought to be shortened to about 1 foot in length, a little longer if they are strong, and shorter if weak. If they should not bear in the following season, that is, when they are one year old, they may be allowed to remain another year, when they will rarely fail if the spring be favourable.

The young shoot, after having been pruned in autumn, should be nailed in the course of the winter pretty close to the old branch, in order to afford room for a succession shoot, which should be encouraged in the following summer. If the shoot first laid in has borne fruit, and if at the autumn pruning the young shoot is seen to be furnished with blossom-buds, the one that has borne should then be cut away; but if not, both ought to remain another season. In the autumn the older of the two should be cut out and the younger trained in its place, and for this a succession shoot ought to be encouraged in the following summer. Thus there will be single shoots, originating at about 10 or 12 inches apart,
laid in between the principal branches. In the second summer, from the base of each of these shoots another should be trained. Or instead of originating on the base of the shoot first laid in, a succession shoot may sometimes be obtained from the branch itself. When the shoot first laid in is in the second summer of its age, a young shoot to replace it will be growing. If considered advisable to retain both of these for another summer, no young shoot for succession will require to be grown in that summer; but if only one be retained, then a succession shoot must be encouraged.

In addition to the shoots to be managed as above, spurs will form along the branches. A good number of these should be permitted to form on all the main branches, which would otherwise remain naked and unfruitful. From these spurs, however, long shoots ought not to be allowed to grow. The young shoots should be pinched or cut back to three or four buds when only a few inches long.

Disbudding is an operation which may be treated of in connection with summer pruning. It consists in removing shoots when they are quite young, chiefly those in front of the branches, where they would otherwise form useless breast-wood. The operation should be first performed in the upper and more vigorous parts of the tree, and after a short interval another portion should be removed. The finger and thumb only ought to be used when the shoot is in a very young herbaceous state; but as soon as it becomes somewhat woody, the knife must be used, otherwise the bark is apt to be torn, and gumming will result.

The foreright shoots having been gradually removed, superfluous shoots situated elsewhere should either be cut clean out, or shortened for spurs. If all the branches are maintained in a proper degree of vigour, none being allowed to become either too weak or too strong—and this will not be the case if care be taken that the different branches are furnished with about an equal amount of foliage—the sap will be equally distributed, and, as a consequence, the tree will be healthy and fruitful, other circumstances being favourable.

Thinning the fruit should be done, to a certain extent, when it is very young, in which state the thinnings may be used for tarts. The final thinning, that is, the reduction of the crop to safe limits, is best deferred until the fruits have stoned. Large kinds should be allowed twice
the space afforded to those which are only half their size. On vigorous branches, or on shoots that proceed from such, more should be left than on parts that are weak, for, where this can be done, it will prove advantageous in repressing excessive vigour.

General Treatment.—About the beginning of February, and again in March, the soil and subsoil on which Apricots are growing should be examined, and if dry, it should be watered. At this season the surface soil is usually moist enough; but loamy subsoils, that have never been thoroughly trenched and rendered porous by an admixture of suitable materials, are not readily moistened throughout either by rain or mere surface watering. The surface soil should be ridged as deeply as can be done without interfering with the roots, and the ridges ought to run parallel to the wall. The hollows between the ridges should then be filled with water, and as it subsides the supply ought to be renewed, until the subsoil is thoroughly soaked. This may be sooner effected by making holes with a crowbar, so deep as to penetrate a little way into the loam; but only a little way, for if the crowbar were deeply inserted, the roots would some day follow its direction, and thus become more deeply embedded than is desirable. After watering, the ridges may be levelled.

If only the surface roots are supplied with moisture, whilst to those more deeply situated the supply is deficient, mildew is apt to attack the foliage; and although this most destructive disease may be checked to a considerable extent by flowers of sulphur, yet the health of the trees cannot be restored whilst the cause of the disease is allowed to exist. We have known Apricot-trees which were nearly killed by mildew, notwithstanding the repeated application of sulphur and frequent syringing, cured in the following manner. Although covering the wall, they were taken up in autumn, and after the border had been deeply trenched, and the loamy subsoil broken up, replanted. In the following season they produced healthy foliage, quite free from mildew, no application of sulphur being necessary. Where a border has not been properly prepared, and where the trees are severely attacked by mildew, it is advisable to take them up, if not too old, and replant them after the border has undergone due preparation; for although watering as we have recommended will be effectual in many cases, yet there may be others in which it would be difficult to ensure the uniform moistening of all parts of the soil where the roots may travel, as when they pass under walks, &c.

If summer-watering be necessary, rain- or pond-water is to be preferred to that from springs, for the latter, although in reality no colder than it was in spring, or probably even somewhat warmer, yet is relatively much colder than the mean temperature of the air in hot dry weather in summer, and ought not to be applied unless previously warmed by exposure to the sun and air.

A mulch of long litter spread 4 inches in thickness on the surface of the alleys early in June prevents too rapid evaporation of moisture by the heat of the sun, and at the same time encourages the formation of quantities of feeding roots just under the surface. Established, healthy trees in full bearing, after the fruit has stoned, will need assistance from stimulants in the form of liquid or artificial manure each time water is given, sprinkling the latter on the surface before the water is applied.

When trees make rank, sappy growth, and fruit but indifferently, the cause may generally be traced to their having been planted in a too rich compost. To add rotten manure to the soil when planting Apricots is therefore a mistake. Trees that have been thus treated should be lifted, and the obnoxious soil replaced with a compost in which no manure is present, but which should contain a good percentage of calcareous matter. In such a compost growth is short-jointed, firm, and fruitful; and whatever stimulus the trees may require can be administered from the surface in the manner already described.

Protection.—The flowers of the Apricot, owing to their appearing so early in the season, are liable to injury from frost. Even the swelling buds will succumb if exposed to severe frost. They should therefore be afforded protection as soon as the buds are on the point of bursting. Wide coping-boards are good, as they shed rain-water clear of the trees, and sometimes are sufficient protection. Generally, however, something more than this is needed. Among the materials used for this purpose are "Frigi Domo", and woolen netting, constructed so as to form a blind; old fish-nets, folded three or four times, are also used. Long stakes or poles, two yards apart, should be fixed in front of the wall, for the purpose of keeping the blinds and nets from damaging the blossoms. The trees should be covered every evening and uncovered again next morning, unless the weather is unfavourable.
THE APRICOT.

In hot, sunny weather the fruit of the Apricot is apt to become ripe and soft on the exposed side, while it is yet hard and green on the side next the wall. By partially shading such from the direct rays of the sun, either with netting or by drawing the leaves partly over them, the ripening process, though retarded, will be more regular and thorough.

FORCING THE APRICOT.

The Apricot may be forced as easily as the Plum, provided it is not subjected to anything at all like strong heat until the fruits have stoned, after which, if necessary, a fairly high temperature will do no harm. In the open air the Apricot is the most precocious of all fruits, and it therefore need hardly be stated that, when given the protection of a glass roof, but little warmth is requisite to excite it into growth. Such being the case, the structure in which it is grown need only be heated to 40° in severe weather. If possible, a whole house should be devoted to Apricots. A lean-to structure is, on the whole, the best for the purpose, and the trees should be trained on a trellis 18 inches from the roof-glass.

The border should be made as directed for Peaches under glass. Until the trees flower and set, a temperature of 45° to 50° will be ample, and on very cold nights it may descend to 40°. A rise of 5° may be allowed after the fruits begin to mature, and, as far as artificial heat is concerned, it is not advisable to exceed these temperatures. With sun-heat the temperature of the house may rise to 60° before admitting air, but it should be closed early enough to secure a temperature of 65°.

As the season advances, more air will be required, until the ventilators may ultimately remain wide open both day and night. The house may be closed for a few hours in the afternoon after the stoning period has been safely passed if early fruits are required; otherwise it is much better to leave them to ripen under more natural conditions.

The flowers require to be fertilized by hand. It is best to allow a little air on the house for an hour or two before operating upon the flowers with a camel-hair pencil, thereby ensuring that the pollen is ripe and dry. Until the flowers are set, it is necessary to keep the atmosphere in the house dry and buoyant; but when the petals have fallen, a light dewing with tepid water will prove very beneficial.

Should a heavy set result, thinning should be done as soon as the fruits are large enough to distinguish the best of them, but the final thinning must be left until the stoning stage is passed. If fruits are required for dessert, they should be left a trifle closer on the trees than would be advisable for Peaches, but if for culinary and preserving purposes leave about one-third more than for Nectarines.

Syringing may be resorted to, so soon as the fruits begin to swell, in the forenoon only, or early morning, until the season is more advanced and sun-heat becomes more powerful, when it should be performed copiously twice daily, and continued until the time that the fruits begin to colour and soften, when it should be discontinued until after the fruit has been gathered.

When the trees are started into growth, the borders should receive a good soaking of tepid water, so that the soil is moistened down to the drainage. During the winter months the borders may have a good soaking with liquid manure, but after this it is questionable whether stimulants are not better withheld until the fruits begin to make their final swelling, when manure may be applied with every watering. Should the trees be in a weak condition and need a stimulus when started, a mixture of 1 lb. of muriate of potash, 1½ lb. of dissolved bones, and 2½ lbs. of bone-meal may be applied at the rate of 2 ounces to each square yard of border surface, just before affording water.

Pinching the shoots to form spurs, and the laying-in of young growths where they are required for filling blank spaces, must be attended to, and it is at this time that the caterpillar of the Apricot moth puts in an appearance. This must therefore be watched for, its presence being revealed by the insect drawing the young leaves together, which gives them a rolled and twisted appearance. A sharp pressure of these rolled-up leaves between the thumb and finger is sufficient to despatch the insect, and the trees should be carefully examined every few days so long as any of these insects are to be found. Red spider puts in an appearance either when the internal atmosphere is kept too dry and hot, or when the border is not kept in a uniformly moist condition. If care be taken to afford the trees an abundance of air, to give them a daily syrinning, and to keep up a good supply of water at the roots, red spider will not give any trouble.

In the autumn all necessary pruning should be performed, this being a much better time to
do it than the winter, as the wounds heal so much quicker while there are yet leaves on the trees. Keep the ventilators and doors wide open, and above all things see that the border never feels the want of water. A dry border in the winter will cause the trees to shed their buds in precisely the same manner that forced Peach-trees do. When the trees are quite dormant give them a thorough cleansing with an insecticide, wash the woodwork and glass, and whitewash the brickwork, so that all will be clean and in readiness for starting-time in spring.


Propagation.—The Apricot is propagated by seeds, by budding, and occasionally by grafting.

The mode by seeds is adopted with the view of obtaining new varieties; there are, however, some sorts which reproduce themselves with considerable exactitude from the stone, and are accordingly propagated in that way. Moor Park is one of these; and although the original variety should not be lost sight of, it is certain that very good seedlings might be raised from it in abundance. This variety and several others are frequently raised from seeds by the French. They select the stones from the finest ripe fruit, and stratify them till autumn. They are then planted in rich soil, covered 2 inches deep, and in case of severe frost a covering of leaves or of litter is afforded. The seedlings may be transplanted in the following autumn, and in doing so the tap-root should be shortened.

Budding is the general mode of propagating the Apricot, the Mussel and common Plums being the stocks employed. In France it is budded upon the Damas Noir, Cerisette, and Saint-Julien; and it may be well to observe that these stocks are raised from the stones of these varieties, and not from suckers or layers, because the latter are comparatively weak, apt to cause gumming, and prone to throw up suckers. The Brussels and the Brompton stocks have also been employed, but the latter ought not to be used as a stock; on the Brussels stock, however, Apricots may be budded for standards to cover the upper parts of high walls, as its shoots are tall and vigorous, and soon form the required height of stem. The Apricot may be budded as early as the middle of June, but later than this is preferable, so long as the buds run freely, that is, whilst the bark with the bud can be easily detached from the alburnum. In selecting the buds care should be taken not to choose blossombuds instead of wood-buds.

Grafting is seldom resorted to, except in certain cases, as where buds of any particular variety have failed. Success greatly depends on the proper selection of scions. These should consist of portions of the base of shoots having the buds very close to each other; or the lower portion of the scion may consist of two-year-old wood, which should, however, be well thinned away in preparing the scion for whip-grafting, which in this, as in most cases, is the preferable mode. As active vegetation commences very early in the Apricot the scions should be cut off early in January, and laid in to half their length in moist sandy soil, or in sand kept moderately moist, but not saturated; and they should be grafted as soon as the sap becomes active in the stocks. The grafts ought to be immediately afterwards earthed up as high as the top of the clay.

List of Varieties.

Breda.—Fruit small, roundish, or somewhat obtusely four-sided at the base, the summit slightly depressed; skin brownish-orange; flesh orange, parting freely from the stone, juicy and rich. Ripe about the beginning of August on a wall; its season is considerably prolonged on standards.

Early Moor Park.—Fruit round, inclined to oval, sutured on one side only; skin yellow, blotched with crimson on the sunny side; flesh reddish-orange, juicy, and of luscious flavour, separating from the stone. Early August, or three weeks in advance of Moor Park.

Frogmore Early (fig. 1904).—Fruit small, roundish, sometimes oblate, and sutured; skin pale-yellow when shaded, deep-yellow when exposed to the sun, mottled with red; flesh orange, tender, juicy, richly flavoured. A free-stone variety, and worthy of extended cultivation for early supply. Tree hardy and a good cropper. Was raised in the Royal Gardens, Frogmore.

Henskirk (fig. 1905).—Fruit as large as in Moor Park, roundish, with the sides flattened and sutured; skin yellow, darker on the exposed side; flesh deep-yellow, tender, juicy, and equal to Moor Park in flavour. Late July. Tree hardier than Moor Park, a good grower, and a heavy cropper.

Kaisha.—Fruit medium, roundish, ovate, slightly depressed on the summit; skin slightly downy, pale-citron coloured, orange tinged and marbled with red next the sun; flesh citron coloured, somewhat transparent, parting freely from the stone, tender, juicy, sugary, and delicious. Ripens early. From Aleppo, where it is stated there exist thirteen varieties with sweet kernels.

Large Early (fig. 1906).—Fruit large, somewhat oblong, flattened on the sides; skin pale-orange, bright with reddish russet spots next the sun; flesh orange, juicy, and rich. Valuable on account of its earliness.

Large Red.—A variety of the Peach Apricot, resembling Large Early in shape and size, but having a much deeper coloured skin, which is most handsome when the fruits
Fig. 1004.—Apricot. Frogmore Early.

Fig. 1005.—Apricot. Hemskerk.

Fig. 1006.—Apricot. Large Early.
THE GARDENER’S ASSISTANT.

have had full exposure; flesh free, juicy, and rich. Tree
hardy and a good cropper. Late August to early Sep-
tember.

Moor Park (fig. 1007).—Fruit large, roundish, com-
pressed, flattened on the summit; skin brownish-orange
with brownish-red specks; flesh dull-orange, juicy, pecu-
liarily rich and excellent. Is not liable to become mealy;
but in some unfavourable seasons and situations it oc-
casionally does not ripen thoroughly on the side next the
wall, and in wet seasons it sometimes cracks. Extensively
cultivated, and deservedly so. It is said to have been
imported from the Continent by Lord Anson, and planted
at Moor Park, near Rickmansworth.

Much.—Much.—Fruit small, roundish, 1½ inch in
diameter; skin slightly downy, lemon-yellow, deep-orange
tinged with red next the sun; flesh somewhat transparent,
parting from the stone, tender, and rich. Bears abun-
dantly; fruit excellent for preserving. Said to be culti-
vated in Egypt.

New Large Early.—In appearance this resembles Large
Early, but is richer in flavour, and ripens a fortnight ear-
lier. The mentioning of these two important facts will
alone suffice to commend this variety to the notice of
cultivators, and a place for one or more trees should be
found in every garden where the Apricot will succeed.

Oullin’s Early.—A variety of the Peach Apricot, equal
to it in size, surpassing it in flavour; ripens the begin-
ing of August. The tree is a first-rate grower and a free
bearer; the bark is conspicuously shining. Should be
planted on a southern aspect to supply very early fruits.

Peach.—Fruit large after the style of Large Early, oval
and flattened, sutured; skin yellow, darker where exposed;

flesh deep-yellow, juicy, and very richly flavoured, parting
freely from the stone. Early September.

Powell’s Late.—Resembles Moor Park, and is quite as
free a cropper, but is of harder constitution. Fruits
medium, richly coloured; flesh juicy, and highly flavoured.
A comparatively new kind and a great acquisition, the
fruit not ripening until the middle of September.

Royal.—Fruit above the middle size, oval, compressed;
skin pale-orange, dotted with red next the sun; flesh pale-
yellow, parting readily from the stone, soft, and soon be-
coming mealy, especially if not gathered a little before it
is fully ripe. Tree vigorous and a great bearer.

Shiplay’s (Blenheim).—Fruit large, oval; skin yellow;
flsh juicy, not so rich as Moor Park. A good sort for culi-
inary purposes. Ripe mid-August. Allied to Large
Early.

St. Ambrose.—A large-fruited early variety, the fruit
being fit for use by the middle of August. It has a juicy
rich flesh, and is of similar flavour to Moor Park. Tree
hardy, and a great bearer.

Turkey.—Fruit large, spherical, deep-yellow, with a
number of brownish-orange spots and blotches on the ex-
posed side; flesh pale-yellow, firm, juicy, sweet, with a
little acid, very rich and excellent, stone separating freely.
Ripens on a south wall about mid-August.

Selection of sorts suitable for growing under glass.—
Frommore Early, Hemskerk, Large Early, Moor Park,
Oullin’s Early, Shiplay, Powell’s Late.

[ A. W. ]

CHAPTER IX.

THE CHERRY.

Origin.—Classification.—Cultivation.—Soil and Situation.—Planting.—Pruning and Training.—Protection.—Propagation.—Budding and Grafting.—Under Glass.—Diseases and Insects.—List of Varieties.

The cultivated varieties of Cherries have been derived from two species of Prunus which grow wild in Britain, namely, P. Cerasus, the wild Cherry, and P. Avium, the Gean.

The former is the origin of the Morello, Duke, and Kentish Cherries, and the latter of the Gean, Heart, and Bigarreau varieties. The
cultivation of the Cherry in this country is said to have been started in the time of Henry VIII., when several varieties were introduced from Italy into Kent. There are now more than one hundred named varieties grown in England alone; some of the best of these were raised by Mr. Rivers of Sawbridgeworth. The Cherry Orchards of Kent have long been famous for the quantity and quality of the fruit produced in them. In some parts of Germany, Belgium, and Italy they are not uncommon as roadside trees, where they afford shade and yield copious crops of fruit.

The fruit of the Cherry is ripe earlier than any other hardy fruit. The sweet kinds are highly valued for dessert, their bright colour and glossy skin being very ornamental. The acid or sub-acid varieties are much used for pies, tarts, and in confectionery. The Morello is excellent for bottling, or preserving in brandy; and from a small black variety, largely grown in the district of the Upper Rhine, the Germans make the well-known kirschvasser. Griotte de Ratafia, a small sort of Morello, is employed for making the cordial ratafia; and a small, black, wild Cherry is used in the distillation of the Italian liqueur maraschino. It may, however, be well to remark that in the manufacture of the above liquors the stones and kernels are pounded and distilled, or fermented with the pulp; and, as the kernels contain more or less of the prussic acid principle—that is to say, prussic acid, although in a diluted form—due caution should be exercised in their use. The Kentish, Flemish, and Montmorency varieties have the stalk so firmly attached to the stone that the latter may be drawn out by it, so that the fruit may then be dried like raisins, in the sun, or in an oven.

The varieties of the Cherry are divided by the French into three groups, namely, Merisiers and Guigniers; Bigarreauxeurs; Cerisiers and Griottiers.

Merisiers are the wild Cherries of the woods; the tree is tall and pyramidal, the branches horizontal, the fruit red, black, or white, with some degree of bitterness. Guigniers are considered to be improved varieties of these, the fruit being larger, heart-shaped, with a soft, very sweet flesh.

Bigarreauxeurs do not naturally assume a pyramidal form, and the extremities of the shoots are rather inclined to become pendulous, whilst the fruit differs from that of the Guignier in the flesh being crisp and firm. This division includes the Bigarreau, and many of the Heart Cherries.

Cerisiers are not so strong-growing as the preceding, and the fruit is more or less acid, the pulp being tender and juicy. Griottiers are scarcely distinguishable from them, except by a bitterness which is combined with the acidity of the fruit. The May Duke, Kentish, and Flemish Cherries belong to the Cerisiers; the Morello to the Griottiers.

Another and perhaps simpler classification of Cherries was proposed in the *Horticultural Transactions*, 2nd series, vol. i., p. 251, and is as follows:

The first class consists of Cherries of which the Bigarreau and Black Heart may be instanced as typical of the better kinds. The leaves are generally large, pendent, coarsely serrated, undulated, the veins prominent beneath, of thinner texture and of a more yellowish green than those of the second class; buds pointed; flowers large, produced on wood not less than two years old; petals loosely set, not forming a well-expanded cup-shaped flower, like those of the May Duke, Kentish, &c.; stamens slender, and irregular in length, some being longer and others shorter than the style.

The second class is composed of aqueous Cherries, such as the May Duke, Kentish, and Morello. The leaves are generally smaller than those of the first class, and are not toothed or undulated; the veins are less prominent, whilst the texture is thicker. The petioles are thicker, and keep the leaves from hanging loosely and pendent. The flowers expand widely, and the petals form a regular cup-shaped flower, with strong stamens, generally shorter than the style.

The subdivisions of the first class are taken from the form and colour of the fruit, and require no further explanation.

In the second class, as all the varieties are coloured nearly alike, no white, nor white and red fruit having yet been met with among them, the form of the fruit, the sweetness or acidity of its flesh, and the colour of the juice constitute the distinctions of the sections.

Class I.—Geaux.—Leaves Undulated.

Division 1.—Fruit Heart-shaped or oval.
A. Colour uniform, dark-red or black.
B. Colour pale-yellow and red.
C. Colour uniform, pale-yellow.

Division 2.—Fruit round or oblate.
A. Colour uniform, dark-red or black.
B. Colour pale-yellow and red.
C. Colour uniform, pale-yellow.
CLASS II.—Griottes.—Leaves not Undulated.
Division 1.—Fruit roundish heart-shaped.
A. Flesh sweet.
   a. Juice pale.
   b. Juice purple.
B. Flesh acid.
   a. Juice pale.
   b. Juice purple.

Division 2.—Fruit round or oblate.
A. Flesh sweet.
   a. Juice pale.
   b. Juice purple.
B. Flesh acid.
   a. Juice pale.
   b. Juice purple.

Dr. Hogg in his Fruit Manual divides the above two classes into Geans and Griottes respectively, a very simple classification that finds favour with most fruit-growers.

THE CULTIVATION OF CHERRIES.

Soil and Situation.—The best soil for the Cherry is a moderately rich, free, rather sandy loam, with a well-drained subsoil. Stiff moist soils are unsuitable; and so on the other hand are dry gravelly subsoils. The trees require a large amount of moisture, particularly the sorts with large leaves, such as the Bigarreau and Heart Cherries. In free soils the roots can more easily travel after moisture; but in clayey or stiff loamy soils, when this is exhausted, they are fixed, as it were, in a compact, hard-baked mass, from which they can draw no moisture. In dry loose soil, on the contrary, there is considerable circulation of air, which, being charged with moisture at night, will afford a supply of that necessary element to the roots, not in abundance, it is true, but to a beneficial extent.

A southern exposure is the best for the Cherry; but the Morello and Kentish varieties will bear fruit useful for kitchen purposes on a wall with a north aspect. An east wall can also be utilized for the production of a good succession of sweet Cherries.

Planting.—The soil must be well prepared and in good condition, but not freshly manured. It should be trenched 2 or 3 feet deep, and if there is a stratum of light sandy loam below the surface soil, the latter ought to be placed in the bottom of the trench, and the loam brought to the top. The holes for the plants must be made large, and dug out nearly to the turned-down surface soil; the tree should be planted not amongst heavy clayey loam, but in tolerably rich free soil, and if the latter is mixed with turfy loam so much the better. The method of planting the tree is the same as for the Apple, Pear, and Plum.

The distance should vary according to the size which the variety usually attains, and according to the breadth of its foliage, for if it have large leaves, it will evaporate much, and will require a larger space for its roots to travel in quest of moisture, to make good that evaporation which in dry weather will be more than the amount of rain which falls upon the surface overlung by the branches. As standards the Bigarreau tribe may be planted 30 feet apart, or even more in rich soil; the May Duke, Morello, and similar varieties at 20 and 25 feet apart. Bushes and pyramids of the vigorous Bigarreau varieties should be 12 feet apart; the Duke family 9 feet apart. Single cordons may be 18 inches apart, and the two-branched vertical trained trees 30 inches to 3 feet apart. Against walls and
espaliers from 20 to 24 feet should be allowed for the Biggerarreau, Elton, and Florence Cherries, and from 15 to 20 feet for the May Duke and Morello. Riders or tall trained standards may be disposed between the dwarf trained trees with a view to utilizing all the wall space till the dwarf trees want the room, when they may either be gradually cut out or transplanted to another position.

**Pruning and Training.** — The Cherry, as a standard, requires but little pruning after the stem has been reared and the six principal branches of the head formed. The stem ought to be grown so as to ensure its tapering; and on this account it is necessary that it should not be stripped of shoots and foliage. The temporary side-shoots left should not, however, be allowed to retain too great a length; they ought not to be permitted to compete with the leader, but must be checked when likely to do so. Further, these shoots should not be more than two years old when they are cut close to the stem, in order that the wounds may heal the more readily, and with less risk of gumming. As the leaves on the shoots of a young tree are usually large, a few shoots will deposit a considerable quantity of alburnum on the stem below them; consequently, in proportion to that amount, the stem will be thickened more beneath such shoots than above them. Hence the requisite taper form will soon be obtained, and the side-shoots dispensed with when one, or at most two years old.

The head should be formed as directed for the Apple and Pear, with this exception, that the first three shoots of the Biggerarreau kinds may be shortened to 15 inches; two shoots from each should be encouraged, one situated at the end, the other 3 inches nearer the stem, so that there may be room for the branches to increase in thickness without pressing against each other, as this gives rise to gumming, as is also sometimes the case when two large limbs originate from two adjoining buds. After the principal branches of the head have been started, very little pruning will be required. It will be well, however, to see that the principal branches are maintained of as nearly equal strength as possible for a few years, and then the tree may be allowed to take its natural development, with the exception of cutting out shoots that would otherwise form cross branches.

The Morello succeeds well as a low standard, and all the Duke family, together with the sturdy-growing Early Rivers, Elton, and Governor Wood, may be grown either pyramidal, bush, or cordon form. In either case they can be framed out from maidsens, much as advised for Apples and Pears thus trained. Birds are the greatest hindrances to success with these forms of trees, but if grouped they might be permanently protected with galvanized wire-netting, cordons often being employed for clothing the support of wire-netting-covered structures, principally devoted to Gooseberry culture.

In training against espaliers the branches should be 1 foot apart, and, like those of the Plum, they ought to spring from the stem.

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**Fig. 109.**—Cherry, Half Standard (Morello).
with an upward course, and afterwards trained horizontally. In summer pruning, whilst the tree is young, and requires foliage to assist in making roots, the summer shoots may be allowed to grow to 1 foot or 15 inches in length, and then be shortened to 3 inches. But the shoots on the upper branches must be shortened at least a week before those on the lower ones. The leading shoots, those at the extremities of the horizontals, need not be shortened. After the tree has been planted a few years clusters of fruit-buds will generally form round the bases of the shoots, and likewise on spurs along the branches. With regard to the winter pruning, very little will be required, presuming that the summer pruning has been well performed. The stubs left in shortening back the summer laterals should be cut back to a length of 2 or 3 inches, or to the first wood-bud beyond the fruit-buds above alluded to as likely to form at the bases of the shoots.

In training the Cherry against walls, the horizontal mode may be adopted for those that are under 7 feet high, but those above that height will be sooner covered by the fan method. Whatever mode be adopted, care should be taken that the lower branches are vigorous. It is difficult to render a branch vigorous if it has originated in a weak shoot. A weakly stem cannot produce a strong shoot; therefore the young tree must be well established, and in a vigorous state, before shoots to commence the lower branches are started.

The directions given for espalier training will apply to horizontal training against a wall, only the summer shoots ought to be shortened more, in order that the fruit may be produced near the wall.

The distance between the branches may be 9 inches for Duke Cherries, and 1 foot for the Bigarreau kinds, their leaves being not only much larger than those of the Duke, but also more pendulous.

The Morello Cherry requires different pruning and training from other kinds, owing to its mode of growth and bearing. Its shoots are slender, and it fruits on those of the previous summer's growth; sometimes all the buds along the shoot are blossom-buds, the terminal bud only being a wood-bud; therefore at the winter pruning such shoots ought not to be shortened. Further, as the fruit is borne chiefly on the young wood, a succession of such must be kept up. There ought, of course, to be a certain quantity of old wood to bear the young, in
fact the shoots should be treated somewhat like those of the Peach; they must be trained in summer to bear fruit in the following season, after which they should be cut away, but whilst bearing fruit, a young shoot ought to be trained to replace them. It is frequently the case that branches and shoots of Morello trees are overcrowded, but this should be avoided, otherwise large and fine fruit cannot be obtained.

Manures.—Cherry trees arrived at a large, heavy-cropping stage soon exhaust the soil of much of its fertility, in particular the supplies of lime, potash, and phosphoric acid. These elements must annually be returned to the soil, otherwise the trees will not remain in a profitable condition. Farmyard and horse-stall manure freely applied is apt to promote a too rank growth, but may safely be applied in the form of a top-dressing during the winter—not digging it in for fear of injury to the roots—when the trees show signs of requiring nitrogen as well as the other elements named. Artificial manures, as a rule, are most easily applied. A mixture that answers well for Cherry-trees is as follows:—Superphosphate of lime, 5 lbs.; sulphate of potash, 2 lbs.; sulphate of magnesia, \( \frac{1}{2} \) lb.; chloride of soda, \( \frac{1}{2} \) lb.

Apply this during mild weather in February at the rate of 4 ozs. to the square yard of border, or the full quantity (8 lbs.) to each rod of orchard ground.

Protection.—Birds, and particularly the blackbird and thrush, are the greatest enemies to the Cherry crop, and the only effectual means of protecting the fruit is by enclosing them in netting. This should be put over the trees so as not to confine the foliage. Although in the case of wall-trees it is necessary that the net should be well closed, so as to prevent ingress at top, bottom, and sides, yet when in doing so the leaves are crowded against each other, the appearance and the effects are bad. The net should hang clear of the leaves; and this may be easily done by running a wire through hooks below the coping, and having another supported about 9 inches from the wall. If the netting be fixed to the former, and drawn over the latter, the object will be so far attained. The netting will hang tolerably clear of the foliage, but it has yet to be fastened at bottom, and this should be done so that it may be readily loosened at any time when fruit requires to be gathered. Small stakes may be driven in to a uniform height, a stout wire fastened along their tops, and to this the net can be easily hooked. When nets touch the ground they are liable to be damaged by rain and damp; it would therefore be better to fix wire-netting to the stakes close to the ground.

For espalier trees wire-netting, if only 1 foot in width, should also be used next the soil, and joined to such other kind of netting as can be afforded for protecting the rest of the tree. If wire-netting be run along to the height of 1 foot, and so that its lower edge may touch the ground, a light netting, such as that made at Nottingham, may be thrown over the tree, and attached to the wire on both sides; for the material alluded to is so light that it will not press so as to crowd the foliage.

By adopting some efficient means of protection, good crops of the sweet kinds of Cherries may be obtained from walls; and this is more than can be said of standard trees, for from these it is scarcely possible to obtain a crop of perfectly ripened fruit on account of the birds. If a supply can be obtained from espaliers, it is certainly better to grow the trees against these, and thus render the space they would otherwise have occupied on walls available for other fruits.

Propagation.—For stocks and for obtaining new varieties the Cherry is raised from the stones. Those of the small black or red Cherries are the kinds usually sown for stocks. For trees intended to be planted against a wall or espalier, stocks raised from the stones of the Duke, or Morello, have been recommended. For very dwarf trees the Mahaleb has long been employed in France, and to some extent in this country, as a stock on which to graft or bud May Duke, Kentish, Morello, and such like sorts, but it is not adapted for large-leaved strong-growing varieties like the Bigarreau. The stones may be stratified till early in spring, when those beginning to germinate should be planted in drills, and covered to the depth of 1½ inch; or they may be sown at that depth in light sandy soil immediately after they have been taken from the fruit. In two years the seedlings intended for stocks will be fit to plant out in nursery rows.

Budding and Grafting.—Propagation by these means is the same as for the Plum. The operation must be performed early, and if properly done, there is little danger of failure. If left until the buds have considerably advanced, the grafts frequently do not resist the effects of dry weather. We have seen vigorous shoots with large pith cut off for scions and stuck in the ground in January; and though in March, when grafted, the pith was discoloured, being of a
dark instead of a light colour, yet the grafts all succeeded, whilst scions cut off and grafted fresh failed to a considerable extent, although treated with the same care in every other respect. Sometimes, in old trees of the May Duke class, every bud on the scions is a blossom-bud, with the exception of the terminal one; this should therefore be preserved, otherwise failure is certain.

Cherries under Glass.

The following directions for the cultivation of Cherries under glass are taken, with the author’s permission, from a paper by Mr. H. Somers Rivers, published in the Journal of the Royal Horticultural Society, vol. xxv. (1900):—

The most convenient house for Cherries is a span roof 24 feet wide, 4½ feet high at the eaves, and 12 feet to the ridge. Ventilators 18 inches wide, hinged at the bottom, run round the sides; the top ventilators are 3 feet wide by 15 inches, 7½ feet apart, on alternate sides of the ridge. We used to fruit our Cherries in a smaller house, 14 feet wide and 9 feet to the ridge. This scarcely allowed sufficient head room for the large trees, many of them fifteen years old. Certainly they seem grateful for the increased breathing-space.

As soon as their crops are finished, the trees are taken out of the house and plunged nearly up to the pot-rims in a border outside. The reason for plunging is two-fold: first, the earth which envelops them keeps the pots and their contents moist and renders the labour of watering less heavy; and secondly, the somewhat top-heavy trees are thus in no danger of being blown over. Water must be given to the trees during dry weather, and occasional good syringing helps to keep them clean and healthy. In October the trees should again be brought into the orchard-house for repotting, before which process they must be under cover for a time, so that the earth in the pots shall not be sodden. This also applies to the mixture to be used for repotting: a good loam with which is mixed rotten manure in the proportion of one load to two, and also broken-up mortar-rubble, a barrow-load to a load.

In repotting, the outer soil, filled with fibrous rootlets, is scraped away, leaving a ball of earth containing the larger roots; the tree is replaced in the pot, and the new soil rammed in firmly and evenly nearly up to the rim. The surface is at the same level round the trunk as before. Thorough repotting need only be done in alternate years. In intermediate years the outer soil can be removed nearly down to the bottom of the pot and replaced by fresh without taking out the tree. A good drainage, very necessary with Cherries, is provided for by a layer of corks at the bottom of the pot. In repotting the tree must not be moved into too large a pot: an 11-inch pot is ample for a three-year-old tree, which may be given one size larger at each repotting if necessary; an 18-inch pot will contain the largest tree.

When this operation is finished the trees are stood as close together as possible, in single rows in the house, in one end of which is heaped sufficient barley-straw to pack round and over the pots, making a layer of about a foot deep, when there is severe frost, and the trees are snug for the winter. Water must be given until the leaves are all fallen; from about the middle of November to the end of December the trees will require none at all. If January be mild they should have some water again, and from then onwards occasionally when necessary.

Towards the end of February the trees must be pruned — an operation rendered quite unnecessary in some cases, where the older trees in full bearing make no new shoots. The last year’s growths must be cut back to about five eyes; with very strong shoots, or in the case of strong growers, eight to ten eyes may be left. Water will now be wanted about once a week. The pruning finished, the house should be set out, i.e. the trees placed in their permanent positions for the summer; and this should be done symmetrically and carefully, as it makes all the difference in the appearance of the house. A centre border 5½ feet wide takes two rows of trees, a path 3 feet wide runs round it, leaving side borders 5½ feet wide. The floor of the house is firm and solid, never being stirred, and the path is rammed gravel and clay. A thin layer of fine cinders over the surface of the borders gives them a neat appearance and is kept raked and clean. The pots may be plunged in the borders up to about 3 inches of their rims, a bed of large cinders being placed in the bottom of each hole to allow the water to drain efficiently. The trees should be grouped with regard to the colour of their fruit. A good smoking with tobacco paper now will lessen the number of aphides hereafter, the trees being syringed thoroughly the next morning.

About the middle of March the trees are
THE CHERRY.

a mass of white blossom, and are wonderfully beautiful: this gives place to dinginess for a time when the flowers fade. The calyx remains round the swelling fruit for a long time and must be removed, as also the scales at the base of the fruit-stalks, which, although they fall off eventually, persist until the fruit is nearly developed, if suffered to do so, and harbour insects, &c. The thinning of the fruits should be done when stoning is finished, and all those fruits which are not going to swell can be detected. Ample room must be allowed to each berry, so that the fruits shall not be overcrowded when ripe. The bunches will have ultimately from six to sixteen or twenty fruits.

During flowering all the ventilation possible must be given, except when there are cutting winds; a single hot-water pipe running round the house will keep out the frost if necessary. Water will not be required in large quantity, sufficient being given to prevent the earth from becoming over-dry. When the foliage is coming out, and from then onward, water must be given more frequently according to the weather. The amount of water the individual trees require may be easily ascertained by tapping the pot, which will give quite a bell-like note if the earth be dry. When watering, the borders and paths should be thoroughly dampened down to ensure moisture in the air. The trees must be syringed morning and evening until the fruit begins to colour, after which it should be discontinued, or the fruit will crack.

Liquid manure or soot water should be given twice a week after stoning; and as there is so little earth in the pot compared to the crop it ripens, additional food must be given in the shape of a top-dressing of equal parts of kiln-dust and horse-droppings mixed, making a layer of about 2 inches thick near the rim of the pot, sloping down to the stem so as to form a basin to hold the water. Two top-dressings will be necessary: the first when the fruits are stoning, the second when they are colouring, by which time the goodness of the first application will be exhausted. When the young shoots have made a dozen or so good leaves they should be pinched back to eight or ten. One pinching alone is necessary, subsequent growths being left alone.

The worst insect enemy to contend with is the black fly, but it may be kept down by watchfulness. The first smoking, with tobacco paper, referred to above, will do much; subsequently the trees may be smoked at any period with the patent vaporizing compounds now sold. X L ALL may be used with perfect safety, even during flowering. For Cherries the glass should be shaded by syringing with whitewash when the fruit is ripe. The direct rays of the sun are too scorching if the summer be hot.

There are many good Cherries well adapted to pot work when budded on the Mahaleb. Though it is a mistake to have too many varieties, several are needed to cover all the season.

In mid-June Belle d’Orléans and Guignes Annonay are ripe, the former light-red, the latter black, both excellent Cherries and good croppers, though the fruit is somewhat small, and that of the latter soon becomes dull after ripening. Werder’s Early Black ripens next; the fruit of this sort also soon loses its lustre, and it is scarcely worth growing, since Early Rivers ripens almost at the same time. Early Rivers is an ideal pot Cherry, bearing its large black fruits abundantly; they are of excellent flavour, and hang on the tree a month after ripening, perfectly sound and bright to the last. Black Circassian, Bigarreau de Schreken, and Bedford Prolific, three good black Cherries, follow.

In July we have Bigarreau Noir de Gubel; Governor Wood, an excellent pale-red Cherry, which is, however, very liable to crack if water touches the ripening fruit; Belle de Choisy, a fine Duke; Foggmore Bigarreau, red; May Duke; Elton, a handsome bright-red Bigarreau; White Bigarreau, with waxen-yellow fruit, slightly tinged with red next the sun; Turkey Black Heart, a fine pot Cherry with firm, juicy fruit; Reine Hortense, a large Duke; Monstreuse de Mezel, a very large dark-red Bigarreau; Bigarreau Napoléon, deep-red; Black Hawk and Emperor Francis, a very large bright-red Bigarreau.

In August ripen Late Duke; Large Black Bigarreau; Guignes de Winkler, bright-red; Late Black Bigarreau; and last, but not by any means least, Géant d’Hédelfinger, a brownish-black Cherry of immense size with very firm flesh.

Diseases and Insects.—The Cherry suffers little from either of these when planted in a suitable soil and situation, and in other respects properly managed. The disease of most frequent occurrence is that known as gumming, and this is rarely injurious, except in cases where it prevails to a very great extent. It is caused
by an exudation of the sap from a rent in the bark arising from accidental wounds, unskilful pruning, or from the breakage of a branch. It sometimes occurs in consequence of too many branches being made to originate very closely together on the stem, and not unfrequently results from the tree having been worked on an unsuitable stock, or planted in too rich soil. In the latter case the obvious remedy is to take up the tree and replant it in a poorer soil; but if this cannot be done, root pruning, which by limiting the supply of nourishment obtained by the roots will diminish the flow of sap, may be advantageously adopted with the view of checking the disease; but above all, vicissitudes of dryness and moisture at the roots should be prevented.

"A leaf disease of Cherries has lately been reported from several orchards in the county of Kent. In the early summer it affects the leaves and fruit simultaneously, rendering the latter unfit for market. In autumn and winter its presence is easily detected. The diseased leaves remain attached to the branches as if the tree had been killed in the full vigour of growth, just as the withered leaves remain on a branch that has been severed from the stem. The fall of the leaf in autumn is a normal process carried out by the living leaf, which forms at the point of its attachment to the branch a cicatrix that secures when completed the easy severance of the leaf from the branch, leaving a clear scar. The speedy and fatal injury to the leaf caused by the fungus prevents the formation of this cicatrix, and the leaf remains attached to the tree, showing in black spots the fruits of the fungus.

"A further striking characteristic of this disease is the shortening of the branches which bear the diseased leaves. The internodes or joints between the leaves of these branches have not been developed. The year’s growth, which should have extended to a considerable length, measures less than an inch. The crowded leaf bases have each a healthy bud in the axil. The dwarfing of the branch is not due to any attack from a fungus, for no fungus is present in the tissues. The dwarfing is entirely due to the want of food, consequent on the early death of the leaf. That this is the case is confirmed by the fact that some of the dwarfed branches have produced in the following year vigorous normal shoots.

"The disease has been spreading rapidly in Kent during the last few years. The varieties of Cherry-trees that have been reported as specially liable are Waterloo, Bigarreau, Frogmore, Napoléon, Black Hearts, Clusters, and Eltons. Turks and Governor Woods have not as yet suffered much, and English and Flemish Reds and May Dukes have not been attacked, though odd trees of other varieties, such as Bigarreau, growing among them have been diseased. In one orchard the disease attacked Waterloo first, soon spreading to other kinds, while at another place this variety had not been affected until last year, and then only the leaves had suffered, the fruit had not been damaged.

"Professor Frank, of Berlin, has described a serious injury to Cherry-trees which, there is little doubt, is the same as the disease that has attacked the Cherry orchards in Kent. The malady was first observed in the Cherry orchards of the Altenland on the lower Elbe in Germany about the year 1880. The diseased leaves remain on the tree all winter, and are intermixed with the new foliage of the following season. In spring he found on the dead leaves a fungus fruit that had not been present on them in autumn, a perithecia round at the base, about one-twelfth of an inch in diameter, tapering up into a pointed beck that projects from the under surface of the leaf. These perithecia contain the spores that re-infect the young leaves and fruit. The fungus had already been described by Auerswald under the name of Gnomonia erythrostroma. Frank traces the rapid spread of the disease in the Altenland to the overcrowding of fruit-trees and to the presence of open ditches in the neighbourhood of the orchards causing too much moisture, and so presenting conditions favouring the growth of parasitic fungi. While such adverse conditions should be remedied, he recommends, as the only method of stamping out the disease, the gathering and burning of all diseased leaves, which, he considers, need not be attended with more difficulty than the yearly harvesting of the fruit. It is very important that Cherry growers should at once be made acquainted with the cause of the injury to the orchards and the remedy recommended by Frank, which is the destruction of the dead leaves. To be efficient this collecting and burning of the dead leaves must not be done in a solitary orchard here and there, but must be carried out throughout Kent."—(Carruthers in the Report of the Royal Agricultural Society, 1900.)

Insects, &c.—See chapter on this subject. Bark Enemies—Weberian Tortrix. Fruit and Seed Enemies—Birds. Leaf Enemies—Cherry
CHERRIES

The cultivated varieties of Cherries have been derived from two species of Prunus which grow wild in Britain, namely, *P. Cerasus*, the wild Cherry, and *P. Avium*, the Gean. The former is the origin of the Morello, Duke, and Kentish Cherries, and the latter of the Geans, Hearts, and Bigarreau varieties. The cultivation of the Cherry in this country is said to have been started in the time of Henry VIII, when several varieties were introduced from Italy into Kent. There are now more than one hundred named varieties grown in England alone; some of the best of these were raised by Mr. Rivers of Sawbridgeworth. The Cherry Orchards of Kent have long been famous for the quantity and quality of the fruit produced in them. In some parts of Germany, Belgium, and Italy, Cherries are not uncommon as roadside trees, where they afford shade and yield copious crops of fruit.
CHERRIES—
1, EARLY RIVERS. 2, EMPEROR FRANCIS. 3, WHITE BIGARREAU.
(Reduced)
THE CHERRY.


LIST OF VARIETIES.

GEANS.

**Belle d'Orleans.**—Tree strong grower, but tender; free-bearing. Fruit medium to large, roundish, somewhat heart-shaped, yellowish-white, pale-red on sunny side; flesh juicy and rich in flavour. Ripens middle of June. Excellent for forcing in a cool house, south wall, also garden and orchard in warm positions.

**Bigarreau.**—Fruit large, roundish heart-shaped, slightly flattened on the side and at the apex, white on the shaded side, bright-red mottled with amber next the sun; flesh firm, nearly white, sweet, and rich. Tree vigorous, an abundant bearer, succeeds well as a standard in the south of England; requires a wall in the northern parts of the kingdom. It ripens in late-July to mid-August, according to the season and situation.

**Bigarreau Napoleon.**—Reminisces Bigarreau, the fruit being about the same size, the flesh equally firm, and the flavour similar; but it is rather longer in shape, darker in colour, and ripens later. A most abundant bearer, and is well deserving of cultivation either as a standard or upon a wall.

**Black Eagle.**—Tree forms a roundish spreading head. Fruit roundish heart-shaped, black when well exposed and fully ripe; flesh tender, with a rich, dark-purple juice. Ripens soon after the May Duke. Deserves cultivation as an orchard tree. Was raised at Downton Castle, about 1806, by Miss Elizabeth Knight, from Bigarreau, fertilized with pollen of May Duke.

**Black Heart.**—Branches spreading. Fruit tolerably large, blunt, heart-shaped, somewhat compressed, nearly black; flesh deep-claret, tender, tolerably juicy and rich. Stone large, roundish ovate.

**Black Tartarian.**—Tree upright, vigorous grower, spreading with age, rather tender, an abundant bearer. Fruit very large, blackish-brown, black when full ripe; flesh rather tender than firm, juicy and richly flavoured, keeping well. Ripens early in July. One of the best for forcing, good for walls and in warm positions; succeeds well in an orchard.

**Bohemian Black Bigarreau.**—Tree strong-growing, branching freely. Fruit extra large, roundish, shining black; flesh firm but not cracking, juicy, rich, and pleasant. Ripens end of June. Good for cool house and walls.

**Butterworth's Black Heart.**—A good bearer, scarcely distinguishable from Black Heart. It has, however, a more vigorous constitution, and does better in orchards.

**Downton.**—Fruit scarcely so large as that of Elton, and less pointed, being of a roundish heart shape, pale-yellow, mottled with red next the sun; flesh yellowish-white, tender, juicy, and very rich. Ripens soon after May Duke, and before Elton. Deserves a wall; bears abundantly as a standard. Raised by Mr. Knight from a seed of either Waterloo or Elton.

**Early Jaboulay (Early Lyons).**—Tree a strong grower and spreading in habit, but tender, bearing abundantly. Fruit large, obtuse, heart-shaped, light-red; flesh juicy, coloured, rich, and delicious. Ripens end of June. Good for forcing, cool house and wall.

**Early Purple Guigny.**—Flowers early. Fruit above the middle size, heart-shaped, shining dark-purple; flesh purplish, juicy, tender, and rich. Is of moderately strong growth, and a medium bearer, its principal merit being its earliness. It ripens, in the south of England, on an east or west wall, in early June, or about a fortnight earlier than May Duke.

**Early Rivers.**—Tree vigorous, healthy, hardy, and an abundant bearer. Fruit large, heart-shaped, shining black, borne in clusters often ten or twelve, two to four being on one peduncle; flesh juicy, sweet, and richly flavoured. Ripens middle to end of June. A fine Cherry, good for forcing, walls, pyramids, or standards.

**Elton.**—This very excellent variety was raised by Mr. Knight, in 1896, probably from Bigarreau crossed with White Heart. Tree very strong and spreading. Fruit large, heart-shaped, pale waxy-yellow on the shaded side, mottled with red next the sun; flesh whitish, rather firm, sugary, and very rich. Ripens in the beginning, middle, or end of July, according to climate and situation. It is a good bearer, and highly deserving of cultivation either as a standard or upon a wall.

**Emperor Francis.**—Tree strong-growing, branching, and free-bearing. Fruit very large, bright-red, very handsome; flesh firm, juicy, rich, and delicious. Ripens middle of August, afterwards hanging well.

**Florence.**—Tree vigorous, resembling Bigarreau. Fruit very large, obtusely heart-shaped, pale-amber, mottled with red; flesh firm, juicy, rich, and sweet. Ripens so as to succeed Bigarreau, but requires a west or south-west wall, except in warm parts of the kingdom.

**Frogmore Early.**—Tree free-growing, healthy, and an abundant bearer. Fruit large, obtuse, heart-shaped, pale yellow, marbled with red; flesh very juicy, sweet, and rich. Ripens early in June. Good for wall and garden culture.

**Governor Wood.**—Tree attains a large size, and bears abundantly. Fruit large, yellow, washed and mottled with light-red; flesh more tender than firm, juicy, sweet, and rich. Ripens early in July. Excellent for forcing, walls, pyramids, or standards.

**Knight's Early Black.**—Fruit large, heart-shaped, shining black; flesh deep-purple, firm, juicy, and rich; differs from Black Tartarian in being more blunt at the apex, and it is also earlier. Has ripened on a south wall about the middle of July ten before May Duke. This excellent sort was raised by Mr. Knight, about the year 1810, from Bigarreau crossed with May Duke. The tree is similar in growth and foliage to Black Tartarian. It fruits freely either as a standard or against a wall.

**Ludwig's Bigarreau.**—Tree strong-growing and spreading; an abundant bearer. Fruit large, heart-shaped, handsome, shining bright-red; flesh tender, melting, sweet, and rich. Good for garden culture.

**Noble.**—Tree robust and hardy. Fruit resembling Black Tartarian, but larger and firmer when ripe. Of excellent quality. Ripe in July, keeping well into August. A comparatively new variety of great merit.

**Tudor's Black Heart.**—An old variety, said to have been raised by John Tudor, gardener to Charles I. It differs from Black Heart in having leaves not so deeply serrated. The fruit is about the same size, blackish with stripes of dark-red; flesh firm, with a similar flavour to that of Black Heart, and ripening about a week later. Rather a shy bearer.

**Waterloo.**—Tree of vigorous growth, bearing abundantly in most localities. Fruit large, obtuse heart-shaped, dark-purple and brownish-red, black when fully ripe; flesh rich and delicious. Ripens end of June. Good for gardens and orchards.
Tradescant's Florence. —Fruit large, obously
heart-shaped, black; flesh purplish, firm, juicy, and sweet.
A tolerably good bearer, and ripens before May Duke.

GRIOTTES.

Archduke.—Tree vigorous, pendulous, and free-bearing.
Fruit large, nearly an inch in diameter, inclining to heart-
shape, dark-red, becoming almost black if allowed to hang;
flesh very tender, rich, and briskly flavoured. Ripens
middle to end of July. Good for walls and as a low standard.

Bel de Choisy.—Tree vigorous, spreading. Fruit large,
roundish, oblate, red and amber; flesh amber, tender, very
rich and sweet. Ripens early in July. An excellent
Cherry as regards quality, but not a first-rate bearer. Is
said to have been found near Paris about 1760.

Bel de Magnifique.—Tree semi-erect, forming a good
pyramid, and very productive. Fruit very large, handsome,
clear bright-red; flesh tender, juicy, and sub-acid. Ripens
middle to end of August.

Buttner’s October Morello.—Fruit medium, roundish
or oblate, dark brown-red; flesh pale-red, tender, acid.
Ripens in October. Tree hardy, and a good bearer, and
is deserving of cultivation as the latest Cherry which
may be used for pies and for preserving.

Empress Eugenie.—Tree a moderately strong grower
and a very free bearer. Fruit large, roundish, bright-red,
purplish when fully ripe; flesh rather firm, but melting,
very juicy, sugary, and refreshing. Ripens end of July.
It forces well, and is also good for wall and garden trees.
A serious defect is its liability to gumming.

Florence.—Tree more upright than Kentish, but does
not bear so abundantly; the fruit is sometimes larger.
As Kentish answers every purpose for which this is
adapted, and is more prolific, it is the more extensively
cultivated of the two.

Kentish (Common Red, Pie Cherry, Sussex).—Fruit
medium, round or oblate, bright-red, sometimes darker;
flesh pale, very juicy, and acid. Ripens end of July. An
abundant bearer, much cultivated as a standard, sometimes
on a north wall.

Late Duke.—Tree vigorous, with spreading habit. Fruit
large, roundish heart-shaped, shining-red; flesh amber-
coloured, tender, juicy, and rich, more acid than May
Duke. Ripens in August, when most tender-fleshed
Cherries are over. A most abundant bearer as a standard,
and deserves a place upon a wall, where it can be
netted when in fruit.

May Duke.—Tree erect. Fruit large, roundish, dark-
red when well exposed; flesh red, tender, juicy, and rich.
Ripe on standards in July, or in late June on walls. A
good bearer, well adapted for forcing.

Morello.—Tree round-headed, with spreading or pen-
dulous branches. Fruit large, obously heart-shaped,
somewhat compressed, dark-red, becoming nearly black
if allowed to hang; flesh deep purplish-red, tender, juicy,
and acid. Ripens in July or August, but may be pre-
served on a tree against a wall till October. One of the
most useful for preserving; bears well on a north wall.

Novelle Royal.—Tree sturdy, compact, and a free-
bearer. Fruit larger than May Duke, dark-red, changing
to black; flesh tender, juicy, brisk in flavour. Ripens
end of July.

Reine Hortense.—Tree vigorous and very productive.
Fruit large, long, and handsome; skin thin, bright-red
changing to dark brilliant-red by hanging; flesh tender,
juicy, and somewhat acidulous.

Royal Duke.—Tree similar to May Duke. Fruit large
and handsome, oblate, shining dark-red when fully ripe;
flesh reddish, tender, juicy, and very rich. Ripens
middle or end of July, after May Duke and before Late
Duke.

Twelve sorts suitable for cultivation as standards.

<table>
<thead>
<tr>
<th>Bigarreau Napoleon.</th>
<th>Knight’s Early Black.</th>
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<tbody>
<tr>
<td>Black Eagle.</td>
<td>Late Duke.</td>
</tr>
<tr>
<td>Buttner’s Black Heart.</td>
<td>May Duke.</td>
</tr>
<tr>
<td>Early Rivers.</td>
<td>Morello.</td>
</tr>
<tr>
<td>Governor Wood.</td>
<td>Waterloo.</td>
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</tbody>
</table>

Six sorts suitable for a south wall.

<table>
<thead>
<tr>
<th>Black Tartarian.</th>
<th>Elton.</th>
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<tbody>
<tr>
<td>Early Purple Guigne.</td>
<td>Noble.</td>
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</table>

Six sorts suitable for an east wall.

<table>
<thead>
<tr>
<th>Archduke.</th>
<th>Florence.</th>
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</thead>
<tbody>
<tr>
<td>Black Eagle.</td>
<td>Noble.</td>
</tr>
<tr>
<td>Early Rivers.</td>
<td>Tradescant’s Heart.</td>
</tr>
</tbody>
</table>

Three sorts for a north wall.

| Kentish, Late Duke, and Morello. |

Sorts suitable for a cottage garden.

<table>
<thead>
<tr>
<th>Elton.</th>
<th>May Duke.</th>
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</thead>
<tbody>
<tr>
<td>Late Duke.</td>
<td>Morello. [W. I.]</td>
</tr>
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</table>

CHAPTER X.

FIGS.

ORIGIN—CULTIVATION IN THE OPEN AIR—SOIL—SITUATION—FRUITING—PRUNING AND TRAINING—WALLS AND ESPALIERS—PROTECTION—PROPAGATION—CULTIVATION UNDER GLASS—IN POTS—LIST OF VARIETIES.

The Fig (Ficus Carica) (fig. 1011) is a native of the south of Europe, Northern Africa, and Western Asia. We find in the Scriptures ample record of its cultivation in the earliest ages, and of the estimation in which the fruit
was held. The Figs of Athens were celebrated for their exquisite flavour; and it is said that Xerxes was tempted by them to undertake the conquest of Attica.

The tree, although remarkably soft-wooded, lives to a very great age—several centuries in mild climates; and even in Britain, a tree of the White Marseilles variety, brought to this country by Cardinal Pole in 1525, is remembered as covering a large extent of wall, and bearing abundantly, in the garden of the Archbishop of Canterbury, at Lambeth Palace, where several of its descendants of great age and size still exist. On the south coast, in various parts of Sussex, as at Arundel and
Tarring, the Fig grows and bears most abundantly as a standard. In parts of the country, where the rigours of severe winters are not mitigated by the sea-breeze, Fig-trees, if not protected, are occasionally killed down to the ground; but although this be the case, vigorous suckers push up again and form plants. When the thermometer, for several successive nights, falls to about zero, the old wood is killed, and at 10° Fahr. the extremities of the young shoots are mostly destroyed. Like the Grape-vine, the Fig-tree can bear, as it does in the countries to which it is indigenous, a very hot summer, but, as appears from the above, not a severe winter, such as the wood of the Grape-vine, if previously well matured, withstands uninjured.

The remarkable character of what is known as the fruit of the Fig is clearly set forth in the following passages from Kerner and Oliver's *Natural History of Plants*;—Looking at a Fig that has been cut open lengthwise (fig. 1012) it is observed that it is not a simple flower, but rather a whole collection of flowers enclosed in an urn or pear-shaped receptacle, which is really a hollow inflorescence bearing numerous flowers on its inner wall. The orifice of the urn is small and surrounded by small scales. The flowers, which are very simple in structure, almost fill the entire cavity; they are of two kinds, male and female. Each male flower is composed of several stamens, which are supported by scales and borne on a short stalk (b). The female flower is a one-celled ovary containing a single ovule. . . . In one form of *F. Carica* the inflorescences contain female flowers only: this is known as *Ficus*; in the other the inflorescences contain male flowers near the opening, and gall flowers lower down: this is known as *Caprificus*. The latter do not produce seeds, but are utilized by a small species of wasp (*Blastophaga grossorum*) as a receptacle for its eggs, the larva from which occupies the place of the seed, and a gall is formed. The wasps which deposit the eggs carry the pollen from the male flowers into the inflorescences containing normal female flowers, and these are fertilized and form seeds.
In Southern Italy and other parts of Southern Europe where the Fig has been extensively cultivated for ages, the majority of the trees planted are Ficus-individuals, i.e. such as have female flowers only in their inflorescences, these yielding the best and juiciest Figs. Fig-plants of the form known as Caprificus, which, beside male flowers, contain only gall-flowers in their inflorescences, are not cultivated, because most of their Figs dry up and fall off prematurely. A few specimens of Caprificus are reared here and there in order that their inflorescences may be artificially transferred to the branches of the Ficus-trees. The process of transference is called caprification, and the growers believe that the Figs of Ficus are improved by the wasps which come out of the Caprificus-inflorescences and enter those of the Ficus. But this opinion, though very wide-spread amongst cultivators and peasants, is not correct. The Figs of Ficus do not require the intervention of wasps to become sweet and juicy. As a matter of fact, Ficus-inflorescences which have been entirely unvisited by wasps and have developed no fertile seeds in their little fruits, ripen into excellent eating Figs, and innumerable quantities of the Figs sold come from trees and from districts where no process of caprification is employed. It seems, therefore, that the use of caprification must be traditional, and have originated at a time when growers were not only concerned with the production of good fruit but of fertile seeds also with a view to the multiplication of the plants. At the present day Fig-trees are no longer raised from seed but from cuttings, and caprification is consequently superfluous. Nevertheless the country people persevere with the old custom in spite of their ignorance of its real significance.

**Cultivation in the Open Air.**

*Soil.*—The Fig will grow well in almost any soil. In the rich well-manured soil of gardens it grows too luxuriantly for the heat and light of our climate. We have known the roots of a Fig-tree extend nearly 30 feet in a kitchen-garden, but the shoots were too luxuriant and soft to mature fruit. Better wood is obtained where the Fig is planted in a border 6 feet wide and 2 feet deep, with a hard road or walk in front, into which the roots can scarcely penetrate. A chalk bottom suits the Fig well, as it affords a moderate supply of moisture in dry weather, and in wet it does not become stagnant. Where such soil does not naturally exist, the subsoil ought to be well drained. A rich friable loam is to be preferred, and if calcareous so much the better. It should be made thoroughly firm, to induce a short-jointed sturdy growth.

*Situation.*—This should be warm, yet airy and exposed to sunlight, otherwise the foliage is apt to become yellow, and the fruit liable to drop off. A wall with a south, or nearly south, aspect is the best, and next to this, one that has a south-west exposure. Near the coast, in the southern parts of the kingdom, the tree will grow as a standard; and in parts of the kingdom inland, where the summers are warm, but the winters occasionally severe, Fig-trees may be planted as espaliers if walls cannot be afforded. In this way their branches can be trained so as to expose the foliage to light and air in summer, and in winter they can be more easily protected than standard trees.

The sandy gravelly soil of Argenteuil, near Paris, suits the Fig remarkably well; but the best trees are those which grow in old quarries, where their roots are free from stagnant water, and where they are sheltered from cold and exposed to a hot sunshine, which ripens the fruit. The water which collects in the ravines keeps them constantly supplied with moisture. The tree also succeeds well planted in a paved court, against a building with a south aspect. A Fig-tree thus planted and left to grow at liberty will produce excellent fruit, and in much greater quantity than in any other situation. The paving protects the roots from frost in winter and from drought in summer; whatever may be the nature of the soil under the pavement into which the roots penetrate, the tree always thrives well. The roots of a Royal Muscadine Grape planted, near London, against a wall in a paved court, extended beneath the pavement, and the fruit was the finest we ever saw produced out-of-doors in this country; and circumstances so highly favourable to the Grape would doubtless prove equally so to the Fig. This is proved to some extent by the Fig growing and cropping well when trained against a wall, where the roots are under a hard gravel walk at the foot.

*Fruiting.*—The Fig is deciduous; it commences to grow, in the neighbourhood of London, in the first, second, or third week in May, and continues growing till late in autumn, if not checked by frost. Whilst the young shoots proceed in growth, one, and sometimes two, fruit-buds are formed in the axils of the leaves, frequently in the axil of every leaf along the shoot in
succession, from the base upwards. The earliest formed, those situated on the lower portion of the shoot, acquire a considerable size, but very rarely attain perfection in this country, as they do in the Levant, and other parts where the climate is more favourable. Here they remain, however, on the shoots after the leaves drop in autumn, but their growth is then of course arrested; they begin to shrivel, and in the following spring wither, even although they may have been protected from frost in winter. Such is the fate of all young fruit that may have acquired any considerable degree of development on shoots of the current season. But towards the extremities of these shoots fruit-buds continue to be formed (fig. 1013), and these, which are about the size of Peas when the season of growth is over, retain their vitality through the winter, growing and ripening the following summer.

As the fruits which in this climate attain maturity in the open air are produced on the extremities of the shoots, it is evident that the latter must be retained in pruning, and protected from frost. In many cases the shoots grow luxuriantly, their wood being soft and spongy, more especially that towards the extremities. The buds on the youngest and softest part of the shoots are not likely to attain great perfection; it would therefore be better if by any means fruit-buds could be induced to form lower on the shoot. The only chance of effecting this is to rub off the buds that naturally form there, so as to induce others to push late enough in the season to stand the winter. The time when this should be done cannot be precisely stated, for it will of course depend on the locality, on the season, and on the nature of the variety.

A Brown Turkey Fig-tree, trained against a wall with a south-west aspect, at Pitmaston, near Worcester, bore fruit, not merely at the extremities of the shoots, as is usually the case out-of-doors, but at intervals all along from their bases upwards. For example, a shoot 40 inches in length had eight fruits, of which four were situated respectively at 3, 6, 15, and 21 inches from its base; the others were borne at somewhat variable intervals on the upper portion. The young fruits which formed on the shoots of last summer's growth, now the bearing shoots, were all rubbed off in the previous August. When the blossoms of Apples, Pears, Strawberries, Raspberries, &c., are cut off, a second blossoming is induced. The Fig manifests the same disposition on its being prevented from nourishing its first-formed fruits. Deprived of its first, it makes an effort to produce a second progeny.

It has been observed that not a single Fig, that can be seen to be a Fig, fairly protruded from the bud in autumn, will ever become a perfect fruit in the following season. Not one of this description, therefore, should be left for the winter, but as soon as they can be dis-
tungished they should be removed, in order to give the tree sufficient time to develop a later crop of buds to replace those of which it had been deprived. The fruit-buds usually begin to show themselves at the beginning of August, from which time the trees should be gone over once a week as long as young fruits make their appearance. These remarks should, of course, be understood to apply to those first-formed fruits on the lower part of the shoots, and not to such fruit-buds as are likely to remain in the bud state during the winter, resuming their growth with the fresh flow of sap in spring, and maturing their fruit in the course of the summer.

Pruning and Training.—The Fig-tree, grown as a standard, requires but little pruning; it has often been said the less the better, and this is true, unless the operation be done very judiciously. If the roots are in rich soil, and the knife be freely applied to the branches, the consequence will be that from the base of each strong shoot cut back others equally strong, or even stronger, will proceed. If the shoots be cut so closely as not to leave an eye, the accumulated sap will in other parts of the tree stimulate buds to push shoots too vigorous for bearing.

It has been explained that the Fig-tree bears on the shoots of the current year fruits that attain maturity in favourable climates, with the exception of some of the latest formed, which even in those climates do not ripen till the following season. But with us the principal crop is derived from near the extremities of the shoots of the previous season's growth, except where artificial means are employed to start lateral shoots near the base of the main shoot. But whether the fruit is matured in the first or second season it originates on the young shoots, and therefore of such it is evident we must endeavour to keep up a regular supply. This should be done if possible without cutting out the oldest branches. A mode of training by which this can be avoided is as follows:

From a single upright stem branches are trained at a foot apart, but they are not on both sides in the same horizontal line; one branch is trained from the central stem, say to the left; at 6 inches higher another is trained to the right, the next to the left, and so on, the branches on one side proceeding from opposite the middle of the intervals between the branches of those on the other. In autumn every alternate shoot is cut back to one eye; the others are left at full length to bear fruit in the following summer, after which they are each cut back in autumn to one eye. The shoots proceeding from the single eyes, to which the shoots or branches are cut back, are trained at full length. They will form fruit-buds in the first season, and in the second year of their growth will bear fruit. They are then in their turn cut back to one eye.

In this way all the branches take the same horizontal direction, and can consequently be the more easily maintained of equal vigour. The extent occupied along the wall may be limited to 6 feet, yet the tree may ultimately be made to cover that extent in width from the bottom to the top of even a high wall; and we may remark that the higher the wall, the greater will be the heat and the better will the Figs succeed. It is necessary, however, to observe that by adopting the above mode the quantity of the young wood will be great in proportion to that of the old, and when that is the case, the shoots are not so firm and short-jointed, and consequently not so well adapted for bearing. If succulent, over-luxuriant shoots be produced, the roots should be confined, and stimulants should be withheld.

Walls and Espaliers.—Presuming that the tree is planted against a wall, let it be cut back to within 15 inches of the ground, and trained with a single stem to the height of a foot. Immediately above this let two shoots be trained, one to the right and another to the left, and from these principal branches two other subdivisions should be encouraged. But these must be trained widely apart, in order to admit of successional bearing shoots being trained between them. These principal branches should be at a greater or less distance according to the size of the foliage; it depends, therefore, on the variety as well as the richness of the soil. In general, 15 inches will not be too wide. Along these branches, at distances of about 8 inches, shoots for bearing ought to be encouraged, and as nearly as possible of equal vigour. A similar equality should be maintained between the respective leading branches. It is a bad plan to allow one or more shoots to grow stronger than the generality throughout the season, and then to cut them back. Instead of doing so they ought to be checked by pinching, as soon as they exhibit symptoms of over-luxuriance. Look at the amount of foliage in connection with the respective branches, compare that on the different shoots springing from the same branch, then apply means to equalize them. By attending to these directions an
equal distribution of the sap will be ensured, and the result will be a disposition to produce fruit which will not be so liable to drop off as when irregularity of growth is permitted.

The bearing shoots, produced along the leading branches, should be trained at full length. In autumn every alternate one should be cut back to one eye; at the same time those not cut back must be trained at full length. In the following summer the latter should bear and ripen fruit, and then be cut back in autumn to one eye, and shoots from the bases of those cut back the previous autumn should be trained for succession. In this way every leading branch will be furnished with shoots of the current year for succession, alternately with shoots or branches of the previous year for bearing.

According to the vigour of the tree the shoots may proceed from the leading branches, at greater or less distances apart. When there is a considerable quantity of firm wood deposited in the leading branches, the shoots will also be firmer and shorter, and a greater number may be trained between the leading branches without being overcrowded. Young shoots will push from the extremities of those branches on which the fruit is being matured. But these branches are destined to be cut back at the end of the season; therefore young shoots from their extremities need not be encouraged. On the contrary, it is advisable to check them by pinching the terminal bud when they have made four leaves. These will prove beneficial to the fruit by drawing sap along the branch; but if the terminal shoot be allowed to grow unchecked, it is apt to rob the fruit, especially if it should start into vigorous growth; for it is well known that fruits situated in the vicinity of vigorous shoots are apt to drop. If the trees are making rampant growth it is advisable to pinch out the points of all the gross shoots. This will cause the young fruit-buds to form and swell rapidly, and will often make barren trees fruitful.

Protection.—Where the climate is tempered by the sea, Fig-trees in ordinary winters require no protection, but generally it is necessary. The covering should be thin in mild winters, but provision should be made for readily increasing it if the weather become severe.

At Argenteuil, near Paris, where the Fig is extensively cultivated in the open, and where the winters are often more continuously severe than they are in Britain, the extremities at least of the branches are laid in the soil, which is not of a sandy nature, and the parts not interred are covered with straw or litter. The same plan has been successfully tried in this country;
but it is not to be recommended where the soil is not of a sandy nature, neither is it practicable where the branches proceeding from a single stem are strong. Sometimes the branches of standards are tied together and then thatched with straw, forming a cone, or they may be tied in several bundles, and each covered separately; but a backing of thatched hurdles on the north side, and a lighter covering of straw-mats on the south, would be preferable.

For trees trained against walls, branches of Spruce have been found to answer, owing to their leaves dropping off gradually when the weather becomes milder, and when the trees require less protection and more light and air, in spring. If Spruce cannot be had, other similar coverings should be contrived, so that they may also be gradually diminished in spring; for it is a bad plan to keep the whole of the winter covering on till danger of frost is over, and then uncover the trees entirely, and at once. Straw, or better, straw-mats, dried fern, reeds, woollen nets, or canvas may be employed. The straw-mats can be made thin, and applied two-fold in winter, and reduced to one in spring. Against a south wall a boarded covering, or thatched hurdles, projecting 4 feet from below the coping, with a slope to throw off the wet, will generally prove a sufficient protection unless the weather be very severe, in which case the trees should be matted in front, and litter laid round the base of the stem.

**Propagation.**—The Fig may be propagated by seeds, layers, and cuttings of the roots, also by tops, suckers, and by grafting.

Seeds should be sown in pots or pans filled with leaf-mould and sand, plunged in a moderate hot-bed. Seedlings may produce good or bad varieties; some sorts are known to be considerably harder than others; and by raising a number of seedlings from different kinds, there is a probability that among them some will be found better suited to this climate than any hitherto imported from warm parts of the world.

Layers take root readily. In some cases this mode may be employed for obtaining fruiting plants in a shorter period than by any other means. Branches in a bearing state, layered in May, and the rooted layers taken up in October, potted in 12-inch pots, and placed in the forcing-house, have fruited freely in the following spring, that is, within twelve months of the layering.

Cuttings should be taken from shoots that have not been injured by frost; or branches of

the best ripened wood, taken off before frosts set in, may be buried in moist sand till early spring, when they can be made into cuttings, planted in pots, and plunged in a hot-bed. They will strike in the natural soil in summer, but in a bottom heap of 70° or 75° the process is rapid, and well-rooted plants are soon obtained. Care should be taken to rear them with single stems.

Good plants can also be reared from suckers, planted either in pots and given the assistance of bottom-heat, or in a warm border, where the soil must be kept moist by watering.

**Cultivation under Glass.**

It is a question whether as much produce cannot be obtained from a wall, with the assistance of glass and fire-heat, as is afforded by double the extent of open wall.

A wall 60 feet in length may cost, say £30, but if half that extent covered with glass will yield as much produce, then £15 may be saved in wall-building, and applied to lessen the expense of glazing; and taking all things into consideration, we believe that a glazed structure would be the cheaper. The supply of fruit from such would be less precarious than from the open wall, and it can be had from an early till a late period of the season. Convinced of these advantages, Mr. Henry Bailey had a house erected, at Nuneham, over a large Fig-tree on a south wall. The tree was root-pruned in September, and fire was lighted on the 1st of February, a humid atmosphere, with a temperature of 55° at night, and from 65° to 75° during the day, being maintained. The roots were supplied with tepid water, and copious syringings were given till the fruit attained the size of a Walnut, when they were discontinued. The tree ripened its first fruit on the 25th of April, continued bearing till August, and had then many dozens to ripen, which, assisted by fire-heat, would afford a supply till November.

The Fig requires a somewhat higher temperature to bring it into leaf than the Grape. It may be commenced at 50° at night, and from 60° to 65° in the day. Afterwards the temperature may be gradually increased, giving very little air, and affording plenty of atmospheric moisture until the fruit commences to ripen. Then less moisture in the atmosphere is advisable, and more air should be admitted to the house to prevent the fruit splitting or rotting through excess of moisture.

It is desirable that the roots of the plants
should be in a temperature corresponding, or nearly so, with that in which the tops are. At all events, every means at command should be employed to render the disparity as little as possible. In the growing season water so cold as to lower the temperature of the soil should not be used. If the trees are planted out in the border of a forcing-house, the soil can be heated by pipes, care being taken that it is invariably kept in a proper state as regards moisture; or it may be heated by fermenting materials.

_Cultivation in Pots._—The ease with which Figs may be forced in pots has led to a great increase in this method of cultivation in private establishments. There is no doubt that this is the most economical method, as a far greater quantity of fruit can be obtained from a house filled with trees in pots than is possible from trees planted in borders; not only so, but it is much easier to manage the supply and make it more continuous than from planted-out trees. A selection of the best varieties would come into use at different times and afford variety in flavour and appearance.

For very early fruit the house should not be too large. Those constructed on the same lines as a Pine stove are excellent. The pots should be plunged in a bed of fermenting material for bottom-heat, and the house being low, a high temperature can be maintained without excessive firing. Plants started in the bed early in November ripen fruits by the second week in February, and if several small houses are devoted to them a succession of fruit may be relied upon.

Probably the finest variety for early or mid-winter forcing is St. John's. This never fails to carry a good first crop, whereas other varieties are apt to cast every fruit when forced so early. For later forcing almost any variety may be used.

Trees forced in pots from March onwards do not require bottom-heat, but may be stood on the floor of the house not too far from the roof-glass in a comparatively low house or on a raised stage to bring the plants close to the light. Great care in watering is necessary in the early stages, as too much or too little will cause the foliage to become yellow and unhealthy, a condition difficult to change the same season. The drainage should be perfect, otherwise the greatest care in watering will not keep the plants healthy.

A temperature of 55° by day, falling 5° at night, will be sufficient at first, but as soon as the foliage is well developed a high temperature may be maintained during the day, with ample atmospheric moisture. The directions already given with regard to ventilation should be followed when the fruit is ripening. It is important that the ends of the shoots should be removed when they have made about five leaves. This applies to all varieties grown in

![Fig. 1098.—Standard Fig in Pot.](image-url)
pots. Other shoots will quickly be formed by healthy trees, and these must again be stopped when four or five leaves have been made. This encourages the formation of new fruit-buds, so that if otherwise well attended to, the plants may be made to produce three crops of fruit in the year, although two crops are sufficient for the strength of the plants.

While the fruit is swelling, copious supplies of liquid or chemical manures are very beneficial, enabling the plants to swell up their fruit to a large size; it also prevents the fruit from falling through exhaustion. In the winter the trees should be kept cool as possible, consistent with safety from frost, as they are all the better for a short and complete rest. Repotting is best done while the trees are dormant, taking care that only a small shift is given and the new compost made quite firm about the roots, as the Fig is usually a failure in loose soil. An excellent compost for pot-grown Figs is three-parts of good fibrous loam and one of decayed manure, old mortar, or plaster refuse, well mixed together.

A small scale is occasionally very troublesome. The best remedy is to thoroughly wash every part of the plant while dormant with a strong insecticide, repeating this washing just before the trees start into growth. Red Spider is not troublesome, except when syringing is reduced while the fruit is ripe, and this is soon ousted when the house is started again for another crop from the trees.

The varieties of the Fig are exceedingly numerous in the countries where it is extensively cultivated, as in the Ionian Isles, Italy, and Provence; but many of them have not been grown in this country, and their adaptation to our climate has not been ascertained. We shall therefore only notice some of those which have been proved to be the best.

*Agen.*—Fruit medium, roundish-turbinate, green with a brown tinge, deep-brown round the flattened crown, covered with blue bloom; flesh crimson, thick, syrupy, and most delicious. One of the best late-fruitering varieties.

*Angélique.*—Fruit medium, roundish-turbinate, yellow with greenish-white specks; flesh white, with a faint rosy tint towards the centre. A good forcer, and does well on walls in the open.

*Black Bouchassotte.*—Fruit medium, roundish-oblative, black, covered with a thick blue bloom; stalk short; flesh deep-red, thick, syrupy, and very delicious. Succeeds well on a warm wall.

*Black Genoa.*—Fruit large, oblong, very broad upwards, blackish-purple, with a thick blue bloom; flesh yellow, red towards the middle, sweet, rich, and juicy. A hardy and productive kind; much grown in Languedoc and Provence.

*Black Ischia* (Early Forcing).—Fruit medium, roundish-oblative, dark-purple, almost black; flesh deep-red, rich and juicy. A good bearer, and comparatively hardly.

*Brown Turkey* (Brown Naples, &c.).—Fruit large, turbinate, or short pyriform, with a grooved surface, brown with sometimes a faint purplish tinge next the sun; flesh tinged with red at the centre, rich and sugary; ripens early. An abundant bearer, and one of the hardiest; the best for outdoor cultivation; it also forces well.

*Brunswick* (Brown Hamburg, Bayswater, White Turkey).—Fruit large, oblong-oblative or pyriform, pale yellowish-green where shaded, pale-brown next the sun, with brown specks; flesh opaline outside, reddish-brown at the centre, tolerably rich and sugary. One of the hardiest; does not force well, the fruit being apt to drop.

*Castle Kennedy.*—Fruit very large, obovate, greenish-yellow, pale-brown towards the eye; flesh whitish, stained with red, tender but not very rich. An abundant bearer, suitable for walls; remarkable for its earliness.

*Celestine.*—Fruit large, long pyriform, pale reddish-brown or grizzly; flesh deep-red, rich, and very delicious.

*Col di Signora Bianca.*—Fruit medium, pyriform, with a long neck, ribbed, green changing to yellowish-white, covered with gray bloom; flesh dark blood-red, thick, syrupy, and delicious. One of the finest Figs.

*Col di Signora Nero.*—Fruit medium, long pyriform, ribbed, above middle size, dark-brown with a thin gray bloom; flesh dark-red throughout, very rich and sugary. It ripens late.

*De l'Archipel.*—Fruit large, obovate, pale-brown; flesh greenish-white, thick, very rich and delicious. The tree has a compact habit, and is a profuse bearer.

*Early Violet.*—Fruit small, roundish, brown-red, covered with blue bloom; flesh red and nicely flavoured. Very
hardy and an abundant bearer, often giving three crops in one season in the forcing-house.

*Grose Monastrae de Lipari.*—Fruit very large, turbinate, broad at the apex, ribbed, pale-brown with darker spots, covered with thick bloom; flesh dull-red, thick, juicy, and well-flavoured. A large handsome Fig, which grows freely and bears abundantly.

*Albino.*—Fruit rather large, nearly round with a short stalk; green; flesh thick, very rich, and exquisite flavour. One of the finest mid-season varieties; a constant and heavy bearer.

*Fig. 1018.—Fig—Negro Largo.*

*Negro Largo* (fig. 1018).—Fruit large, long pyriform, ribbed, black; flesh pale-red, with abundant thick rich juice, and forming a delicious sweetmeat when highly ripened. It is of good habit and adapted for pot-culture.

*Ponache.*—Fruit medium, roundish-turbinate with a short neck, yellow striped with bright-green; flesh pink, thick, syrupy, and richly flavoured. A very handsome fruit.

*Preussata.*—Fruit large, turbinate, dark-brown with a purplish tinge, and sprinkled with pale dots; flesh red, very sweet and rich. The tree is a good bearer, and forces well.

*Fig. 1019.—Fig—Verdel de Valencia.*

*Verdal.*—Fruit medium, long pyriform, ribbed, reddish-brown or purple, hairy, with a thick bluish bloom; flesh bright-red, very juicy and melting, richly flavoured. A prolific variety.

*Royal Vineyard.*—Fruit medium, long pyriform, ribbed, dark-purple; flesh whitish, thick, and of moderate flavour. The value of this variety is its great earliness, great cropping qualities, and its never casting its first crop when forced, making it the most reliable Fig for very early forcing.

*St. John's* (Pingo de Mel).—Fruit large, bluntly pyriform, yellowish-green; flesh whitish, thick, and of moderate flavour. The value of this variety is its great earliness, great cropping qualities, and its never casting its first crop when forced, making it the most reliable Fig for very early forcing.

*Violette de Bordeaux.*—Fruit small, long pyriform, dark-purple; flesh dark-red, thick, and delicious when fully ripe. A very prolific variety.

*White Dechin* (Brocket Hall).—Fruit small, roundish-ovulate, greenish-yellow, skin thin and semi-transparent; flesh purplish-red, exceedingly juicy, sweet, and rich. Being of small growth, a great bearer, and forcing well, is well adapted for pot-culture.
White Marseilles (White Standard, White Genoa, Ruby Castle).—Fruit large, roundish-ovate, slightly ribbed, pale-green, becoming yellowish-white when mature; flesh opaline, very succulent, sweet, and rich. Ripens freely against a wall, and forces well.

CHAPTER XI.

GOOSEBERRIES.

HISTORY—CULTIVATION—SOIL AND SITUATION—PLANTING—PRUNING—PROPAGATION—ENEMIES—LIST OF VARIETIES.

The cultivated varieties of the Gooseberry are all the progeny of *Ribes grossularia*, a native of N. Africa, N. W. Himalaya, and Europe, including the British Islands. The name Gooseberry most probably had its origin in the use of the fruits, which were made into a kind of sauce to be eaten with young or green geese, instead of the apple-sauce usually preferred now. It is especially in Germany, Holland, and England that the Gooseberry has been cultivated for its fruits, from about the sixteenth century.

"The Gooseberry is not alluded to by writers of the classical period. Turner mentions it in 1573, and Parkinson, in 1692, specifies eight varieties. The catalogue of the Horticultural Society for 1842 gives 149 varieties and the lists of Lancashire nurserymen are said to include above 300 names.

"The most interesting point in the history of the Gooseberry is the steady increase in the size of the fruit. Manchester is the metropolis of the fanciers, and prizes of from five shillings to five or ten pounds are yearly given for the heaviest fruit. The Gooseberry Growers' Register is published annually; the earliest known copy is dated 1786. The Register for 1845 gives an account of 171 Gooseberries shown held in different places during that year; and this fact shows on how large a scale the culture has been carried on. The fruit of the wild Gooseberry weighs about a quarter of an ounce, or 5 dwts.; in 1786 Gooseberries were exhibited weighing 10 dwts.; in 1817, 26 dwts.; in 1825, 31 dwts.; in 1852, 37 dwts., that is between seven and eight times the weight of the wild fruit." (Darwin, Animals and Plants under Domestication.)

The Gooseberry not only grows and bears well in the comparatively cool climate of Scotland and the north of England, but the fruit is also better flavoured than in the hotter parts of the south. The fruit is not so good when it is rapidly brought to maturity by very hot weather as it is when brought forward slowly by a moderate temperature. At Alford the mean temperature of July is about 56° or 57°, and that of August about 56°; at Glasgow, the mean of those months is respectively 61°25' and 59°78'; at Manchester, about the same; and at Lancaster, 57°71' and 57°05'. At these places the fruit acquires its full richness of flavour; but near London, where the mean of July is about 63°, and that of August about 62°, it is frequently overheated in ripening; the large sorts with thin skins appear as if parboiled, especially where the soil is not tender, rich, well manured, and moist; likewise where the trees are pruned so as not to afford sufficient shade.

Many of the large-fruited varieties are much cultivated for culinary purposes, the young fruit soon acquiring a size fit for pies, tarts, and puddings; hence they are of great importance in the neighbourhood of large towns. In this way the Gooseberry, though not the first ripe, is of all hardy fruits the earliest fit for use.

Soil and Situation.—The Gooseberry will succeed in any good garden soil that is sufficiently loose and permeable, and rather moist than dry. It does not grow well in stiff clayey soils that become hard in hot, dry weather. To produce large fruit, it should be planted in a compost of good turfy loam and rotten stable manure. The best-flavoured fruit is obtained from plants grown in an open situation.

Planting.—In quarters, the planting may be done in the quincunx form, and in this way if the distance between the plants is to be 6 feet, that of the rows from each other will require to be 5 feet 2 inches. These we consider to be good medium distances, but in rich soil they may be increased, and in poor ground diminished. The bottom of the holes should be made convex; and in planting the roots must be regularly spread out, and not deeper than they were before removal.

Pruning.—Bushes intended for open quarters, if raised from cuttings, at the end of the first year should have about four shoots each a foot long; these should be shortened to about half their length if slender, but if sturdy, to one-third. From these four shortened shoots during the next summer a dozen or more new shoots will spring, and of these two of the best-placed and most vigorous on each main branch should be allowed to grow, pinching back all the others to four leaves, thus concentrating the energies
of the bush into the shoots that are to be retained.

In winter, these summer-pinned laterals should be cut back to an inch in length, but the extended new shoots will only require a few inches of the unripe tips cut off, taking care to always cut to a bud pointing outwards for an erect growing variety, or upwards for a drooping variety.

For bushes of good size it is desirable to retain some young shoots their full length, or nearly so, to replace old, worn-out branches, which should be cut away, thus securing a supply of young shoots throughout the bush. This annual renewal of shoots will keep the bush in vigorous health. At the same time, there must be no overcrowding through neglect of summer pruning.

A Gooseberry bush thus pruned fruits freely on the spurs formed along the entire length of the main branches, as well as on the annual new shoots. The older spurs, from their position, can only be kept vigorous and fruitful for successive years by the free admission of air and light. A larger crop and finer fruit of better quality can be got from bushes thus pruned than from bushes in which the young shoots are all cut hard back, resulting in a thicket of shoots which smother all the lateral shoots growing inside the bush.

A model Gooseberry bush may be described as having main branches thinly disposed, furnished throughout with vigorous fruiting-spurs, and maintained so by the annual extension and addition of young wood.

When there is an equal degree of vigour in the respective branches, the tree will be more healthy than if some were allowed to be too weak in consequence of others becoming too strong, and the fruit will also be finer flavoured. The largest fruit is, however, produced on vigorous shoots of the preceding summer; and therefore, when size is the object, young shoots must be encouraged to supply the place of old wood, which must be cut away.

Mr. Saul of Lancaster has placed it on record that the Lancashire growers, who excel in growing very large Gooseberries for prizes, transplant the young plants with three shoots in the first instance, only they incline them nearly to a horizontal position. For this purpose they employ hooked sticks to pull down the shoots that are inclined to grow upright, and forked ones to support those that are inclined to grow too drooping. By next autumn these three shoots will have produced a number of lateral shoots, most of which may be cut back to one eye, and the others to half their length. The less the number of shoots, and the younger the tree, the larger will be the fruit. In November the tree is pruned so as to consist of the three primary shoots, each bearing two young shoots, which are shortened to about 7 inches in length. These last are pruned in the following autumn so as to have only two young shoots each; all the others being closely cut off.

The system of pruning and thinning he recommends is to keep a moderate and constant supply of strong healthy young shoots, from which alone can be expected large and fine
fruit; and wherever the extremities grow beyond the proper bounds, such branches should be cut back so as to keep the tree in a compact form, and furnished sufficiently, though rather thinly, with new bearing wood; large fruit cannot be expected if the tree is crowded with old and young wood.

It is not only to the branches and top of the tree that the care of those who wish to excel in the cultivation of the Gooseberry must be directed; they must pay attention to the roots also, which should be pruned every two or three years.

Trenches filled with compost or manure are formed round the tree in advance of the roots, into which these may strike root. This will ensure plenty of nourishment; and, besides, the trees are mulched and regularly supplied with water both as regards the roots and foliage. The fruit is also thinned excessively, so as to leave only two or three on each branch. By these means, and by placing a saucer with water under the fruit, the latter attains an enormous size—upwards of 1½ ounce in some cases. Under these circumstances richness of flavour cannot be expected.

By the mode of pruning described, the bushes will assume a concave form. This will be suitable for the northern and midland parts of the kingdom, but in the warmest parts of the south it exposes the fruit too much to the sun, and therefore many growers leave a few shoots in the middle. Some prune their bushes only every second year, only half their plantation being pruned in one season, and the other half the next. In the portion not pruned the young fruit often escapes destruction from spring frosts, whilst that on the pruned trees, from being more exposed, is cut off; and again, if excessively hot weather should set in when the fruit is ripening, the unpruned bushes afford more shade.

Gooseberries may be trained against espaliers or pales, in which case the fan mode is most suitable, because it affords the greatest facility for training in a succession of young wood. They are also trained on arched trellises. For this purpose they ought to be planted 15 or 18 inches apart, and trained with a single stem, which should be shortened at the autumn pruning, in order that it may be well furnished with spurs and laterals to fill the space; but none of these laterals should be allowed to grow so strong as the leading shoot, otherwise it will not make good progress.

Gooseberry plantations should be dressed in
autumn, taking care in stirring the soil not to injure the roots. The surface of the soil near the stems ought to be drawn back towards the middle of the space between them. Manure should be plentifully supplied as mulchings on the surface, and no digging allowed near the roots.

The very best quality Gooseberries, both as to size and flavour, are obtained from plants grown on what is known as the cordon system; each little bush is restricted to four branches, and trained to a V-shaped post and wire trellis, 6 feet high, running north and south for preference. These trellises form an excellent screen or dividing-fence. Their erection is very simple, and may be done by any handy labourer. Oak posts, 6 inches thick and 6 feet out of ground, should be used for the two ends. Across the top of each post a piece, 2 feet long and 3 inches square, should be fixed, the ends projecting equally sideways; stretch tightly a stout wire from end to end of row, and fix with staples to the outsides of the cross-pieces. Then run a single bottom wire through holes in the posts, and quite close to the ground. If the row is long, intermediate posts will be required.

Bamboo canes or sticks 6 feet long should now be tied, 6 or more inches apart, to both bottom and top wires, thus forming the V-shaped trellis. One- or two-year-old plants, each with four shoots, should now be planted 18 inches apart, two shoots to be tied to the outside of the stakes on either side of the trellis. This cordon system of training admits the maximum amount of sun, air, and light to the shoots and fruit, and results in the certain production of good crops of first-quality berries. Other advantages in favour of cordon are, that the depredations of bird-destroying birds are less persistent, probably because the branches are less convenient perches for them. Furthermore the cordon can be so easily netted when the fruit is ripe. We have also found that fruit grown on cordon fences will keep better and is less susceptible to mildew. Any waste fence, not open to stock, or where a lining-screen is required, may be utilized for Gooseberries grown on any of the cordon forms, and more fruit can be had from a given extent of land by this method of training and good cultivation than by any other means. All the varieties do well as cordon.

Summer pinching of the laterals of these trained cordon to four leaves is essential, and the laterals should be further cut back to an inch in length in the following winter; the leaders, however, must not be stopped, only shortening their unripe tips in winter.

**Propagation.**—The Gooseberry is propagated by seeds, cuttings, layers, and suckers. New varieties can, of course, only be obtained from seed. The seeds ought to be washed, and dried on sheets of brown paper, but not hardened by exposure to the sun. They should then be sown in sandy loam in the open ground, or in pots filled with loam, sand, and leaf-mould, covering with about an inch of soil. Those sown in beds will be fit for transplanting into nursery rows in the following autumn. Those sown in pots may be forwarded by potting them singly, as soon as fit, into small pots, and taking care to shift again, or transplant, before the roots get in the least matted. The seedlings generally come into bearing in the third or fourth year.

Propagation by cuttings is the usual mode, and is performed in autumn, winter, or spring, early in autumn being the best time. Cuttings of almost any length will strike, but vigorous firm-wooded shoots, 12 to 15 inches in length,
are the best. If the cuttings are taken off close to the branch from which they spring, so much the better.

It may be observed that roots are emitted from any part of the cutting below ground; therefore it may be presumed that the deeper it is inserted the more roots will be produced. This is true to some extent; nevertheless it is found that roots produced along a great length of shoot, like fibres from a tap-root, are not so vigorous and effective as those which proceed from points nearer the leaves; at least this is the case with the Gooseberry, which is not naturally a deep-rooted plant.

Layering is a sure mode, and may be resorted to when plants of any particular sort are required to be speedily obtained, without risk of failure, though the plants are not so shapely as those raised from cuttings; but the most rapid mode of obtaining well-rooted plants is by that which has been termed layering by insertion of the growing point. In moist seasons, it may have been observed that occasionally the pendulous shoots in summer root at the extremities when these come in contact with the soil. If towards the end of June the tips of the shoots of any variety are inserted to the depth of an inch in soil that has been recently dug and made fine, they will form a large quantity of roots before autumn, together with a bud for a shoot. In autumn these plants will be so well-rooted that they may be taken up, and either planted where they are to remain, or put in nursery rows till next autumn; but, in doing so, care must be taken not to break the bud formed at the crown of the roots.

Propagation by suckers is generally considered objectionable, as the plants so obtained are apt to produce suckers. In a well-managed plantation there should be no suckers to propagate from; but in the case of scarce sorts, it may be advisable to encourage them for the sake of increase. They should be planted in autumn, and transplanted a year afterwards, when the roots ought to be examined, and every bud carefully removed. By a little care good plants with clean stems may be formed; and if the shoots and leaves are kept healthy and vigorous, the disposition to produce suckers will be easily overcome.

When Gooseberries are intended to be grown in bush form it is important that the cuttings should be properly prepared and of the best kind to produce clean, healthy bushes, each with straight clean stems about a foot high.

Bushes on stems can be easily kept free of weeds and manured; the fruit is also out of the reach of splashes of soil during heavy rain, and can be easily gathered.

The last week in October is the most favourable time, and the best cuttings are those taken from short-jointed ripe growths of the current year. All the buds, except five at the top of the shoot, should be carefully cut out to prevent the growth of suckers. They should then be planted 4 inches deep and apart, in rows 18 inches apart, in sandy soil for preference, treading the soil firmly about them as the planting proceeds.

Market growers, whose crops of Gooseberries are gathered and marketed green, do not trouble about keeping the plants to a clear stem, but allow suckers to come up thickly from the base, and without scarcely any pruning; but such bushes produce fruit of very inferior quality.

INSECTS, &c.—See chapter on this subject.


**Adams' Snow-ball.**—Branches pendulous. Fruit white, middle-sized or rather large, roundish, slightly hairy, rich, and sweet. Middling early.

**Allen's Glory of Ratcliff.**—Branches spreading, somewhat pendulous. Fruit middle-sized, oblong, quite smooth, light-green, thick-skinned, very good, and sweet. Middling early; a moderate bearer.

**Antagouist.**—Fruit very large, long, hairy, creamy-white, of good flavour. The largest white exhibition Gooseberry. An excellent bearer.

**Branrae's Smiling Beauty.**—Branches somewhat pendulous. Fruit large, oblong, quite smooth, yellowish-white, thin-skinned, somewhat transparent, sweet and good. Early, and an abundant bearer.

**Berry's Farmer's Glory.**—Branches somewhat pendulous. Leaves slightly pubescent above. Fruit very large, obovate, downy, red intermixed with green, thick-skinned, well flavoured. Middling early; an abundant bearer.

**Brotherton's Lord of the Manor.**—Branches spreading. Fruit very large, roundish, hairy, red, rather thick-skinned, very good. Late, and a good bearer.

**Broom Girl.**—Branches erect. Fruit very large, roundish, hairy, yellowish-olive, thin-skinned, and of first-rate flavour. Early, and an abundant bearer.

**Careless.**—Fruit very large, long, smooth, creamy-white, very handsome, and of good flavour. An abundant bearer.

**Catherina.**—Fruit very large, obovate, slightly hairy, bright-yellow, of excellent flavour.

**Cheshire Lady.**—Branches erect. Leaves pubescent. Fruit middle-sized, oblong, hairy, deep-red, rich and excellent, with a clear pulp. Rather late.

**Cleworth's White Lion.**—Branches somewhat pendulous. Fruit large, obovate, slightly hairy, white, thin-skinned, rich, and excellent. Very late.

**Cobham Seedling** (fig. 1023).—A variety with exceedingly large fruit, oval, slightly hairy, greenish-yellow in
GOOSEBERRIES.

colour, and conspicuously veined; flavour rich and tasty; a first-rate dessert Gooseberry.

Collier's Jolly Angler.—Branches erect. Fruit large, oblong, downy, light-green, thin-skinned, of good flavour. Late, and a good bearer.

Cook's White Eagle.—Branches rather erect. Fruit large, obovate, smooth, white, thick-skinned, of good flavour.

Dr. Hogg.—Branches erect. Fruit very large, slightly hairy, purplish-red, veined with a darker shade, of good flavour.

Drill.—Branches spreading. Fruit large, long, smooth, greenish-yellow, of good flavour. Late, and an abundant bearer.

Early Green Hairly.—Branches erect. Leaves dark-green, slightly pubescent. Fruit small, round, hairy, deep-green, thin-skinned, very sweet, and rich. Very early; a good bearer.

Early Sulphur.—Branches erect, armed with numerous strong prickles, which are generally triple. Leaves light-green, pubescent above, Fruit middle-sized, roundish oblong, very hairy, bright-yellow, thin-skinned, tolerably good. Very early, and an abundant bearer. Its earliness is its principal merit. It is distinguished from the Sulphur by its earliness, and the leaves being pubescent.

Early White.—Branches spreading. Fruit roundish oblong, slightly downy, yellowish-white, with a thin transparent skin, very sweet, and well flavoured. Early, and an abundant bearer.

Edward's Jolly Tar.—Branches somewhat pendulous. Leaves rather large, of a shining deep-green colour. Fruit very large, roundish obovate, smooth, green, veined with yellow, rather thick-skinned, rich and sweet. Middling early; a good bearer.

Fanny.—Branches erect. Fruit large, round, hairy, pale-yellow, of a rich, fine flavour. An excellent bearer.

Forester.—Fruit large and uniform, hairy, bright-red, and of excellent flavour. Early; an abundant bearer.

Garibaldi.—Branches pendulous. Fruit very large, long, hairy, bright orange-yellow, of very good flavour. An abundant bearer.

Glenton Green.—Branches somewhat pendulous. Leaves pubescent above. Fruit middle-sized, oblong, narrower at the base than at the opposite end, very hairy, green, with whitish veins, thick-skinned, very sweet, and good. Early.

Golden Gem.—A cross between Antagonist and White-smith. The fruits are of a deep buff-yellow and very fine in flavour.

Green Overall.—Fruit middle-sized, round, smooth, dark-green, of first-rate flavour. An early variety, and bears abundantly.

Green Walnut.—Branches spreading. Leaves adpressed to the branches. Fruit middle-sized, obovate, smooth, dull dark-green, very thin-skinned, sweet, moderately good. Early, and an abundant bearer.

Gregory's Perfection.—Branches pendulous, very prickly. Fruit middle-sized, round, slightly downy, green, veined with white, rather thick-skinned, sweet, and agreeable. Late; a moderate bearer.

Hepburn Yellow Aston.—Branches erect. Fruit small, roundish oblong, hairy, deep-yellow, thin-skinned, very good. Middling early; an abundant bearer.

High Sheriff.—Branches pendulous. Fruit very large, round, hairy, orange-yellow, of excellent flavour. An abundant bearer.

Ironmonger.—Branches spreading. Leaves pubescent.

Fig. 1023.—Gooseberry—Cobham Seedling. (Natural size.)

Fruit small, roundish, hairy, dark-red, with rather a thick skin, rich, but not so rich as the Red Champagne, with which it is often confounded. Middling early.

Jackson's Abraham Noutland.—Branches erect. Fruit large, oblong, slightly hairy, white, rich, sweet, and excellent. Late.

Kean's Seedling.—Branches somewhat pendulous. Fruit middle-sized, oblong, very hairy, bright-red, thin-skinned, rich, and excellent. A good bearer, ripening earlier than the Red Warrington.

Keepake (Banks).—Branches slightly pendulous, of very strong growth. Fruit large, obovate, smooth, but sometimes hairy, green, thin-skinned; flavour excellent. Ripens early.

Langley Beauty.—A cross between Yellow Champagne and Railway. The berries are very large, of a buff-yellow colour, semi-transparent, somewhat hairy, and of delicious flavour. It combines the size of Railway, a large greenish fruit, with the fine flavour and upright growth of the little Yellow Champagne.

Langley Gage.—A cross between Pittman's Gage and Telegraph. The berries are in size between medium and small, silvery white, transparent and of very fine flavour; an enormous bearer.

Large Early White.—Branches erect. Fruit large, obovate, downy, greenish white, thin-skinned, and of rich flavour. Very early.

Late Emerald (fig. 1024).—A favourite sort in the United States. It crops well, and is an excellent dessert fruit. It has a tendency to mildew in damp weather.

Leigh's Rijswouw.—Branches somewhat erect. Fruit very large, roundish oblong, hairy, red intermixed with green, thick-skinned, sharp, rich, and agreeable. Late, and a good bearer.
**Leveller.**—Fruit large, long and tapering, smooth, greenish-yellow, of good flavour. An excellent bearer.

**Lomas’ Victory.**—Branches somewhat pendulous. Fruit rather large, roundish oblong, hairy, light-red, thin-skinned, and of moderately good flavour. The unripe berries are esteemed for cooking.

**London (Banks).**—Branches pendulous. Fruit very large, of a roundish ovate shape; skin smooth, of a dark-red colour. Quality rather inferior; a somewhat tender and uncertain bearer, but the largest Gooseberry grown.

**Monarch.**—Fruit very large, oblong, hairy, deep-red; of good quality. A very heavy and sure bearer.

**Mount Pleasant.**—Fruit large, long, hairy, deep-yellow, of very good flavour. Late, and an abundant bearer.

**Parkinson’s Laurel.**—Branches erect. Fruit large, obovate, very downy, pale-green, nearly white, thin-skinned, very sweet. Rather late, and an abundant bearer.

**Peer’s Queen Charlotte.**—Branches somewhat erect. Fruit middle-sized, oblong, smooth, yellowish-white, thin-skinned, of very good flavour. Early, a moderate bearer.

**Pere.**—Branches spreading, somewhat pendulous. Fruit large, long, and tapering, slightly hairy, pale-yellow, of a very good flavour.

**Pitmanston Green Gage.**—Branches erect. Fruit small, obovate, smooth, green, rather thick-skinned, rich, very sugary, and excellent. Late and an abundant bearer. The fruit will hang till it shrivels without deteriorating in flavour like that of most other varieties.

**Porcupine.**—Fruit small, roundish oval, extremely pubescent and downy. Flavour rich and honeyed.

**Princess Royal.**—Branches pendulous. Fruit large, obovate, hairy, greenish-white, of excellent flavour. A very good bearer.

**Raspberry.**—Branches spreading, somewhat pendulous. Fruit small, roundish oblong, hairy, dark-red, thick-skinned, rich and sweet, with a Raspberry flavour. Very early, and a good bearer.

**Red Chausépine.**—Branches remarkably erect. Fruit small, roundish oblong, hairy, light-red, rather thick-skinned, very rich and excellent, with a clear vinous pulp. Middling early, and a good bearer.

**Red Turkey.**—Branches somewhat erect. Fruit small, obovate, smooth, shining, dark-red, thick-skinned, of an agreeable sweet flavour. Late, and a good bearer.

**Red Warrington.**—Branches pendulous, armed with strong prickles, which are generally triple. Fruit roundish oblong, hairy, red, thick-skinned, with a clear, rich, vinous pulp. Late, and an abundant bearer. One of the best.


**Royal White.**—Branches erect. Leaves pubescent. Fruit small, round, downy, and slightly hairy, white, thin-skinned, very rich, and good.

**Rumbullion.**—Branches erect. Fruit small, roundish, oblong, very downy, pale-yellow, rather thick-skinned, of moderately good flavour. Middling early, and a very abundant bearer. Much cultivated for bottling.

**Saunders’ Cheshire Lass.**—Branches erect. Fruit large, oblong, downy, white, thin-skinned, rich, and sweet. Very early, and a good bearer.

**Scotch Best Jam.**—Branches erect. Leaves pubescent above. Fruit small, roundish, slightly hairy, dark-red, thick-skinned, brisk, and rich. Middling early, and a good bearer.

**Shiner.**—Branches spreading. Fruit large, round, smooth, pale-green, of very good flavour. A free bearer, and one of the heaviest green Gooseberries.

**Small Dark: Rough Red.**—Branches spreading, rather upright. Leaves pubescent. Fruit small, round, very hairy, dark-red, nearly black when fully ripe, rather thick-skinned, of good flavour. Early and an abundant bearer.

**Snowdrop (Bratherton).**—Fruit very large, roundish,
hairy, white, veined with green, thin-skinned, and of excellent flavour. An abundant bearer.

**Stringer's Maid of the West.**—Branches erect. Fruit large, roundish oblong or somewhat ovate, very downy, white, thin-skinned, excellent. Early, and an abundant bearer.

**Sulphur.**—Branches erect. Fruit small, roundish, hairy, yellow, moderately thick-skinned, of rich flavour. Rather large; a good bearer.

**Taylor's Bright Venus.**—Branches erect. Fruit medium-sized, obovate, very slightly hairy, white, sugary, rich, and excellent, hanging till it shrivels. Middling early; a good bearer.

**Thunder.**—Fruit large, roundish, hairy, green, of excellent flavour. Early, and an abundant bearer.

**Whinhan's Industry.**—Branches partly erect. Fruit large if ripened, the best variety for picking green for tarts, attaining size early, a great improvement on older varieties, both habit and constitution good.

**White Champagne.**—Branches very erect. Leaves pubescent above. Fruit small, roundish oblong, hairy, slightly downy, white, rather thick-skinned, sweet, and rich. Middling early; a moderate bearer.

**White Davenport.**—Branches erect. Fruit small, roundish, smooth, greenish-white, thin-skinned, excellent. Very early, and a good bearer.

**White Fig.**—Branches erect. Fruit small, obovate, tapering to the stalk, smooth, white, rather thick-skinned, rich, and excellent. It will hang and shrivel on the plant like a raisin. The bush is not vigorous.

**White Honey.**—Branches erect. Fruit small or medium-sized, roundish oval, generally smooth, white, rather thick-skinned, rich, and of excellent flavour.

**Woodward's Whitesmith.**—Branches erect. Fruit large, roundish oblong, very downy, white, thin-skinned, excellent. A variety rarely equalled, scarcely ever excelled. Middling early; an abundant bearer.

**Yellow Ball.**—Branches erect. Fruit middle-sized, roundish, smooth, yellow, thick-skinned, of good flavour. Deserving of cultivation on account of its lateness.

**Yellow Champagne.**—Branches erect. Fruit small, roundish, obovate, hairy, yellow, thin-skinned, rich and excellent. Rather late; an abundant bearer. The best yellow-fruited variety.

The earliest to ripen is Early Sulphur, the richest flavour Red Champagne, and the best varieties for picking green for bottling or for tarts are Keepsake, Whinhan's Industry, and Lancashire Lad. New varieties that show any marked improvement on existing varieties, or that possess sufficient merit when tested by a severe standard, have not been very numerous until quite recently, when Messrs. Veitch, of Chelsea, were successful in raising three very fine flavoured seedling varieties—namely Golden Gem, Langley Beauty, and Langley Gage. When these varieties become better known, doubtless they will become universally grown.

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**CHAPTER XII.**

**CURRANTS.**

**Origin—Soil and Situation—Pruning and Training—Propagation—List of Varieties.**

There are three principal sorts of Currants, the Red (Ribes rubrum); the White, a pale-fruited variety of the same species; and the Black (R. nigrum). They are natives of Europe, including the British Islands, and also of other temperate regions, including North America. They are, as garden fruits, comparatively a modern development, probably since the sixteenth century. Compared with their relation the Gooseberry, the cultivated forms show little difference from the wild types.

The Red Currant is extensively used for pies, tarts, and jellies; and both it and the White are employed for making Currant-wine. The White, being less acid than the Red, is preferred for dessert, although it is not unusual to use both for the sake of colour.

The skin of the Black Currant contains an oil of a powerful and peculiar odour, which is disagreeable to many persons. The fruit is, however, in much request for preserving and for making wine. On the whole, Currants are important objects of cultivation, especially in the neighbourhood of towns, where the fruit is always in demand.

**Soil and Situation.**—A deep, loamy soil is best adapted for Currants; and the fruit acquires the richest flavour in a situation open to the sun. They are, however, frequently planted against north-aspect walls, on which they succeed with certainty, when other kinds of fruit-trees often fail. Deprived of the sun's rays from six in the morning to six at night, the fruit cannot be expected to become so sugary as that on bushes exposed throughout the day to the influence of the solar rays; yet on a north aspect, when the plants are properly managed, it attains a good size and acquires a fine colour. The fruit ornaments the wall by its brilliant contrast of white and red, presuming that both sorts are planted with that view; it can also be kept in good condition on the plants, and will thus afford a late supply.

The soil should be prepared as for the Gooseberry; and, as with it, the planting is best performed in autumn. The distance apart, when planted in quarters, should be 5 or 6 feet each way.

**Pruning and Training.**—Plants consisting of a clean stem of 5 inches, and having three shoots, should, when transplanted, have these shortened back to about 4 inches, and to a bud pointing upwards. In the following spring two shoots should be encouraged from each of the shoots so cut back, so that, in autumn, the plant will consist of six shoots. These should all be cut back at the winter pruning, so as to leave them from 4 to 6 inches long, observing always to cut
to an outward bud. To about this length the terminal shoots of the six branches should be cut at every winter pruning, and when they have nearly attained the intended height, which need not exceed 3 feet, the terminals should be shortened every autumn to within two or three buds from the base.

In soil that is very rich, and likewise naturally favourable to the growth of the Currant, the plants may be allowed to grow to the height of 4 or 5 feet, and, in that case, nine or even twelve branches may be allowed. In the latter case it would be well to have the branches trained round a hoop placed in the centre, so as to extend them at equal distances from each other, and more widely than would otherwise be the case.

Having explained the manner by which the three primary shoots are shortened so as to produce two shoots each, and which give rise to the six branches of which the head should generally consist, and having followed up the annual pruning of the terminal shoots of these branches, we now turn to the laterals. These should be shortened, at each winter pruning, to about half an inch in length. Some good growers for the London market cut even closer than this, or almost to the old wood. The base of the shoot consists of nearly solid wood, but farther up the shoot is pithy, and by exposure to the air the pith wastes, leaving the shoot hollow below the cut, and it usually dies back. It is therefore better to cut back nearly close to the old wood, or to the origin of the shoots, in order that the buds, whether for young wood or for fruit, may have a solid basis.

As heavy crops of fruit cannot be produced without plenty of nourishment, which can only be supplied from abundance of fresh roots, and as the formation of these requires a considerable amount of foliage, young shoots must be allowed to grow for this purpose, and also for producing a sufficient thickness of layers of albumen along the branches and stems; for when these are meagre, the fruit cannot be large. It is nevertheless wrong to allow too much crowding of young shoots in summer. When this is likely to be the case, they should be moderately thinned early in summer, by removing some of the weakest shoots, or any that cross each other. Besides this, the tops of the strongest shoots may be cut off in June, taking care, however, that no extensive removal of foliage takes place at any one time.

Currants are trained in some gardens with a single upright stem, and when well managed in this way the plants have a very good effect. They bear well; and there is an advantage as regards the fruit being kept free from soil, by which those grown as dwarfs are frequently injured after heavy rains. When grown as standards, the principal aim should be, in the first place, to grow the stem as straight and as strong as possible. It is
necessary to keep the leading stem trained to a rod or stake. Shoots must be allowed to grow along the stem; and if the latter is intended to be ultimately naked, the lower shoots and spurs should be gradually taken off as others are produced higher up.

When intended to be trained against a wall or espalier, Currants should be planted 3 feet apart, and one strong upright shoot encouraged for a stem. It is essential that the plants should be well established before the formation of the primary branches is attempted; therefore, if the plants are not strong and well rooted when planted, it is better to merely shorten the shoot a little, and allow the plant to grow at freedom till the following autumn, and then cut down the upright to 3 inches from the ground. Train one shoot, the strongest of course, upright, cut it back in autumn to 6 inches from the ground, and in the following summer, from the base of the last year's shoot, train one young shoot horizontally to the right, and another to the left. From these horizontals four upright shoots should be trained, at the distance of 9 inches from each other. These perpendicular shoots ought to be allowed to grow at full length, and should be shortened back in autumn to 6 or 8 inches. A leader from each must be trained upright every summer, and shortened to the above height every autumn; the laterals from the upright branches should be cut very closely, as directed for the laterals of the branches grown in the open ground.

Red and White Currants succeed admirably grown as cordons on V trellises, either on the one, two, or four branch system, as described for Gooseberries.

The soil should every year be drawn from around the trees with a hoe, and buried in the middle of the intervals, for which purpose a spade is the best; but in stirring the ground near the trees, a fork should be employed. Plenty of manure should be given. Manure water increases the size of the fruit, but does not improve the flavour.

The fruit should not be gathered when it is wet, and, if intended for preserving, not immediately after a wet period, for they will be less watery if several days are allowed to elapse. It may not, however, be advisable to delay so long in wet seasons, for when dry days are rare it is necessary to take advantage of them.
**Propagation.**—The Currant, like the Gooseberry, may be propagated by seed, cuttings, suckers, and layers; also, as we have seen in particular cases, by budding and grafting. The best mode, and that which is generally practised for obtaining good plants of any particular variety, is by cuttings. These may be taken off, prepared, and planted, soon after the fruit is gathered, that is, when the young shoots are mature; but any time from the beginning of autumn till March will do; those, however, which are struck in autumn have a great advantage over those inserted in spring, inasmuch as the young roots of the former, are prepared to start early in spring, and shoots are produced at the same time, the cutting becoming a plant; whilst in the latter case the cutting is only commencing to form roots. It will therefore be readily understood that nearly a year is gained by early autumn propagation over that performed in spring.

The cuttings should consist of well-ripened vigorous young shoots. If taken off close to the old wood so much the better. The end should be cut smooth, and the buds removed as far as the cutting is to be inserted in the ground. The very small buds near the base of the cutting are apt to be overlooked, and these are most likely to produce suckers, so that care should be taken to remove them completely.

Currants ought to have a clean stem of 5 inches above the ground. If cuttings sufficiently long can be obtained, 6 inches may be allowed for insertion in the ground, 5 inches for the stem, and 3 inches for shoots to proceed from, for forming the head, thus making the whole length 14 inches. But should the cutting be too short or weak, then it may be cut to the length of about 9 inches, or so as to leave 6 inches below ground and about three buds immediately above the surface. When prepared, the cuttings should be inserted as for the Gooseberry. When the shoots begin to push, three should be encouraged, if the cutting is long enough to admit of these being at the proper height from the ground. If the cutting is short the strongest and most upright shoot ought to be allowed to take the lead, and should be trained as straight as possible at least to 8 inches above the surface. If other shoots push they may be allowed to grow, as their foliage will assist in forming roots; but they should be kept subordinate to the one trained upright. They will require to be cut off close in autumn, and the upright one shortened back so that the third bud below the cut shall be 5 inches above the ground. The plants should be fit for planting out in autumn, but if not strong, they had better remain another year.

**Insects, &c.**—See chapter on this subject.


**Black Currant.**

—Bud and flower enemies—Currant Gall Mite. Leaf enemies—Currant Aphid.

**Selection of Varieties.**

**Black.** Naples.—Bunches abundant; berries large. A good black-fruited variety for general cultivation. It comes into leaf early.

Carter's Champion.—Fruit in long clusters, large, black, juicy, and palatable; a very prolific bearer.

Comet (fig. 1029).—An exceptionally free Red, remarkable for length of bunch and size of berry. The fruits will hang on the bushes till September if netted.

Fay's Prolific.—Fruit large, red, and of agreeable flavour; often used for dessert and for flavouring ices.

Goulain (Raby Castle).—Bunches long; berries large, with a sharp acidity; ripening late and hanging well. Vigorous and suitable for growing as a standard or large bush.

Houghton Seedling.—A late and most abundant cropper; bunches long, berries medium, deep-red, very acid. Is
suitable for growing in exposed situations, and for training as an espalier or pyramid.

Knight's Large Red.—Bunches large; berries medium, of a fine deep-red. An abundant bearer, not so early as Red Dutch.

Lace-leaved.—Compact habit, bushy, very prolific; leaves laced, bunches medium, berries pale-red.

Lee's Prolific.—An excellent black; bunches large, very abundant; berries larger than Black Naples, very sweet and pleasant when ripe; hangs long after ripening. Red Champagne.—Of dwarf habit, the bunches short, the berries small, pale-red, not so sweet as the white, and less acid than the red sorts. An abundant bearer.

Red Dutch.—Surpassed by none in size of bunch, quality, and abundant bearing; ripens early, and the berries are large, juicy, and bright-red.

White Dutch.—Habit and appearance of Red Dutch; bunches large and abundant, berries large, transparent, yellowish-white, with a mild sweet juice. The best White.

White Grape (fig. 1030).—Larger than White Dutch, marvellously productive, in crowded clusters. Bush somewhat struggling, and requires to be carefully pruned.

Wiford's Large White.—Bunches long, less compact than those of the White Dutch, and scarcely so large; the leaves are deeply lobed. A good cropper.

[W. C.]
different habit. There appears to be no doubt that hybrid Rubi have been raised in gardens, but some of the so-called hybrids between the Raspberry and others are seedling forms of *R. Idaeus* simply. "Seedling Raspberries from the Yellow Antwerp produce, for the most part, yellow fruit with but little variation, except that a few will give red fruit. It is rare to find any variety worth perpetuating among them. Seedlings from the Red Antwerp and Fastolf also vary but little. The latter is said to have produced both the Yellow and Red October Raspberries, which reproduce themselves from seeds with but little variation" (T. Rivers, 1863).

There is a variety of the Raspberry which is found wild only in Britain, and is known to botanists as *Rubus Idaeus Lecii*. This is also said to have been raised artificially by crossing the Strawberry with the Raspberry.

**Soil and Situation.**—Raspberries succeed in any garden soil that is not too stiff, but preferably in one that is rich and rather moist. They grow well in sandy alluvial ground, also in peat and soils that are mixed with peat; but those which are heavy and compact, becoming hard in dry weather, are not suitable. The ground should be trenched at least 2 feet deep and a good dressing of manure added, placing it between the spits of soil as the trenched proceeds. An annual mulch of farmyard manure should also be given.

**Planting.**—Raspberries are usually planted in rows, and their canes tied to stakes. In this way the distance allowed between the rows may be 5 feet, and that between the plants in the row 3 feet. In very rich soil, 3 feet between the rows, and 3 or 4 feet between the plants in the row, would be more suitable distances; or the rows may be 8 feet apart, so that other crops may be sown between. Care should be taken that the soil is kept well manured and sufficiently moist.

Raspberries are sometimes planted for arched training, in rows 4 feet asunder, and the same distance between the plants in the row (fig. 1031). When planted to be trained against an espalier, they may be 2 feet apart (fig. 1032). The best time to plant is October or early in November. If one-cane suckers are used they should be planted in triangular groups of three about 9 inches apart. They should be planted firmly. The canes should be cut to within 6 inches of the ground as soon as they show signs of growth.

The Raspberry sends up shoots or canes in spring which lose their leaves in autumn, and from these canes branchlets push in the following spring, on which fruit is produced in the course of the summer and autumn. The branchlets diverge in all directions, so that in the natural state they cannot be overcrowded. Whilst these are bearing the fruit new canes spring from the base, and suckers frequently spring from the roots, at a distance from the plant. These bear in the following season, forming a succession to those which are bearing, and which die back to the ground before winter.

**Pruning and Training.**—When the plants are intended to be fastened to stakes in the usual way, the pruning and training are very simple; especially with a new plantation, where one, two, or three canes have been planted to be tied to a single stake. Stakes are not necessary the first season, as the canes require to be cut down as advised, although, if strong, and fruit be desired the first season, they should be shortened more than the bearing shoots of an established plantation. The object of cutting back the year-old canes is to invigorate the young ones. When these push, three, four, or five of the strongest of them should be encouraged; the others ought to be rubbed off, or destroyed by means of the suckering-iron.

In October or November the plantation should
be pruned, in order that the ground may be surface-manured, leaving it there to be washed in by rain, as it is not wise to fork over the surface or dig the manure in, lest by so doing the best fibrous surface feeding roots be injured. Some think that the canes are injured by frost and rain when pruned before winter; but this is very unlikely, except so far as the pith may get too much soaked with wet, which will be only a little way, especially if the canes are cut slanting.

In pruning, the two-year-old canes, now dead, should be cleared, and three or four of the strongest young canes selected to remain. These should be shortened where they exhibit signs of weakness and begin to twist or bend. If there are more canes than the number here stated, they should be cut away. The stakes should be driven in correctly in line, and their tops cut to a regular height. The canes should then be tied to the stakes with osier twigs, than which nothing is better, or tar-twine may be substituted. This operation completes the first year's pruning and training.

Objection has been made to the above mode of training, as it brings the canes too closely together, but as the canes do not require much light, whilst the buds do, the shoots from the latter extend outwards and are fully exposed to sunlight. There is, therefore, less danger of the fruit-bearing branchlets crowding each other than of the interference of the young shoots which spring from the root.

In the second season the tied-up canes will require no further attention. Lateral shoots will push from them; and these, as already remarked, bear the fruit. At the same time shoots for succession spring up, and frequently in too great abundance. When such is the case they must be thinned out more or less, as in the preceding season; only, as the plants are now established, from four to six shoots may be allowed to grow. In autumn three, or if strong enough four, from each stool should be pruned and tied as already directed.

When Raspberries are intended to be trained to a rail, the latter may be constructed of stakes and strips of deal about 1 inch thick. The stakes should be driven in line 5 or 6 feet apart, and the strips of deal nailed along their tops, which may be 3 or 4 feet from the ground, according to the length of the canes; other strips may run along at 18 inches or 2 feet from the surface, or a wire may be stretched at that height. To these horizontals the canes should be trained, so as to leave room for a succession shoot between each. The weak points of the bearing canes ought to be cut off, and superfluous shoots removed at an early stage of their growth. Perhaps the best support is obtained by fastening the points of the shoots to a slight horizontal rail or bar, about 4 feet high, and placed 1½ foot on the south side of the rows. By this means the bearing shoots are deflected to the sunny side of the row, and are not shaded by the annual wood.

Raspberries are sometimes trained by arching, and for this mode they are planted about 4 feet apart in the rows. A stake is driven in midway between the plants; half the canes belonging to one plant and half of those of the adjoining plant are bent towards each other, and their ends tied together so as to form an arch, which is secured to the stake.

Some varieties of Raspberry naturally produce fruit late in autumn; others may be induced to do so by cutting down the canes to within 1 foot of the ground. The shoots which push from these shortened canes grow vigorously, and usually produce fruit late in the season. Another mode is to shorten the canes rather more than usual; then, when the laterals push, and before they flower, they are cut back nearly to the base, and fresh shoots push which bear fruit late in the season. In order to obtain large fruit, so far as this depends on pruning and training, few bearing shoots should be left to each plant, or in particular cases some plants, or a row or two, may be sacrificed by permitting no suckers to grow. Of course no fruit can be obtained in the following season from plants so treated, the formation of shoots for future bearing being prevented; but in consequence of this the fruiting canes will be better nourished and the fruit larger.

Summer Management.—This consists chiefly in an occasional hoeing to keep down weeds, and the timely thinning of the suckers to prevent waste of vigour; from four to six of the strongest suckers should be left on each stool. The next season's crop depends entirely upon the management of, and the encouragement given to these new growths.

In autumn, as soon as the crop is gathered, all the old canes that have borne fruit should be removed, so as to allow air and light to the young canes.

In winter, there is little to be done beyond cutting off the unripe tips of the canes. Raspberries may be grown as advised for Gooseberries on the four to six shoot cordons.
on the V trellis system, and they will produce heavy crops of large, good-quality fruit. Thus trained, the canes and leaves are well exposed to sunshine, and more and better fruit is got in consequence.

On large fruit farms, where the labour and cost of stakes and tying have to be considered, it is advisable to select one of the dwarf, sturdy, self-supporting varieties, such as Carter's Prolific, which is in every way adapted for field cultivation. The canes are cut back to various lengths up to 3 feet.

**Forcing.**—The Raspberry is seldom considered worth the necessary trouble and expense of forcing, but plants in pots may be brought on in the orchard-house along with the Gooseberry and Currant, or they may be planted along the front of a pit, and trained to a trellis under the glass. They bear very well in pots, which can be removed to the open air when the crop is gathered. For this purpose plants should be taken up in autumn, and potted in 12-inch pots. All buds on the roots likely to produce suckers ought to be picked off. The soil should be a mixture of turfy loam, peat or leaf-mould, and sand. The canes may be shortened to 3 or 4 feet in length. The pots should be placed where they can be protected from frost and snow till they can be introduced into the house. If this be done in January, ripe fruit may be obtained in the beginning of April. Or if introduced into gentle heat in February, with a little assistance in dull or severe weather, well-flavoured fruit may be obtained in May. The plants should be duly attended to with water, of which they will require a good deal when in full growth, and until the fruit begins to colour. Suckers must be removed as soon as they make their appearance.

Plants established in the pots in the course of the summer will stand forcing better than...
those lifted and potted in October. Suckers ought to be planted in large pots in autumn or early in spring; at the same time the bearing wood should be cut away, in order that the canes intended to bear when forced may have every advantage.

Red Antwerp is one of the best sorts for forcing.

Propagation.—The Raspberry is propagated by seeds, and occasionally by cuttings, but the usual mode is by suckers or offsets.

The seeds should be taken from ripe fruit, washed from the pulp, and then be sown in sandy soil, in pans. They will vegetate in the spring, and in autumn the seedlings will be fit for transplanting, the first shoot being then shortened to a few eyes.

In propagating by suckers or offsets, care should be taken to injure as little as possible the plants from which they are separated. The best time to remove them is October, which is likewise the best time for making the plantation. Root-suckers are often thrown up at a considerable distance from the plant, but usually the suckers come out almost like offsets. When this is the case, they ought to be detached with a sharp suckering-iron, and, at the same time, care should be taken not to injure the bud or buds which will be found on the part of the root just below-ground, at the base of the shoots made in the course of the current season; for these buds give rise to the shoots which become the canes for bearing in the following year.

Propagation by cuttings is not a sure method, and is seldom resorted to, but any particular sort may be more rapidly increased by both cuttings and suckers than by suckers alone. The cuttings should be inserted in light, rich, rather moist soil, and in a situation that is not exposed to the direct rays of the sun in the hottest part of the day.

Insects, &c.—See chapter on this subject.


Selection of Varieties.

Baumforth's Seedling.—A medium grower and cropper, with almost spineless canes. Fruit large, of a deep-red colour and good flavour.

Belle de Fontenay (fig. 1033). Fruit large, round, deep-red; ripening in autumn. A sturdy grower and free bearer. An excellent late variety.

Carter's Proliç.—Sturdy in habit, dwarf, a heavy cropper. Fruit in big clusters, large, deep-red, sweet; carries well.

Cuthank's Prince of Wales.—Canes strong and long, slightly globose, nearly smooth. Fruit large, globular, or inclining to conical, of a bright-red colour and good flavour. An early and most abundant bearer; not disposed to sucker freely.

Fastolf.—Canes very strong, of a light-brown colour, nearly smooth. Fruit large, globular, of a bright-red colour, and of good flavour. A most abundant bearer, and a generally useful sort.

Golden Queen (fig. 1034).—Said to be a hybrid between Raspberry Superlative and the North American Parsley-leaved Bramble Rubus laciniatus. The foliage is in three divisions instead of five, as in the true Raspberry, and the stems are as spinous as in the Bramble.
fruit is large, rich-yellow, of delicious flavour, and borne in great clusters. Distributed in 1900 by Messrs. J. Veitch & Sons.

Hornet.—A strong grower, of good constitution, very prolific. Fruit in great clusters, round, large, deep-crimson, exceptionally sweet.

Mahdi (fig. 1035).—Said to be a hybrid between Raspberry Belle de Fontenay and the common Blackberry. The fruit in appearance resembles a large red-purple Blackberry, and the leaves are intermediate between the two parents. The plant bears freely, the fruits ripening after Raspberries are over and before Blackberries are ripe. Distributed by Messrs. J. Veitch & Sons in 1900.

Red Antwerp.—Canes strong, yellowish-green, slightly glaucous, occasionally tinged with purple, covered with dark-brown bristles, especially towards the base. Fruit large, conical, dull-red, sweet, and rich in flavour. It bears carriage well, and is therefore much cultivated by market-gardeners. A second crop is sometimes borne in autumn, but the fruit is both scanty and small.

Rivers’ Large-fruited Monthly.—Canes moderately tall, very hirsute, with reddish prickles. Fruit medium, roundish or obtusely conical, of a deep purplish-red, in the second crop of a brighter red. Ripens about the usual time, and again in autumn.

Superlative.—Canes tall and strong. Fruit crimson, extra large and luscious, firm in texture, and carries well. Probably the best Raspberry grown.

Yellow Antwerp.—Canes with numerous small prickles. Fruit medium, ovate, pale-yellow, rich, and sweet. A good bearer, not so strong-growing as the Red Antwerp.

Yellow Superlative.—A seedling raised by J. Veitch & Sons from Superlative and Yellow Antwerp. Fruit as large as Superlative, clear-yellow, with a crisp sub-acid flavour especially agreeable for preserves. The canes are strong and robust, bearing enormously and continuously.

CHAPTER XIV.

STRAWBERRIES


The Garden Strawberry is comparatively a modern creation. It does not appear to have been cultivated by the ancients, although the fruits are said to have been gathered from the woods where it grew wild. “It was probably during the Middle Ages, or perhaps only at the beginning of modern times, that the custom of growing Strawberries in the garden became established, with the result that new and improved strains originated owing to the plants being more amply fed and carefully cultivated” (De Candolle). Three species of Fragaria appear to have been concerned in the origin of the Strawberries now grown, namely, F. virginiana, a native of temperate Europe, Asia, and North America; F. virginiana, also North American; and F. chiloensis, a native of South America. From these, three distinct races have been bred, namely, the large-fruited or English, the Alpine, and the Perpetual Strawberries.

The English or large-fruited varieties are by far the most important. They are supposed to have originated in England about a hundred and fifty years ago from a chance cross between F. virginiana and F. chiloensis, which produced the variety known, and still grown, as the Old Pine Strawberry (Fruiser Ananas). “It was only in the earlier part of the present century that skilful horticulturists began to originate named varieties of this large-fruited Strawberry. Keens’, Myatt’s, Rivers’s, and Turner’s novelties were successively sent out, several of
which still hold a prominent place among esteemed varieties” (De Candolle).

Among the most successful breeders of new Strawberries in recent years are Messrs. J. Veitch and Sons, Laxton Brothers, Carmichael, and Allan. There is a marked tendency to breed for size and form of fruit only, consequently, whilst some of the new sorts are in these characters superior to older favourites, they are inferior to them in the real test of a good Strawberry, viz. firmness of flesh and richness of flavour.

Soil and Situation.—The Strawberry will grow in any good garden soil. Some kinds prefer a rich sandy loam; but the Pine varieties, and especially the Old Pine, succeed well in rather strong loam, provided it is enriched by manure and kept moist. Tenacious soils do not suit them, unless ameliorated by such means as have been pointed out in the chapter on soils. Ground that is apt to get very dry from the effects of only ten days’ or a fortnight’s drought is not suitable, on account of the enormous quantity of water that will be necessary; and if once the plants begin to flag for want of moisture, the crop will suffer. A soil that is naturally somewhat moist, but not too wet, answers well; and where the land admits of irrigation, heavy crops may be produced every year on even light soils.

If the nature of the ground permit, it should be trenched to the depth of at least 2 feet, supplying, at the same time, plenty of manure, most of which should lie at 1 foot from the surface. If the surface consists of old garden soil that has been long manured, and if there is any yellow loam below, it will be very desirable, in trenching, to turn up some of the latter to the top, and then, after trenching, to spread a layer of dung on the surface, mixing it well with the fresh loam in digging it in. The loam will tend to prevent the plants from growing too much to leaf, instead of forming flower-stems. For stiff soils, good peat, if at command, may be added; leaf-mould is also an excellent mulch for Strawberries.

Planting.—The best time for this operation is as soon as the plants are well rooted. If the ground is not available for planting in summer, then it should be done early in autumn, whilst the ground is warm enough to encourage the plants to root before winter; or if this cannot be done, the operation had better be deferred till the plants are about to start into fresh growth in spring, say February or March, according to the season and state of the weather.

When it is foreseen that the plantation cannot be made in autumn, it is a very good plan to take up the runners when well rooted, and plant them at 6 inches apart each way, in 4-foot beds, with 1-foot alleys between them, which will afford convenient space for weeding and watering. In this way 4 or 5 rods will hold sufficient for planting ½ acre. When the ground is ready for planting, furrows should be drawn with a hoe, as if for sowing Peas.

The plants ought to be carefully taken up with balls, laid on a hand-barrow, and planted with a trowel. The proper distance between the rows varies according to the nature of the soil and the variety. In very rich soil the varieties with large foliage may be allowed as much as 2½ feet between the rows, and 18 inches from plant to plant in the row. For such large growers as Royal Sovereign 2½ feet apart each way is not too much, if the room can be spared. Mr. Keens planted in rows 2 feet apart, with an interval of 3 feet between every two rows, the plants 18 inches apart in the row. Mr. Myatt, the celebrated grower at Deptford, planted in rows 18 inches apart, and the same distance from plant to plant in the rows, but left a space of 30 inches for an alley between every three rows, and after the fruit was gathered in the first year the middle row was cleared away. Mr. Lydiard, one of the best growers near Bath, planted in rows 2½ feet apart, the plants being 2 feet from each other in the rows. In Mr. Keens’ plan there are seventy-two plants to a rod, in Mr. Lydiard’s fifty-four or fifty-five, in Mr. Myatt’s ninety-nine in the first year, and sixty-six afterwards.

The distance allowed by Mr. Keens is very proper for general cultivation. The interval of 3 feet between every two rows admits of space for young plants from runners, when a new plantation is required. By Mr. Myatt’s plan the ground is more fully occupied during the first season, when the plants are comparatively small, than is the case when the other distances are adopted.

Young plants that are early rooted and well grown may be planted doubly close for bearing in the following season, and after the fruit is gathered every other plant can be removed, care being taken in doing so not to injure the roots of the plants intended to be left. In planting, the roots with the ball of earth should be placed as deep as they can be without covering the heart of the plant. Water must be plentifully given at first, but afterwards sparingly, until the plants have taken root.
Cultivation.—After the plantation has been completed, the ground should be kept clear of weeds, and the surface stirred. Runners should not be cut off on their first appearance, otherwise a superabundance of foliage is induced; but when the runner has formed a second joint or bud, it may be cut off near to the plant from which it springs, unless wanted for propagation.

After August all runners should be taken off as they make their appearance.

With regard to the removal of the foliage before it has faded, much has been said both for and against this proceeding. We believe it to be advantageous or the contrary according to the time and manner in which the operation is performed. To mow down the foliage, young and old indiscriminately, is doubtless injurious; but the removal of the old leaves at the proper time must prove beneficial, inasmuch as more light is in consequence admitted to the young and active portion of the foliage. The practice is adopted by the Bath growers, so celebrated for their magnificent Strawberries, some of which have measured fully 7 inches in circumference, and who, as soon as the fruit is gathered, cut off all the old leaves with a knife. This is certainly preferable to mowing them with a scythe, for with the knife the old foliage can be removed and the young spared.

These young and vigorous leaves are in a condition to elaborate sap to form equally vigorous roots for supplying abundant nourishment to the ensuing crop. After it is gathered, the knife is again immediately employed to remove all old leaves, in order to give space and light for new ones. And inasmuch as the large amount of fresh foliage thus annually encouraged produces a corresponding amount of new tissue, the plants are so far annually regenerated.

Mulching between the rows of Strawberries, as performed by many growers, is very advantageous. Before this is done, however, it is essential to surface dress the soil close up to the plants with freshly slaked lime to keep in check both slugs and wire-worms. It serves to keep the ground moist and the fruit clean, as well as to afford nourishment to the plants. This mulch should consist of stable litter, put on in spring as soon as the fruit is set. It helps to keep the fruit clean and the soil moist. In poor soils the mulch may consist of horse-droppings, covered with at least 1 inch thick of clean straw, laid on just when the plants are coming into flower; and by watering frequently in dry weather the manure is washed down amongst the roots by the time the fruit is ripe,
and when they are most in need of it, leaving the straw clean.

Various other materials are recommended as a mulch, but, on the whole, nothing serves the purpose better than stable litter. Tiles have been employed in order to hasten the ripening process of the earliest kinds, but they are apt to get heated by the sun and spoil the flavour of the fruit which rests upon them; they also afford shelter to insects injurious to the crop.

From the time the blossoms appear until the fruit is ripe, the ground should never be allowed to become dry. Plants in full foliage and active growth evaporate a large amount of moisture in dry weather. Watering over the tops is not sufficient. In some soils it is necessary to flood the whole surface of the ground repeatedly, so that the water may reach the lowest roots. The leaves should never be allowed to flag, or they will never perfectly recover, even if afterwards supplied with abundance of moisture, and the fruit will consequently be poor in flavour.

Renewing the Plantations.—Whilst some growers recommend the plantations to be renewed every year, others prefer every second or third year. Some of the celebrated growers near Bath allow a plantation to run for six or ten years without renewal. Much depends on the way the plants are managed, and equally as much upon the soil itself; if kept free of runners and divested of the old leaves after fruiting, the plantation may be allowed to remain longer than when these matters are neglected.

The system of planting annually, i.e. destroying the plants after the first crop and thus treating them as annuals, is only to be recommended for early kinds, such as Royal Sovereign, and then only upon warm, sheltered borders and the most favourable open spots in the garden. Such late kinds as Latest of All crop better upon two-year-old plants.

If the stem of any strong-growing sort be taken and the lower leaves stripped off, it will be seen that there are a number of white eyes ready to push when circumstances are favourable. They do not push through the coatings formed by the bases of the leaves above-ground; but if the stems are buried in soil, or in a good top-dressing of rotten dung, leaf-mould, or even leaves, they will strike root, in consequence of which the plants will be greatly invigorated, and will bear well for many years. The Old Pine has been known to produce excellent crops for twelve years when so treated.

A covering of leaves suits the Strawberry remarkably well. Some have been known to bear good crops under a large Bigarreau Cherry-tree, the leaves of which were allowed to remain, as they fell, upon the plants. The Strawberry will push through a considerable thickness of leaves, or any light substance. A top-dressing of loam is beneficial, if applied before the plants begin to grow in spring, after which they should not be disturbed either at root or top.

Digging between the rows with the spade is often injurious. The object can only be to loosen the soil, in order that fresh roots may push freely; but many of those formed the previous season will be cut off in the operation, and they are the roots which contribute most to the support of the crop. If the soil is stirred with a fork with care, the plants generally derive benefit from the operation.

Strawberry plants sometimes produce a great number of leaves and flowers from the same stock. When it is desired to have the fruit large and fine, about four of the strongest flower-scapes should be retained, and the others, as well as all superfluous leaves, cut out. The lowest blossoms on the scape produce the largest, earliest, and best fruit, and these are ripe whilst those higher up are still green or only bearing flowers. The fruit from the latter never acquires the perfection of that formed lower down. In forcing, it is found advantageous to remove all except a few of the young fruits which attain a larger size than would otherwise be the case. The same operation might be advantageously performed on plants in the open ground.

Strawberries are occasionally grown on banks, ridges, and terraces; but it is unnecessary to enter into details respecting these modes, for the plant will grow in almost any situation where it can be supplied with moisture and sufficient nourishment, and where, at the same time, the foliage is exposed to light. There are, however, advantages in the terraced ridge formed to run east and west, the plants on the south side ripening fruit earlier than those on the level ground, whilst those on the north side afford a later supply.

Gathering.—Strawberries should be gathered when dry, but not when heated by the sun. For dessert, they ought to be gathered with the calyx and just as much of the stalk below it as is sufficient to lay hold of. Those intended for preserving are taken without the calyx.

Much has been written respecting male, female, and hermaphrodite plants, but we have
never seen what could be properly designated either male or female plants. It is often the case that the flowers prove abortive, either from the effects of frost late in spring, or from an abnormal state of growth in the plants; but, in the former case, there is neither stigma nor style to be seen, only stamens. Frost frequently proves injurious before the flowers expand, and when this occurs they have what is termed black-eyes, the styles having been killed, and discoloured. Sterility has, however, been known to pervade, with a few exceptions, a whole plantation of Hautbois, although the plants were not at all injured by frost. These plants, however, had been taken from bearing beds the year previous, and planted in a rich, well-manured border, in which they started rapidly into luxuriant growth, the growth being to leaves rather than to fruit. The plants, however, were not removed, nor were others introduced, nevertheless they bore a most abundant crop in the following season.

Forcing the Strawberry.

Strawberry runners intended to form plants to be forced should be selected from the first or earliest rooted. The earlier in the summer the runners are established the longer the period of growth, and consequently the stronger and more matured the plants will be by the end of the growing season.

It is necessary to observe that although the plants may be vigorous, with large well-formed buds, capable of producing blossoms that would set their fruit well, yet, without a knowledge of the mode of growth, the whole or greater part of the blossoms may be rendered abortive.

"Those who would understand the philosophy of Strawberry forcing should begin from the beginning, and first determine what it is which they have to deal with. This can only be ascertained by examining the young flower-buds as they exist in the plant when it makes its first move towards growth. At that time they are collections of tiny scales, placed over a small spongy centre. By degrees they take on the forms of calyx, corolla, stamens, and pistil. They form successively in the order in which they are named, the calyx first, the pistil last. The calyx and corolla are the most simple, grow the quickest, and most easily bear to be hastened; stamens require more time for growth, the pistil most of all. When a high temperature, night and day, with abundance of moisture, and as much light as February yields, are suddenly applied to the Strawberry, it is compelled to grow; the predetermined parts advance, and, obedient to the influences which their nature cannot disregard, they by degrees unfold. But how? The oldest parts, namely, the calyx and corolla, simple in structure, and already advanced in their formation, suffer no injury, but appear in their usual state, arraying the blossom in gay apparel of white and green. The next, however, the stamens, having less time to form, acquire perhaps their yellow colour, but are powerless for their allotted office; while the pistil, the most complicated of all the parts—that which demands the longest period for its perfect formation, but which is the latest that the flower produces, and which is to become the fruit—is a mere tuft of abortions, incapable of quickening, and shrivelling into pitch-black threads as soon as it is fully in contact with the air" (Dr. Lindley).

It is evident, therefore, that the main points to be kept in view in forcing Strawberries are, 1st, to have strong, stocky plants, grown under the influence of plenty of sunlight; 2nd, to grow them slowly till fruit is set, in order that the parts of the flowers may have time to form, as they naturally do, in gradual succession. The first consideration ought therefore to be directed to obtaining plants with good substantial stems and well-formed heart-buds.

In dry weather the plants from which the runners are to be layered should be kept watered. Plants that have been growing one year, or not more than two, throw out stronger runners than those that are older. By the time they have pushed a joint, some good rich loamy soil should be prepared, and also a number of 3-inch pots. If moss can be easily procured, a little of it put in the bottom of each pot will serve for drainage, otherwise a few crocks or some bits of old turf may be employed. The pots should be filled with soil, the same being pressed firmly, plunged a little in the ground by means of a trowel or other tool adapted for the purpose; but in doing this care must be taken not to injure the roots of the Strawberry plants near which the pots are plunged.

The runner-plant should be inserted lightly in the soil of the pot, and kept down either by a hooked twig or small stone, as explained in treating of the culture of the Strawberry in the open ground. If kept moist, the runners will soon take root. The point of the runners beyond the joint should be stopped, so that the nourishment from the mother plant may go only to the one layered.
When well-rooted, the plants should be shifted into 5- or 6-inch pots, properly drained, using a good turfy loam, mixed with leaf-mould or well-rotted cow-dung. If the compost is prepared six or twelve months previous to its being required for the purpose, so much the better. One plant in each pot will be sufficient. The plants when potted may be shaded till they recover, and then be placed in an open space with a hard surface — either paved or covered with coal ashes, to prevent the worms from working up into the pots; quicklime may also be sprinkled over the surface with the same object. The plants may be placed tolerably close at first, but as they grow larger they should have more space allowed, so that the foliage may have plenty of light and air. To prevent the roots from growing through the bottom of the pots, which they will be apt to do in wet weather, it is a good plan to lay the pots on their sides, or to stand each pot on an ordinary brick. The latter method also serves to keep out worms.

On the approach of winter, when the leaves mostly decay and the season of growth is over, the pots should be placed in a pit, where they can be protected from frost. Or they may be put into a heated pit close to each other, on shelves near the glass; abundance of air must here be admitted to them; and the heating apparatus only used to prevent frosts from injuring the roots. Where there is not the convenience of pits, ordinary garden frames will serve, but in this case the roots must be protected by plunging the pots in some light material, such as cocoa-nut fibre refuse. Or the pots may be placed on their sides in layers, one above the other, with their bottoms against a wall, coal ashes, old tan, or leaves being interposed between the layers. Some stack them in double rows by placing a row of pots on their sides, then another row with their bottoms against those of the first, any substance that will not readily freeze being laid upon and stuffed among the pots. Before the plants are taken in to force the pots should be cleaned, and a little of the surface mould taken off and replaced with rich soil. The crown of the plants, before they start into growth, may be covered with half-decayed leaf-mould. The plants should, wherever it be possible, be dipped in a pailful of sulphur and water—a handful of sulphur being ample. This is about the best possible preventive of mildew.

When the plants are started, the temperature must at all times be freely admitted, but of course much less will suffice when the weather is cold than when it is warm. The temperature and air should be regulated by the appearance of the foliage. If the leaflets are observed to be broad, yet of thin substance, and if the leaf-stalks are drawing up, as if likely to be taller and more slender than those in the open ground, less fire-heat and more air must be given, but an average temperature of 55° by day may be allowed, and continued when the flower-buds begin to open, at which period forcing must be conducted very slowly, for the reasons already stated, and if this is done every flower will set, or at least as many as the plants ought to bear. The upper portions of the flower-stalks are inclined to continue flowering in succession; but these should be cut off, for they only rob the fruit already formed, while they themselves are worthless.

After the fruit is set the temperature should be gradually increased, and towards the ripening period it may be raised to 65°, and occasionally as high as 75° by sun-heat. An occasional watering with weak liquid manure is a great assistance. Do not, however, be led away with the too popular notion that manure water is so essential as some think it to be. Three, or at the most four, such applications are ample. The plants should never be allowed to get dry, or the growth of the fruit will not afterwards progress so favourably, neither will the flavour be good.

When the fruit begins to colour no more water should be given than is requisite to keep the leaves from flagging, the quantity depending upon the temperature and dryness of the air, or, in other words, upon the amount of evaporation. This must be supplied, especially during hot sun, even during the period of ripening, otherwise the fruit would get heated, and the flavour be spoilt. The fruit ought to be gathered in the morning. The plants should be removed from the house as they are stripped of fruits.

Instead of layering the runners for plants to be forced in the ensuing winter and spring, runners may be planted out in August, the plants taken up just before they begin to grow in spring, potted in 5-inch pots, and shifted into 6-inch pots towards the end of July. In this month the spring foliage begins to get too old, and the plants are disposed to start a second growth of young foliage. This is favoured by the shift into fresh soil and larger pots. Along with new foliage fresh roots are produced, and
these are much better feeders whilst the plant is being forced than older roots would be.

Where there is not a sufficient supply of pots, or a scarcity of hands to attend to potted plants, young plants from runners may be put in about 8 inches apart, in rows 15 or 18 inches asunder; neither fruit nor runners should be allowed to grow on these in the following summer; a portion of the oldest foliage of each plant should be cut off in July, and a top-dressing of rich soil or leaf-mould and loam ought to be given close up to the necks of the plants, to encourage fresh roots from that part. These plants may be taken up in oblong strips about 1 foot wide, and placed near the glass in a pit, on some gently heating material, or on a platform with a hot-water pipe below. The heat from the latter should not exceed 60°.

Various other plans may be followed in forcing Strawberries, for if the main principles are attended to, modifications as regards minor points of detail may be varied according to means at command and other circumstances. We have known patches cut out of a plantation with the spade, potted into 8-inch pots, and immediately taken in to force; the crop was very good, although the fruit was not so large as from plants prepared for the purpose.

In France, Strawberries are sometimes forced in the bed in the open air; and where stable manure is plentiful this might occasionally be adopted in this country. Frames are placed over the bed, trenches 18 inches deep are dug out round the outside of these, and filled in the first instance to the level of the surface with fermenting manure, and afterwards to the height of the frames if necessary, to maintain the proper temperature. At night the sashes are covered with straw mats. In order to obtain a second crop from the beds so forced the plants are kept dry for some time after the forced crop is gathered; the old leaves are cut off, a top-dressing is given, water supplied, and in August a fair second crop is frequently obtained. The best variety for this purpose is Vicomtesse Hericart de Thury, which, if forced early, or reasonably so, will yield another crop in August and September. An open plot of ground is most desirable for this late second crop.

Propagation.—The Strawberry is propagated by seeds, division of the plant, and by runners. The Alpine varieties are always best raised from seeds (see special culture of, and notes upon); the others by runners.

To obtain the seeds the fruit may either be crushed on sheets of brown paper and dried by exposure to the sun and air; or it may be bruised by hand in water, and the seeds washed, those which float being rejected. If intended to be kept till spring, the seed should be well dried; but if not, it ought to be merely surface-dried and immediately sown, either in a sheltered part in the open ground or in pots. If in the open ground, the soil should be a very fine rich mould, mixed with peat, well-decomposed dung, or leaf-mould. The ground, if dry, should be watered; and when in working condition, the surface having been made smooth and even, the handle of the rake or any straight rod should be laid across the bed at every 6 inches, moderately pressed, and in the impressions so made the seeds should be thinly sown, then pressed by again applying the rod; and they ought afterwards to be very slightly covered by sifting over them a little decayed leaf-mould or old decomposed cow-dung. When necessary the bed should be watered.

The young plants, which should appear in less than a month, as soon as they have made four or five leaves may be transplanted to where they are to remain for fruiting. The plants may, however, be much more quickly brought forward under glass, where that is at command. The runners should be kept cut off the seedling plants, unless some are required to extend the plantation, and in that case it is a good plan to employ the first plant made by the runner from the seedling.

Runners are usually produced in abundance from most varieties. The growing point of a runner is furnished with a bud, and when the runner has extended to some distance from the stem the bud unfolds, and soon afterwards roots are emitted from its base. If in contact with moist permeable soil, these soon fix themselves, and a young plant is established. This is fed from the mother plant by means of its stolon, and until it has formed roots of its own; then a second stolon springs from the young plant, and another young plant is formed; and so on. It is evident, therefore, that if the runner be stopped after the first plant is formed, it will be better nourished than if several were allowed to grow from the same source. Again, the earlier the young plant can be rooted, the stronger and more substantial it will become, from having the advantage of exposure to light whilst the days are long.

The first proceeding is to encourage the plants to emit runners. This they do readily in moist warm weather, or when well watered. The run-
STRAWBERRIES
1, Sir Joseph Paxton; 2, Scarlet Queen; 3, Climax; 4, British Queen; 5, Leader; 6, Royal Sovereign; 7, Mentmore; 8, Trafalgar; 9, Countess; 10, Latest of All; 11, St. Antoine de Padoue
(Natural Size)
ner makes greater progress along a moist surface than it does along one that is dry. On a large scale, the runners for propagation are allowed to root in soil adjoining the plants; it should therefore be dug or forked over and made fine for the roots to strike into, which they will soon do if it is kept moist and they are closely in contact with it; and this, in many cases, can be easily secured by placing a bit of stone on the runner.

As soon as the young plant has developed a few leaves, the runner from it should be removed. On a small scale, and to obtain plants for forcing, 3-inch pots can be very advantageously employed; these to be filled with good rich soil, and then buried in the ground nearly to the brim. As soon as the bud at the first joint of the runner has developed a few leaves, it should be pressed closely upon the soil in the pot, and kept in contact with it either by means of a small hooked peg or a small stone.

The Strawberry may be propagated, in cases of emergency or in the absence of runners, by division of the plant; but it is neither a sure nor an expeditious method, for the plants are apt to fail, and, if they do take root, they grow but slowly compared with young plants from runners, and are apt to die off in winter. The best time to divide them is early in spring, before the young leaves expand, or in August, whilst there is heat in the ground to encourage the growth of roots before winter. If done in August, the old leaves should be mostly taken off. The plants must be protected from the direct rays of the sun till they have struck root, and the ground should be kept moderately moist. They ought to be mulched, before winter, with leaves, or any kind of litter that will afford some protection during severe frost.

*Insects, &c.*—See chapter on this subject.


The following descriptive list of varieties of Strawberries has been supplied by Messrs. Laxton Brothers of Bedford, whose collection of varieties is probably the largest known, and whose efforts to raise new and improved seedlings have met with exceptional success:

*Aberdeen Favourite.*—A fine late variety with handsome bright-crimson fruit, much grown in the north, and succeeds well in Bedford.

**Admiral Dundas.**—An old and well-tried mid-season variety, of a bright-red colour, fruit inclined to be slightly furrowed, of large size, wonderfully prolific, and good flavour.

**A. F. Barron.**—A large first-class mid-season fruit, varnished or glossy-scarlet in colour, raised from Sir J. Paxton crossed with Sir C. Napier. A valuable main-crop Strawberry, and good for forcing purposes.

**Amateur.**—A very large variety of the President type, but larger in size and better in flavour. Succeeds well in some localities, rather soft in the flesh.

**Auguste Buisson.*—A fine French variety, which has recently come into much prominence. A main-crop variety, large, and finely flavoured.

**Auguste Nieuw.**—The splendid large Strawberry sent by the Earl of Pembroke to the late Emperor Frederick William in his last days. An excellent variety both for growing in the open and probably the best of all for forcing. In addition to its enormous size the fruit is very beautiful, firm of flesh, of regular size, and of good flavour. The plant is free and productive.

**Bedon White Pine.**—The true white Strawberry. Heavy cropper, rich pine flavour; worth cultivating as a novelty.

**Black Prince.**—A very early small dark-coloured, good-flavoured fruit, much grown for earliest supplies and preserving.

**Bothwell Bank.**—A good, hardy, and fertile sort, somewhat after the style of President, but brighter in colour.

**British Queen** (see Plate).—The richest flavoured of all Strawberries, sweet and vinous, large and bright-coloured, but not ripening regularly; plant of vigorous growth, but requires a deep and warm soil and high cultivation.

**Captain.**—A beautiful Strawberry, very early, large and handsome, of a brilliant wavy-scarlet colour; good quality, and travels well. An excellent market and table fruit, a free-grower, coming in before Sir J. Paxton.

**Clairt** (see Plate).—A cross between Latest of All and Waterloo. It is intermediate between its parents, partaking of the enormous cropping qualities of Latest of All with the firmness of flesh of Waterloo. Flavour rich, colour bright glossy, crimson flesh firm and solid. A standard late variety.

**Cockscomb.**—Fruit large, ovate, occasionally cockscomb-shaped, pale-scarlet with white flesh, prominent seeds, richly flavoured; mid-season.

**Commander.**—A distinct and fine-flavoured main-crop Strawberry; plant hardy and most prolific; will grow and succeed well where British Queen fails.

**Competitor.**—Ripens immediately after Noble, extremely prolific and of good constitution, fruit large, conical, flavour moderate; best in dry seasons.

**Comte de Paris.**—A favourite with those who prefer a brisk-flavoured fruit; berry obtuse or heart-shaped; mid-season.

**Countess** (see Plate).—Large second early fruit, good colour and flavour, and of handsome cockscomb shape.

**Crescent Seedling** (American Scarlet, Little Gem).—An early American sort, tried and recommended by the Royal Horticultural Society as the earliest Strawberry and a free-bearer suitable for market purposes; a hardy and distinct variety.

**Dr. Hogg.**—One of the finest of all late Strawberries, of large size, quality first-rate, but does not succeed in all localities; considered by many superior to British Queen.

**Dr. Morer.**—This well-known French variety is, per excellence, the Strawberry grown in France both for market, forcing, and general purposes, and is as popular there as Sir J. Paxton is in this country; fruit highly
THE GARDENER'S ASSISTANT.

coloured, quality excellent, travels well; plant is hardy and vigorous.

Dr. Veillard.—A recent French introduction, near Creston Seedling; prolific, early fruits produced in clusters on a stout footstalk, and said to be a fortnight earlier than any other known variety.

Duke of Edinboro'.—Mid-season, dwarf, compact and of good constitution; fruit handsome in form and colour. Moderately prolific.

Elton Pine.—The true variety, very late, flavour somewhat acid, a good bearer and hardly. Useful for preserving.

Empress of India.—Plant of compact habit and a fine bearer, fruit obtusely conical, bright-scarlet, flavour approaching that of British Queen; an excellent free-setting variety, and one of the best for forcing.

Enchantress.—One of the most richly-flavoured; fruit dark-coloured, cockscomb in shape; requires to be well done to be good.

Fillbasket (fig. 1036).—Raised from Royal Sovereign and Latest of All; colour bright-scarlet, similar to Royal Sovereign; flesh white and firm with no hollowness in the centre; size between that of the two parents; flavour juicy, sweet, and luscious. The cropping qualities of this variety are most remarkable, no other variety approaching it in this respect—it carries more flower-spikes than foliage, with as many as thirty fruits on each. The habit of the plant is compact and robust, leaves thick and leathery, resisting mildew thoroughly. Ripens with Latest of All. As a second early-forcing variety it will prove equally valuable with Royal Sovereign.

Frogmore Late Pine.—Where this variety will succeed it is one of the most useful high-flavoured varieties to grow for a mid-season or late crop. Requires a rich soil.

Georges Leicser.—A very large mid-season variety, of French origin, almost flattened, ribbed, rather pale in colour, flavour excellent.

Gunton Park.—Fruit extra large, varying in shape from cockscomb to obtusely conical, dark crimson-scarlet, and of a pleasant brisk flavour, flesh firm and light-coloured; a fine early kind, very useful for forcing, and bearing in long succession.

James Veitch.—One of the largest Strawberries, colour good, flavour sweet and agreeable; plant hardy and prolific, suitable for forcing.

John Roskin.—One fine early variety, from a cross between Black Prince and Dr. Hogg, of good size and flavour, and a good cropper; plant hardy and vigorous.

Jubilee.—A fine, distinct, and prolific variety of good quality; very late, in some seasons the latest Strawberry.

Kens' Seedling.—The well-known and much- appreciated hardly second early variety, useful for all purposes; fruit large and of good flavour; plant hardy and prolific.

King of the Earlys.—Now well-known and largely cultivated as a most productive, early, and richly-flavoured sort.

Kitley's Gold.'—A very hardy main-crop variety, large, prolific, vigorous, and a good all-round sort.

La Constante.—An abundant bearer of very dwarf habit, producing runners very sparingly; fruit large, flesh white and firm, juicy and richly flavoured.

Lady Suffolk.—An excellent all-round variety, cropping well in the open, and forcing as a second early most satisfactorily. Fruits long, tapering, dark crimson, deliciously flavoured.

La Grosse Sucre.—The best Strawberry of the Kens' Seedling type, unsurpassed for flavour, size, and fertility as a forcing variety, and in the open as a continuous bearer of large, fine-flavoured fruits.

Latest of All (see Plate).—A cross between British Queen and Helena Gloede. Fruit larger than that of either parent, the flavour vinous, yet luscious, and quite equal to that of British Queen, but ripening several days after it. The best flavoured and largest late Strawberry yet introduced.

Leader (see Plate).—A cross between Latest of All and Noble, of good constitution. Fruit large, wedge-shaped, bright-crimson; flesh firm, of good flavour. Very prolific. A good forcer.

Lord Kitchener.—A cross between British Queen and Waterloo. The plant is vigorous and a most prolific cropper, ripening early in July. The fruits are large, roundish, dark-red, and very richly flavoured. A valuable addition to the mid-season varieties.

Lord Suffield.—Plant of good habit and foliage, very prolific; fruit large and handsome, inclining to cockscomb shape, dark-crimson flesh, firm and richly flavoured, ripening after President and Paxton.

M.'Mahon.—A very large late main-crop variety of a bright glossy-vermilion colour and good flavour.

Mentmore (see Plate).—Raised from Noble and British Queen. A handsome main-crop Strawberry of a rich-crimson colour with a smooth varnished appearance which adds much to its attractiveness; large, regular, flat-pyform in shape; flesh rich-red throughout, with no hard core or hollowness in the centre, in large loose trusses; a very heavy cropper. A good forcing variety.

Monarch.—A distinct second early variety with berries of enormous size, richly-coloured, wedge-shaped, and ripening early.

Norton Seedling.—A very hardy, distinct, and free-bearing mid-season to late variety, which grows in partial shade where other sorts will not succeed.

No. 1.—The earliest of all Strawberries. A seedling from Noble, fertilized by May Queen.

Noble.—The largest, handsomest, and most prolific early Strawberry ever introduced; produces an immense quantity of large and even-sized fruits, succeeding wherever Strawberries can be grown.

Old Pine or Carolina.—Very richly flavoured, but will not grow on all soils. It is worth a trial, as when it will do it is worth its place.

Oswar.—An excellent variety for general crop, an abundant bearer of firm, juicy and richly flavoured, wedge-shaped fruit.

Pioneer.—A very large and handsome late mid-season fruit of excellent quality. Flesh firm, colour deep-scarlet.

President.—One of the most useful and highly-flavoured main-crop Strawberries grown. Fruit large, bright-crimson, flavour excellent; plant hardy and prolific, forces well.

Preston Seedling.—A Strawberry largely grown under various names as a garden and market variety chiefly in northern districts. It is very productive, hardy and vigorous, the fruit large, long conical in shape, and of good flavour.

Prince of Wales.—A cross between Waterloo and British Queen, of large size and rich flavour, dwarf in habit.

Princess of Wales.—A cross between Latest of All and Frogmore Late Pine, of fine rich flavour and dwarf compact habit.

Queen of Denmark.—Raised from Frogmore Late Pine and Waterloo, new in colour, firm in flesh, and of good flavour; good for general culture.

Royal Sovereign (see Plate).—Raised from Noble, crossed with King of the Earlys. This possesses all the qualities required in a good Strawberry, either for open-air cultivation or as a forcer. The fruit is of the largest
Sensation.—An enormous second early or mid-season variety of good flavour, probably the largest Strawberry ever raised.

Sharpless.—The best of all the American Strawberries. Very large, early, and productive, and succeeds well in this country. Probably one of the parents of Noble.

Sir Chas. Napier.—One of the best forcing varieties, fruit firm and solid, of the brightest glossy-scarlet, ripening with Paxton.

Sir Harry.—An old and most useful variety for forcing, for which purpose it can be strongly recommended, good flavour, firm in flesh and of good constitution.

Sir Joseph Paxton (see Plate).—The most appreciated and widely grown of all main-crop Strawberries. Fruit large, handsome, bright-scarlet, flesh firm and travels well, flavour good; plant hardy and vigorous.

Souvenir de Bossuet.—A very large new main-crop variety raised in France, with enormous fruits, of first quality and fine form, flesh firm and white.

Stevens' Wonder (Monsignor Dupanloup).—A good early forcing variety of compact habit, producing large fruit of a light shade of colour; a free setter.

Stirling Castle Pine.—Second early or mid-season. An excellent variety, largely grown for market and suitable for general cultivation.

Teutonia.—A large-fruited variety, credited as being the earliest sort grown in Germany, and much recommended. In an election of Strawberries, conducted last season in Germany, this variety obtained the largest number of votes.

The Albert.—One of the best late Strawberries of recent Continental introduction. A good grower and bearer, flavour excellent.

The Laxton (fig. 1037).—"We believe this to be by far the finest of our many introductions, and in it we claim to have combined all the good points of those two fine varieties from which it was raised, viz. Royal Sovereign and Sir J. Paxton, and consider it to be the most wonderful Strawberry for earliness, size, firmness, quality, hardness, and vigour of plant combined. It is several days earlier than Royal Sovereign; it is considerably larger than either of its parents; it is much darker and brighter than Royal Sovereign, partaking of the rich colour and taking appearance of Sir J. Paxton. In flavour it is quite as rich as Royal Sovereign, with rather more sweetness. The fruit is firm, and it does not rot on the ground in damp weather, and is a good traveller. A very hardy and vigorous grower, retaining its foliage well in winter" (Laxton).

Trafalgar (see Plate).—An exceptionally fine late variety of rich pine flavour, equalling Royal Sovereign in size, crop, and colour, and as late as Waterloo. The fruit is pointedly conical in shape, very large, flesh and skin very firm, yet sweet and luscious. A good traveller, and exceptionally good grower and cropper, and likely to supersede many of the later varieties.

Traveller.—From La Constante and Napier. Fruit
medium, ovoid, deep-scarlet, seeds prominent, flesh firm, good flavour.

Unser Fritz.—A very large and handsome good late variety. Fruit dark-crimson; plant a sturdy grower and a free bearer.

Veitch’s Perfection.—The result of a cross between British Queen and Waterloo, a superb late variety of large size and deep colour. Is not recommended for very early forcing, but is an excellent second early kind for pot-culture.

Veitch’s Proméa.—A hardly, strong-growing, and exceedingly prolific variety raised from Empress of India and British Queen. The fruits vary in shape from conic to cockscomb; in the latter form they attain a large size, often 1½ to 2 inches long, and more than 1 inch deep, ripening to the apex. The skin is bright crimson-scarlet, the flesh whitish and firm, with a pleasant vinous flavour, in which that of British Queen is strongly pronounced. Most robust and vigorous. Will prove a fine forcing variety.

Vieussens Hericort de Thury.—A most excellent early Strawberry of high quality; plant hardy and prolific.

Waterloo.—A very distinct and popular late Strawberry. Fruit very large, dark-coloured, and of good flavour.

White Knight.—A distinct and richly-flavoured Strawberry, colour externally of a light scarlet on the upper and white on the under side, and when partially shaded the whole fruit frequently comes white.

**ALPINE STRAWBERRIES.**

The French growers have now for years past adopted the system of raising their stock of Alpine Strawberries from seed, treating them in fact as annuals or biennials, but it is only recently that English cultivators have followed their example. Plants raised from runners (the first runners from the seedling plants excepted) will not bear comparison with those raised from seed. One plant of the latter is worth a dozen of the former, not only in vigour of growth but also in the size and quality of the fruit and the extent of the crop. If raised from seeds annually the Alpine Strawberry is bound to become popular.

Sowing the Seed.—The Continental, and particularly the French growers, recommend that the seed be sown in August and September, but we prefer March or April, in order to have strongly-rooted plants before the hot weather sets in. Sow the seed thinly in shallow boxes or seed-pans, in the same way as for Celery. The first batch should be sown early in March, and later on another, if the stock obtained in the earlier sowing be not sufficient for the purpose. The seeds germinate quickly in a gentle and moist heat. As soon as the plants are large enough to handle they must be pricked off in shallow boxes 12 inches by 24 inches. These will take fifty plants comfortably. A genial temperature will be conducive to growth without any perceptible check, shading being scarcely needed. As soon as the plants are well established, a cold pit or frame near the glass will be the better choice, and a few weeks later—say by the middle of May—they can be quite hardened off to stand outside. The best soil for the seed is a light sandy loam with leaf-mould passed through a fine sieve; this retains moisture and saves frequent waterings.

When the plants crowd each other, they should be pricked off upon prepared ground—a light sandy loam with either leaf-soil or the manure from a spent bed of Mushrooms; or, failing this, roadside scrapings form a good substitute. A heavy and retentive soil is not in any sense desirable. The position should be partially shaded, such, for instance, as at the foot of a wall with an eastern aspect, where the sun does not shine upon the plants long. In this position the plants can remain until September or October. The position now need not be a shaded one, but all the same semi-shade suits the Alpine Strawberry at all times, such, for instance, as that afforded by standard trees of Pears or Apples; not Plums, however, because of the woolly aphid, which will deposit filth upon the foliage.

The ground should be well prepared by deep digging or trenching, as the case may be, regard being had to its previous good culture. Avoid a shallow soil with a hard subsoil, which will invariably be productive of drought. It is quite true that the Alpine Strawberry is not deep rooting; moisture, however, is essential for its successful culture. Either sloping banks or flat ground will answer. Beds made upon the flat can be watered more thoroughly than those upon sloping ground.

For the main planting, decomposed farmyard manure worked into the second spitt will afford considerable assistance upon light or warm porous soils. From the time of first pricking off the seedlings until the fruiting stage the hoe should be freely worked amongst the plants to keep the surface open as well as to cut down weeds. After pricking off, and also after planting, see that the plants are thoroughly watered so as to settle the soil around the roots. Whilst still in the former stage a damping overhead in the afternoon during hot weather will be beneficial. The plants should also be well watered when the fruit is ripening. This will need to be frequently repeated, from the fact that the same plants will remain in a continuous fruiting condition for months together. The ripe fruit does not so readily suffer as do those of the
large-fruited varieties. Mulching is advisable, quite as much so as in other kinds, but it should be of a finer description. The mulch may consist first of leaf-soil fairly well decomposed, or a spent Mushroom bed with short clean litter added as the fruits begin to colour.

It is better to plant 18 inches apart each way in beds, missing out every fourth row to form an alley. If the plants have time to become well established before winter, and at the same time are vigorous, they may be allowed to bear an early crop of fruit the following summer. The better plan, however, would be to pick off all the flower trusses until the middle of July, as in the case of the runners. By this means a grand autumn crop of fine fruits will be ensured up to the time of frost supervening. The following season the plants so treated should carry the first early crop, which will ripen about the same time as Royal Sovereign; these same plants will continue to bear well until the beginning of August, when the young plantations will be ripening their crops. After the early crop has ceased to be good, it is better to destroy the plants and rely upon the younger plants alone for the autumn supply. The annual raising of a sufficient number of seedlings will recommend itself as the most satisfactory mode of cultivation.

Towards the late autumn, when a morning frost is apprehended, the plants may with advantage be netted over, preferably by straining the nets upon wires at about 4 feet or so from the ground. This will ward off a considerable amount of frost. Although birds are well known to prey upon Strawberries, they do not do much harm to the Alpine sorts.

Alpine Strawberries are grown in pots for forcing in France, but this system will scarcely find favour with us, more particularly where the claims upon the glass space are heavy. The pot system is better perhaps for extending the late supply rather than for an early crop. If movable frames can be spared these might be placed over a portion of the plants either for the first early picking or for the latest crop. The best time for picking the fruit is in the early morning, and the time when the fruits are most appreciated is at breakfast. In gathering the fruits it is best to pick straight away into the dish, fancy basket, or punnet, so that they go straight to the table. It is not necessary to retain the stalks in picking.

Selection of Varieties of Alpine Strawberries.

*Belle de Meaux.*—This is quite distinct and of excellent flavour. In form and colour it much resembles Hautbois, being of the two the darker fruit, and in shape obtuse rather than conical.

*Bergy* and *Janus* are recommended by the French growers. The red and white varieties of *F. de Gaillon* do not produce runners, and are not so desirable. The plants are of dense growth, and the fruit somewhat small.

*Blanc* (White) is a very distinct and useful variety, and is much superior to the old white form. When gathering, a mixture of this and a red-fruit kind has a pretty effect.

*Blanc Ambloëre* (Improved Red).—This is a very distinct variety with slender fruits, often measuring 2 inches in length. Very prolific and hardy.

Perpetual Strawberries

These recent additions to garden Strawberries were brought into prominence a few years back on the Continent, and are now better known in this country, although their culture is not yet well understood. They are reputed to be crosses between the ordinary large-fruited or English Strawberry and the Alpine forms. After a few more years' experience with these Hybrid Perpetuals they will probably be largely grown in this country. The ordinary methods of cultivation for Strawberries do not answer for these.

The first Perpetual Strawberry raised was Louis Gauthier, a white-fruited variety with a slight tinge of pink upon the sunny side. As a summer-fruiting Strawberry it does not compare well with our well-known kinds. It is most prolific, and many fine fruits are produced. Its habit is robust, hence it should be planted at least 2½ feet each way—3 feet even, if room can be spared. The old crowns do not produce fruits again in the autumn, hence it is not in this respect similar to those yet to be noted.

The successional crops of fruit are produced upon the first and second runners of the current season; hence the advice to plant far apart and to encourage the production of runners as early as possible, even if it be necessary to denude the old stools of all their flower trusses. When these runners have been secured they should at once be pegged down securely, stopping the growth beyond the second one. As soon as they are well rooted the old crowns should be removed to afford room and light for the young stock. These will quickly show their flower trusses and in due course ripen fruits, if mulching and watering are attended to.

The runners can be layered into 48 pots, and during the months of September and October be placed in a frame or upon shelves in a cool house to ripen. There is no difficulty in securing ripe fruits up to the end of Novem-
ber in a Strawberry house proper, or where a slight warmth can be maintained.

The runners for pots should be taken as early as possible, selecting the strongest only. As soon as these are well established they should be cut off in order to give room for those rooted upon the ground, these latter providing a crop oftentimes in advance of the pot-grown stock. When the pot-plants are cut off they should be placed fairly close together, so that the necessary watering is an easier performance. When housed, these pot-plants should be damped over, either with a rose or syringe, both morning and evening, to supply the place of the dew then lacking. No harm will come of this practice, and if it were followed more with early forced Strawberries there would be fewer attacks from red spider. Of course when

the fruits are ripening it should be discontinued, and discretion exercised if the weather be damp or foggy.

These pot-plants after fruiting make capital stock for planting in the open. Never retain the old stools of Perpetual Strawberries, not even of the more recent kinds, but treat them as annuals, renewing the stock every year. Both Oregon and St. Antoine de Padoue will yield good crops, it is true, ripening nearly as early as Royal Sovereign, but neither of these is equal to it at that season; hence it is recommended that all these stools be denuded of their flower trusses, to prevent exhaustion and to hasten the production of runners as in the case of Louis Gauthier.

In autumn it is an excellent plan to support the fruits with sprays from old birch brooms to keep them from touching the soil or the mulch, which of itself retains moisture in excess oftentimes of the requirements at that season. Bearing this in mind, the wisdom of planting at 3 feet apart is clear, as at least six runners from each plant may be depended upon, oftentimes more.

Select Varieties of Perpetual Strawberries.

Jeanne d'Arc.—Very similar to St. Joseph, and possibly an improvement upon it, possessing greater vigour.

Louis Gauthier.—Already described.

Oregon.—Of supposed American origin, very similar in appearance to small fruits of Royal Sovereign, very productive upon runners, and good on the old stools.

St. Antoine de Padoue (see Plate, and fig. 1038).—All points considered, this is the best variety yet sent out in this section; it is a reputed cross—and its characteristics tend to confirm it—between Royal Sovereign and St. Joseph. Its fruits may be described as second-sized fruits of the first-named parent, which it also resembles in flavour, colour, and solidity of flesh.

St. Joseph.—Distinct and most prolific, requiring to be thinned of the smaller fruits to ensure size and good quality.
These varieties should all be tried, even if in small quantities, for it is possible that one may thrive better than another through varied surroundings.

All that is needed is a good Strawberry soil, an open, sunny position—then propagation by runners is ample and efficient. [J. H.]

CHAPTER XV.
MISCELLANEOUS HARDY FRUITS.

Almond—Chestnut—Hazel Nut or Filbert—Walnut—Quince—Medlar—Date Plum—Mulberry—Bramble—Logan Berry—Wineberry—Cranberry—Bilberry or Blueberry—Berberry—Elder.

Almond (Amygdalus communis) (fig. 1039) is a deciduous tree, growing to the height of 15 or 20 feet, a native of the warmer parts of Asia. The fruit consists of a dry or fleshy husk, and a shell of a greater or less degree of hardness, containing a kernel, which is sweet or bitter according to the variety, and which is the edible portion. The kernels of sweet Almonds are eaten at the dessert, and are largely used in confectionery and cookery. They also yield an oil, which is employed in medicine and the arts, especially in perfumery. The kernels of the Bitter Almond are used in the production of noyau and for flavouring confectionery. They contain hydrocyanic acid, and are poisonous to birds and animals. They also yield an oil which is extensively used in flavouring, but it should be used with caution, as it is poisonous.

The Almond seldom bears any considerable quantity of fruit, even in the south of these islands; for the blossoms appearing in March, and sometimes in February, are frequently destroyed by frost; and even if they do escape, there is rarely sufficient sun-heat to ripen the fruit as well as that imported from the south of France, and which can be purchased at a cheaper rate than Almonds could be produced in this country. The tree is therefore rarely planted for any other purpose than ornament, or occasionally as a stock for the Peach and Nectarine.

The Almond prefers a warm, deep soil, well drained, a sheltered situation, and a sunny aspect. Propagation is effected by seeds, and by budding on the Almond or on the Plum stock, for the perpetuation of the varieties. In raising from seeds, the finest and most perfect nuts only should be selected, and stratified in damp sand in November. When they have germinated, they may be planted in March or April, 2 inches deep, in light, rich, well-dug ground, and in a warm situation. They may be placed 18 inches apart, in rows 2 feet asunder, and many of them may be budded near the ground the same year, or standard high when two or three years older. In the autumn of the year after budding, the young trees may be planted where they are to remain; they should be carefully taken up, so as to preserve the fibrous roots as much as possible, and the tap-roots should be shortened by about one-third of their length. They ought then to be planted in well-trenched ground, and supported with stakes till well established.

Though the Almond stock is generally to be preferred, yet when the subsoil where the trees are to be grown is of a cold, moist, heavy nature, and where the surface soil is shallow, it is generally better to bud upon the Plum, as its roots do not strike so deeply into the ground, and are not so liable to suffer from an excess of humidity. The Almond may be trained as a standard, half standard, dwarf standard, or as a pyramid; and, in respect to pruning, it may be treated like the Peach. If fruits be produced, as sometimes happens, they may either be gathered whilst the shell is soft for immediate use, or remain on the trees till they fall. After gathering, the husks should be taken off and the nuts spread out on the shelves of the fruit-room to dry. Afterwards, they may be
packed in dry clean sand, and kept in a dry cool place.

Little is known respecting the comparative merits of the varieties in this country; and the following particulars as to the principal sorts are chiefly taken upon the authority of M. Vilmorin—:

_Bitter Almond.—_Diffs little from Common, except in the kernel being bitter. The shell is generally hard and dark in colour; there are several sub-varieties, differing in the size of the nut, as well as in the colour and thickness of the shell.

_Common (Amandier Commun)._—Nut about 1½ inch in length; shell hard and smooth, terminating in a sharp point; kernel small, sweet, but inferior to that of the other kinds. It is productive, and the sort most commonly cultivated in France. According to Downing it is one of the most hardy and productive kinds in the climate of New York. It is frequently used as a stock for the Peach.

_Hard-shelled Sweet (Amande douce à coque dure)._—Nut about 1½ inch long, smooth, and of a dull colour; shell thick and hard; kernel small. Differs from Common in having larger fruit. Also grown as a stock.

_Ladies' Almond (Amandier des Dames)._—Nut oval, more than 1 inch in length; shell of a light colour, porous, and so tender that it can be broken between the fingers; kernel sweet and rich. Considered the best sort, but is not so hardy as Common.

_Peach Almond (Amandier Pécher)._—Appears to be a cross between the Peach and Almond. It produces two kinds of fruit on the same tree, and sometimes on the same branch. The one is large, fleshy, and succulent, like a Peach, but bitter, and only edible when cooked; the other has only a dry husk like the Almond. They both contain a stone with a tolerably sweet kernel.

_Pistachia Almond (Amandier Pistache)._—Nut small, somewhat resembling a Pistachia nut in size and form.

_Soft-shelled Sweet (Amande douce à coque tendre)._—Resembles the Hard-shelled Sweet, but has a tender shell; kernel sweet and of good flavour, usually eaten in a young state. Very productive in France.

_Sultana Almond (Amandier Sultane)._—The nut resembles that of the Ladies' Almond, but is smaller; probably only a variation of that sort. Not an abundant bearer, and is peculiar to the south of France.

_Chestnut (Castanea sativa)_ is a native of South Europe, North Africa, and the Orient. It was at one time supposed to have been introduced into Europe from the trans-Caspian regions by the Romans, but the large areas covered with it from Portugal to the Caspian represent an indigenous growth. It has been so generally cultivated in Europe for centuries that it is not easy to determine how much of its actual distribution is due to the interference of man. In Italy and France careful attention has been paid to the improvement of the fruit. In Pliny's time eight varieties were known, and now there are very many more.

"The cultivated Chestnuts are divided into two classes, known as Marrons and Chataignes, the latter bearing about the same relation to the former as the Crab-Apple does to the Apple. Marrons are larger, more farinaceous, and much sweeter and more aromatic than the ordinary Chestnut, and are the result of careful selection and cultivation, which has been going on for centuries. Marrons of the best quality are produced in France, although it is in Italy that the Chestnut is more used as an article of food than in other parts of the world." (Sargent).

The following interesting note on the Chestnut in Italy appeared in the _Daily News:_—

"Signor Schirza, Inspector-general of Forests, says that the famous Chestnut-tree on Mount Etna still lives, and it now measures 64 metres (about 210 feet) at the base. Its age is estimated differently, the most recent observer fixing it at about 850 years. Almost all the Italian Provinces cultivate the Chestnut, some 500,000 acres being covered with it. The most are found in the provinces of Lucca, Sondria, and Genoa. The total annual produce of nuts in this country is about 5,768,000 quintals. There are several methods of preserving the nuts, from sugaring them to slightly boiling and then drying them, or laying them, when newly gathered in November, among perfectly dry sand in earthenware vessels and burying the vessels in dry earth, when they will remain fresh and good till the following June."

In England very little attention has been given to the Chestnut as a food-producing tree; yet there are few of what are known as forest trees which have anything like so great a value in this respect. Chestnuts are largely planted for effect, being excellent shade-trees, and suitable for screens, avenues, or groups, or as single specimens in landscape effects; moreover, there are few trees which thrive so well on poor sandy or gravelly soil. If, therefore, instead of planting the common form, the nut of which has been compared to a Crab-Apple, the large Marrons were planted, the crop of nuts obtained from them each year would be of considerable value.

The Chestnut of North America (_C. dentata_) and the Japanese Chestnut (_C. crenata_) are very nearly allied to the European plant, and their nuts are used as food in the same way.

The Chestnut succeeds in sandy soils and sandy loams resting on a dry subsoil. Calcareous soils are not well suited to its growth, and in stiff clays and retentive subsoils it seldom lives for any length of time.

_Propagation_ is effected by grafting and bud-
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ing in the case of named varieties; and by seeds for the common sort. The latter may be sown in October or November, or it may be better to stratify the seeds in sand, and sow in February or March, so as to avoid injury from severe frost. They should be sown in drills 2 feet apart, the seeds about 4 inches apart, and buried to a depth of 3 inches. Beyond keeping the ground clean, nothing further is required till the plants have attained the age of two years, when they should be taken up any time between October and March, about one-third of the tap-root cut off, and replanted 1 foot apart, in rows 2 feet asunder. A clear stem ought to be preserved by pruning off lateral branches.

The young trees should be transplanted every other year, and, according to their growth, allowed more space. When they have stems about 1½ inch in diameter, they should be planted where they are to remain. A distance of from 30 to 40 feet may be allowed between the trees.

Budding or grafting may be done in exactly the same way and at the same time as for Apples. Trees thus raised will fruit in from three to seven years from the graft, whereas seedlings may take twenty years.

Pruning.—Stop the lateral branches where disposed to make an undue growth, with a view to forming a straight main stem. Thin out the shoots where they cross or interfere with each other, and check grossness by root-pruning, thus making the trees early productive.

The fruit when fully ripe naturally detaches itself from the tree, and may be collected from time to time as it falls. The nuts should be beaten out of the husks and spread out in a thin layer in the fruit-room. Those not required for immediate use, after having been exposed for some time to the air, to get rid of a portion of their moisture, may be packed in alternate layers with dry sand, and kept in any dry place secure from frost.

The best varieties are:

Darlington (fig. 1040).—Of American origin. Tree vigorous and productive; nuts medium, of good quality, ripening early.

Numbo.—Burs usually single, nuts consequently large, sometimes two or three times larger than the common sort.

Paragon.—Nuts large, juicy, and sweet. A favourite in America.

Fig. 1040.—Chestnut—Darlington (natural size).
Hazel-Nut or Filbert.—These are the seeds of Corylus Avellana (fig. 1041), a shrub or small tree with a comparatively thick trunk, a spreading head, and orbicular cordate leaves. It is a native of the British Islands and other parts of Europe, and is not uncommon in our copses and hedgerows. The size and quality of the nuts have been improved by cultivation and selection, and we have now numerous named varieties. They are extensively cultivated in the south of Europe, especially in Spain, whence come the large variety known as the Barcelona nut. They are also much grown in some parts of Kent.

The term Cob-nut is applied to those with short-tailed husks, those with tails longer than the nuts being known as Filberts.

Soil and Situation.—The Hazel-nut will grow in almost any soil; but that in which it is most fruitful is a loam upon a dry sandy rock. It succeeds very well in sandy loam, or in a mixture of loam and brick rubbish. In strong, moist, loamy soils, the trees are apt to grow too much to wood. In the warm parts of the Continent they are planted towards a northern exposure, but in this country a southern slope is the best.

Culture.—The distance between the trees may be 10 feet each way, and then they must be kept within limits by pruning, so that they may not shade each other. If the soil is not naturally rich, if it is thin, sandy, or rocky, manure of some sort should be given every year, especially if the trees bear heavy crops. Old woollen rags
are found to be a good manure, and the decayed prunings and foliage of the trees themselves are likewise used with advantage. Manure is applied by laying it on after having removed the surface soil for some distance round the tree in autumn. When the soil is removed, all suckers should be carefully eradicated, otherwise manuring will be of little avail, for the nourishment afforded by the manure will be carried by the sap into the suckers rather than through the vessels of the old stem. Keeping the plants clear of suckers is a most important point in the cultivation of the Hazel-nut; if, indeed, it is not of all others the most important.

Pruning.—The plants should be reared, in the first instance, with a single stem, which in autumn should be topped at 18 inches from the ground. If after the final planting the stem should appear too weak, it will be advisable to allow the plant to grow unchecked, except in respect to suckers, none of which should be permitted to expand their foliage, but must be removed as soon as they can be discovered.

When the plants have grown for one season, those that have too weak stems should be cut down near the ground, and only the strongest one of the shoots which subsequently push should be permitted to grow. It should be trained erect during the summer, and cut back in autumn to 18 inches from the ground. This constitutes the upright stem, 1 foot of which should always be kept quite clear of shoots. If above this height six sufficiently strong shoots push, let them be inclined outwards and at equal distances from each other. This can be done with the greatest regularity by means of a hoop placed in the centre. If six good shoots cannot be obtained, select three of the best, and endeavour to grow these three of equal strength during the summer, and cut them back to within 4 or 5 inches from their base. In the following summer two shoots from each of these three will become the origin of six branches for forming the head. The leading shoots of these branches require to be shortened more or less at every winter pruning. How far they should be shortened back depends on the soil and climate. The object is to cause the shoot to push laterals along its whole length, instead of being naked near its base, as would otherwise be the case; and this will be ensured by cutting off two-thirds; but one-half or one-third may, under some circumstances, be found sufficient.

In Kent, the trees are not allowed to exceed 6 feet in height, and in many cases not more than 4½ or 5 feet. In consequence of the leading shoots being thus shortened, laterals will be abundantly produced. If any of these are likely to grow too strong, they should be checked by pinching. In autumn, the laterals should be shortened back nearly close to the stem, and in consequence of this two or more shoots will push from their bases, which would not otherwise have been the case. If the plant is not growing too luxuriantly to wood, these shoots will bear fruit. If they are too numerous they should be thinned; and if any are too strong for the others, they should be checked, for by this means the flow of sap will be equalized, and then not only will productiveness be induced, but the fruit will be well nourished and of large size. It should, however, be borne in mind, that if any shoot is allowed to push with excessive vigour in any part of the tree, the fruitfulness of the other parts will be rendered uncertain.

It should be understood that the Hazel-nut is monoecious, that is, separate male and female flowers are produced on the same plant (see fig. 1041). The male flowers, those long pendulous catkins, appear in winter; but the female flowers are not visible till spring, and are then rather inconspicuous. The bud containing a female flower is a little more plump than the ordinary wood-buds, and from its apex several deep crimson thread-like styles are protruded in spring. The pollen of the male flowers being essential to fertilization, if there are no catkins, or if they are cut off in pruning before the female flowers appear, there can be no fruit. It is, therefore, necessary to save a good number of catkins when the trees are pruned; if this can be done, it is best to prune in January; but if the catkins are scarce it is advisable to delay pruning till the female blossoms have been for some time expanded; and even then, if the catkins are so situated that, in order to give the tree a symmetrical form, they would have to be cut away, it is well to leave some of the shoots which are best furnished with male blossoms, for a week longer. In cases where the catkins have been badly injured by frosts, or are very scarce, branches well furnished with them may be cut from the common Hazel and fixed among the branches of the cultivated trees; the pollen from these branches will then fertilize the female blossoms.

As already observed, the laterals generally bear the fruit. They should be shortened to a female blossom-bud as early in spring as these can be discerned. Occasionally some of the shortest twigs, with a flower-bud at the ex-
tremity, may be left unpruned; but laterals that have borne should be cut back to two eyes, or within $\frac{1}{2}$ inch of the branch from which they proceed.

Gathering and Storing.—Nuts may be gathered for immediate use when the husks become brown; but for keeping, they should remain till ready to drop from the tree, and then be gathered when perfectly dry. The Red and White Filberts are the sorts best adapted for keeping in the husk. The base of the latter is succulent, and must be thoroughly dried before the nuts are packed for keeping. When the husks become dry, they are exposed by dealers to the fumes of sulphur, which doubtless prevent them from becoming mouldy. Others, when the husks are dry, pack the nuts in dry-ware casks, or in new flowerpots, with a sprinkling of salt, which also pre-

vents mouldiness; others again put them in jars, and strew a layer of salt 1 inch thick over them before covering up. In all cases, when packed, they should be kept in a cool, dry situation, with a steady temperature.

Propagation.—The Hazel-nut may be propagated by seeds, layers, suckers, or grafts. The nuts should be gathered when ripe, and allowed to dry until they drop out of the husk or can be readily taken out. They should then be kept in sand, and sown in October in rich light soil. Though this mode may be adopted on a large scale, yet, as the nuts, when so treated, are liable to be attacked by mice, it is generally better to stratify the nuts, and plant out in nursery rows in spring. Plants raised from the nuts of good varieties are rarely so good as their parents, but answer well for planting in woods for rods, hoops, and other purposes; or they may be reared with single stems, and grafted with any of the improved sorts.

Layering should be performed in autumn, or at any time before spring that the weather may permit. The layers will generally be fit for taking up and planting in nursery rows, 3 feet apart and 1 foot asunder in the row. Some prefer plants from layers to those raised by any other mode.

Propagation by suckers is the mode usually adopted in Kent, where they are generally taken from the parent plant in autumn, shortened to 10 or 12 inches, and planted in nursery rows, where they remain three or four years.

Propagation by grafting is not the usual mode, but it may be very advantageously employed in some cases. The grafts take readily, and if a strong-growing sort be grafted on one that is less vigorous, fruitfulness will be induced, and over-luxuriance checked. Whip-grafting is the best mode, and the operation should be performed in February or March.

Diseases and Insects.—The tree is rarely at-
tacked to an injurious extent by either of these, but the crop is sometimes destroyed by the nut-weevil (*Balainus nucum*), which pierces the tender shell of the young nut, and deposits a single egg in the interior. The maggot hatched from this feeds upon the kernel until it has attained its full size, when it eats its way out either before or after the nut has fallen to the ground, and buries itself in the earth, where it becomes a pupa. In the following summer it reappears as a moth, again to carry on its work of destruction. All that can be done to prevent the repetition of the mischief is to shake the trees in August, and having collected the fallen nuts, to burn those which are perforated.

The most esteemed varieties are:

_Cob._—Husk short, hispid. Nut large, short ovate, slightly compressed; shell very thick and hard, generally well filled by the kernel, which is of good quality. **Tree of strong upright habit, and a good bearer.**

_Cosford._—Husk nearly the length of the nut, deeply divided, slightly hispid at the base, expanding but not becoming reflexed when the nut is ripe. Nut large, oblong; shell light-brown, very thin; kernel filling the shell, white, sweet, and very good. **Tree a good bearer, ripening its fruits rather early.**

_Downton Large Square* (Atlas) (fig. 1042, c).—Husk smooth. Nut large, short, four-sided, rounded at the corners; shell thick; kernel very good.

_Duke of Edinburgh* (Princess Royal).—Husk frequently longer than the nut; downy, coarsely fringed. Nut large, shell thick; kernel of fine flavour. **Tree a good bearer.**

_Frizzled Filbert._—Husk about twice the length of the nut, deeply divided, spreading open at the mouth, frizzled, hispid. Nut in clusters of three or more, small, oblong, flattened; shell rather thick, well filled by the kernel. It ripens rather late.

_Merrielle de Bokelierre._—Husks shorter than the nut, frizzled. Nut large, shell thick; kernel large and of good flavour. **Tree vigorous and remarkably productive.**

_Pearson's Prolific* (Dwarf Prolific, Nottingham Prolific).—Husk short and hairy. Nut medium-sized, shell thick; kernel large and sweet. **Tree of sturdy, productive habit of growth, quite young bushes bearing freely.**

_Bed Filbert._—Husk long, tubular, hispid. Nut medium-sized, ovate; shell thick; kernel covered with a crimson pellicle; flavour good. **Tree a good bearer.**

_Wobb's Prize Cob Filbert* (fig. 1042, a).—An improvement on the well-known Lambert's Filbert. Husk nearly smooth, longer than the nut. Nut large, over an inch in length, produced in large bunches; shell thick, brown; kernel full, covered with reddish skin, richly flavoured, keeping admirably. **Tree extremely vigorous, very productive.**

_White Filbert._—Husk long, tubular, contracted round the apex of the nut, hispid. Nut medium-sized, ovate; shell thick; kernel covered with a white pellicle; flavour good. **Tree a good bearer.**

Other good sorts are:—**Brunswick Cob, Close-headed Prolific, Cosford Club, Daviana, Emperor, Kentish Cob, Louis Berger, Prize Exhibition Cob, Purple-leaved, Reigate Cob, Trebizond and Spanish Prize* (fig. 1042, b).

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**Walnut** (*Juglans regia*, fig. 1043). A lofty monoecious tree, a native of Persia and Asia Minor, whence it appears to have been carried into Greece at least three hundred years before the Christian era; then into Italy, France, Spain, and other parts of Europe. The date of its introduction into Britain is unknown; and though the tree is not recorded to have been cultivated till about the year 1562, yet the circumstance of a Walnut-shell having been found, together with a large quantity of Roman remains, 35 feet below the surface, in excavating the foundations for the Royal Exchange in London, renders it by no means improbable that the Walnut was brought into this country by the Romans. The fruit whilst young and tender is largely used for pickling, and when ripe it forms a favourite article of the dessert. An excellent oil, much used in the arts, is obtained from the kernel; and the wood, being light, durable, and susceptible of a high polish, is largely used by the cabinet-maker; it is also considered preferable to any other for making gun-stocks.

The Walnut succeeds best in deep sandy loams; calcareous soils, and stiff loams resting on a gravelly bottom, are also well suited for its growth. It requires plenty of room, as well as a free exposure to air and light; and in consequence of its not succeeding well in clumps or groups, the trees are generally planted in a

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**Fig. 1043.—Walnut** (*Juglans regia*)
single row in some open spot where their shade and wide-spreading roots will not prove injurious to other plants.

The final plantation may take place the year after grafting or budding; it may either be performed in autumn, after the fall of the leaf, or in spring. The ground should be deeply trenched, and large holes having been made, the trees must be carefully lifted with balls and planted. In the spring, when all danger of severe frost is over, the graft may be shortened back a little, and at the same season in the following year it should be cut back to five or six eyes. As the trees form their heads naturally, little pruning is required; it is merely necessary to keep a straight stem by cutting off struggling growth, to prevent branches crossing each other, and to remove dead wood or that which is accidentally injured. The best time for performing these operations is in autumn, a little before the fall of the leaf.

For pickling, the fruit should be gathered whilst the shell is so soft that it can easily be pierced with a needle. When perfectly ripe, the husk opens, and at this time it is usual to beat the tree with rods; but this is at best a barbarous practice, and, where there is no danger of depredations, unnecessary; for the nuts, when ripe, drop, and may be collected from time to time. There is, however, a common prejudice, that threshing the trees increases their fruitfulness, but it does not appear to be founded on fact. Where this mode of gathering is adopted, care should be taken to strike lightly, and not to bruise the buds upon which the future crop depends. After gathering, the nuts should be spread out in a layer about 3 inches thick, in a dry, airy place, and turned frequently till they easily part with their husk; and after having been thoroughly dried, they may be packed in alternate layers with sand in jars or casks, or they may be placed in jars, and salt scattered over them as they are put in. The jars should then be kept in a cool, dry place. Previous to use, the Walnuts should be wiped perfectly clean with a cloth; and if the kernel is shrivelled, they should be steeped for several hours in milk and water, to restore its plumpness, and cause it to part readily from the thin pericarp with which it is covered.

Large quantities of Walnuts are imported into this country from France, Belgium, and Holland. The total quantity imported annually is said to be about 70,000 bushels. The tree grows so well, and crops so regularly and abundantly in this country under the most ordinary conditions, that it would be worth our while to plant it largely for the sake of its nuts.

Propagation is effected by seeds, budding, grafting, and inarching. The best nuts should be selected for seeds, and these, having been stratified in sand in a cool place during the winter, may be planted in February, either where the trees are intended to remain, or in a nursery for transplantation. By the former method the tallest and best trees for timber are obtained, whilst the latter mode is generally more convenient, and affords trees which come sooner into bearing and ripen their fruit earlier in the season than those not transplanted. The ground having been trenched 2 feet deep, the nuts, if sown where they are to remain, should be placed 4 inches apart, in patches of three or four, and covered to the depth of 2 inches. In general 60 feet may be allowed between the patches; but in rich, deep soil, 70 or 80 feet will not be too much. The strongest seedling in each patch should be retained.

If the plants are to be grown in a nursery, the nuts should be placed 18 inches apart, in drills 2½ feet asunder. In the autumn of the year after sowing, and as soon as the leaves have fallen, every alternate plant should be taken up with a ball, and replanted elsewhere at 1 yard apart, the extremity of the tap-root having been cut off, in order to induce the production of fibrous roots. The next year, those not transplanted should be taken up, treated in a similar manner, and replanted somewhat farther apart. As the plants increase in size, successive transplantations should take place every second or third year till the trees are finally planted.

Although it is usual to propagate the Walnut by means of the seed, yet other means must be resorted to in order to secure the reproduction of particular sorts with certainty. Grafting the Walnut is seldom practised in this country, but in France it is usual where named varieties are cultivated. The trees are grafted when the stems are from 3 to 5 inches in circumference.

The methods employed are whip and cleft grafting, flute-budding, ring-budding, shield-budding, with a pushing eye, and herbaceous cleft-grafting; but whatever be the mode adopted, the sap must be in full flow at the time the operation is performed. For cleft-grafting the scions should be taken off in spring, before the rise of the sap, and laid with their ends in the ground in a north border, where they should remain till required for use. In
grafting, care should be taken to behead the stock above a shoot, opposite to which the scion should be applied. When the scion begins to push, this shoot may be pinched; and when success is no longer doubtful, it should be pruned. In ring-budding, which is only performed when the sap is in full flow, a ring of bark provided with an eye is taken from two-year-old wood, placed on the stock from which a similar ring has previously been removed, and the edges, having been accurately fitted together, are covered with grafting wax, but it is not necessary to tie up. In the following spring the portion of the stock above the graft should be cut off. It may be remarked that this mode of budding is also applicable to shoots and branches.

Insects.—The Walnut very rarely suffers from insects, to which the smell and astringency of the leaves appear to be peculiarly distasteful.

The caterpillar of the wood-leopard moth (Zeuzera osculi) and that of the goat-moth (Cossus ligniperda) occasionally attack the stem, and greatly deteriorate the value of the timber. (See chapter xi, pp. 113, 114.)

The principal varieties are:

Cluster.—Fruit produced in clusters of fifteen or twenty, thin-shelled, and of good flavour.

Common.—Fruit oval, not large, but well filled. Tree an abundant bearer.

Highflyer.—Middle size, remarkably thin-shelled, and well filled. It ripens early. One of the best for this climate.

Large Double (Noyer à bijoux).—Fruit very large, double, kernel good, but soon shrivels. The shells are frequently used by ladies for holding gloves and trinkets, hence its French name.

Large Long-fruited.—Fruit thin-shelled, very full, of excellent flavour, and produced in great abundance.

Late (Noix Saint-Jean) (fig. 1044, c).—The principal merit of this sort consists in its not flowering till the end of June, so that the crop is not exposed to injury from late spring frosts.

Parisiene (French Walnut) (fig. 1044, a).—Fruit very large, but must be eaten soon after gathering, otherwise it becomes hard and shrivelled. The tree is not a great bearer.

Prohibe.—This variety is said to come into bearing when the seedlings are three years old, and to reproduce itself from seed. It may be trained as a pyramid, but the pruning for this purpose should be performed in summer, whilst the shoots are soft.

Pyriformis (fig. 1044, b).—Remarkable for its Pear-shaped fruit, containing an oval nut of good quality.

Thin-shelled.—Fruit double, longer, earlier, and of better quality than the others. It has a very thin shell, which is frequently pierced by birds in order to get at the kernel.

Yorkshire.—Large but not double, well filled, shell moderately thin. It ripens well.

Quince. — Several species of Cydonia are cultivated under the name of Quince, viz. C. vulgaris (the common Quince), C. sinensis and C. cathayensis (Chinese Quinces), and C. japonica (Japanese Quince). The last-named is grown as a decorative plant, but it crops very freely, and its fruits are useful for jellies, flavouring, &c. The best-known is C. vulgaris (fig. 1045, a), which is supposed to be a native of South Europe, but this is uncertain. It forms a low, deciduous tree, of a crooked, branching, irregular habit of growth. The fruit, which is powerfully odoriferous, and in its raw state acid, astringent, and unfit for eating, is principally used for making an agreeable ice, Quince.
marmalade and other preserves, as well as to give briskness and flavour to Apple pies and tarts.

The tree itself is much employed as a stock for certain varieties of the Pear which are intended to be trained as dwarf pyramids or espaliers.

*C. cathayensis* and *C. chinensis* (fig. 1045, c, d) are not unlike each other in general characters; they have ovate fruit 5 to 7 inches in length, which have all the useful qualities of the common Quince. They require, however, the protection of a south wall, and even then they do not ripen fruit in England except in exceptionally warm summers.

The common Quince (fig. 1045, a) succeeds in any soil, but prefers one of a rich, somewhat light, and moist nature; heavy clays and dry sandy soils are but ill suited to its growth. To ripen the fruit properly, a situation open to the sun on the south, east, or west side, is necessary; but in any case, and particularly in cold and backward localities, a southern aspect is highly desirable.

Pruning and Training.—The Quince does not naturally grow with a strong erect stem, such as is desirable for a standard, but is apt to grow up with long flexible shoots, inclined to branch and twist. A tree planted where it is intended to remain, should be allowed to grow at freedom for a season. It ought then to be cut back, in autumn, to within 18 inches of the ground. Several shoots will push, the strongest of which should be trained upright to a rod, and shortened a little at every autumn pruning. If the one highest up be the strongest, so much the better; if not, the shoot or shoots above it must be rubbed off; and those below it should be pinched, when 1 foot in length. Laterals on the young upright ought to be allowed to grow during the summer, but they should be shortened to a few inches at the autumn pruning; at the same time, the shortened shoots between the base of the one trained upright and the ground ought to be cut clean off. By continuing to train the young shoot quite upright, an erect
stem will be ensured; and, by allowing plenty of laterals to grow, and by gradually reducing them, the stem will be rendered strong enough in course of a few years to be self-supporting. When the stem has attained the required height, the head should be formed as directed for the Apple. After the principal branches have been originated, very little pruning will be necessary. Over-luxuriant shoots are apt to start up; these should be looked for, and checked at an early period of their growth, and weak spray and cross shoots ought to be cut off.

The fruit ripens in the end of October or beginning of November, and may hang on the tree as long as there is no danger of frost. After gathering, it should be wiped with a clean cloth and laid out on shelves, or on well-dried straw, in some cool place, apart from other fruits, to which it is apt to communicate a disagreeable flavour. It does not keep longer than a month or six weeks.

**Propagation** is effected by seeds, but as these seldom ripen in this country, cuttings and layers are the modes generally adopted. Cuttings should be made early in autumn, from wood of the same year, and if possible with a small heel of two-year-old wood. They should be planted 1 foot apart, in rows 2½ feet from each other, and if watered in dry weather they soon strike root. If intended for stocks, they may be grafted or budded the second or third year after they are put in; if not, they may remain in the nursery for two or three years, and may then be planted where they are to remain. The best plants are obtained in this way, though not so quickly as by layering.

In propagating by layers, the stem of a Quince-tree is cut down in autumn to form a stool, and the young shoots which are put forth in consequence are layered in the autumn of the following year, leaving two buds above-ground. When these buds have made shoots a few inches in length, the top of the weaker one should be pinched off, and in two weeks after it may be cut back to the lowest two leaves. The remaining shoot must be trained upright. In autumn the layer should be taken up, the shoot which was shortened back in spring cut off close to its base, and any laterals which may have pushed cut back to two eyes. The rooted layers formed in this way may then be planted out in nursery rows. Instead of laying down the shoots in the above manner, the following procedure is generally adopted near Paris:—The stem of a young and vigorous tree is cut down in spring to within 8 inches of the ground, and in the following year, when a number of good shoots have pushed, mould is thrown in amongst them so as to cover the top of the stump, but leaving their tops above-ground. The earth is then formed into a truncated cone, and a basin is made in the centre. The shoots soon strike root, and may, for the most part, be severed from the stump and planted in the autumn of the succeeding year. The stool will soon produce fresh shoots, which may be treated in the same way, and young plants may thus be obtained every two years.

Young plants intended for stocks should be shortened back to 18 inches, but if for standards, they ought to be trained upright and at full length to a rod. Those for stocks should, in the summer after planting, have the lateral shoots cut entirely off to the height of 6 inches above the ground, in order to form a clean stem near where they are to be worked. But those not propagated for this purpose should have the lower laterals shortened to two eyes, and the points of the remainder must be pinched to determine the sap towards the leading shoot. In two years they may be taken up, after the fall of the leaf, and transplanted to wider distances apart, or planted where they are to remain. In the latter case, they may be placed 15 feet apart.

The principal varieties cultivated for the fruit are:

**Apple-shaped Quince.**—Leaves ovate, downy beneath. Fruit roundish, 2½ inches in diameter, of a rich golden colour. Very productive; ripens in a less favourable climate than the other sorts.

**Champion.**—Fruit very large, round; skin bright-yellow; flesh very tender when cooked; flavour delicate. Tree very productive, commencing to bear freely when young.

**Pear-shaped Quince.**—Leaves oblong-ovate, downy beneath. Fruit large, pyriform, or sometimes roundish, with a short neck, more or less ribbed towards the eye, of a somewhat paler colour than the Apple-shaped, and ripening later.

**Portugal Quince.**—Leaves very large, broad oval or ovate, downy on the upper side, very downy beneath. Fruit 4 inches in length, and 3½ inches in diameter at the widest part, from which it is most elongated towards the stalk, tapering more abruptly towards the eye, where it again projects, forming irregular ribs; skin thickly covered with grey wool, beneath which it is deep-yellow; flesh more tender, juicy, and much better for every purpose than that of the other sorts. The tree is taller and more vigorous than in the Apple-shaped and Pear-shaped varieties, but is not quite so hardy, and bears less abundantly. It is frequently planted for the ornamental appearance of its flowers and fruit; also, from its vigorous growth and forming thicker annual layers of wood, it is well adapted for stocks for the Pear.

**Medlar (Mespilus or Pyrus germanica)** (fig. 1046) is a low, deciduous tree, a native of Asia
and Europe, including the British Islands, where it grows naturally in hedges, woods, and copses. Its fruit is hard, acid, and unfit for eating till it loses its green colour and bleeds, or begins to decay, when it acquires an agreeably acid, somewhat astringent flavour. It is generally eaten raw, but is also occasionally made into preserves along with sugar.

The Medlar is raised from seeds, which should be taken out of the ripe fruit and sown immediately. They usually take two years to germinate. The seedlings should be trained to a strong stake in order to preserve a tolerably upright stem. Seed is only sown with the view of obtaining new varieties or stocks, the varieties being propagated by budding or grafting upon the wild Medlar, Pear, Quince, or Thorn. The latter kind of stock is preferred on the Continent, and is perhaps the best where the soil is sandy and dry. The Quince stock is best in moist soils, as its roots extend near the surface; and the Pear, grafted standard high, gives a straight stem and a more regular appearance to the tree, for which it is probably the best stock in ordinary soils. Any of the usual modes of grafting may be employed; but for that purpose scions should be chosen from shoots of the previous summer's growth, and care be taken to cut off the extremities where the flowers appear, otherwise they will not succeed. When budding is resorted to, the mode with a dormant eye is preferred.

With regard to soil, the Medlar is not particularly growing in any that is not arid or swampy, but it produces the largest and best fruit in rich, loamy, somewhat moist ground.

The tree may be trained as a standard, and the Nottingham, Royal, and Stoneless varieties may even be formed into productive pyramids, in the same way as the Pear. The Nottingham Medlar, which takes an upright growth, requires very little pruning; but the Dutch Medlar, and others of similar crooked growth, will require some regulation to prevent the branches from crossing and rubbing against each other. More than this need not be attempted, for the branches
are naturally so inclined to assume an elbowed form, turning frequently at right angles in any direction, that to keep them straight would be almost an impossibility, and in our opinion would only spoil the characteristic rusticity of the tree.

The fruit should remain on the tree until the end of October or beginning of November; and when the stalks are ready from the bearing shoots it should be gathered on a dry day, carried to the fruit-room, and laid out upon the shelves. It is a good plan to dip the end of the stalk in a solution of common salt, for this tends to prevent the attacks of a minute fungus, which usually commences at that part and extends to the fruit, which it renders useless. Some place straw beneath the Medlars, but unless perfectly clean and dried upon a kiln or in the sun, it encourages mouldiness, and is apt to give them a musty flavour. The fruit should be looked over from time to time, and any that is affected with fungus must be at once removed, otherwise it will taint the rest. It becomes fit for use in two or three weeks after gathering, and may keep good till January.

The varieties worthy of cultivation are:

_Dutch Medlar._—Fruit very large, 1½ inch in diameter, grayish-green previous to bletting, bright reddish-brown when ripe. Flavour good, but inferior to that of the Nottingham.

_Nottingham Medlar._—Fruit 1 inch in diameter, obovate, of a bright yellowish-brown spotted with russet, of a rich, brisk, sub-acid flavour. The best as regards quality. Tree of upright growth; leaves small.

_Royal._—Fruit medium, flavour brisk and pleasing. Tree of upright growth, and very productive.

_Stoneless._—Fruit small, ½ inch in diameter, obovate, of a russet-brown colour when ripe, and stoneless. Inferior in flavour to the preceding sorts, but keeps longer, and is worthy of cultivation on that account.

_Date Plum (Diospyros Kaki),_ also called Japanese Persimmon and Kaki, is scarcely known in English gardens yet, although it has been cultivated for many years in the south of Europe, and its fruits have found a ready market in continental towns where their merits are recognized. The tree is not likely to be hardy in England, except in the warmer parts, although Professor Sargent, whose observations are quoted below, is of opinion that some of the varieties cultivated in Japan would thrive in a climate as cold as that of the north of England. In a few gardens in the south the Diospyros has ripened fruits in the open air, whilst in a sunny greenhouse at Kew it grows and fruits every year.

Apparently the requirements of the plant are essentially those of the Apple or Peach; it is certainly easily grown, and it flowers freely.

About a dozen named varieties are now being tried at Kew in an unheated house, and they promise to do well there.

As the varieties are propagated by grafting, and the Diospyros bears male and female flowers on separate plants, it follows that all the plants we cultivate are females, and as they mature their fruits without the aid of fertilization, as in the case of the Banana, &c., they are seedless. Fruits matured at Kew were as large as a Cox’s Orange Pippin Apple, and when ripe were as soft as a very ripe Tomato, and quite as juicy.

The Date Plum has been abundantly grown, from the earliest period, in all of the Japanese provinces, except in those where the climate is excessively hot or cold.

The fruits are very harsh and astringent before maturity, but become luscious and highly nutritious when ripe, more especially after exposure to frost. They are edible in the raw state when ripe, or made into very delicious sweetmeats and dried fruit. From the unripe fruit a juice is expressed, which is used instead of varnish for many purposes, under the name of Persimmon sap. The tree is distinguished for the excessive hardness of its wood and its black ebony-like colour.

In Japan the Kaki has long been subject to
improvement by culture and selection of the best varieties, of which there are now many, differing greatly in size, shape, and quality; some being oblong, others resembling, both in shape and colour, a large, red, smooth Tomato.

The soil most suitable for the Kaki is a gravelly clay-loam, in an open situation neither too dry nor too damp. The plants require manuring once in winter, preferably with night-soil applied in a circular furrow around each plant. They must be pruned each alternate year in early spring or in late autumn. In Japan this is done by breaking the branches with the hand without using any knife, because this tree should not be touched with iron.

The varieties are only propagated by grafting, being seedlings very slow in bearing fruit, and their fruit is always astringent.

Professor Charles Sargent, in his notes on *The Forest Flora of Japan* (1893), says:

"The more common and important of these two species [D. Lotus and D. Kaki] is, of course, the Kaki, which is planted everywhere in the neighbourhood of houses, which in the interior of the main island are often embowered in small groves of this handsome tree. In shape it resembles a well-grown Apple-tree, with a straight trunk, spreading branches which droop toward the extremities and form a compact round head. Trees 30 to 40 feet high are often seen, and in the autumn, when they are covered with fruit, and the leaves have turned to the colour of old Spanish red leather, they are exceedingly handsome."

"Perhaps there is no tree except the Orange which as a fruit-tree is as beautiful as the Kaki. In central and northern Japan the variety which produces large orange-coloured, ovate, thick-skinned fruit is the only one planted, and the cultivation of the red-fruited varieties with which we have become acquainted in this country is confined to the south. A hundred varieties of Kaki, at least, are now recognized and named by Japanese gardeners, but few of them are important commercially in any part of the country which we visited, and, except in Kyoto, where red Kakis appeared, the only form I saw exposed for sale was the orange-coloured variety, which, fresh and dried, is consumed in immense quantities by the Japanese, who eat it, as they do all their fruits, before it is ripe, and while it has the texture and consistency of a paving-stone!"

"Diospyros Kaki is hardy in Pekin, with a climate similar to that of New England, and fully as trying to plant-life; it fruits in southern Yezo, and decorates every garden in the elevated provinces of central Japan, where the winter climate is intensely cold. There appears, therefore, to be no reason why it should not flourish in New England, if plants of a northern race can be obtained; and, so far as climate is concerned, the tree, which, in the central mountain districts of Hondo, covers itself with fruit year after year, will certainly succeed in all our Alleghany region from Pennsylvania southward. In this country [United States] we have considered the Kaki a tender plant, unable to survive outside the region where the Orange flourishes. This is true of the southern varieties which have been brought to this country, and which may have originated in a milder climate than southern Japan, for the Kaki is a plant of wide distribution, either natural or through cultivation in south-eastern Asia. But the northern Kaki, the tree of Pekin and the gardens of central Japan, has
probably not yet been tried in this country. If it succeeds in the northern and middle states it will give us a handsome new fruit of good quality, easily and cheaply raised, of first-rate shipping quality when fresh, and valuable when dried, and an ornamental tree of extraordinary interest and beauty."

The names of the varieties are Japanese. The following is a selection:

Hachiya.—Produced at Hachiya in the province of Mino. Fruit very large, oblong, pointed, a little flattened at the stem; colour rich-red, with black at the end when quite ripe; flesh when blotted juicy, very rich, delicious in flavour.

Ko-tsuru.—Fruit small, oblong, pointed at the end, orange-yellow. It begins to ripen early in August, but is not quite ripe till September. Inferior in quality, esteemed for its earliness.

Kuonan-maru.—Fruit medium, yellowish-orange, with black cobweb-like markings on the end when quite ripe; flabby, rich in flavour. Very good. Ripens from the middle to the end of November.

Shimo-maru.—Fruit roundish-oblong, somewhat four-sided. It loses its astringent property early in September and changes to a yellowish colour, ripening entirely after exposure to frost and changing to reddish-orange. Flesh juicy, crisp, of excellent quality.

Tsuno-magit.—Fruit roundish, pointed, somewhat four-sided at the stem; skin light reddish-yellow; seedless. It retains its astringency even when quite ripe.

Tsuru-no-ko.—Fruit medium, oblong, pointed, bright-red with black markings on the end when quite ripe; flesh rust-colour, with purplish-black dots, sweet and rich in flavour. Ripens in October.

**Mulberry** (*Morus nigra*). (Fig. 1049.) A deciduous tree, native of Persia, whence it is supposed to have been introduced into Europe by the Greeks. The fruit, which is composed of a number of grains, is oval, 1 inch or more in length, and about \( \frac{3}{4} \) inch in diameter at the widest part, of a dark-purple colour approaching to black, very juicy, and having a sub-acid flavour. It is occasionally eaten at the dessert, and sometimes preserved, or made into wine. A syrup known as *syrupus mori* is prepared from the berries gathered before they are ripe; it is principally used by chemists and others for colouring medicines.

The Mulberry succeeds best in a rich deep, rather light, and somewhat moist loam. In very dry shallow soils, as well as in those which are heavy, cold, or wet, the fruit rarely acquires any degree of perfection, and generally drops before it is fully ripe. The tree requires a situation well sheltered from northerly winds, but open to the sun on the south. In the neighbourhood of London, and in all the warm parts of the kingdom, it succeeds perfectly well, and ripens its fruit as a standard; but in the cold parts of Scotland, and in the north of England, it requires a warm wall.

Propagation is effected by seeds, cuttings, and layers, and also by budding, inarching, and grafting. The seeds are separated from the fruit by bruising the latter between the hands, and washing them free from the pulp in a basin of water. The seeds should then be thoroughly dried, put in paper or canvas bags, and kept in a cool dry place till spring. They may be sown in March, in pans filled with light rich mould, placed in gentle heat, the seedlings being potted off or planted out in the course of the summer; or they may be sown out-of-doors in soil of a similar description in May. In either case there should only be a slight covering of fine mould, and frequent waterings through a fine rose ought to be given. During the winter the young plants should be protected from severe frosts by hoops and mats, or other available means. In March they may be taken up, shortened to one node, and planted 1 foot apart, in rows 2 feet from each other. Propagation by seeds, however, is seldom practised, as plants so raised, unless grafted, are long in coming into bearing, and may produce only male blossoms.

Cuttings made in spring or autumn should be taken from the upper branches of the tree in preference to the lower ones, for when so chosen, they are said to come sooner into bearing. Spring cuttings should be taken from well-ripened shoots of the preceding year, with, if possible, a little older wood left at the base. They may be planted 6 inches apart, in rows 1 foot distant, in light rich mould, in a shady border; or, what is better, they may be potted, and plunged in a moderate hot-bed till they strike good root, when they may be hardened off and put out of-doors. In either case only one or two of the buds should be left above-ground, and gentle waterings must be given from time to time, so as to keep the soil sufficiently moist, but not wet. During the winter, protection should be given in severe weather, and in the spring or autumn of the following year they may be planted out in nursery rows. Another mode consists in taking in spring perfectly matured portions of shoots of the preceding year, and cutting them into as many pieces as there are buds; these pieces are then placed, with the bud upwards, in light rich soil, and covered to the depth of \( \frac{3}{4} \) inch. If the soil is kept sufficiently moist, the buds soon vegetate, and roots are emitted from the under side of the cutting.
Autumn cuttings ought to be taken off with a small portion of two-year-old wood when the shoots are well matured. They should then be planted, as above, in a shady situation, and protected from severe frost in winter. They may remain in the open ground till they make good roots, or may be taken up in spring, potted, and plunged in a hot-bed to hasten the production of roots.

Bearing branches, and even large limbs, will strike root with facility, and are sometimes employed instead of cuttings of the shoots, especially when the object is to obtain a tree which will bear in two or three years. They should be inserted in autumn in good soil, to the depth of a foot or so, according to the size of the branch and the depth of the soil; large branches should be supported in an upright position by a stake. At planting, the laterals ought to be shortened back a little, and if possible to a wood-bud at the base of a young shoot; at the same time a good shoot should be preserved as a leader. Afterwards a good supply of water should be given, and when the branch has taken good root a portion of the lower branches should be removed every year in order to form a clean stem.

By far the most common mode of propagation is by layering the young branches, either in autumn or spring. Layers may be severed from the tree in the autumn of the year after they are laid down, if sufficiently rooted.

Grafting when the sap begins to flow in spring is rarely successful with this tree, owing to its bleeding; but it is probable that success would be ensured, as in the case of the Vine, by taking off the scions before vegetation commences, and working them when the leaves are developed and capable of appropriating the superabundant sap. On the Continent, flute-budding, ring-budding, and budding with a dormant eye are successfully employed, and are considered the best modes of ensuring the objects of grafting. Flute-budding is performed when the sap rises in spring, the other two operations before the descent of the sap in autumn; and if the bud succeed, the portion of the stock above it is cut off in the following spring.
Young plants in the nursery should be trained to a straight stem, and transplanted every second or third year; when their stems are 3 or 4 inches in circumference they may be planted early in spring where they are to remain. In planting, a large hole should be made, and the roots must be extended at full length; afterwards the hole should be filled up with moderately rich light loamy soil.

The Mulberry is generally trained as a standard, and planted in the orchard, or on lawns, in order that the fruit may not be damaged by its fall from the tree, but it is always better to keep the ground beneath dug. The tree will also succeed, spur-pruned, as an espalier, and in cold localities it may be trained against a wall with a south aspect, on which, however, it occupies a much greater space than can well be spared in such situations.

As a standard the tree requires but little pruning. The leading upright shoot should be cut at the proper height, and three shoots originated for principal limbs. These shoots ought to be subdivided into two each. An equality of growth should be maintained among these, so as to form a well-balanced head. On walls the fore-right shoots must be pinched in summer to six buds, and if they push again they should be cut back to within four buds from the base.

Beyond pruning, as above directed, the tree requires but little culture, it being merely necessary to dig over the ground about the roots in autumn and spring, and to keep it free from weeds. The fruit ripens in succession in August and September, and should be gathered when about to drop. If the tree is not growing on a lawn, grass mowings should be spread out in a layer, not so thick as to ferment, in order to prevent injury to such fruit as may fall before it can be gathered. It does not keep good more than a day or two, and the sooner it can be used after gathering the better.

Besides the large black Mulberry, the only other species worthy of mention on account of its fruit is the red Mulberry (Morus rubra), a native of North America, producing berries of a dark-red colour, but greatly inferior in quality to those of the common sort; the white Mulberry (Morus alba), grown principally for its leaves, which are eaten by silk-worms; and the Weeping White Mulberry from Russia, an ornamental tree.
Bramble (Rubus).—There are several species and varieties of Bramble, in some of which the fruit is of excellent quality for making pies, tarts, and preserves; in others it is of a very inferior description, but all appear to be susceptible of improvement by cultivation. Some account of the different kinds and their productions may therefore prove useful, and may lead to experiments being made for their improvement: indeed varieties classed as Raspberries, one of them producing orange, others purple fruit, have been obtained by Mr. Rivers from a hybrid between the Raspberry and Bramble.

Brambles may be raised from seed or layers, but the latter seldom take good root till the second year; a better and more expeditious method is to cover the point of the shoots with soil, in consequence of which they make plenty of roots the first year (fig. 1052). The species with herbaceous stems require to be grown in peaty soil; the others will succeed well in any good garden ground, and may be trained like Raspberries, either to upright stakes, or arched, which is doubtless for them the more natural way; or the shoots of the current year may be disposed in circles round the centre of the plant, and kept in their position by means of pegs. With the exception of cutting out superfluous shoots and dead wood, no further care will be required.

Buckthorn-leaved.—Stems long, trailing, armed with straight, deflexed, reddish prickles; leaves generally qui-
nate, bright-green; flowers white. Fruit large, agreeably acid. An abundant bearer.

Cloudberry (R. Chamæmorus).—A native of Britain, where it is found in the highest mountains, as well as of other parts of the north of Europe. Stems herbaceous, about 4 inches high, not armed with prickles; leaves simple, heart-shaped; flowers white, and borne singly on the stem. Fruit large, of a tawny-yellow colour; when ripe, of a pleasant, agreeably acid flavour. It makes excellent preserves. The plant may be propagated by seeds or suckers, and requires to be grown in peaty soil.

Cut-leaved (R. laciniatus) (fig. 1053).—Stems somewhat upright, the barren ones long, spreading, and armed with strong recurved prickles; leaves dark-green, with from three to five deeply cut leaflets; flowers rose-coloured. Fruit large, black, composed of full, though not numerous grains, agreeably acid. A good bearer.

Parsley-leaved.—The finest of all the native varieties. It was raised from R. laciniatus, and succeeds admirably in most positions. Forms long, spreading stems, and produces freely large clusters of extra fine fruit.

A spineless Blackberry (fig. 1054) is grown at Kew under the name of R. ulmifolius inermis. It is vigorous in growth, fruits freely, the fruits are of good size and palatable, and as it has no prickles on either stems or leaves it ought to find favour: as a probable breeder of a race as worthy of a place in the garden as the Raspberry it deserves attention.

American Blackberries when first introduced into England caused a sensation, but those that have been given a fair trial have failed to come up to expectations. It is possible that the American sorts have not proved satisfactory with us because we have either not grown them on the right lines or have tried the wrong sorts.
The American gardeners have themselves discarded some of the sorts which were sent out about fifteen years ago as excellent.

The following notes on American Blackberries were published in Garden and Forest in 1890:

"Of the numerous sorts tried I would select for the garden Agawam, Erie, Minnewaski, and Taylor. Confined to two sorts, I should perhaps take Erie and Agawam; but should not like to miss Taylor. For market the same sorts hold good, with Snyder added.

"The Blackberry has been improved far more than is generally known. Kittatinny caused great disappointment, and led many growers to discard Blackberries from their grounds.

"I grow with cultivation for two or three years, but let the plants ultimately take possession of the soil and care for themselves. They do best let alone. Cut out the dead canes, and cut back the new ones. Weeds and grass will not hold their own with Blackberries in good soil.

"The kind of soil for the Blackberry is invariably dry, well drained, strong, clay if possible; but well drained it must be. If I intended to cultivate I should have the rows 10 feet apart and a row of Potatoes between."
tops may be detached from the parent plants, and put out 4 feet apart on moderately rich, well-cultivated ground. The young canes should have their tops pinched off, and in the following year, whilst they are fruiting, new growths will develop, these duly taking the place of those cut out after fruiting.

**Wineberry.** — The Japanese Wineberry (*Rubus phoenicolasius*) (fig. 1057) is another plant that may be associated with Blackberries. In addition to producing an abundance of ripe fruit early in August, the plant is also distinctly ornamental in appearance, or sufficiently so to merit a place in the pleasure-grounds, and would be a feature in the "wild garden" if only the birds would not interfere with the fruit. It is of the same habit of growth as a Bramble, the stems growing to a length of from 6 to 10 feet, which are covered with reddish hairs. The fruit, borne closely together in clusters, is wine-red in colour, juicy, and agreeably acidulous. It ripens very evenly, this admitting of whole sprays being cut and disheched up for dessert purposes. The fruit can also be made into an excellent preserve. It is propagated principally by layering the ends of shoots in the autumn, and the young plants may be planted out either in groups, or 4 feet apart each way in a sunny position and moderately rich, deeply cultivated ground. The fruit is produced on the canes formed the summer previous, and these should be cut out after they are exhausted.

**Cranberry.** — Two species of *Oxyccoccus* (a near relation of *Vaccinium*) yield the Cranberries that are now largely used as food, namely, *O. palustris*, a widely-distributed little plant which is abundant in peat-bogs in some parts of the British Islands. It is of creeping habit, with thin wiry stems, tiny ovate leaves, deep-green above, glaucous beneath, and small red flowers succeeded by dark-red globose berries \(\frac{1}{4}\) inch in diameter. They ripen in August, and are gathered by poor people and sold to fruitiers, &c.

It would be easy to establish a plantation of...
Cranberries in wet soil, especially where there is peat. In some of the North American States large areas of land, which for other purposes is valueless, is made to yield a considerable profit annually by the cultivation of Cranberries. The species grown there is:—

*O. macrocarpus* (fig. 1058), a native. According to Professor Bailey this Cranberry was first cultivated about 1810, but its culture had not become general until forty or fifty years later. The berries naturally vary in size and shape and colour, and three general types, named in reference to their forms, are known as the Bell, the Bugle, and the Cherry, and there are many other named sorts in cultivation now, such as Early Black, Dennis, M’Farlin, Gould, Franklin, &c.

"It is an arduous duty to subdue a wild bog. The bushes and trees must be removed, roots and all, and it is usually necessary to remove the upper foot or so of the surface in order to get rid of the roots, bushes, and undecayed accumulations. This process is termed 'turfing'. It is necessary to leave the surface level and even, in order that all the plants may have an equal chance, and thereby make an even and continuous bed, and to avoid inequalities in flooding. Although the Cranberry thrives in swamps and endures flooding at certain seasons, it nevertheless demands comparative dryness during the growing and fruiting season. The swamp must therefore be drained. Open ditches are cut, at intervals of four or five rods, about 2 feet deep, and these lead into the main or flooding ditch. . . Growers always divert a creek through the bog if possible. Before planting, the bog is sanded. This operation consists in covering the whole surface with about 4 inches of clean coarse sand; the object being to prevent rapid growth and consequent unproductiveness. Plants that grow in pure mud rarely produce well. Every four or five years after the plants begin to bear it is necessary to give a top-dressing an inch thick or so of sand.

"Fifty barrels per acre is a good crop of Cranberries, yet 200 barrels have been produced. The grower usually gets from 20 to 40 shillings per barrel of 100 quarts. Bogs that have been cultivated thirty years have yielded a crop annually and are still good."—(Garden and Forest.)

The plantations are made by putting in cuttings 6 inches long, two-thirds of which is thrust obliquely into the sand, and a foot apart each way. This is done in early spring, and the plants root in about three weeks; in three or four years a full crop of berries is obtained. The plantations are flooded in December, and the water is drawn off again in April.

The Common Cranberry (*O. palustris*) may be grown in beds formed by digging out the ground at the side of a clear pond or running water, so that the bottom of the excavation may be about 6 inches below the surface of the water, and then filling in a layer of loose stones and peat earth to the depth of about 9 inches. The bed may then be planted and the water let in.

**Bilberry or Blueberry** (*Vaccinium Myrtillus*) (fig. 1059) is a deciduous shrub, growing to the height of 1 or 2 feet, and commonly found on stony heaths in various parts of Britain. The fruit, a small berry, is dark-purple, and has an agreeable slightly acid
flavour. It makes excellent tarts and preserves. The plant is propagated by layers, and may be grown in peat soil mixed with garden mould.

Berberry (**Berberis vulgaris**) is a deciduous shrub, growing to the height of 7 or 8 feet, a native of Britain and most parts of Europe and North America. It is found wild in woods and coppices in dry soil, and was formerly common enough in hedgerows, but is now everywhere banished from these in consequence of the plant being very generally supposed to produce the rust on corn growing in its vicinity. The fruit when ripe is acid and astringent, but makes excellent preserves; those made at Rouen from the stoneless fruit are held in high estimation. In a green state the berries are pickled in vinegar.

The Stoneless Berberry, supposed to be a distinct variety, is produced by old plants which have been propagated by layers.

The Berberry may be raised from seed, but is generally propagated by suckers taken off in autumn, by dividing the plant, or by layering the young shoots. The layers are frequently two years before they make good roots, and should be separated from the parent plant in autumn. The plant will grow in any good garden soil, but bears best in one that is rich, light, and resting on chalk. All the culture it requires is to remove suckers so as to leave only a single stem, and to prune in all branches that are inclined to straggle too far.

The principal varieties are: Common Red, Large Red, Purple, and White.

**Elder (**Sambucus nigra**)), a low deciduous tree, a native of Britain and other parts of Europe, as well as of the north of Africa. The berries are employed in making wine, of which large quantities are consumed at Christmas, and for the production of a jelly which is said to be useful in cases of severe cold and sore-throat. Elder-flower water, which is used for flavouring confectionery and as a lotion for the skin, is obtained from the flowers; and the whole tree is held in great estimation by country people for its medicinal properties.

Besides the common sort with black berries, there is a variety with green, and another with yellow fruit, but these are chiefly planted for ornament.

The Elder is propagated with great facility, either by seeds sown in autumn or spring, or by cuttings. The latter method, being the most expeditious, is that usually adopted. The cuttings may be made any time between the end of October and the beginning of March; they should be taken off immediately below a joint, and may be 1 foot or 18 inches in length. They should be inserted to about half their length in the ground, where they soon strike root, and in the following year are fit for being finally planted out. If the trees are to be grown as standards, they may be planted 20 feet apart; sometimes, however, cuttings are put in 1 foot apart, so as to form a hedge. The Elder will grow luxuriantly in any good garden soil, and is not particular as to situation; but a sunny spot is preferable, where good fruit is required. Beyond the removal of suckers when the trees are young, and helping it to form a regular head, no other culture is required.

**CHAPTER XVI.**

**THE ORCHARD HOUSE.**

**SOIL—THE FLOWERS—SUMMER TREATMENT—AUTUMN TREATMENT—INSECT PESTS—LITS.**

The Orchard House is the latest development of fruit-growing under glass, and it is chiefly
owing to the efforts of the late Mr. Thomas Rivers that this branch of modern fruit culture has made such rapid progress during the last thirty years.

In cold, bleak districts in the neighbourhood of large manufacturing towns, especially in the northern half of the kingdom, where first-class dessert fruit cannot be produced in the open air, Orchard Houses have become a necessity in large garden establishments, and particularly for the cultivation of such tender fruits as Figs, Oranges, Guavas, &c.

In the garden at Hutton Hall, Guisboro', in North Yorkshire, there is a span-roofed house 150 feet long, 10 feet wide, and 10 feet high, running east and west. It serves as a corridor, other houses branching off from it. The hot-water pipes from the boilers to these houses are laid under the floor of the corridor, and from these pipes there is sufficient heat to maintain a moderately warm temperature all the year round, such as Oranges and Figs delight in. The Figs are planted and trained up the south side, and under the roof to the apex; Oranges, &c., on the other side. The varieties suitable for such a house are as follows:—Figs: Brown Turkey (the best of all); this with Negro Largo will produce fruit extending from May to November. Lemons: the Common, Imperial, and Sweet are very good varieties. Oranges: Blood, St. Michael's, Exquisite, Jaffa, Egg, and Silver are all well worth growing. When trained under the roof they bear enormous crops of handsome fruit, giving a beautiful effect, the evergreen leaves and the bright golden fruit making a delightful contrast.

An Orchard House intended for the cultivation of such fruits as Cherries, Nectarines, Peaches, and Plums may be either lean-to, half-span, or span-roofed; the span-roofed form being preferable (see fig. 1060), as with it the trees get more light and a better circulation of air. Such a house may be of any length, but one, say, 20 feet wide, with a height of 10 or 11 feet to the apex of the roof, and 6 feet high at the sides, makes a very suitable house for trees grown in pots. The trees can be removed from the house when the fruit is gathered, and the space utilized for Chrysanthemums or other plants requiring protection during winter.

A house of this description requires no borders or paths except for appearance, a path through the middle being perhaps useful for working purposes. The floor should be of concrete, the pot-trees being raised upon two bricks or some similar contrivance to allow the water to escape freely. Where a span-roofed house is not available, a lean-to house against a south wall may be made to serve. The wall can be covered with Peaches or Nectarines, planted in a suitably prepared border.

At Lambton Castle, near Durham, where, owing to obnoxious vapours from chemical works in the neighbourhood, the climate is bad for fruit-trees grown out-of-doors, Mr. Hunter, the gardener, has for many years been a most successful cultivator of Orchard House fruits. Here may be seen two long lean-to houses almost entirely filled with Pear-trees planted along the front and trained up under the roof as cordon, which in autumn present a sight not easily to be forgotten.

A moderately warm, dry atmosphere all the winter is necessary for the perfect maturation of Oranges, and this will do no harm to Figs while in a dormant state.

Peaches and Nectarines will in most seasons ripen their fruit fairly well in a cool house, yet in exposed or damp situations they are much benefited by a little assistance from the hot-water pipes. If only a flow and return 4-inch pipe is placed on each side of the house, the heat given off by these will be found most useful in early spring when the trees are in blossom, as even with protection of glass without artificial heat a crop cannot be in every season relied on. Long spells of cold, damp weather
are often harmful, and this can be prevented by the use of a little artificial heat, with, at the same time, a little ventilation both night and day. Thus treated the trees are constantly on the move, and checks, so disastrous to trees grown in the open air, are prevented.

Apples and Pears do not flower so early as Peaches, it is therefore less important to have hot-water pipes in the house for them,—in fact they can in most places be successfully grown without the aid of artificial heat.

The next question is, Are the trees to be grown in pots, or planted out? With regard to Oranges, Figs, and Guavas, where it can be done by all means plant them out, allowing space enough for them to develop into good-sized trees.

Peaches, Nectarines, Plums, and Cherries may be grown in pots. Trees that are planted out do not require so much attention as regards water, but their not being movable is a disadvantage, and when a tree misses a crop, as sometimes happens even with the best of management, so much space is wasted for the season. If the house should be required for any other purpose during the winter months, planted-out trees will be in the way.

Pot trees, as we have said, require much attention in watering. As soon as the fruit is set and the growth is free, plenty of water is required regularly; if the trees are allowed to suffer from inattention, the prospects of a season will be destroyed.

Except in highly-favoured localities it is not safe to turn Peach-trees in pots out-of-doors, but after they have been pruned they can be wintered in a very small space. Where the amount of labour is limited, and the house is not required for any other purpose, it is a good plan to plant out some of the trees and grow others in pots; by this means a greater variety can be put into small space, and a sprinkling of fruit can be had all over the house, thus adding to its interest and appearance.

Trees for the Orchard House should be pyramidal in shape, and these can be procured from a nurseryman who makes this class of trees a speciality. By purchasing them established in pots and well set with flower-buds at least one year's start is gained over trees dug up and newly potted. If the latter must be used, then let the operation of transferring them
from the ground into pots be performed as early in the autumn as it is safe to lift the trees.

Soil.—The most suitable soil is good turfy loam, not too heavy; to five barrow-loads of this add one of sifted old mortar rubbish or road scrapings with plenty of grit in it, one bushel of wood ashes, and one peck of half-inch bones. This mixture will suit any of the plants named. In potting, care must be taken to shake the compost well in amongst the roots, and to ram down the same quite firmly with a wooden rammer, then watering sufficiently to soak the ball through. They may then be placed in their winter quarters. Peaches and Nectarines are safest under glass, but Apples, Cherries, Pears, and Plums winter perfectly out-of-doors, preferably in a sheltered situation, and plunged close together in a bed of coal ashes, covering the top of the pots at least 2 inches. Here they may remain until the blossom-buds start swelling, when they must be removed into their summer quarters.

The Flowers.—In due course the flowers will expand, when some attention is necessary to secure a good set of fruit. The atmosphere in the house should be kept moderately dry, and if the weather is at all favourable, a free circulation of air may play about the trees night and day, avoiding cold draughts as much as possible. Fertilization of the flowers may be aided by giving the trees a smart shake once or twice a day, and by stroking over the flowers with a light feather brush such as housemaids use for dusting ornaments.

Summer Treatment.—This consists of pinching the growing shoots, thinning the fruit, keeping insects in check, &c. No definite rule can be laid down as to pinching at the right bud; sometimes it is desirable, in order to extend a young tree, that the shoots may grow a foot or more long before the point is taken out. In cases where the trees are as large as the house will permit, the shoots may safely be pinched at the third or fourth leaf; the operation may be repeated on the laterals when they have made two or three leaves.

The fruit should be thinned as soon as the crop is safely set and has begun to swell. First single them out, and if all goes well in another ten days they will require further attention. By this time a good idea can be formed as to what fruit will drop owing to defective fertilization. These are of a lighter green colour than those perfectly fertilized. If the crop is abundant and the fruit swelling evenly, a severe thinning may safely be made, taking care to leave plenty for the final thinning. This can be deferred for several weeks, when it will be seen which are taking the lead and occupying the best position on the trees.

It is important in the cultivation of trees in pots to give a top- or surface-dressing after the second thinning, as by that time the roots are in full action and in a fit state to take in large quantities of nourishing food. An excellent compost for this purpose is to take, say, half a barrow-load of night-soil, add to it the same quantity of dry wood ashes and of dry sifted loam, a peck of fresh soot, and a peck of bone-dust. The whole should be thoroughly mixed a few days prior to its being required. If night-soil is objectionable or cannot be procured, fresh poultry droppings may be substituted. A layer half an inch thick of the mixture should be given to each plant, and watered with a fine rose, to settle the compost. After the final
thinning, and during the remainder of the growing season, a weak solution of liquid manure may be given two or three times a week, but it must be applied with discretion, or it may injure the young roots. Fertilizers or plant foods sold by vendors of these useful manures, when mixed with at least their own weight in fine sifted dry soil, may with advantage be used as a surface-dressing two or more times during summer; after application the dressing should be watered in with a fine rose-pot.

When the fruit begins to colour, the feeding should be discontinued.

To ripen the fruit well some care is necessary. Cherries, Nectarines, Peaches, and Plums will finish perfectly in the position in which they have been grown, but syringing must be discontinued, and as the crop approaches maturation the ventilators on fine mornings should be opened to their full extent, and a little air left on all night. Peaches and Nectarines are improved in colour by having any leaves that overshadow them tied up and the fruit fully exposed to the sun's rays. Apples and Pears are very much improved both in colour and flavour by removing the trees out-of-doors just as the fruit commences its second swelling, which is usually about the middle or last week in July. A warm, sheltered, sunny situation should be selected for this purpose, and in the case of large-fruited varieties each Apple and Pear is best tied round the stem with a bit of raffia matting and secured to a branch. This precaution prevents any fruit that may prematurely drop from falling and being bruised. If the pots are partly plunged, there need be no fear of the trees being blown over.

**Autumn Treatment.** — Having gathered the fruit, it becomes necessary to make preparation for another year. The soil required for re-potting and top-dressing should be got ready and placed under cover. The trees should be pruned, and carefully examined for insects. Plants in good health will have filled the pots with roots, and in most cases will require moving into pots two sizes larger. Any additional trees that may be required from the nurseryman should be got in the autumn, so that they may be re-potted, plunged, and wintered with the others.

Before re-potting, see that the trees are thoroughly moist at the roots. On turning them out of the pot remove the crocks, then with a pointed stick prick part of the soil from all round the sides and surface of the ball, prune off any straggling roots, and place the tree into a clean, sound, and properly-drained pot. The top of the ball should be about an inch and a half below the top of the pot. Work the compost round the ball by giving the pot a smart shake, and ramming it firmly with a wooden rammer. Two or three days after repotting, give sufficient water to thoroughly soak the ball. The trees may now be placed in their winter quarters, and no further attention will be required until spring.

Orchard House trees in pots, treated as here described, have borne good crops of fruit annually for a quarter of a century, and look as if they would go on for many more years to come.

Trees that have grown as large as is desirable, and are in 16- or 18-inch pots at potting time, need only to be examined to see that the drainage is perfect, and to remove with a hand-
fork 3 or 4 inches of the old soil from the surface, to be replaced with fresh compost.

The insect pests to which Orchard House trees are liable are not numerous, but unless kept under they do much mischief. Black and green aphides may be kept under by two or three syringings of soap-suds free from soda, followed by one with pure water; fumigating with tobacco smoke is most effective, but should not be done while the trees are in bloom. Red spider is the result of inattention to moisture. If taken in time it can easily be eradicated by a few vigorous syringings with clean water. After the fruit has been gathered, a little sulphur may be mixed with the water. Caterpillars and grubs may be detected by the curling of the leaves or flower-petals; hand-picking is perhaps the best remedy. A close watch must also be kept for the moths, which should be destroyed whenever seen. American blight on Apple-trees is another pest that must be looked after; its patches of cotton-wool, like clusters of aphids, are easily discerned. If these are carefully touched with a small brush slightly dipped in fish-oil their destruction is certain, but it is dangerous to oil the trees all over. Gishurst’s compound, mixed at the rate of one pound to the gallon of soft water and applied repeatedly, using a stiff painter’s brush for the operation, will be found both efficacious and safe.

The Pear-tree kernes and the Pear-tree oyster-scale require strong remedies to exterminate them. “Boil four ounces of Quassia chips in a gallon of soft water until the bitter principle has been extracted, the time required being from 25 to 30 minutes; in this mixture dissolve at the time of application four ounces of soft-soap to the gallon and apply hot if possible (up to 150° will not harm the trees); but if it is inconvenient to use hot water, cold will answer the purpose. If trees have been severely attacked, they should be washed during winter with above mixture” (T. Francis Rivers).

The following Apples, Cherries, Nectarines, Peaches, Pears, and Plums may be successfully grown in the Orchard House. Some of the Apples and Pears named might be considered too large for dessert. If this is so in the case of the former, they are always welcome in the kitchen, where large fruit are often in demand for dumplings, &c. It is not generally known that many of the so-called culinary Apples make splendid dessert fruit when grown under glass. In most establishments large Pears are wanted for stewing; any of the varieties named will serve for this purpose.

When it is desired to have several trees of one variety, those marked with an asterisk can be recommended; these also are suitable where only a few trees can be grown. The names are arranged in the order of ripening.

**Apples.**
- Lady Sudeley.
- Washington.
- James Greive.
- Worcester Pearmain.
- King of the Pippins.
- Cox’s Pomeran.
- King of Tomkin’s County.
- Gascoyne’s Scarlet.
- Peasgood’s Nonsuch.
- American Mother.
- Bradick’s Nonpareil.
- Adam’s Pearmain.

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<th>Apple</th>
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<tr>
<td>Allington Pippin</td>
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<td>Bijou</td>
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<td>Reinette du Canada</td>
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<td>Ribston Pippin</td>
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<td>Beauty of Kent</td>
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<td>Cox’s Orange Pippin</td>
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<td>Melon Apple</td>
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<td>Scarlet Nonpareil</td>
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<td>Bismarck</td>
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<td>M’Indoe’s Russet</td>
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<td>Calville Blanche d’Hiver</td>
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<td>Rosemary Russet</td>
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**Cherries.**
- *Early Rivers.*
- *Black Tartarian.*
- Emperor Francis.
- Bargarreau de Schreken.

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<thead>
<tr>
<th>Cherry</th>
<th>Variety</th>
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<tr>
<td>Guigne d’Annonay</td>
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<tr>
<td>Bigarreau Napoleon</td>
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<tr>
<td>Late Duke</td>
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<tr>
<td>Noble</td>
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**Nectarines.**
- *Early Rivers.*
- *Stanwick Elrige.*
- *Pine Apple.*

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<tr>
<th>Nectarine</th>
<th>Variety</th>
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<tr>
<td>Lord Napier</td>
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<td>Humboldt</td>
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<td>Spenser</td>
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**Peaches.**
- *Alexander.*
- Early Alfred.
- Royal George.
- Noblesse.
- Dymond.
- Bellegarde.

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<th>Peach</th>
<th>Variety</th>
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<tr>
<td>Hale’s Early</td>
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<td>Stirling Castle</td>
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<td><em>Grosse Mignonne.</em></td>
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<td><em>Violette Hâtive.</em></td>
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<tr>
<td>Princess of Wales</td>
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<td><em>Golden Eagle.</em></td>
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**Pears.**
- *Clapp’s Favourite.*
- *Souvenir du Congrès.*
- Triomphe de Vienne Conference.
- *Pitman’s Duesse.*
- Glou Moreau.
- Durondeau.
- Beurré Diel.
- Beurré Superfin.
- Marguerite Mariellat.
- Louise Bonne of Jersey.
- *Marie Louise.*

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<tr>
<th>Pear</th>
<th>Variety</th>
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<td>Van Mons (Léon le Clerc).</td>
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<td><em>Doyenne du Comice.</em></td>
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<td><em>Princess.</em></td>
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<td><em>Winter Nelis.</em></td>
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<td><em>Josephine de Malines.</em></td>
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<td><em>Bergamotte d’Eperon.</em></td>
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<td><em>Beurré Rance.</em></td>
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<td>Ne Plus Meurs.*</td>
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<td>Zoë</td>
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<td><em>Nouvelle Fulvie.</em></td>
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<tr>
<td>Olivier des Sevres.</td>
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<td>President Barabe.</td>
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**Plums.**
- *The Czar.*
- *Early Transparent Gage.*
- Green Gage.
- *Jefferson’s.*
- Reine Claude du Comte.
- Haethem.
- Prince Engelbert.
- *Transparent Gage.*
- Monarch.
- *Coe’s Golden Drop.*
- Golden Transparent.

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<tr>
<th>Plum</th>
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<tbody>
<tr>
<td>July Green Gage</td>
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<tr>
<td>Oulin’s Golden Gage</td>
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<td><em>M’Laughlin’s Gage.</em></td>
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<tr>
<td><em>Kirk’s.</em></td>
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<td><em>Decaisne.</em></td>
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<tr>
<td>Reine Claude de Bevey.</td>
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<tr>
<td>Magnum Bonum.</td>
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<td><em>Late Transparent Gage.</em></td>
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<td>Grand Duke.</td>
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<td>President.</td>
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[J. M’L.]

**[Image 0x0]**
CHAPTER XVII.
THE VINE.


*Vitis vinifera* grows wild in the temperate regions of Western Asia, Southern Europe, Algeria, and Morocco. It is especially in the Pontus, in Armenia, to the south of the Caucasus and of the Caspian Sea, that it grows with the luxuriant wildness of a tropical creeper, clinging to tall trees and producing abundance of fruit without pruning or cultivation. Its vigorous growth is mentioned in ancient Bactriana, Cabul, Kashmir, and even in Badak-Khan to the north of the Hindu Koosh. Of course it is a question whether the plants found there, as elsewhere, are not sprung from seeds carried from vineyards by birds.

"The dissemination by birds must have begun very early, as soon as the fruit existed, before cultivation, before the migration of the most ancient Asiatic peoples, perhaps before the existence of man in Europe or even in Asia. Nevertheless, the frequency of cultivation, and the multitude of forms of the cultivated Grape may have extended naturalization and introduced among wild Vines varieties which originated in cultivation.

"The records of the culture of the Vine and of the making of wine in Egypt go back five or six thousand years. In the West the propagation of its culture by the Phoenicians, Greeks and Romans is pretty well known, but to the east of Asia it took place at a late period" (*Vilmorin, Origin of Cultivated Plants*).

At the present time there are perhaps 2000 described varieties of Grapes.

The exceptionally wide range of temperature the Vine will not only support but actually thrive and fruit in has no parallel among domesticated races of plants. "There is a marked difference in the constitution of the several varieties, some being Hardy (in England), whilst others, like the Muscat or Alexandria, require a very high temperature to come to perfection. According to Labat, Vines taken from France to the West Indies succeed with extreme difficulty, whilst those exported from Madeira or the Canary Islands thrive admirably" (*Darwin*).

The cultivation of the Vine is said to have extended from Asia to Egypt, from thence to the southern parts of Europe through Greece. From Italy it progressed northwards into France, and in all probability it had been tried in Britain by the Romans, but possibly without success; for varieties suitable for the warm climate of Italy would be likely to fail in maturing their fruit in the moist climate of our island, as indeed is stated by Tacitus to have been the case. In the year 85 Domitian prohibited by an edict the planting of new vineyards in Italy, and ordered those existing in the provinces to be destroyed. This edict was rescinded by Probus in the year 280, and Britain is particularly mentioned among the provinces which enjoyed the privilege of being allowed to cultivate the Vine. Vineyards are mentioned by Bede (before A.D. 731) as existing in several parts of Britain. In 1140 barons as well as monks possessed vineyards; by the latter, wine was made in good, and verjuice in bad seasons; and from the hardier sorts of Burgundy Grapes, planted in the most appropriate situations—and in regard to this the monks were particularly careful—a tolerably good wine may have been produced, better, no doubt, than some of the artificial champagnes of the present day.

The Vine lives to a great age under favourable circumstances. Pliny mentions one 600 years old; vines 100 years old are accounted young in the vineyards of Italy; and Bose states there are some in Burgundy upwards of 400 years old.

The celebrated Vine at Hampton Court was planted 1769, and is yet bearing annually a large number of bunches; and though neither bunches nor berries are as large as those obtained from young plants, yet their aggregate weight is still very great for one Vine to bear. There are also several other instances of Vines attaining a great age in this country, notable examples being a fine specimen of Black Hambro at Cumberland Lodge, Windsor Park; one of the same variety at Eastnor Castle, Ledbury, Herefordshire; a Frankenthal Black Hambro at Stoke Edith, Herefordshire; and the famous Muscat of Alexandria at Hardwood House, Leeds—the latter being the largest known Vine of this variety in the
under the influence of artificial heat and moisture resulting in leaves that are generally larger, but comparatively weak and thin. Vines growing in the open air, even in this country, maintain their roots in a sound state for many years in any ordinary garden soil; but those grown under glass are liable to become weak at the root, and even to perish. This being the case, great care is necessary in the formation of the border, and in the selection of the materials of which it is composed.

**Culture under Glass.**

*The Border.*—Grapes grown on Vines in the open air generally colour well, even if they fail to ripen, and their leaves are thick and leathery. It is not always so with the foliage of Vines grown under glass, the rapidity of growth

In order that the Vines may produce regularly and support good crops of fruit for a number of years, it is necessary to provide for them a good border of rich soil. This should be 3 feet deep, and of the same width as the house, whether it is to be inside or outside. If the border is to be partly inside and partly outside, the front wall is usually built upon arches, the foundations of which should be level with the bottom of the border; and if the house is 18 feet wide, then the border inside should be 9 feet wide, and that outside the same width. The borders should be made by degrees, a portion from 3 feet to 4 feet in width each season being ample, so that it will take three or four years to complete the borders. The advantages of this plan are in its providing annually a mass of new compost for the roots to feed upon, and by the time the border is complete the whole mass of soil will be full of working roots.

A depth of 3 feet of prepared soil is not too much if on a well-drained subsoil, or a good layer of drainage not less than a foot in depth. In cold, low-lying districts the borders should be elevated above the surrounding level, and this must be taken into consideration and allowed for when constructing the houses.

*Drainage.*—In some situations holes may be dug to the depth of 4 feet or more without a drop of water collecting in them at any time of the year; but in others at that depth, water will rise at almost any season, especially towards the beginning of summer, when the water-springs are at their highest. In the former case efficient drainage alone will suffice, but in the latter it is necessary to provide a flooring of cement concrete not less than 3 inches in thickness. In both cases drains must be provided to carry off water: in the former, one laid along the front and below the bottom layer of drainage material will be sufficient, providing it has a proper fall and outlet; in the latter, the whole site of the vinery must be well drained with agricultural drain-pipes laid below the level of the concrete.
floor, and leading into a main drain with a good outlet.

The material for drainage should consist of three grades, the coarsest and largest to go in the bottom, the medium-sized next, and lastly the finer to finish off with. This may consist of brickbats, burrs from brick-yards, or sandstone; but whatever material is used, it must be clean and durable. The rougher portions of the drainage should be placed in position by hand, and the whole mass, when finished, should slope slightly towards the front, and be covered with whole turves, the grass-side downwards.

Soil.—To produce heavy crops of fruit the soil must be rich, and to prevent the roots from suffering from cold or drought it should be made up of materials not likely to become close and retentive of moisture. A rich, turfy, fibrous loam is the principal constituent, the fibre in which is of such a nature that it will not soon rot. Loams vary very much in texture, and it is not always possible to obtain that which is best suited to the growth of the Vine. A loam of poor quality may be fortified by adding burnt soil, wood ashes, road sidings, road scrapings, and ½-inch bones. Heavy loams are improved by the addition of lime rubble, which ensures the requisite degree of porosity. A medium-heavy, fibrous loam should be prepared as follows:—First chop the turves into rough-sized pieces; add a fair percentage of charcoal or wood ashes and burnt soil, and as much lime-rubble as will keep the whole mass open for the free percolation of water. For manure use 1 cwt. of ½-inch bones and the same quantity of bone-meal to every ton of soil. Farmyard and stable manure should be avoided. The whole should be thoroughly incorporated by turning it twice, leaving it in a ridge-shaped heap to ward off rain. Rather than allow the compost to become saturated it is better to cover it with tarpaulins or shutters. This work should be done in dry weather.

Planting.—This may be performed either in the autumn or spring, the latter being on the whole preferable. The Vine should be prepared for planting by cutting it back to within 6 or 12 inches of the soil or base, and early enough in the season to prevent bleeding. When the buds have started about half an inch or so, planting should be done as follows:—Open out a hole wide enough to allow of the roots being spread outwards from the stem, and so deep that when it is filled in the stem will be about 1 inch deeper than it was in the pot. Disentangle the roots after washing the soil from them in a bucketful of tepid water, as shown in fig. 1065, then lay them out carefully.
in a horizontal position; the topmost layer of roots should be within 2 inches of the surface; cover with soil, make firm, and finish by giving as much tepid water as will settle the soil closely round the roots. When the border is wholly or partly inside the house the largest proportion of the roots should be laid pointing inwards, as they have a tendency to grow towards the openings in the front wall and into the outer portion of the border. For planting in an outer border early in the season dormant canes are best. Water will not be required after planting until the Vines start into growth.

Many growers plant young green Vines, that is, Vines raised from eyes the same season. The planting has to take place somewhat later in the season, and it can only be done where there is an inside border. This plan has its advantages, not the least of which is that a whole season's growth is gained.

The distances at which to plant must be determined by the mode of training it is intended to adopt. The usual method is to confine the Vines to single stems, or canes as they are termed, and to allow a distance of 5 feet between them. If they are to be trained with two rods apiece, then 10 feet apart is not too wide. Some growers plant their permanent Vines 5 feet apart, with supernumeraries between, which, after fruiting two seasons, are cut out, as by this time the plants intended to be permanent have become established and capable of bearing good crops of fruit.

The surface of the borders requires to be frequently renewed, many growers performing this annually. This has the effect of keeping the Vines in good health by inducing the formation of fibrous feeding-roots near the surface. If this is not done the surface soil in time becomes sour and inert from the constant application of manure and mulching, and the roots, which should be preserved and encouraged, are starved. Top-dressing should therefore be done annually, and as soon as the Vines are clear of fruit.

The soil should be carefully removed with a fork, so that as few roots as possible shall be destroyed. Replace this with the compost recommended for the borders, with the addition of half as much again of bone-meal. Manures specially prepared for top-dressing Vine borders are to be had, and these are safe and efficacious when properly applied.

However well the borders may be constructed, in time they become exhausted. As a rule the Vines themselves indicate when this is the case by growing less vigorously, and by ceasing to produce fruit of good quality. If taken in hand as soon as the first indication is observed, matters can be rectified by a partial renewal of the border, but if left longer, the whole border must be taken out and replaced with fresh compost.

In the case of partial renewals, a strip 4 feet wide may be taken out the whole width of the border, opposite every other light, renewing the remaining portions in the course of a few seasons. If the border is partly inside and partly outside the house, renew the outside portion one season, and the inside two seasons later. When the entire border is to be renewed the crop should be ripened early and removed from the Vines, so that the roots may be lifted and the soil cleared while the foliage is still green. This operation must be carried out with the greatest promptitude, so that the roots are exposed for as short a period as possible, by having the compost mixed beforehand, and clean, fresh drainage ready. The house should be shaded while the lifting is being performed, and the roots tied in bundles and surrounded with damp moss as fast as they are liberated, keeping the moss damp and syringing the Vines if the weather is sunny. Continue to shade and syringe for two or three weeks after the roots have been laid out afresh, by which time new fibrils will have been formed, and shading and syringing may then be dispensed with.

Lifting, if done as early in the season as is consistent with safety, and performed with despatch, proves a wonderful restorative to Vines which have got out of health, or are weak in consequence of soil-exhaustion.

Protection of Borders.—This consists of placing a layer of dry leaves about 9 inches thick on the surface of the border, with some litter on the top to fix them. It serves to shed off heavy rains and snow, and to prevent loss of heat. Long stable-litter also answers the same purpose. This covering should be placed on about mid-November, or, at any rate, before the borders become saturated with autumnal rains. It used formerly to be the custom to place a fermenting bed of leaves and litter on the outside borders of early vineries, but it is usual now to plant for early forcing in inside borders; where early vineries have outside borders the above means of protection is general.

Forcing.—The time when a winery should be started depends on when ripe fruit is required. For the fruit to be ripe by the beginning of May, the house should be started in the previous November, thus allowing a period of
about six months. For later crops less time is required; for instance, if a house of Black Hambro be started in February, the fruit will be ripe in from sixteen to eighteen weeks. Muscats and late-keeping kinds, such as Lady Downes, must have a long season of growth, and be started not later than the second week in March for the crop to be finished by the end of September or early in October. Grapes thus produced can be depended on to hang well on the plants, or to keep for a long time in the fruit-room in perfect condition.

When late-keeping Grapes are started later than the time specified, much fire-heat is necessary to ripen the fruit. This affects the flavour, which is never so rich; nor does the fruit keep so well.

Temperature.—Assuming that a vineyard is to be started the first week in January, the temperature should be 45° at night and 50° in the day. When the buds have broken, increase the warmth to 50° and 55°, and as soon as the shoots are about 3 inches long further increase it to 55° and 60°. Adhere to these figures until the laterals have lengthened and the bunches begun to develop, when a further rise to 60° and 65° should take place. As soon as the Vines commence to flower, raise the temperature to 75° by day; but 65° will be ample at night.

When the fruit is set, the day and night temperatures should read 70° and 65° respectively, and continue with these figures until the fruit is properly coloured and ripe. The temperatures must be gradually lowered; for Muscats they should read quite 5° higher than the above-named figures until the fruit is set, when a night temperature of 65° to 70° will be ample, and for the day from 75° to 80°. This treatment may be followed until the Grapes are ripe. A rise of 10° with sun-heat should in all cases be allowed for before admitting air. When the house has to be ventilated, the air should be shut off early enough to ensure the temperature rising to 90°; and even if it should exceed these figures by a few degrees no harm will be done, providing the house is damped down immediately. Avoid overheating the hot-water pipes during cold weather; rather maintain a temperature a few degrees lower.

Ventilation.—Air should be given at all times when the state of the weather will permit, but with due caution, particularly when there is a great disparity between the internal and external temperatures. When the wind is east, especially during March and April, pieces of thin scrim or tiffany should be fastened over the ventilators to prevent rushes of cold air. If possible avoid giving air to lower the temperature. Even if through neglect the house should be too hot, a sudden reduction of temperature by admitting cold air must not be attempted. In vineries of modern construction, where large panes of glass are used, the temperatures rise quickly under the influence of the sun's rays. The attendant must therefore be on the alert, and admit only a little air early in the morning, gradually increasing it as the heat of the sun becomes more intense; there will then be no difficulty in keeping up the required temperature.

Watering and Syringing.—Heat, air, and moisture should be so regulated as to induce an uniformity of growth, for on this depends not only the present but also the future crops. A warm, humid atmosphere is necessary to ensure an even break of the buds, and this is obtained by syringing the Vines several times a day, and by damping the surfaces of the borders, walls, and footpaths twice a day. Some growers make up a hotbed in the body of the house to obtain both the requisite amount of heat and moisture in the earlier stages of growth. The evaporating troughs should be kept filled with water. Syringing should be discontinued during the flowering period, and a dry atmosphere is necessary when the Vines are in flower. Damping of the floors and filling the vaporizing troughs must therefore be suspended until the fruit is set, when the syringing and damping of all exposed surfaces in the house may be resumed at least twice a day, before admitting air in the morning and again at closing time. On hot days the floors will need to be frequently wetted. When the fruit begins to colour, atmospheric moisture must be gradually reduced, and a dry, buoyant air maintained.

It is usual to give inside borders as much tepid water as will moisten them throughout when the house is closed for starting, unless the soil in the border is found to be sufficiently moist. Generally, however, inside borders are fairly dry when starting-time arrives. After this, watering should be done only when the roots really require it. To ascertain this, examine the soil with a subsoil-tester at different depths. Avoid watering if possible while the Vines are in flower.

Outside borders often do not receive the attention they should with respect to watering. It should not be performed hap-hazard, but only after ascertaining by means of the tester that
water is actually required. When water is required give sufficient to moisten the border throughout and down to the drainage. A good mulch of short litter or horse-droppings spread over the surface of the borders obviates the necessity of too frequent watering by preventing evaporation. The manure also benefits the Vines by affording food to the roots, a great help in the finishing of the crop.

Stimulants.—When Vines have become established and borne full crops of fruit, they soon exhaust the soil unless they are supplied with stimulants from time to time, either in the form of liquid manure, or carefully compounded artificial manures. The following is a powerful stimulant, of which a small quantity only is required at a time:—To 1 lb. of muriate of potash add 2½ lbs. of dissolved bones and 1 lb. of bone-meal. Mix all well together, and use at the rate of 2 ozs. per square yard of border surface when starting the Vines, one-half of this quantity when the fruit has been thinned, and the same after the stoning period. Superphosphate of lime may be substituted for the dissolved bones, using equal quantities of the three ingredients. These mixtures are confidently recommended as safe and powerful stimulants for Vines.

Treatment after Planting.—Assuming that the young dormant Vines were cut back sufficiently early in the season to prevent bleeding, the buds will, when the house is closed, begin to push; and these, when sufficiently developed, should be reduced to one or two on each plant. Support the shoots until they reach the trellis, and then keep them regularly tied to the wires. Pinch all lateral growths at the second leaf; take the point out of the leader when it reaches about half-way up the roof; and then when it breaks again allow it to grow away to the top of the trellis. If supernumeraries have been planted, stop them when they have made from 8 feet to 10 feet of growth, and the laterals at the first leaf.

The mode of bearing in the Vine is very different from that of many other kinds of fruit-trees. In the Peach, for example, no fruit is borne on the young shoots of the current year, but on these blossom-buds are formed for fruiting in the following season; and it can be perceived in winter where fruit will be situated in the summer, provided no accident occur. Such is not the case with the Vine: a shoot may push from an unseen latent eye in the old wood, and on this shoot as it grows, whilst young and tender, the rudiments of a bunch may be seen (fig. 1066); and frequently, as the same shoot proceeds in growth, a second bunch, or even more, will sometimes be formed. A young shoot may this year grow to the length of 15 or 20 feet, and having been shortened to 10 or 12 feet by cutting off the more recently formed, and consequently least matured portion, an eye or bud will be found in the axil of every leaf on that which remains. Next season it is possible that on this shoot, or rod as it is termed, every eye will develop a young shoot which will bear one or two bunches of fruit.

Thus, any young shoot of a Vine, whether
proceeding from a bud on the last year's shoot, or from older wood, is capable of bearing fruit. Therefore, whether we leave the last year’s shoots long or short, or cut them back to within a few eyes of the base, or even to the lowest eye, still, on the shoot or shoots which push there may be fruit. It is necessary to bear in mind that if there are plenty of eyes on young rods of the preceding season’s growth, latent eyes will not readily push from old wood. Some growers depend on the last year’s shoots for fruit, and leave a few at considerable length for that purpose; others adopt the system of cutting back, nearly close to the stem, all the last year’s wood.

Accordingly there are three systems in use, termed the long rod, the extension, and the spur systems. Good crops have been obtained for several years in succession by each of the above methods; and that being the case it is evident that productiveness does not depend on any particular mode of training. Whatever this may be, the production of foliage, and its maintenance in an efficient state, should be the primary consideration.

Large crops of fruit for a few years may be obtained from strong, well-conditioned Vines; but if the quantity of foliage be not equal to supplying the roots with a due share of elaborated sap, general weakness will ensue. Roots under certain circumstances will continue to grow for a time, although there may be no leaves on the plant; but the growth of roots cannot be long carried on independent of the leaves. If the foliage is scanty, the roots will be few; if unhealthy, the roots will soon become unhealthy too. The whole of the leaves should, as far as possible, be well exposed to sunlight. For the maintenance of a healthy, vigorous state, that mode of pruning and training is the best which admits of the greatest amount of healthy foliage.

The Long-rod System.—It is generally admitted that larger bunches are obtained by this than by the spur system; although for a greater weight of fruit under the same extent of glass the spur system is preferred. In long-rod pruning, the principle is to train a shoot of the last year’s growth to produce shoots to bear fruit in the current year, shortening it more or less according to its strength. From the buds formed on it last season young shoots will push and bear fruit in the present. After bearing, this rod is cut away, and thus all the two-year-old wood is dispensed with. As by this system the two-year-old rods have to be cut away in the autumn, young shoots must be trained up during the summer in order to be ready to replace them; and these, in their turn, are cut out in the autumn of the following season, and are then replaced by shoots of that summer’s growth. Long-rod training in its simplest form is accomplished as follows:—

Plant the Vine, train up one shoot, and when the leaves have fallen from the young rod of the first year’s growth prune it back to the bottom of the rafter. In the next season train up only two of the best shoots, and when they have completed that season’s growth cut one of them back to two eyes at the base. The shoot left at greatest length will likely bear some fruit; the other, cut back to two eyes, will produce two shoots. In autumn the one that bore the fruit should be cut out, to be replaced by one of the two young shoots, cut back according to its strength, the other young shoot to be cut back to two eyes.

The Extension System.—By this system one or two Vines may be trained to fill the whole of a house. Most of the old Vines noticed in the opening chapter are grown on this principle. The Vine is planted in the centre of the front of a house if a lean-to, and at either end if span-roofed. In the last-named case a single rod should be trained under the apex, and from this young rods should be trained down on either side, from 4 feet to 5 feet apart. Another method is to plant a Vine in each of the two extreme corners of a house and train single rods parallel with the wall-plate, from which rods to furnish the roof may be taken up at certain distances apart. In a lean-to house the young Vine should be cut down level with the eaves or wall-plate, and a shoot trained out on either side to form the base from which rods may be taken up the roof.

Extension, then, really embraces the long-rod and spur systems, as the first named has to be put into practice to lay the foundation, as it were, by filling the house with the requisite number of rods, after which the spur system is followed. While the house is being filled, temporary Vines can be made to supply a good deal of fruit; these can be cut away as space is required.

The Spur System (fig. 1067).—This is the method most generally adopted. Assuming that a one-year Vine has been pruned back to the length of 5 feet or 6 feet, and is to be started; bend the point round so that the rod describes a semicircle. This is done to secure a more even break of buds by equalizing the flow of
sap. When the young shoots push, tie the rod to the trellis, and when long enough gradually bring the young shoots to a horizontal position. Frequently, opposite the fourth leaf the rudiments of a bunch will be found; this should be pinched off, and the number of shoots reduced or disbudded, so that they will be about 18 inches apart, or one to each transverse wire on the trellis on either side of the rod. These laterals must be pinched at the third or fourth leaf, stopping the sub-laterals at the first leaf. When the season’s growth is completed and pruning takes place, these laterals should be shortened back to one bud to form the basis of the spur. In the following season the portion of rod above the spurs will produce shoots, which in turn will form spurs, and by pursuing this system each season the rod becomes clothed throughout its entire length with spurs.

Disbudding.—As Vines invariably develop more growths than are required, it is necessary to reduce their number by disbudding. This is most important with young plants, as their whole future form depends on its proper performance, while established and older plants would soon become overcrowded with growths if disbudding were not resorted to. The proper time to disbud is as soon as it can be seen how many shoots are likely to develop, and which of these it is deemed best to retain. It can be done with the finger and thumb, and without loss or check to the Vine. Many defer disbudding old Vines until they can perceive which of the laterals are carrying the best bunches, but even then the weakest and badly-placed growths should be removed as soon as they push out.

Stopping the Shoots.—This is generally performed with respect to fruiting Vines at the second leaf beyond the bunch, and in the case of two-year-old Vines, when the shoots have developed five or six leaves. Some stop the young shoots at the first leaf and others at the third, but it is of little importance, as regards the swelling or development of the bunch, at which it is done. Where there is plenty of room for the foliage, stop at the second leaf, or even the third, for the sap elaborated by the additional leaf or leaves will add vigour to the Vine. If stopping at the second leaf beyond the bunch would render the foliage crowded, by all means stop at the first. After being stopped, new growths will push from the axils of the leaves; these should be stopped at the first joint, unless there should be room on the trellis for training out the one formed at the extreme end of the shoot, and then it may be pinched at the second, third, or fourth leaf according to space at command. In addition, these sub-lateral growths may also be used for filling up any bare spaces there may be between the spurs. For the stopping of young growing Vines see Treatment after Planting.

Setting the Flowers.—Some varieties of the Vine will set well without any extraneous aid whatever, while others set badly if not assisted. Those in the first category are termed “free setters”, and in the last “bad” or “shy” setters (fig. 1068). A gentle tapping or shaking of the rods suffices to cause a free dispersion of pollen in the case of free setters. In the latter instance artificial means are necessary to ensure a good set. Several expedients are adopted to accomplish this end. Some syringe the bunches when in flower, others draw their hand down them to ensure the necessary dispersion of the pollen, while others pass a pampas plume or a rabbit’s tail over them. The best of artificial aids is a camel-hair pencil, and to render the operation the more successful, pollen from a free-setting sort, such as Black Hambro or Black Alicante, should be employed. Should the latter flower earlier than the varieties which have to be fertilized by hand, the pollen may be shaken or brushed into a cardboard box,
and if kept dry it will retain potency for some weeks.

The adoption of these expedients is sufficient to ensure a good set of shy-setting kinds, but there are a few exceptions, of which Alnwick Seedling is a notable example. The flowers of this variety, on account of structural defects, are not self-fertile; therefore special means have to be adopted. Sterility in this case arises from two causes, one of which is the deflection of the stamens from the stigma, and the other the presence of a gummy substance on the point of the stigma itself. To remove the latter it is usual to syringe the bunches when in flower in

**Fig. 1069.**—Young Bunches of Grapes. 1, Before, and 2, after thinning.

the early morning, and when dry to fertilize the flowers at midday with pollen from another sort.

*Thinning the Fruit* (fig. 1069).—This is generally necessary as regards the bunches; and in all cases the berries have to be properly thinned out and regulated. When more bunches are produced than the Vine can bring to perfection, some should be cut off. The weight of fruit ought to correspond with the amount of good foliage; but a safe rule to adopt is to allow from 1 lb. to 1½ lb. of Grapes for every foot run of rod. If the Vines are healthy they will carry this amount.

Thinning the berries should take place with regard to free-setting kinds as soon as they are set, but Muscats and other sorts more difficult to set should be allowed to swell to a somewhat larger size before thinning, as the more promising berries can by that time be more easily perceived.

The general form of the bunches of some sorts is that of an inverted cone, of which the stalk is the axis; in others the main stalk subdivides and forms shoulders. At the upper part of the bunch branchlets diverge from the axis, and often these again throw out stalks, bearing frequently three berries, namely, two side ones and one terminal. Towards the lower extremity of the bunch the footstalks of the individual berries proceed directly from the axis, which terminates in a single berry. In thinning, the berries which proceed directly from the axis should be first removed, then
each ramification should be successively inspected, and the berries thinned out where they
would otherwise be too thick, taking care to cut off those nearest the axis or central stalk.
The reason of this is obvious, for if we cut off, say, two-thirds of the outer berries, those
left would still be crowded; but by reversing the process the berries occupy a wider space,
just as a number of persons forming a small circle may be overcrowded, but by each with-
drawing from the centre all soon find plenty of room. In proceeding up the bunch, peduncles
from the main axis bearing three berries, as already mentioned, will be met with; the ter-
final one may be left, and the two side ones removed.

The thinning of the berries should be modified according to the varieties and the space
the berries require when full-grown; and in avoiding overcrowding the bunches should not
be made too thin. Moreover, the berries should not be touched either with head or hands that
are perspiring. As they increase in size after the first thinning, the bunches should be looked
over, and regulated by a second thinning. After the berries have stoned and taken the final
swelling, they should be again examined in case any should be in danger of wedging at the
finish.

Where there are shoulders they should be tied away from the main part of the bunch,
and then thinned. A readier mode of suspending the shoulders of large bunches is by means
of convenient lengths of fine wire, such as is used for mounting bouquets, bent at each end
into the form of a crook, one end being hooked in near the end of the shoulder, and the other
hooked on to the nearest training wire, or firmly-placed shoot, so as to elevate or spread out the
portion of the branch to which it is attached. This may be done and undone much more
rapidly than a tie.

Keeping the Grapes.—When the fruit becomes ripe in the early houses it can, if required, be
kept in good condition for some considerable time if the following simple conditions are ob-
served:—The house should be kept cool, the floors damped down on hot, bright days, and the
borders kept in an equable state of moisture; the reverse conditions cause shrivelling. Un-
less the Vines are well furnished with foliage a slight shading of the roof will be beneficial,
as black Grapes when fully ripe soon lose colour if exposed to direct sunshine.

More care is needed with regard to the keep-
ing of late Grapes. These should be ripe at
the end of September or early in October. After this stage has been reached and the house
cooled down, the temperature, whilst avoiding the use of fire-heat, must never be below 45°.
The internal air must be kept dry and the house well ventilated when our climatic condi-
tions will allow. During damp weather use as much fire-heat as will keep the air in circu-
lation, and keep the ventilators at the apex closed, and at the front also if the damp is
accompanied by fog. Gather up the cast leaves daily, as they give off moisture if allowed to lie
about. Look the bunches over frequently, cutting out any decaying berries.

Towards the end of the year the fruit will
keep better off the Vines, the bunches should therefore be cut and transferred to a room that
is quite dry, and in which the windows are fitted with shutters (late Grapes are best kept
in the dark), and with a temperature ranging between 45° and 50°. In this, temporary racks
can be fitted up for holding the requisite num-
ber of bottles at small outlay. Wine bottles,
if clean, are as good as any that can be had,
as they allow the insertion in the water of a
good length of stem (fig. 1070). Fill these
with clean water and put a small piece of char-
coal in each to keep the water sweet. When
all is in readiness the Grapes may be cut and
transferred the first fine day. With proper
care in the way of inspecting the bunches
weekly, keeping the bottles filled with water,
the Grapes will—so long as the air is dry and
the above temperatures are not exceeded—keep
until the season is well advanced.
POT CULTURE.

The fruiting of Vines in pots was practised by Speechly at Welbeck a century ago, but chiefly with the view of proving varieties forming part of a collection too extensive for all to be planted out. Now, however, this mode of culture has been found an easy means for the supply of early fruit without forcing the permanent Vines in winter.

Vines for fruiting in pots should be raised from eyes, and be grown on as strongly as possible. When the young plants have filled the pots with roots, give them a shift into 6-inch or 8-inch pots, and from these into the fruiting-pots, which should be 12 inches or 14 inches in diameter. For compost use the best fibrous loam obtainable, chopped moderately fine. With each barrow-load mix a 10-inch potful of bone-meal, a little charcoal broken to the size of cob-nuts, or wood ashes, and a little well-rotted manure quite free from worms. Wash the pots, and place 2 inches of crocks in the bottom, sprinkling a little fine soot among them before covering them with pieces of rough turf. The potting is best done in the house in which the Vines are growing, to avoid risk of chill, and if the compost is taken in a few days before the potting takes place, it will get warm by the time it is wanted. These precautions should always be taken with young Vines.

When the Vines commence to make free growth they require a brisk temperature and an abundance of atmospheric moisture. Some apply a brisk bottom-heat to the pots after the first shift, but we think they are best grown without its aid once they are shifted into fruiting-sized pots. While in full growth the night temperature may range from 65° to 70°, and from 75° to 80° by day, allowing a further rise of 10° with sun-heat. Close the house as early as is consistent with safety; ply the syringe vigorously on plants, walls, paths, &c. As growth proceeds train the plants as single canes tied to the wire trellis under the roof. Until the shoots reach the trellis stake them and attend to the tying. When the canes are 6 feet or 8 feet long, pinch out the ends. Lateral shoots will then push, and these must in turn be stopped at the first leaf as fast as they appear. From the time they begin to make new roots, they must be watered freely; they should also have liquid manure when the pots have become filled with roots. Mulchings of short manure or horse droppings will also be beneficial, as they serve both to feed the roots and to a great extent check too rapid evaporation from the soil.

When the canes show signs of becoming ripened, i.e. when the bark turns brown, less atmospheric moisture and more air will be required, reducing it by degrees, so that the house can eventually be freely ventilated both by day and by night. Continue to give the same amount of attention to root waterings, and as soon as the ripening of the canes is complete, cut away all lateral growths, and prune back each cane to the desired length. Then place them in the open air against a south wall, or hedge, to get thoroughly ripened. Protect the roots in the pots by standing boards in front of the latter, or otherwise placing some long litter round and about them, and always give them all the water they require.

Another method of producing pot Vines is, instead of raising and growing them on to a fruiting size in the first season, to rear them with less heat, and to fruit them after they have made the second year’s growth. In this case it is unnecessary to shift them the first year after they have been put into 6-inch or 8-inch pots. In the winter following propagation, cut back the young canes to within three eyes of the soil. When the canes are started into growth (which should take place early in February), shake them out, and re-pot in as small pots as the roots can conveniently be got into, and grow them on as already advised; select the strongest of the three breaks to form the future cane, rubbing off the other two. When well grown, such plants are much stronger and more robust than those grown in one year.

Fruiting Vines in Pots.—About the middle of November, earlier or later according to the urgency of the demand for early Grapes, the Vines should be placed in the house or pit in which they are to be forced. The pots may be plunged in manure or tan having a temperature of 70° to 75°, or they may be fruited quite as satisfactorily if the pots are merely stood on boards, or a stage placed over the hot-water pipes near the front of the house. The temperatures already given with regard to forcing the Vine will apply here, as will also other directions for general management.

To ensure an even break of buds, pot Vines should always have the apex of the canes bent round to a point below the rims of the pots, and be well syringed three or four times a day. When well started, the canes may be re-tied to the trellis and disbudded as soon as it can be seen which of the shoots are showing the best
bunches, stopping those retained at the first leaf beyond the bunch. Keep the air rather dry when the plants are in flower, and fertilize with a camel-hair pencil. Reduce the number of bunches as soon as the fruit is set and swelling, and then start thinning.

The number of bunches to leave on each Vine must be governed by its strength. As a rule six bunches are sufficient, and on the strongest canes the number should never exceed eight. By this time the roots will require plenty of moisture and rich food, both liquid and solid, applying the latter in the form of top-dressings. In all other respects the cultural treatment is the same as that recommended for Vines in borders. A good example of a single pot-grown specimen in fruit is shown at fig. 1071.

Diseases.—Grown under favourable circumstances, the Vine is not particularly subject to disease. Mildew (Oidium Tuckeri, fig. 1072) was at one time very prevalent, and its first appearance in England was reported by Mr. Tucker of Margate about 1847. It has since proved very destructive both in vineyards and in the open air not only in this country but in France, Germany, Italy, and the Greek Archipelago, where, in some seasons, the crops have been almost destroyed by it. The mildew appears to the naked eye like a white powder, but seen under the microscope it consists of a net-work of white branching filaments, from which others, either resembling a club or necklace in shape, arise, almost in a perpendicular direction; and by the spores and utricles of these the fungus is rapidly propagated.

When the disease becomes visible to the naked eye there is no effectual remedy. If allowed to vegetate for the short space of three days on berries, it renders them incapable of a natural distension, but the pulp and seeds continue to increase in bulk, and the consequence is that the berry cracks, so that the seeds are exposed. This being the case, prevention should be aimed at by the cultivator. The chief cause of mildew in vineyards is a too low temperature, accompanied by a damp, stagnant atmosphere. In vineyards which are liable to attacks of this disease, the hot-water pipes should be kept warmed, and air admitted whenever it is safe to do so, damping down only when it is absolutely necessary.

The most effectual agent for the destruction of mildew is sulphur, and this is best applied with a pair of Malbee Bellows, and the leaves and branches should be well dusted completely over with it, and washed off with a copious syringing of clean soft water as soon as it is seen the fungus has been killed. Sulphur may also be advantageously applied in the form of a vapour. This is best done by heating the pipes to such a degree that the hand can hardly be held on them. Then take some flowers of sulphur, add enough water to make a thick paste, and smear the hot-water pipes with it. Allow the heat to continue for an hour, and then shut it off. This may be done three evenings in succession.

By the liberal use of sulphur in one year there is little danger of an attack in the follow-
ing season, but it is always best to adopt preventive measures early in the season. Before commencing to force, &c., the Vines should be washed with water in which some soft soap has been dissolved, and afterwards dressed with sulphur, soft soap, and a little tobacco-water, mixed in such proportions that 3 ozs. of soft soap and half a pint of tobacco-water may make two quarts, sufficient sulphur being added to thicken it.

Shanking.—This term is applied to a disease of the footstalks of the berries, in consequence of which they lose their green colour, and prematurely their vitality, before the berries are ripe. The disease has been assigned to various causes, such as cold borders, over-cropping, injudicious denudation of foliage, &c.; but the most frequent cause of all is the roots getting down into the cold subsoil. The only remedy in that case is to lift the roots; and to avoid future trouble, concrete the base before putting in a new border. The other causes named can be prevented by careful management, particularly when it is brought about by the removal of a quantity of foliage at one time, arising from neglect to stop the sublateral when young.

Rust.—This so-called disease is in reality the result of injury to the skin of the berries while they are young and tender. It is caused either by cold cutting draughts, the result of admitting air on bright mornings early in the season when the wind is blowing from the east; or overheating of the hot-water pipes, especially if there should be any sulphur left on the latter from the previous season; and allowing the hands, arms, or hair of workmen to come into contact with the berries while the thinning is being done. The ventilators of a span-roofed house should be opened on the opposite side to that from which the wind is blowing, or, if a lean-to, fasten something over the openings to temper the irush of the cold outer air.

Scalding (fig. 1073).—This is invariably caused through vineyards being allowed to become too hot on bright mornings before admitting air, and generally while the Grapes are stoning, and more particularly when little or no fire-heat is made use of during the night. The berries then become cold, and when the sun raises the temperature in the early morn-

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Fig. 1073.—Scalded Grapes.

A. Bunch of Lady Downes (reduced); a, scalded side.
B. Partly scalded berry; b, scalded portion.
C. Shrivelled berry, after scalding.
D. Partly scalded berry; c, shrivelled patch; d, seeds.
E. Sounded berry at time of scalding.
F. Perfectly finished berry.

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Seeding is very liable to scalding whilst stoning.


Outdoor Culture of Vines.

Glass being cheap, there is greater inducement to have Grapes under its shelter now than formerly, and less to attempt their ripening on walls in the open air. We still see cottages and farmhouses with their front walls and gables covered with Vines; but it is only under good management and in warm situations that
they produce fruit worth eating, even when weather conditions are favourable.

Soil.—Provided the situation is warm, the leaves freely exposed to light and air, and the roots supplied with a moderate quantity of moisture, the Vine will grow in almost any soil. We have seen it succeed both in strong, deep loam, and in rocky ground thinly covered with poor sandy soil. In the open air, or against a wall, Vines will thrive in any well-conditioned soil that is suitable for fruit-trees generally. The best soil, perhaps, is a rich, mellow loam, and it should be renewed occasionally with a top-dressing of turfy maiden loam and dung. In gravelly soil mixed with peat the roots of the Vine are not liable to perish from moisture in winter; and having roots fit for action, the plants are prepared to make an earlier growth than those that have nearly all their smaller fibres either destroyed or in bad condition.

Planting.—The best time to plant Vines against walls or elsewhere in the open ground is in October or November, or in spring, just before the sap begins to rise. The roots should be carefully spread out and covered with rich, turfy loam, made rather fine, then moderately watered, and afterwards mulched.

The cultivation of the Vine on open walls is perhaps nowhere so carefully attended to as at the village of Thomery, on the banks of the Seine, about five miles from Fontainebleau, and from this neighbourhood Paris is supplied with 30,000 lbs. of Grapes daily during the Grape season. We shall therefore briefly state the mode of culture which the industrious inhabitants of that village have from long experience adopted. The soil is a light-brown sandy loam; a sample of it, analysed by Professor Solly, gave 81 per cent of silica, 7 of alumina, and only 3½ of organic matter, therefore it had not been highly manured; yet from such soil the Royal Muscadine or Chasselas de Fontainebleau Grape is produced of excellent quality. The bunches we saw were only middle-sized, as were also the berries; but these had acquired a fine yellow tinge, indicative of perfect maturity, and the quality was excellent. Doubtless this is in a great measure owing to the climate, but much is no doubt due to the system of management.

The Vines are trained with two branches extending horizontally, as nearly as possible from the same point, one to the right and the other to the left, and from these the bearing shoots are trained upright (fig. 1074). The distance between the horizontal courses is 18 inches. At Fontainebleau we observed that the plants were 3 feet apart, and the distance between the courses of horizontals was 2 feet, and these distances are preferable in our soil and climate, in which the Vine makes longer shoots than at Thomery. The length of the two horizontals of each Vine is equal to the distance at which the Vines are planted, multiplied by the number of horizontal courses which the height of the wall will admit; or the length of each horizontal is equal to half that product. A wall 12 feet high will thus admit of five courses; and, planted 3 feet apart, each plant will extend its horizontals 15 feet, or 7½ feet on each side, crossing the adjacent upright naked stems. A bearing shoot is allowed to spring from each eye; it is trained upright, and stopped when it reaches the next horizontal; if laterals pushed, as is likely to be the case in consequence of the stopping, they are cut off above the second leaf. At the winter pruning all the upright shoots are cut back to the lowest two eyes. On the upper one of these the fruit is chiefly borne; but it is completely cut away at the ensuing winter pruning, whilst the other shoot is cut down to its lowest two eyes. If more than two shoots push from the bases of the shoots cut back, they are pinched off close as soon as they can be well laid hold of. The horizontals extend
equally on both sides of the stems, and are allowed to meet, but not pass each other.

By the Thomery mode, according to the Bon Jardinier, as many as 320 bunches can be produced on a surface of little more than 8 feet square. In this calculation it is supposed that each horizontal of 4 feet 4 inches in length will support eight upright shoots, with two bunches on each; but in this climate the shoots would require more space, and besides, the wall, in order that it may be heated by the sun, should not be completely covered with foliage; therefore only half of the quantity should here be reckoned on for the same space.

It will be observed, that, in this mode of training, the flow of sap in each plant is divided among sixteen shoots, all of which are equal as regards origin and position. They all spring from a horizontal base, they are equally upright, and all are stopped when they attain a certain height, and each should have the same amount of foliage. The stopping takes place in the early part of the season, and in consequence of this the bud at the base of the part left gets well matured. Considering the limited development which each plant is allowed to take, the quantity of foliage is in ample proportion, and year after year it is almost uniformly the same; consequently, the elaborated sap supplied for the support of the roots is as regular as is the demand on these for support in return. Such is not the case when Vines are trained in a rambling manner and without system; for in that case the roots are perhaps to-day in full communication with the large amount of foliage on a number of long shoots, and to-morrow all these may probably be cut away without considering that the roots must suffer severely from the shock, the portion of foliage left being frequently less than that suddenly removed. It is not so with the Thomery system, in which the shoots have only their points taken off in a young state, rendering the removal of perfect foliage for the most part unnecessary.

From what we have observed of the system abroad, as well as the favourable results which have, in some instances, been obtained in England by adopting it, we think that the Thomery system is the best that can be pursued in our
climate, allowing, however, a distance of 3 feet between the plants, and 2 feet between the horizontal courses.

Should it be found that after a fair trial the above mode does not succeed, in consequence of the dampness of the climate and soil, then the following may be adopted. Horizontal branches should be formed to the right and left, and from these upright shoots ought to be allowed to push at 1 foot apart, stopping them in summer when they have attained a height of from 4 to 6 feet, according to their strength. At the winter pruning every alternate upright should be cut down to the lowest two eyes; and those not so cut back may be shortened to 2 feet if rather weak, but to 3 or 4 feet if strong and well matured. These are to bear the fruit in the following summer.

A vineyard of the French pattern for the open-air cultivation of Grapes for wine-making was formed by Lord Bute at Castell Coch, near Cardiff, in 1875. The Vines are planted in rows a yard apart each way, and trained to stakes 4 feet high. In favourable seasons they yield good crops of fruit, from which excellent wine is made. The variety grown is Gamay Noir, which is largely grown in the French vineyards.

**Propagation.**

This is effected by seeds, cuttings, eyes, layers, and grafts.

**Seeds.**—This method is resorted to only with the view of obtaining new varieties, usually by means of cross-fertilization. If the petals of the flowers of the Vine are examined, it will be observed that they are inflected at the top, and form a kind of case enclosing the stamens and pistil. When the Vine is in good health and growing in a suitable temperature, this cap is thrown off, and the anthers exposed to the influence of light and air; they then soon burst, the pollen escapes, some of which falls upon the stigma, and fertilization is effected. When crossing is to be performed, the stamens should be cut away before they burst with a pair of fine-pointed scissors; and afterwards when the stigma is sufficiently developed, indicated by the stickiness of the surface, it should be covered by means of a camel-hair pencil with the pollen from a flower of the variety intended to be the male parent. The seeds that result should be saved and sown early in February, in pots or pans filled with light, rich loam, mixed with a little leaf-mould, in bottom heat. Pot the seedlings as soon as they are in fit condition, and grow them on in heat both top and bottom. They will make rapid growth, and may, if thought desirable, be inarched on Vines already established, with the view of testing their merits the more quickly. If means are not at command for doing this, grow them on in pots, when they will fruit either the second or third year.

**Cuttings.**—Where the soil is warm, well-ripened Vine shoots inserted in the open ground will strike root; but in this climate the progress is too slow for a good shoot to be formed before cold weather sets in. With bottom-heat the rooting process is accelerated, but it is found, notwithstanding, that when a young shoot is produced with plenty of air and sufficient moisture, the returning sap is checked considerably when it comes to the old wood, and we frequently see that the young shoot becomes in consequence thicker than the old wood intervening between it and the roots. Such being the case, it is found best in propagating the Vine to dispense as much as possible with the old wood.

**Eyes.**—For the reason just given, plants raised from single eyes or buds are preferred, experi-

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Fig. 1076.—Eye-cutting when rooted.
slice off half the wood opposite the bud, as a further inducement to the more rapid formation of roots. The eyes should be planted early in January, and singly in small pots, filled with a compost consisting of good friable loam, leaf-mould, and sand. They ought then to be kept in moderate heat for a week, and afterwards plunged in a propagating-case, or hot-bed, having a bottom-heat of 75°. When the plants have made roots and growth as shown in fig. 1076, the bottom-heat may be increased to 85°, the top-heat averaging about the same by day and 75° by night. As soon as the roots have reached the sides of the pots, give the plants a shift into larger-sized pots, which, unless the Vines are intended for forcing the next season, need not exceed 7 inches in diameter. By the time the plants are ready for shifting they will be growing freely, and by affording them the right degree of top and bottom heat, with plenty of light, air, and moisture, as well as occasional waterings with clear liquid manure, or weak guano-water, strong, well-rooted plants, with firm wood, will be ensured by the end of the season, and superior to those raised from cuttings and other means.

Another method of raising Vines from eyes is by inserting each eye singly in pieces of turf a few inches square, placed closely together in a propagating-case, or on a hot-bed. As soon as plenty of roots have been formed, each plant should be potted off and grown on in precisely the same manner afterwards as advised above.

Layering.—By this mode it was formerly usual to propagate the Vine in the open ground, and strong plants were produced by the end of the first season. Layering is but little practised now, and then only when it is desirable to fill part or the whole of a house with rods of the same variety. To accomplish this, take an established Vine possessing sufficient flexibility to be bent round and brought down to the surface of the border without sustaining damage. Then open out a narrow trench in the border, and of sufficient depth that the rod may be buried just below the surface. A few strong pegs will be necessary to hold the rod in position, and when this has been done, cover with soil. When the buds break, all that is necessary is to select the required number of rods from among the strongest and most conveniently placed of the young shoots issuing from the spurs, and rub all others off. In a short space of time an abundance of roots will be emitted from each spur, and by the end of the season the entire length of the old rod will have become firmly rooted, and the roof furnished with strong healthy rods. This method of layering is practicable only when the borders are situated inside the vinery.

**Grafting.**—The grafting of Vines is easily and successfully accomplished, provided the operation is performed when both stock and scion are in a fit state. When vegetation is inactive no vital union can take place; and, on the other hand, if the Vine is wounded when the sap is rising, and before the leaves expand, bleeding ensues. Having at the time of pruning selected scions from the best-matured shoots of the kind it is intended to propagate, let their ends be inserted in pots filled with moist earth and stand outdoors until required. In the meantime the stock or branch intended to be worked should be cut back to where the graft is to be put on; doing this before there is any danger of bleeding likely to occur. The grafting may be done either on last year's wood or that which is older, taking care, however, to see that a bud is
situated just below where the cut is made. Cut back the stock to where the scion can be conveniently put on; the best method is that termed "whip" grafting.

When the buds begin to grow on the Vines to be grafted, introduce the scion into a similar temperature to that in which the stock is growing, so that they may start the quicker after grafting. When the terminal bud on the stock has pushed and made four or five leaves, pinch it back to two leaves, and then insert the scion on the opposite side of the stock (fig. 1077), taking care not to injure the pinched-back shoot, as the loss of this will result in the scion failing to grow. Bind the scion on tightly with raffia, leaving the bud free to push, and when completed smear with grafting-wax to exclude air. As soon as the buds of the scion have fairly expanded into leaf, and growth becomes vigorous, the shoot on the stock may be gradually removed. If the grafting has been properly performed the union will be complete in from four to six weeks, when the ties may be cut. The shoot from the graft, if allowed full freedom, will make rods from 15 to 20 feet long the first year.

Another method is that termed bottle-grafting, which is, if anything, more certain than the above mode. This should be performed after the stock has started into growth. The scion should be from 9 to 12 inches in length, and at about the middle of it a slice cut out about 5 inches long, taking care that there is a good bud at or near the top of it. Then cut a corresponding piece out of the stock, fit the two carefully, and bind them together carefully in the usual way, covering with grafting-wax. From 2 to 3 inches of the scion should project above, and from 4 to 5 inches below the binding. The piece below must be placed in a bottle filled with water, and suspended from the trellis or fixed in any convenient position, and be filled up as often as required. The scions usually root freely in the water in the bottles, but the roots generally die when the bottle is removed, which may be any time after the young rods have made from 10 to 12 feet of growth. The portion of the scion which was in the bottle may be pruned away either soon after there is no further need for the latter, or in the winter months, it being immaterial which.

Inarching, or grafting by approach, is another method of propagation frequently adopted to test the merits of a new variety, or to change the variety without removing the old plants.

The scion is usually a young Vine in a pot, which is started into growth along with the stock, so that growth on both shall be of about equal strength. When the shoots have developed from four to five leaves, the inarching is done by cutting a slice of the green wood off the scion, and a corresponding piece off the shoot on the stock, fitting them together, and binding with raffia (fig. 1078). In the course of ten days or a fortnight the union will be complete, when the ties should be removed and replaced again rather loosely, as a protective measure in case of accident. When growth becomes vigorous, the scion below the point of union may be gradually cut away, as the stock will supply all the nourishment required to enable the young shoot to develop. All growth on the stock should be persistently pinched back so that its energies may be concentrated on the production of what will ultimately become the future Vine.

**Varieties.**

The varieties of Grapes are exceedingly numerous; the following are some of the best for cultivation in this country, either on the open wall or under glass:

_Alicante_ (fig. 1079).—Leaves large, leathery, downy beneath. Growth vigorous, moderately fruitful. Bunches very large, broadly shouldered; stalk short and stout; very
Fig. 1079. Alicante

Fig. 1080. Black Hambro'

Fig. 1081. Lady Downes

PRIZE GRAPES EXHIBITED AT THE CRYSTAL PALACE SHOW, 1901
free setting. Berries large oval, jet black, and densely covered with a bluish bloom; skin tough when the fruit is not properly ripened; when it has hung on the Vine until January it has been mistaken for Black Hambro. Flesh tender, juicy, slightly acid, or of holunderine flavour, unless well-ripened. It is a decidedly late Grape, second to Lady Downes in keeping qualities, and succeeds best when grown with it.

Alnwick Seedling (Clive House Seedling) (fig. 1052).—Leaves large, green, much serrated, and handsomely coloured in the autumn immediately before falling. Habit vigorous, growth strong, and extremely fruitful. Supposed to be a seedling from a cross between Black Morocco and Syrian. A very fine Grape of easy cultivation that will keep in fine condition for a long time after it is ripe. Should be grown in the coolest end of the latest vineyard if required for winter use. The only drawback to this otherwise fine variety is that it is a bad.setter, and great care is needed in the setting, otherwise a crop of nothing but small and seedless berries will result. If the flowers are syrinxed in the early morning, the gummy exudation at the points of the stigmas, which is the cause of sterility incidental to this variety, is washed off. At mid-day fertilize the bunches with pollen collected on a camel-hair brush from a free-setting kind. By adopting these means a very heavy set may be ensured. Bunches large, often irregularly formed, heavily shouldered, sometimes long, often short and conical; berries large, roundish, sutured down one side; skin thick, tough, deep-black, covered with a copious blue bloom; flesh firm, purplish; flavour rich, and much resembling that of Black Hambro. The flavour is much enhanced by working it on the Muscat; the bunches then come longer and more tapering.

Appley Towers.—A fine black Grape of recent introduction; highly esteemed by many growers for its late-keeping qualities. Bunch large-shouldered, symmetrically formed; berries medium to large, roundish-oval; skin thick, hairless, covered with a blue bloom; flesh tender, juicy, and richly flavoured when well ripened. Should be grown to succeed Black Hambro; also in the late house for mid-winter supply. Was raised at Appley Towers, Isle of Wight.

Black Cluster (Black Burgundy, Early Black, Small Black Cluster).—Leaves nearly smooth, rather deeply lobed, but having shallow serratures. Bunch small and compact; berries rather small, roundish-oval; skin deep-black, thick; flesh sweet, juicy, and rich. This is a very old variety, and one of the hardest known. In this country its wood becomes firmer and better matured in the open air than that of any other kind.

Black Frontignan.—Leaves roundish, sharply serrated, but not deeply lobed; midrib smooth. Bunch medium to large, tapering, frequently shouldered; berries small, round; skin blue-black, covered with an abundant bloom, thin in texture; flesh firm, juicy, with a rich Muscat flavour, on which account this Grape should be included in every collection.

Black Hambro (fig. 1080).—Leaves large, with three principal lobes, the middle one tapering and elongated, smooth above, slightly pubescent beneath; footstalks long. Bunches medium to large, broadly shouldered; berries large, round and occasionally oval, when highly fed oblate, measuring less from the stalk to the opposite end than transversely; skin black covered with a copious bloom, rather thick, unless allowed to hang till at the point of commencing to shrivel. It is only then that the fruit is perfectly ripe, and the flesh acquires to its fullest extent its rich and delicious flavour; indeed it may be affirmed that nine-tenths of the produce of this excellent variety is consumed when only well coloured, and even in that state is considered good. A bunch of Black Hambro has been grown by Mr. Hunter of Lambton Castle which weighed 21 lbs. 12 oz.

Black Mouvex.—A very distinct and peculiar Grape but seldom cultivated. Bunches very large, with heavy shoulders; berries oblong, truncate at the ends; skin deep dull brownish-purple, very thin, adhering to the flesh, which is firm, crisp, and juicy, with a remarkably pleasant flavour. The fruit may be eaten with comfort, as there are no seeds. It is a strong grower, a great cropper, and suitable for mid-season supply.

Black Morocoo (Black Muscadel).—Leaves very deeply lobed, the lobes overlapping the broad open sinuses; very beautiful when dying off in autumn. Bunch very large, long and regularly shaped, and shouldered; berries large, oval, black; pulp firm and sweet. A noble-looking Grape, but a shy setter. It should be fertilized with the pollen of Hambro or Alicante, and grown in a Muscat house. A robust grower, but somewhat shy of producing bunches if too closely pruned.

Black Muscat of Alexandria (Muscat Hambro).—Leaves large, three-lobed, nearly smooth above, pubescent beneath, the ribs set with short bristly hairs. Bunch very long, tapering, and shouldered, oftentimes setting badly, and much given to shanking; berries large, oval or roundish-oval, black; skin thin; flesh of the consistency of Black Hambro, very rich, and when fully ripened of true Muscat flavour. This fine Grape appears to have almost gone out of cultivation until about 1848, when, with the increased skill of modern practice, examples of it produced as a supposed new Grape by Mr. Snow of Wreth Park again brought it into notice, since which time it has been highly esteemed by many cultivators. It is both free-growing and fruitful, especially when grafted either on Black Hambro or Muscat of Alexandria, and fertilized with the pollen of a free-setting variety when in flower. Will succeed either in a Muscat house or with Black Hambro.

Black Prince.—Leaves lobed, generally overlapping, pubescent, the ribs slightly bristled, dying off purple in the open. Bunches very long and tapering, occasionally shouldered; stalk long; berries medium, oval, bluish-black, covered with a copious bloom; flesh white, purplish under the skin, juicy, and rich in flavour, but not equal to Black Hambro. It is a free-bearing, vigorous-growing variety; valuable for early forcing, as the berries always colour well. Will succeed in the open air in warm situations.

Bowood Muscat.—Bunch large-shouldered; starch green, differing in this respect from those of Muscat of Alexandria, which are tinged with red; berries very large, oval or obovate, deep-amber when fully ripe; flesh firm, juicy, with a rich, sugary, Muscat flavour. It requires the same cultural treatment as Muscat of Alexandria, is a more free settet than it, while it has the merit of keeping equally as long and well. Raised at Bowood, from Canon Hall and Muscat of Alexandria.

Backland Sweetwater.—Bunches very large shouldered, sometimes unsymmetrical in appearance; berries large, round, and occasionally scarred; skin thin, golden or amber when ripe, otherwise pale-green; flesh melting, juicy, and richly flavoured. This is one of the best white Grapes other than Muscat. It is rather later in starting than Black Hambro, and should be grafted on that variety. It ripens with Hambro, and requires precisely similar treatment; does not set its berries quite so freely, and when forced early should be fertilized by hand when in flower. It is not adapted for late work.
Calabrian Raisin.—Leaves not deeply lobed, smooth above and below, even the ribs being glabrous, instead of being furnished with short bristly hairs, as are those of most other varieties. Bunch large, very long and shouldered; berries round, white, thinly covered with a delicate bloom, transparent, so that the seeds can be seen; flesh firm, sweet and pleasant, though not rich. The bunch is of handsome proportions when highly cultivated, and although a Grape of third-rate quality, is deserving of being included in the late vinery, as the fruit hangs in excellent condition to a late period.

Fig. 1083.—Grape—Diamond Jubilee.

Canon Hall Muscat.—This variety has thicker shoots, larger and more tapering branches, and larger berries than Muscat of Alexandria. In point of flavour Canon Hall is rather the inferior of the two. Is a bad settler, and must be fertilized by hand with foreign pollen. Is said to be much grown in the Channel Islands for market. Was raised at Canon Hall in Yorkshire.

Chasselas Musqué (Tokai Musqué).—Leaves roundish, somewhat convex, not deeply lobed, of a bluish-green colour, smooth above and nearly so beneath. Bunches tapering, rather loose, with or without shoulders; berries middle-sized, round; skin moderately thick, apt to crack, white; acquiring a yellowish tinge when thoroughly finished; flesh firm, with a rich, sugary, delicious Muscat flavour. An excellent bearer, ripening early. Its only fault is that the berries are apt to crack during the ripening stage, to counteract which apply no more water at the roots than is absolutely necessary at that particular period, and maintain a warm, dry atmosphere. Should these means fail, pierce or ring the lateral above the bunch, to arrest the flow of sap. The flavour of this Grape is considered by some to be equal to that of Muscat of Alex-

andria, and it ripens with much less heat. May be grown in lieu of Muscat of Alexandria for early work.

Diamond Jubilee (fig. 1058).—A cross between Gros Colmar and Gros Moroc. It was raised in 1865 by Messrs. D. & W. Buchanan, Forth Vineyard, Kippen. It has large black, oval berries of splendid flavour, and is very free setting and fruitful. One of the earliest Grapes, ripening before Black Hambro. It is quite distinct from Black Morocco.

Duke of Buccleuch.—Bunches large, ovate, broadly shouldered; berries very large, round, inclining to oblate; skin thin, of a fine golden colour when well finished and ripe; flesh melting, with a very abundant juice; flavour quite distinct, and extremely rich and pleasant. This noble-looking Grape was raised by the late Mr. W. Thomson, of Cliftonords, Galashiels, who not only grew it extensively for market, but succeeded in bringing out all its good qualities better than any other grower. It is an early Grape, and will not hang long after ripening. Succeeds best grown on the long-rod system, and requires to be fertilized by hand to ensure perfect fructification.

Dutch Hambro.—Berries larger than those of Black Hambro, firmer fleshed, but of inferior quality; skin thick, bloom thin, does not always colour well; flesh coarse; flavour second-rate. A handsome Grape.

Espiran (Turner’s Black, Hardy Blue Windsor, Red Port of some).—Leaves roundish, with five moderately deep lobes, pubescent on both sides, dying off a deep rich purple; the footstalk is also pubescent, and of a purple tinge; wood somewhat striped with purple. Bunch large, shouldered, long and tapering; berries round, black, covered with a dense bloom; flesh sweet and vinous, but rather acid unless thoroughly ripened. The Vine is vigorous, hardy, bearing abundantly, and ripening outdoors if accorded a distinct position. It is well figured in the Transactions of the Horticultural Society, vol. iii. p. 93.

Foster’s Scolling (fig. 1083).—This is an excellent white Grape, much superior to Royal Muscadine, and being equal to it in flavour has superseded that good old sort for culture under glass. Is also one of the best Grapes for pot culture. Sets as freely as Black Hambro, and requires similar treatment, except that the leaves ought to be moved aside to allow the sun to act upon the fruit, which will greatly enhance the colour. Obtained by crossing Black Morocco and White Sweetwater. Bunches large, compact and tapering; berries medium, oval; skin pale-yellow, or greenish when not properly finished; flesh tender, melting, juicy, with a rich saccharine flavour.

Frankenthal Black Hambro (Victoria Hambro, Black Tripoli).—Considered by some to be identical with Black Hambro, but it is quite distinct, having larger round berries and a much more robust habit. Bunch large and heavily shouldered; skin black when well coloured, well bloomed, thicker than Black Hambro, which fact enables the grower to keep this Grape until Christmas if needed; flesh firm, juicy, sugary, and good-flavoured; growth vigorous, and very productive. A noble Grape.

Golden Champion.—A handsome but uncertain Grape. Should be worked on the Black Hambro to impart vigour to its weak constitution, and grown either on the long-rod or long-spur principle to ensure fruitfulness. Bunches large, shouldered; berries very large, oval; skin thin, pale-yellow; flesh firm, juicy, with a sweetwater flavour. Its proper position is in the list of early varieties. Was raised by the late Mr. W. Thomson when at Dalkeith.

Golden Queen.—This fine Grape is much esteemed by some cultivators. On some soils it is a great success, but requires Muscat treatment to bring out its best points.
Fig. 1082. Alnwick Seedling

Fig. 1083. Foster's Seedling

Fig. 1084. Muscat of Alexandria

PRIZE GRAPES EXHIBITED AT THE CRYSTAL PALACE SHOW, 1901
Bunches long, tapering, shouldered; berries oblong or oval, an inch or more in length, on rather long stalks; skin membranous, amber-coloured; flesh firm, juicy, and richly flavoured. Will keep on the canes until the end of the year.

**Grizzly Frontignan (Red Frontignan).**—In foliage, form of bunch and of berries, this variety is similar to Black Frontignan, and its rich Muscat flavour is also much the same, the only material difference being the colour. Some consider the Red Frontignan different, but we think the supposed difference arises from the Grizzly becoming, under some circumstances, more red than usual, or from the Black Frontignan colouring only red instead of black, as is sometimes the case with Black Hambro. Introduced by Sir William Temple about 200 years ago. The Black, the White, and the Grizzly Frontignan all require the same treatment.

**Gros Colman (Gros Colmar).**—Bunch of medium length, sometimes long, shoulders broad, the latter often being of nearly the same size as the bunch; a very free setter; berries very large, oval; skin thick, black, well covered with bloom when properly finished; flesh coarse juicy, sweet when well ripened, otherwise of an indifferent flavour much resembling that of a Mulberry. It is a late Grape, and if worked on Muscat of Alexandria and accorded Muscat treatment the flavour is much improved; requires considerable time to finish. The Vine is a vigorous grower, very fruitful, and is one of the best to grow for market, where appearance is paramount importance. The thinning of the berries must be done early and with a free hand, to allow of the full development of those retained.

**Gros Guillaume (Seacliff Black, Barbarossa of some)** (fig. 1086).—Strong grower, rather shy in bearing. Leaves large and downy. Bunch very large, tapering, and shouldered; berries large, somewhat oval, black, bloom thin; skin tough; flesh tender and juicy, agreeably but not richly flavoured. It is a valuable late Grape, hanging till March, and it is only after hanging thus that it attains its best condition. The Vine, like nearly all other late kinds, delights in Muscat treatment; should be pruned on the long-spar system to secure a sufficiency of bunches, or otherwise grown on the long-rod principle for the same reason. A bunch grown by Mr. Roberts of Charleville Forest, Ireland, weighed 23 lbs. 5 ozs.

**Gros Marce (Cooper's Late Black).**—Bunches large, long, compact, and evenly shouldered; berries very large, roundish oval; skin thick, black, and covered with dense bluish-gray bloom; flesh tender, sweet; flavour pleasant, but not rich. The Vine is a vigorous grower, but must not be too closely pruned if first-rate bunches are desired. Some growers advise it being grown on the long-rod system to produce the best results. Succeeds and ripens with Black Hambro, and hangs well till the end of the year. Is a mid-season variety of easy cultivation, and may be grown where Gros Colman is not a success.

**Lady Downes (Lady Downes' Seedling)** (fig. 1081).—A most valuable late-keeping Grape, surpassing all others in this respect, as it will hang without decay, loss of colour, or plumpness till the end of March, if thoroughly ripened and accorded proper treatment. It is slow to start into growth, and on that account should be started not later than mid-March, in order that its fruit may be mature by the beginning of October. It succeeds best on its own roots, and when given the same treatment as is afforded Muscats. The Vine is vigorous and fruitful, but the berries have the fault of sauldng badly, to counteract which less moistirue should be given, keeping the hot-water pipes warm throughout the night, and leaving the ventilators slightly open during the stoning period. Bunches oblong, with generally an irregular-shaped shoulder, which most growers remove; berries large, roundish-oval; skin thickish, membranous, of a purplish-black, becoming quite black when fully coloured, and covered with a good bloom; flesh firm, richly flavoured, and excellent. The wood and leaves are downy, and the foliage is remarkably handsome in the autumn.

**Lady Hutt.**—A large, round, white, sweet-water Grape of the highest merit; is a good keeper, and when better known will be largely cultivated for late supply. Foliage and habit of growth similar to Gros Colman; the leaves become pale-yellow in autumn. Bunch medium to large, shouldered, compact; berries large, round; skin thin, greenish-yellow at first, afterwards changing to pale-amber; flesh tender, juicy, breaking, and richly flavoured. Should be grown with Lady Downes, as it requires a long season of growth in which to properly mature its fruit. Will then keep in the Grape-room in fine condition till March. Was raised at Apple Towns, Isle of Wight.

**Madeira Frontignan.**—Bunches medium, evenly formed; berries small to medium, round; skin red or grizzly; flesh juicy, rich, with a decided Muscat flavour. Ripens well with Black Hambro.

**Madresfield Court.**—Bunches large, long, tapering, sometimes widely shouldered, with a short stalk; skin tough but not thick, black, covered with a blue bloom, but does not always colour perfectly; berries large, oval or oblong; footstalks short and stout; flesh tender and juicy, rich, with a true Muscat flavour. This is a very excellent early Grape of great merit; will succeed in a cool viney. Should be grown with the early or mid-season varieties. It being
a failure in the late vinery. In some places the berries crack during the ripening process, which fact indicates that a drier treatment of either root or top is necessary. When cracking is first observed it may be checked by placing a covering to shed off rain from outside borders, also by piercing the laterals between the bunch and rod with a gimlet, or otherwise partially severing them.

**Miller's Burgundy.**—Leaves downy, nearly white, in allusion to which appearance it has the name of Miller Grape, or one with that signification, in various languages. Bunches short, ovate, compact; berries small, round or inclining to roundish-oval; skin thin, black; flesh tender, with an abundance of juice, which is rather sharp after the fruit is coloured, and when fully ripe is not so sweet as the Black Cluster. It is hardy, and therefore suited for cultivation against a wall in the open air; or it might be grown for wine in warm, sandy, or chalky soils.

**Mill Hill Hambro.**—Leaves large, pale yellowish-green, flaccid. Bunches large, long, and well shouldered; berries large, round inclining to oblate, dented as if hammered; skin black covered with blue bloom, thin and tender; flesh melting and tender, juicy, sweet, and richly flavoured. A noble-looking Grape of excellent quality, but does not keep long after it is ripe.

**Mrs. Pearson.**—Although not generally cultivated this Grape finds favour with some by whom it is well grown.

![Fig. 186. - Grape-Mrs. Pierce's Black Muscat.](image)

It is a round white Grape possessing a Muscat flavour; a good setter and keeper, and should be accorded a warm position in the late vinery. Bunches medium to large, broad-shouldered, tapering; berries roundish-oval; skin thick, amber-coloured when fully ripe; pulp firm, juicy, sugary, with a Muscat flavour. Raised by Mr. Pearson of Chilwell from Black Alicante, crossed with Ferdinand de Lesseps.

**Mrs. Pierce's Black Muscat (fig. 1087).**—Bunches large, very long and tapering, shouldered, with a short stalk; berries oval, medium-sized, with short, stout stalks; skin tough, thick, blackish-purple, seldom well-coloured, bloom moderate in density; flesh firm, with a decided Muscat flavour. A useful late-keeping Grape, requiring time and a high temperature to finish it to perfection. It is best grown on its own roots, and should be fertilized by hand when in flower, when it sets abundantly.

**Muscat Champion.**—Leaves and general habit of growth much resembling Mill Hill Hambro, which was one of its parents. Bunches large and well shouldered; berries large, round; skin red or grizzly; flesh tender, rich, with the distinct flavour peculiar to the Frontignans. A mid-season Grape, succeeding in a greenhouse vinery, but is not often cultivated.

**Muscat of Alexandria (Charlesworth Tokay) (fig. 1084).**—Vine vigorous, of robust growth. Leaves large, deeply lobed, sharply serrated, smooth above, slightly pubescent beneath; petioles long, smooth, stained with red, as are also the ribs some distance from them. Bunches large, tapering, strongly shouldered; berries large, ovall, hanging loosely; skin rather thick, of a pale-amber colour, with a rather thin bloom; flesh firm and breaking, exceedingly rich, with a very pronounced and delicious musky flavour. Dr. Lindley held that this was one of the very best Grapes ever introduced into this country. Succeeds best when grown in a house by itself. If it has to be accommodated in a mixed house, it should be with such varieties as require strong heat, or what is termed Muscat treatment. Requires particular care in the setting, this having to be done with the pollen of the Hambro or a similar free-setting kind in many places, to ensure good and shapely examples. A higher degree of temperature is requisite to thoroughly ripen the fruit and ensure the rich amber tint so much admired in well-finished samples of this Grape. Exposing the berries to direct sunlight is also a great aid in securing depth of colour.

**Pitmanstow White Cluster.**—Leaves with deep incisions, smooth above and rather glossy beneath, the ribs slightly hairy; footstalks smooth, tinged with red. Bunches scarcely so large as Royal Muscadine, but more compact and shouldered; berries round; skin white, acquiring an amber tinge; flesh tender, with a Muscadine flavour. It ripens earlier than Royal Muscadine, and is an excellent Grape for the open wall. Was raised from a seed of Black Cluster, by Mr. Williams of Pitmanstow, near Worcester.

**Royal Muscadine (Chasselas).**—Leaves with moderately deep lobes, smooth above and almost so beneath; the underside thickly reticulated. Bunches medium, tapering, occasionally shouldered; berries medium, round; skin thin, white-amber; flesh tender, rich, and sugary. A good bearer and sets well. One of the best white Grapes for the open wall, greenhouse, and for early forcing in pots. The berries keep well after being ripe, a desirable property, more especially when there is but one vinery.

**Syrian.**—Bunch very large with broad shoulders; berries large, oval; skin thick, white; flesh firm, of tolerable flavour when well ripened in strong heat to a fine amber colour. Is a hanging variety, and not recommended for a limited collection, one Vine sufficient for a large establishment. Grown by Mr. Speechly, at Welbeck, in 1781, to a weight of 15½ lbs.

**Trebbiano.**—Bunch very large, long, broad-shouldered and well-set; berries roundish-oval, medium, on short stalks; skin thick, greenish-yellow, becoming amber-coloured when properly finished; flesh firm, juicy, sweet, but not rich. Requires a long season of growth and Muscat treatment to bring out its best qualities. A handsome Grape, valuable on account of its long-keeping properties. Some
For Walls in the Open Air.

Black Cluster. | Pitmaaston White Cluster
Black Prince. | Royal Muscadine
Miller's Burgundy.

For Cool Vinery.

Black Hambro. | Madresfield Court
Foster's Seedling. | Royal Muscadine

For Early Forcing.

Black Hambro. | Foster's Seedling
Buckland Sweetwater. | Madresfield Court
Duke of Buccleuch.

SELECTION OF SORTS.

PINE-APPLE.

CHAPTER XVIII.

PINE-APPLE.


The Pine-apple (Bromelia Ananas) is a native of tropical America, but it is now naturalized in the tropics generally, and in some countries is largely cultivated as a field crop.

According to Philip Miller (1768), the first person who succeeded to grow a Pine-apple fruit in Europe was M. Le Cour, of Leyden, in Holland, who, after a great many trials with little or no success, did at last hit upon a proper degree of heat and management so as to produce fruit equally good, though not so large, as those produced in the West Indies. It was by M. Le Cour that English gardens were first supplied with plants.

The temperature most suitable for the Pine-apple is a mean of 70° in the coldest period of the year, and about 83° in the warmest, with a range of 8° or 10° between the coldest at night and warmest in the day. As the days lengthen, the mean should be gradually raised from 70°, the lowest, till in the summer months
it reach 83° or 84°, the highest; the range should be limited generally to 8° or 10°, that is 4° or 5° above the mean in the day, and as much below it in the night; thus, when the mean temperature is to be 75°, the lowest at night should be 70°, and the highest in the day 80°. On this principle the following table, exhibiting the temperature which we consider most suitable for the Pine-apple, has been calculated:

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<th>Jan</th>
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<td>Highest in the day</td>
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<td>74°</td>
<td>71°</td>
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By sun-heat, with an additional amount of ventilation, the temperature may be allowed to rise 10° higher than the maxima indicated in the above table. This would limit the highest temperature by artificial means and sun-heat combined to 97°; the house may, however, in summer be shut up at 100° in the afternoon, when the intensity of the sun’s rays have diminished so much that, instead of the temperature rising higher, it will only remain stationary for some time and then gradually decline.

Excessive heat in the day must be counteracted by a gradually increased amount of ventilation, for if the temperature can be kept within proper limits the sun’s rays should by no means be excluded. In certain cases when air cannot be admitted so as to have the desired effect, as in very hot weather, or where the construction of the house is such that with all the air that can be given the temperature cannot be kept below 100°, then a shading of some thin material may be employed, in order to prevent the air of the house from rising above that point. When the external temperature is as high as 80°, or nearly so, air may be given freely, provided a rush of it is not suddenly admitted when the atmosphere of the house is much warmer. The greater the disparity between the heat of the internal and external air, the more cautiously should the latter be admitted. When the sky is clear, with bright sun, and when at the same time the wind is very cold and dry, it may be advisable to use a slight shading rather than to introduce much air from outside, unless it can be warmed previous to its coming in contact with the foliage, when it may be admitted to any desired amount.

On cold nights a warm covering would be highly beneficial as regards both the temperature and moisture of the internal air. A single layer of mat will prevent radiation from the glass to a considerable extent; but a much warmer covering would not only economize fuel, but also greatly benefit the plants, by preventing the air from becoming dry to an injurious degree.

Fig. 1099.—Mendon Pine-house.

\( a, a, \) Ground-line. \( b, \) Hot-water pipes for top heat. \( c, \) Bed of peat soil in which the Pine-apples are planted. \( d, \) One of the iron bars for supporting the boarded flooring on which the bed of soil rests. \( e, \) Vault filled with stable-dung and leaves. \( f, \) Foot-path. \( g, g, \) Air-holes. \( h, \) Shelf for Strawberries. \( i, \) Iron rail over which the straw mats are hung when the house is uncovered.
There should always be a good command of bottom-heat. When this is obtained by means of hot-water pipes, there need be no difficulty in regulating it; but when it is derived from tan or other fermenting materials, its regulation is somewhat precarious. Tan is cheap, and a quantity of it should always be in readiness to supply any deficiency that may occur. Should the tan get too hot, the plants should be removed, either wholly or in part, according as the heat is more or less in excess of what it ought to be. It is a good plan to plunge a small pot, with its mouth upwards, and on this place the bottom of the pot containing the plant.

If the plants are found to be poorly furnished with roots, the bottom-heat should be at least as high as the maximum for the respective months. This is quite high enough to keep the roots at all times in good condition and constantly in action, an absolute necessity, for if they are so cold that the sap cannot flow freely the roots become so inert as to be useless; and consequently the plant is reduced to the condition of a cutting.

Pine growers used to starve their plants for months previous to March, after which a general shifting of the plants and renewal of fermenting materials usually took place, and with an increased bottom and top heat the plants were started to grow; but a considerable portion of the summer was spent in efforts to remedy the evils which the winter had entailed. Hence the long period formerly considered necessary to fruit the Pine-apple, compared with that now required by those who maintain throughout the winter a brisk bottom-heat.

Soil.—The soil for Pine-apples should be friable and open. It may be either fibrous, peaty, or sandy, and if assisted by some appropriate manure, good fruit may be produced. Loam may, however, be advantageously mixed in the proportion of two parts to one of peat. At Meudon, in France, where Pine-apples of an astonishing size have been produced, the soil employed was a sandy peat or leaf-mould, obtained from a high-lying spot where hard-wooded trees, chiefly Beech, had long been growing. In this soil plants of Queen Pines were planted out, and produced fruit weighing 10 lbs.; but it must be observed that the bed of soil was supported on planks, between which ammonia from a large mass of fermenting horse-dung and leaves could readily ascend.

In English gardens the soil used for Pine-apples consists of 2 parts rich friable loam, peat 1 part, mixed with deer, sheep, or pig dung. Some growers prefer turfy loam, deer or sheep dung, and leaf-mould, in the proportion of six parts of loam to three of dung and one of leaf-mould, whilst others recommend a compost consisting of three parts of loam, three of peat, and one of horse-droppings, the latter having been kept dry, and mixed with the soil when about to be used; the horse-manure, it may be remarked, affords ammonia, a substance which appears to be favourable to the growth of this fruit.

When the plants do not appear to be thriving, although under favourable circumstances in other respects, they should be shifted into fresh soil, and that at any period of their growth if done carefully; even when the fruit has been swelling we have known instances of plants having been shifted with advantage.

Mr. D. Thomson, who, while at Archerfield, grew some of the finest Pine-apples ever exhibited, used a sandy soil, very full of fibre, taken from the surface of a rocky crag, and stacked for a twelvemonth previous to use. This, a few months before being required for potting, was put into a dry, airy shed, and chopped up without separating any of the fibre from it; and it was used without any addition, except an 8-inch potful of $\frac{1}{2}$-inch bones, and the same quantity of soot, to a barrow-load of soil. Where a friable loam, such as the top 4 inches of an old pasture, cannot be had, and heavier soil must be used, he advises the addition of sand, powdered oyster-shells, charcoal, mortar-rubbish, &c., to keep it open.

Manures.—It will be seen that manure of a rather strong nature may be applied to the Pine-apple with advantage. Plants in such composts require no other stimulus, so long as they continue to grow vigorously; but frequent watering, evaporation, and the absorbing action of the roots, all tend to exhaust the nutritive principles which the compost originally contained. A fresh supply therefore becomes necessary, and this can be conveyed in liquid manure. Ammoniacal manures appear very suitable for the plants at a season when luxuriant growth is desirable, and they produce a healthy green appearance in the foliage. Stable drainings will afford ammonia in considerable quantity; it is not, however, advisable to apply this manure in an undiluted state; the admixture of two parts of water to one of urine constitutes a safe application. Liquid manure can also be formed by mixing the dung of horses, cows, sheep, or poultry with water in a tank or large cask; or guano-water may be used. An
ounce of carbonate of ammonia dissolved in 4 gallons of water, and applied once a month, will likewise prove very beneficial.

Guano or other ammoniacal manures placed in the evaporation troughs have been found to increase the vigour of the plants and deepen the green of the foliage.

Moisture.—Formerly, moisture was very sparingly given to Pine-apples for fear of causing them to damp off, but it is now the practice to water them freely, if they are in a healthy growing state; even in winter, if a proper temperature is maintained, the soil when dry may be moistened thoroughly with safety. During the summer, if the soil is of the proper texture and the drainage good, there is little danger of overwatering. Just before the fruit begins to ripen, water should be withheld. Much more water is necessary when the plants are growing rapidly than when they grow slowly; more also when the pots are filled with roots, except during the ripening process, when a dry atmosphere should prevail.

In summer, unless the weather is dull and damp, the house may be filled with steam every afternoon, and the house shut up immediately after steaming without danger of raising the temperature too high.

Light.—The foliage cannot be too much exposed to light. The sun's rays should be freely admitted, but in proportion to their intensity care must be taken to give sufficient air to prevent too high a temperature. Young plants should be placed within 6 or 8 inches of the glass, and all others must be as near it as their height will permit. The surface of the bed of soil in which the Pines were planted out at Trentham was not more than 18 inches below the wall-plates. The plants should have sufficient room to permit the leaves to spread themselves so as to ensure their obtaining the maximum amount of light. The whole plant naturally inclines towards the side where the strongest light falls; therefore it may here be remarked that in resetting after shifting, the same side of the plants should be placed next the south as before. The glass should be kept clean.

The Mendon System.—The suckers are potted in 4-inch pots immediately after the fruit is cut, usually in August or September, the earlier period being preferred; in these pots they remain till March or April, when a bed is prepared, half dung and half leaves, and covered with 10 inches of peat soil. In this the rooted suckers, turned out of the 4-inch pots, are planted for the summer. In October they are carefully taken up with a little soil attached to their roots, and potted into 7-inch pots, and in these they remain for the winter. In the following spring, when the plants show fruit, generally in March, a number of the strongest are finally planted out of the 7-inch pots into beds of peat soil, in houses, where they ripen their fruit in the course of the season.

The plants not selected for planting-out are fruited in pots. Beds made of half dung and half leaves are prepared in March, and when they are in a proper condition as regards heat the pots are plunged, and in them the plants are fruited.

The plants are always in pots during the winter. Commencing with the suckers, they are planted in the early part of autumn in small pots, in which they remain for the first winter, and become rooted plants. In spring they are turned out of their pots into peat soil, in which they grow freely during the first summer of their separate existence. In October they are all taken up, re-potted, and again kept in pots during the second winter. In the second summer the strongest are planted out for fruiting in the beds, and those not planted out are fruited in 7-inch pots.

In forming the bed the litter is well beaten. Cayennnes and other large sorts are planted out, some of them in January, after their fruits have formed.

Hamilton's System.—The system adopted by Mr. Hamilton essentially consists in fruiting the suckers without detaching them from the old stool. At the last shifting the plants are potted rather deeply, so as to allow room for soiling up after the first fruit has been cut. After cutting, some of the bottom leaves are taken off as high as where the roots appear, which is generally 2 or 3 inches above the top of the pot. The stem is then earthed up, and new roots are soon thrown out from the bared trunk into the fresh soil. Mr. Hamilton endeavours to keep the soil moist by frequently syringing over the leaves with lukewarm water. By attending to watering, keeping a moist atmosphere, &c., the suckers grow rapidly, and perfect their fruit generally in from eight to twelve months from the time the first fruit was cut. Thus two fruits have been obtained, one in the first season from the original plant, and one in the second season from a sucker produced by it. After the second cutting the soil is removed to the roots of the original stool, the latter is placed in a larger and deeper pot, some of the bottom leaves are removed
from the base of a sucker intended to produce fruit, and fresh compost is employed in earthing as before, and thus a third fruit is produced. A fourth is obtained in a similar manner, and then the sucker which bore it is cut off, together with 6 or 8 inches of the old trunk, and potted, in order to produce a new progeny of suckers.

The following notes on the cultivation of the Pine-apple in Jamaica are from the Bulletin of the Botanical Department, 1901:

Cultivation.—The best soil for Pine-apples is a well-drained, sandy loam. Red clay can be made suitable by thorough tillage, the addition of lime, and artificial drainage. Pines are very impatient of excessive moisture, and good drainage, either natural or artificial, is essential to the successful cultivation of this crop.

The site having been selected (it should, if possible, be on sloping ground), the land should be weeded and cleaned, then forked or ploughed to the depth of a foot or more, the deeper the better, as every crop benefits by deep cultivation. It should then be thoroughly broken up by means of a cultivator or harrow, or both where these can be used.

Where it is not practicable to work plough and cultivator, the fork should be used, first to turn up the soil, then to break it up fine.

In districts where the average rainfall exceeds 50 inches per annum, it is advisable to plant in raised beds.

These beds should run in the same direction as the natural slope of the land, and may be 10 feet wide, which will be sufficient space for five rows of suckers 2 feet apart, leaving a margin of 1 foot on the outside of the two outer rows. Between the beds there should be a trench about 1½ foot wide which will serve as a drain, and also as a path to enable workers to weed the beds without trampling them.

In selecting suckers take those that are 12 to 15 inches high. The lower leaves should be pulled off, to allow the young roots to push freely, and the base of each sucker should be cut crosswise with a sharp knife, making a clean cut.

Having prepared the land, and the suckers for planting, the beds or grounds should be lined at distances of 2 feet apart, and the suckers should be carefully planted at distances of 2 feet in the row. At this distance 4 square feet of ground will be allowed to each plant. Some planters recommend 3 feet between the rows, and 2 feet from plant to plant in the rows, but the tendency now is to plant closer, as it has been found in close planting that the suckers support each other and are not liable to be blown over when in fruit, as is so often the case when more space is allowed; also that the plants in time completely cover the ground and prevent the growth of weeds to a considerable extent.

In planting, make holes at the proper distances, and put the suckers in just deep enough to cover the naked base of each, then draw in the earth and press firmly around them. The ground should be kept free from weeds, and the surface open, by means of a Dutch hoe.

Manures.—If land is planted that had previously been used for several years to pasture stock, and the soil is good sandy loam, manure will not be necessary for a few years; on the other hand, if it is arid and poor, it would be well to fork in, or plough in, a good dressing of farmyard manure when breaking up the soil, six months or so before planting, and give a top-dressing of wood-ashes, which should be lightly raked in after the plants have started to grow. Artificial manures for Pine-apples are now offered for sale, and are largely used by growers who wish to force their crops. In clayey soils, the application of lime, when preparing the land for planting, is highly beneficial. Soils that have become exhausted by other crops may be made suitable for Pines by growing a crop or two of Cow-peas, and ploughing these in when they are in flower.

The best time to plant Pines is July–August; good strong suckers put in at this time of the year will fruit in nine to twelve months from time of planting. If planted earlier or later in the year, the suckers will take longer to fruit—fifteen to eighteen months or more.

The one Pine-apple being sold in England is the Smooth Cayenne, but not, as many people would have us believe, on account of its superior quality. The chief reason it sells so well is that it is a good-looking fruit of fine colour and good size, the weight ranging from 3 to 8 lbs., but the average is about 4 to 6 lbs., larger not being required in England. The second reason for the Cayenne selling better than the much finer flavoured Ripleys, is that it gets to market in better condition. Many dealers lost money over the Ripleys being black in the centre, although apparently good on the outside. Mr. George Munroe of Covent Garden stated that if Ripleys could be got to market in good condition they would run the Cayennes out of the market.

PINE-APPLE. 305
There is a good market in England for Pine-apples at all seasons; a 3-lb. fruit will always fetch 4s. retail if in good condition; fruits weighing $5\frac{1}{2}$ to 6 lbs., if not too plentiful, sell retail at 8s. to 10s. There is a good demand for Pines before the St. Michael fruit arrives, which is generally about the beginning of June, although they are by no means plentiful before August.

The following is a list of varieties of Pine-apples now grown in Jamaica:

<table>
<thead>
<tr>
<th>Variety</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbaka</td>
<td></td>
</tr>
<tr>
<td>Black (Black Jamaica, Black Spanish)</td>
<td></td>
</tr>
<tr>
<td>Bull-head (Man of War, Red Spanish)</td>
<td></td>
</tr>
<tr>
<td>Charlotte Rothschild</td>
<td></td>
</tr>
<tr>
<td>Cheese (Red Jamaica, Red Pine, Brick Pine)</td>
<td></td>
</tr>
<tr>
<td>Cow-boy (Crab Pine, Mam-mee Pine)</td>
<td></td>
</tr>
<tr>
<td>Enville City</td>
<td></td>
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<tr>
<td>Golden Queen</td>
<td></td>
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<tr>
<td>Jerusalem</td>
<td></td>
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<tr>
<td>Moscow Queen</td>
<td></td>
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<tr>
<td>Porto Rico</td>
<td></td>
</tr>
<tr>
<td>Ripley Queen (Green)</td>
<td></td>
</tr>
<tr>
<td>Ripley Queen (Red)</td>
<td></td>
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<tr>
<td>Smooth Cayenne</td>
<td></td>
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<tr>
<td>Sugar</td>
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</tr>
<tr>
<td>Sugar-loaf</td>
<td></td>
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</tbody>
</table>

There is little doubt that when all the varieties or forms are brought together, and cultivated in the same locality under exactly similar conditions, the slight differences which are now considered sufficient to warrant a distinctive name, and which may be due to differences in soil, moisture, and temperature, will disappear, and the present list of varieties in Jamaica will probably require to be shortened.

It is well known that the same variety is often known by different names in different districts. The secretary of the Agricultural Society states that the following varieties, placed in order of merit, are at present considered best for export, having realized the highest prices in London this year:—Smooth Cayenne, Abbaka, Ripley, Black Pine, Bull-head, Sugar-loaf, Sam Clark (this is probably the same as Cheese Pine).

The three latter are of equal merit.

It is thought that if a cross could be obtained that would combine the size, shape, general appearance, and keeping qualities of Smooth Cayenne, with the exquisite flavour of Ripley, an ideal Pine for export would be the result.

Last year (1900-1901) 90,132 Pine-apples, of the value of £1033, were exported from Jamaica to England, &c.

Insects.—The Pine-apple is liable to be infested with white scale and mealy bugs. To keep them down the plants should be occasionally washed with water of the temperature of 20° by means of an engine with a flexible tube and fine rose, which should be held near the plant. The rose being fine, the water may be strongly urged and directed against both sides of the leaves. The tube should also have a nozzle terminating in a small orifice, for the purpose of passing a stream with considerable force into the axes of the leaves. When this is to be used the plant may be taken up and supported at a convenient height with the bottom of the pot upwards, so that a stream of water can be played into the axes of the leaves from below. The mealy bug, if it exist there, will be driven out by the mechanical force of the water.

The steam of fermenting fresh hot dung was successfully employed as an insecticide by Baldwin, one of the best Pine-growers of his time. He put the plants bottom upwards over the fermenting dung in a frame, which was then closely shut up and covered with mats for about an hour; the plants were then taken out and washed. This treatment, he states, will kill every insect. With the same object in view Pine plants may also be syringed with water of between 120° and 132°, but the latter temperature should not be exceeded.

A wash consisting of lime, black sulphur, and water is successfully employed in Holland. The ingredients are mixed in the proportion of 2 quarts of lime and 2 ozs. of sulphur to 16 gallons of water, and after having been well stirred up and allowed to settle, the wash is fit for use.

Propagation.—This is effected by seeds, crowns, gills, and cuttings of the stem. Seeds should be sown about a quarter of an inch deep, in light rich soil mixed with leaf-mould, plunged in a bottom-heat of 85°, and covered with a bell-glass. By due attention to shifting the plants as they require it, and keeping them always growing, though, of course, but slowly in winter, seedlings may be fruited in three or four years.

Good plants, though not equal to those from suckers, may also be reared from crowns. The crowns were formerly laid aside till they became partially dried; but it is better to pare off the base part when twisted out of the top of the fruit, and either pot them at once or insert them in the tan-bed.

Suckers afford the best means of propagation, and those are to be preferred which proceed from the lower part of the stem. They are usually taken off soon after the fruit is cut. As some of the lower leaves of the suckers have to be taken off before they are potted or planted, it will be advisable to shorten these leaves half their length a few weeks previous to the removal of the suckers from the parent plant. The suckers should be removed by grasping them
close to their base, and moving them from side to side, twisting a little at the same time. The base should be pared with a sharp knife, and a few, but very few, of the lower leaves taken off. They must then be potted in a mixture of loam and peat, with a little sand, in 6-inch pots, or in larger or smaller ones, according to size. They should be inserted so that the base of the leaves next to those taken off may be a little below the surface, and the soil should be pressed firmly about them.

Gills are offshoots produced at the base of the fruit, but they take a longer time than suckers to form a large plant, and are therefore seldom used except in the case of rare sorts.

Cuttings of the stem may be employed when neither suckers nor crowns can be had. The stem should be cut in lengths of 2 or 3 inches, and split longitudinally down the centre; each piece is then laid on its flat surface, and covered about 1 inch deep with peat soil. Another method is to strip the leaves from the stem after cutting the fruit, and placing them entire in shallow boxes, covering them about an inch with light rich soil, and subjecting them to a bottom-heat of 90°. Thus treated every latent bud bursts forth, and the young shoots, as they begin to emit roots, are carefully twisted off the stem, and potted.

The cultivated varieties of the Pine-apple are somewhat numerous, but many of those formerly included in garden lists are now seldom met with. The following is a selection of the best:

**Black Antigua.**—Leaves very long, narrow, acute, of a clear bluish-green, inner ones tinged with pale-brown, very mealy beneath, slightly so above; spines large, placed widely apart. Flowers purple. Fruit cylindrical, inclining to oval, of a dark-yellow colour; flesh pale-yellow, sweet, very juicy, pleasantly acid, and highly flavoured. Should be cut when it begins to change to a yellow colour, or just before ripening. Weight from 5 to 6 lbs.

**Black Jamaica.**—Leaves long, narrow, dark-green tinged with brown, mealy; spines small, thinly set. Flowers purple. Fruit long, oval, somewhat pyramidal, dark brownish-yellow; flesh firm, pale-yellow, rich, juicy, and highly flavoured; weight from 4 to 5 lbs. One of the best for fruiting in winter; is probably the highest-flavoured winter Pine.

**Brown-leaved Sugar-loaf.**—Leaves short, broad, dark-green much tinged with brown, slightly mealy; spines medium. Flowers lilac. Fruit cylindrical, dark-yellow; flesh deep-yellow, slightly fibrous, rich, sweet, and excellent; weight from 4 to 5 lbs.

**Brown Sugar-loaf.**—Leaves broad, pale bluish-green tinged with brown, slightly mealy; margins spinous. Flowers lilac. Fruit pyramidal, dull reddish-orange, almost without mealiness; spines large; flesh firm, deep-yellow, very juicy, rich, slightly acid, and of high flavour; attaining a weight of from 4 to 5 lbs.

**Charlotte Rothschild.**—Leaves broad, slightly curved, as long as those of the Smooth-leaved Cayenne, dark grayish-green above, mealy below; spines large, thickly set. Flowers pale-blue or lavender. Fruit large, cylindrical, freely produced; flesh yellow, very juicy, but not so melting as that of the Smooth-leaved Cayenne; flavour excellent when ripened in a high temperature under the influence of plenty of light and dry air. Especially valuable from October to March. The fruit averages 8 inches in height by 6 inches in diameter, and about 7 lbs. in weight, but may be grown up to 11 lbs. Fig. 1090 represents a fruit of this variety weighing 2½ lbs., grown in seventeen months from a rootless sucker by Mr. G. T. Miles, of Wycombe Abbey Gardens.

**Enville.**—Leaves moderately long, rather broad, bluish-green, very mealy; spines medium, irregular, thickly set. Flowers lilac. Fruit pyramidal, deep-orange, with pale copper-coloured scales; crown small; pipes middle-sized or rather large, slightly prominent; flesh pale-yellow, juicy, tolerably rich, sweet, perfumed; generally weighs 6 or 7 lbs. Is harder than most others, and is cultivated on that account.

**Hurst House (Fairrie's Queen).**—Leaves short, much recurved; spines strong, thickly set. Flowers pale-purple. Fruit pyramidal, rather dull-coloured, with prominent pipes; flesh very juicy, firm, and of good flavour. A good summer Pine, and useful where accommodation is limited, being a very dwarf compact grower, and producing fruit weighing from 6 to 8 lbs. It is shy in starting unless...
kept rather dry at the root, and its slow growth is considered objectionable by some cultivators.

Lady Beatrice Lambton.—Leaves tall and robust, straight and erect, dark-green, covered with white mealyness; spines strong, widely set, about four to the inch. Flowers purple. Fruit pyramidal or conical, with a moderate-sized crown; deep-orange colour in the prominent parts, rich yellow in the furrows; flesh pale-yellow, remarkable for the abundance of its juice; flavour rich and excellent, even in mid-winter, and is superior to Cayenne and Charlotte Rothschild when ripened in May, though kept for a considerable time in a temperature of 60°; average weight 9 lbs., though fruit weighing 11½ lbs. have been grown. One of the handsomest of the larger varieties of Pineapple, free-bearing, and more robust in growth and less spreading in habit than Smooth-leaved Cayenne.

Montserrat (Red Ripley).—Leaves longish, green tinged with brown; spines dark, of medium size. Flowers purple. Fruit cylindrical, often broadest at top, weight from 4 to 7 lbs., very mealy, pale-orange tinged with copper-colour; flesh pale-yellow, solid, juicy, and of excellent quality. A good winter Pine-apple, and, like the Black Jamaica (with which it is often confused), swelling its fruit better than most others at that season.

Oodeite.—Leaves long, erect, terminating abruptly, dark brownish-green, very mealy beneath; spines medium, very regular. Flowers lilac. Fruit longish, inclined to oval, deep orange-yellow, attaining 4 lbs. to 7 lbs. in weight; flesh pale-yellow, very juicy and well-flavoured. A good autumn sort.

Prince Albert.—Leaves tall, erect, much fluted, dark-green with grey streaks, mealy below; spines large, about four to an inch. Flowers pale-blue or lilac. Fruit large and handsome; yellow suffused with red; flesh yellow, very juicy and melting, the flavour excessively rich; average weight about 6 lbs., but it can be grown up to 8 lbs. Suitable for summer and autumn use, from July to November. It does not keep well after becoming quite ripe.

Queen.—Leaves very short, broad, of a bluish-green, very mealy; spines strong, set widely apart. Flowers lilac. Fruit cylindric, of a rich deep-yellow; flesh pale-yellow, juicy, sweet, rich, and excellent; weight from 4 to 8 lbs. One of the most generally cultivated, and the best and most useful for general purposes. Its flavour, as a summer and autumn Pine, is not excelled by that of any other kind, and it keeps in good condition for three weeks after being ripe. In winter it does not swell freely, and at that season it is generally deficient in juiciness and flavour. Ripley Queen is stouter in growth, and produces rather larger fruit; while the Moscow Queen is dwarfer, with smaller fruit.

Ripley.—Leaves rather long, broad, dark-green tinged with reddish-brown, mealy; spines middle-sized. Flowers purple. Fruit ovate, slightly compressed at both ends, of a pale copper-colour; flesh pale-yellow, sweet, rich, and of an agreeable flavour; weight 4 lbs. or 5 lbs.

Russian Globe.—Leaves rather short, broad, dull-green tinged with dark-brown, mealy; spines long, thinly set. Flowers lilac. Fruit globular, sometimes tapering to the summit, dark-orange, very mealy; flesh bright-yellow, very juicy, sweet, rich, and highly perfumed.

Sierra Leone.—Leaves long, broad, bluish-green frequently blotched with a darker colour; spines short. Flowers purple. Fruit cylindric, very mealy, of a dull ochre-colour; flesh very pale, yellow, tender, juicy, and sweet; usual weight about 6 lbs.

Smooth-leaved Cayenne.—Leaves long, spreading, broad, dark-green, brittle, smooth or with very few spines. Flowers pale-blue. Fruit very large, cylindrical or somewhat barrel-shaped, dark orange-yellow; flesh pale-yellow, rich, and excellent. A handsome fruit, averaging from 7 to 10 lbs.; one of the best varieties for supplying ripe fruit from October to May. It swells more freely and is more juicy in winter than any other Pine.

St. Vincent's.—Leaves long, broad, pale-green, mealy; spines medium. Flowers purple. Fruit bluntly pyramidal, slightly mealy, dull-yellow; flesh pale-yellow, juicy, rich, sweet, and highly flavoured; weight from 3 to 5 lbs. Suitable for winter fruiting.

Thoresby Queen.—Leaves very broad, taller than those of the Queen, upright and compact in growth, purplish-green, with a very light-coloured mealy surface; spines very fine and thickly set. Flowers purplish-lilac. Fruit large, roundish-ovate, shorter and stouter than that of Charlotte Rothschild, which it otherwise resembles; flesh firm, moderately juicy, deep orange-yellow, flavour good, not very highly perfumed, but equal to that of Moscow Queen. Is much cultivated in the Midland Counties, and produces fruit of from 6 to 8 lbs. weight. The plant is very distinct, being dwarf, close-set, and stout in habit, with broad mealy leaves and a very small crown. It produces suckers freely, and is easily started into fruit.

Trinidad.—Leaves very long, reflexed, broad at the base, and tapering regularly to the apex, dull-green much tinged with reddish-brown, mealy; spines numerous, middle-sized. Flowers lilac. Fruit of a tall, conical form, dark-orange; flesh pale-yellow, sweet, and tolerably well flavoured. Perhaps the largest known fruit produced in Trinidad, weighing 26 lbs. Though large and showy it is inferior in quality.

White Providence.—Leaves long, broad, light bluish-green; spines small, numerous. Flowers purple. Fruit oblong or oval, very mealy, reddish-yellow; flesh white, sweet, and juicy, but not highly flavoured. The fruit attains a very large size, frequently weighing 10 lbs. or 12 lbs., and one grown by Mr. Mills weighed upwards of 15 lbs.

CHAPTER XIX.

BANANA.

Origin.—Importance in the Tropics.—Cultivated at Kew.—Treatment.

The Bananas of commerce are the fruits of *Musa sapientum*, of which there are many varieties, and *M. Cavendishii*, the Chinese Banana. There are about forty described species of Musa, but only few of these have edible fruits, and these seem to have migrated with man into all the climates in which they can be grown, and are universally cultivated in tropical countries for purposes of shade and food.

"The Plantain or Banana, with which as a tree no one can be unacquainted, is the principal fruit consumed by the inhabitants of the torrid zone; and from its nutritious qualities and general use may, whether used in a raw or
CHINESE BANANA 'Musa Cavendishii' AT PADDOCKHURST, SUSSEX
dressed form, be regarded rather as a necessary article of food than as an occasional luxury. In equinoctial Asia and America, in tropical Africa, in the islands of the Atlantic and Pacific Ocean, wherever the mean heat of the year exceeds 75° F., the Banana is one of the most interesting objects of cultivation for the subsistence of man. The fruit is produced from amongst the immense leaves in bunches weighing 30, 60, and 80 lbs., of the richest hues and of great diversity of form. It usually is long and narrow, of a pale-yellow or dark-red colour, with a yellow farinaceous flesh. But in form it varies to oblong, and nearly spherical; and in colour it offers all the shades and variations of tints that the combination of yellow and red in different proportions can produce. Some sorts are said to be of a bright-green colour when ripe. In general, the character of the fruit to an European palate is that of mild insipidity; some sorts are even so coarse as not to be edible without preparation. The greater number, however, are used in their raw state, and some varieties acquire by cultivation a very exquisite flavour, some of them surpassing the finest Pears. In the better sorts the flesh is no harder than butter is in winter, and has much the colour of the finest yellow butter. It is of a delicate taste, and melts in the mouth like marmalade. To point out all the kinds that are cultivated in the East Indies alone would be as difficult as to describe the varieties of Apples and Pears in Europe; for the names vary according to the size, form, taste, and colour of the fruits.” (Lindley.)

There are now large plantations of Bananas in tropical countries to supply fruit to other regions. Many tons of the fruit are annually imported into England from the West Indies, Canary Islands, &c. The bunches are cut whilst the fruits are green, for convenience of transit. Provided they are mature before being cut, they ripen with full flavour; but many of the fruits one sees in the greengrocers’ shops have been cut much too early to be palatable, even when yellow and apparently ripe.

A good Banana is one of the most enjoyable of fruits. A selection of the best varieties is cultivated in the Palm-house at Kew. They are planted in large tubs or boxes, or in borders of rich soil. Shoots about 6 feet high, when planted singly, fruit in from two to three years. The bunches of fruits are cut as soon as the fruit shows signs of changing colour, and are hung in a warm room to ripen. They are ripe and fit to eat when they are fairly soft and their colour is wholly yellow or russet. The fruits are better when cut and ripened in this manner than when they are left on the plant to

Fig. 1091.—Leaves and Fruit of the Banana (Musa sapientum).
duced into Europe from southern China about 1827. It is now extensively cultivated in all tropical and sub-tropical countries. It furnishes a large proportion of the Banana fruits sold in this country, and which are imported from the Canary Islands. "Bananas are largely grown in the islands of Grand Canary and Teneriffe. They flourish only on land that is irrigated and in warm localities near the sea-coast. The sort almost exclusively cultivated is the Chinese Banana. This is a shorter and stouter plant than the tropical Banana, but produces very large bunches of fruit. There are often 150 to 250 'fingers' to a bunch. The suckers are planted at 8 to 10 feet apart. The first crop is obtained in eighteen months after planting. After the fruit is gathered, the stem is cut down and a sucker is allowed to grow up in its place. . . . The exports in 1893 from Grand Canary alone were 217,095 bunches." (Dr. Morris.)

The Chinese Banana is cultivated in a few gardens in England for its fruits, and when well managed, produces bunches weighing nearly a hundredweight. Such a bunch is shown in fig. 1092. This was grown at Sherwood Park, Tunbridge Wells. It contained 275 "fingers", and its weight was 105 lbs. The stem which produced it was 7 feet high. The plant was grown in a border 4 feet wide and 2 feet deep, with a flow and return pipe for bottom-heat. The soil was old pasture loam, and the plant was fed with liquid manure and with several top-dressings of Thomson's Vine Manure. The temperature of the house in winter was from 65° to 70°, and in summer from 70° to 85°. Plenty of water was supplied.

A house for Banana culture should be span-roofed, 20 feet high and 18 feet wide. It should have three paths formed of iron-gratings, below which should be the hot-water pipes in chambers, the walls of which should form the sides of the beds. These should be at least 3 feet deep, and contain a foot of drainage and 2 feet of soil. The tall growers (M. sapientum vars.) should be planted along the sides of the central path, and the short ones on the outside. Plants in pots might be grown on the border against the side of the house. The hot-water pipes should be sufficient to maintain a stove temperature in all weathers. Too much ventilation is bad, and shade will rarely, if ever, be needed. The soil in the borders will require to be renewed about every three years.

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CHAPTER XX.

ORANGE, LEMON, &c.

ORIGIN—TREATMENT—PROPAGATION—INSECTS—LIST OF VARIETIES.

It is not generally known that excellent fruits of both the Orange and the Lemon may be grown in this country at no greater cost than it takes to produce good Peaches and Grapes. Mr. Rivers, of Sawbridgeworth, has cultivated a collection of varieties for many years, and the large richly-coloured fruits he sometimes sends to exhibitions are a proof of what may be accomplished under glass in this country, whilst those who have tasted properly grown English Oranges can testify to their excellence as dessert fruits.

The genus Citrus comprises five tropical Asiatic species, and two Australian. Of these only three are of horticultural value, namely, C. medica (the Citron, Lemon, and Lime), C. decumana (the Shaddock or Pomalo and Grape
Fruit), and *C. Aurantium* (the Sweet Orange and the Bergamotte).

The genus is essentially an Eastern one, and the forefathers of Oranges, Lemons, Citrons, and Limes may be found in the hot valleys of the Himalaya, of the mountainous districts of Eastern Bengal, and of the Deccan. They have been transported in their numerous cultivated forms into Africa, Australia, and the New World (Hooker).

Whilst the Lemon, the Lime, and the Shaddock may be grown in the conservatories of this country for their interest and decorative qualities, the Sweet Orange has a still higher claim. The varieties recommended by Mr. Rivers for cultivation on account of the excellence of their fruits, of which a list is given here, are certainly worth the expense incurred in growing them. The value of the flowers, although not a matter for consideration in a chapter on Fruits, is nevertheless of sufficient importance to be referred to.

A well-grown Orange-tree, both when in flower and in fruit, is an object of exceptional attractiveness, and when to this can be added the value of the fruits for dessert, their claims as garden fruits must be admitted.

To grow Oranges well, they should have a good light house, essentially different from the old heavy-roofed, half-glass, half-wall sort of structures—orangeries they were called—in which they used to be wintered, and where they little more than existed. A modern house for Oranges should be span-roofed, with glass at both sides to within 3 feet of the ground, and may be from 14 feet to 20 feet in width, and any length. The house should have a passage down the centre, with a row of trees on each side. In the larger size a row of trees should occupy the centre of the house with one on each side, and two paths betwixt the rows. After space for the paths is taken, the house should be divided into beds for the trees; efficient drainage must be provided for them, by placing at least 9 inches of broken bricks under each bed, with a drain from each leading outside the house; over this good tough turf should be laid, the grassy side down. The beds should consist of free loam that has lain together for some months until the grass has been killed; this should be chopped moderately fine, and some rotten manure added, in quantity according to the more or less rich nature of the loam, sufficient sharp gritty sand being also incorpo-

The soil should be 18 inches in depth over the drainage. If two or three shovelfuls of burned ballast, or refuse bricks (such as may be had at any brick-kiln), broken so that the whole will pass through an inch-mesh sieve, is added to each wheel-barrow load of the soil, it will do much to ensure its keeping in a satisfactory condition.

The distance apart at which the trees should be planted will of course depend upon their size at the time of planting; if small, it will be advisable to plant at a sufficient distance in order to afford them room when they are large, and to fill the space between with other plants in pots, which can be removed as the space is required for the Oranges. This is a better arrangement than planting the whole out, as these that are not planted out can be supplied with larger pots as they need more root-room,
can be moved according as the requirements of the permanent trees demand it, and when the time comes that they can be altogether dispensed with, they are available for use elsewhere.

There are few things grown under glass, either flowering or fruit-bearing, that are more benefited by bottom-heat than Oranges, for although they can be grown without it, yet they will not make so much progress in a given time. In the case of trees that are to be planted out in the manner described, and where it is the intention to apply bottom-heat, this can be done by constructing under each bed a chamber, which it will be necessary to sink below the level of the floor inside the house. Wherever chambers of this description are used in which to lay pipes for bottom-heat, they should always be made large enough to admit of the pipes being got at in case of leakage. Want of forethought in this matter is often most serious in its consequences, the roots of trees grown over the chambers having to be disturbed, or the trees removed altogether, in order to repair leakage. A flow and return pipe should run in each chamber, with in all cases a valve to regulate or entirely shut off the heat. There is another matter that must never be lost sight of when this or any other fruit is afforded bottom-heat; that is, the liability of the soil at the
bottom of the border to get dry; strict attention to the watering, and occasional examination of the soil will prevent this. It often happens that roots so placed suffer great injury before the cause is discovered.

Oranges grown in pots or tubs require the same treatment as those that are planted out. The soil should be such as will last long, for plants of this kind do not like their roots to be often disturbed. In houses devoted altogether to Orange culture, like the above, a limited amount of bottom-heat will be of service all the year round, even in winter, the temperature of the house being kept at 48° or 50°. Although they can be grown considerably cooler than this, the trees do not grow so fast, and consequently are longer in getting up to a useful size, the fruit being also much longer in coming to maturity.

When the Orange-house is kept at a temperature as above advised, the trees will come into bloom in February; as the days lengthen, the heat must be increased 8° or 10° in the daytime, and further on in summer must rise to 80° or 85°. So managed the fruit will ripen from October to January, and furnish dessert of surpassing excellence.

It will be seen from this that the Orange, from the time of flowering, is much longer than most fruits in coming to maturity, taking from eight to eleven months. Indeed, when grown in a greenhouse temperature, it does not generally flower before midsummer, and in that case the fruit will not ripen till the summer following; and, as might be supposed, so managed, the quality bears no comparison to that which is grown on in a temperature more in accordance with the natural requirements of the trees. The fact of their being able to carry the fruit and ripen it at all when grown so much cooler than is their nature, speaks for itself as to the wonderful powers of the tree to accommodate itself to usage such as few fruits could be induced to succeed under.

Orange-trees often get into bad health, and this can scarcely be wondered at considering the treatment they receive. When grown in pots and boxes, they must have root-room proportionate to their size, and they may have bottom-heat supplied by being plunged in a tan or hot-bed; but this, like all bottom-heat obtained by means of fermenting matter, entails a good deal of labour in its renewal, and requires much attention in its regulation.

In a very light house most likely the plants will require a little shade in bright weather to prevent the leaves scorching. They must have air given timely in summer and in sufficient quantity. One essential to success is a free use of the syringe all through the growing season. The garden engine is a still better implement, especially where a number of trees are grown; if this is used freely so as to thoroughly drench them every day, yet without so much force as to injure the young leaves, it will materially assist in keeping down insects, especially brown scale, to which these plants are very liable. The water should reach both the upper and under surface of the leaves.

Orange-trees require little pruning or training; if any branch appears to take the lead so as to rob the rest, it should be shortened back or tied down in order to induce it to break back.
Like all other evergreen plants, Oranges cannot bear the soil in which they grow to become very dry, especially in the summer season; on the other hand, they must not, when at rest, be kept too wet. It is the want of discernment in giving too much water in the winter to weakly state, until their roots have been got to move freely, otherwise death is almost certain to follow.

Propagation.—The Orange family can be increased by seeds, layers, cuttings, budding, and grafting. Plants raised from seeds are principally used as stocks on which to graft choice varieties, seedlings growing strongly, and also being slow in fruiting, and unreliable as regards quality. Sow the seeds thinly in well-drained pots nearly filled with fine sandy soil, covering with 1 inch of soil, and place or plunge in a brisk bottom-heat. The seed under such conditions will not be slow in germinating, and the seedlings, when about 2 inches high, should be placed separately in 3-inch pots, keeping them in a close, warm frame or house till they are well established. They should be kept growing in a warm house or frame and shifted into larger pots before they become badly root-bound.

When about two years old they will be large enough for grafting, that is, if dwarf trees are desired, but if standards are preferred the stocks should be grown strongly and with a clear stem till they are tall enough. The small stocks may be budded or grafted. Budding is either done in August or in the spring, selecting perfect buds from healthy young shoots, and inserting these in the stems near the ground in the usual way. The stocks ought to be kept in a warm house and be headed down to near the buds, when these should start into growth in the spring. Ligatures ought to be removed before they injure the bark. If the buds have taken well, rapid growth of shoots should result, especially if the plants are given the benefit of bottom-heat. To make the plants bushy they should be cut in occasionally.

Grafting may be performed in the spring when the sap is active, side-grafting being the best method. Seedling stocks of Citron or Lemon are the best if large trees are desired, while the neat-growing Citrus trifoliatus answers well for small trees, such as are frequently grown for decorative purposes.

Cuttings 6 inches long, of firm, young wood, with a heel of old wood attached, duly cleared of lower leaves, and inserted in pots filled with sand and plunged in a bottom-heat of 75° to 80°,
covered with a bell-glass, and kept moist and shaded, will strike root in about two months. They should be put in in August or September.

Layering is a slow process. A 5-inch pot filled with soil may be raised to where a two-years-old shoot can be fixed in it. The shoot should be notched just where it is to be pegged down into the soil, 1 inch or so deep, and if properly attended to a well-rooted layer ought to be ready for detaching from the parent plant in about a year.

For the plants in these early stages of growth the compost may consist of good fibrous loam two parts, leaf soil one part, adding some sharp sand, charcoal, and crushed bones.

Insects.—All the Orange family are subject to insects, the most troublesome of which is scale. If affected with the white scale, there is little chance of eradicating the pest without cutting the trees well back into the hard wood, as the leaves cannot bear a dressing strong enough to kill the insects. After this heading down, a thorough washing with insecticide, used according to instructions received with them, repeated two or three times in the course of a fortnight, before the young buds have begun to push will, if carefully carried out, completely free the trees. For brown scale a good syringing in the winter, before the flowers begin to move, with a weak solution of paraffin will leave few of the insects alive.

List of varieties:

**Oranges.**

*Blood (Malta).*—Pulp stained with deep-crimson; fruit large; skin thin; delicious; the foliage and growth differ greatly from the St. Michael's. A story believed by credulous travellers is that the blood-stain was produced by the union of the Pomegranate with the Orange.

*Emblyuo, or Navel Orange.*—A singular variety, with a nipple-like excrecence at the apex; fruit large and good; pulp pale in colour.

*Horned Orange (Citrus corniculata).*—A curious variety, not edible.

*Jafist.*—The largest Orange in cultivation.

*Oval (Malta).*—Like the Blood Orange in size and form of fruit, but without blood-stains in the pulp. Produces flowers abundantly.

*Seville.*—The variety used for marmalade. Produces the finest flowers freely.

*Silver, or Plata.*—A delicious Orange. This and other varieties of the St. Michael's have been selected as being the most excellent.

*St. Michael's (fig. 1093).*—The ordinary Orange of commerce, thin-skinned, large, and well-flavoured. *Botelho, Dulcispiina, Egg, and Enquistie* are varieties of St. Michael’s differing in foliage and form of fruit.

*Sustain.*—Also a variety of St. Michael’s, but remarkable for the delicacy and high flavour of the pulp.

*Tangierin.*—A delicious little Orange. The rind parts freely from the pulp, which has a delightful aroma.

*Tangierin (St. Michael’s).*—The same size as the preceding, but superior in flavour. These two sorts are comparatively hardy, and may be grown to perfection in an orchard-house.

*Variegated Orange.*—An ornamental sort, the leaves and fruit being variegated; the fruit is exceedingly good for the table.
White Orange.—Very distinct, with striped fruit and white pulp; flavour very good.

Lemons.

Bijou.—Pronounced to be a Lime by some authorities. Fruit small, with a delicious aroma; growth of the tree very dwarf and fruitful; a remarkable sort.

Imperial.—Fruit very large, with a fine aroma; habit of the tree robust and vigorous.

Lemon, common, of commerce (fig. 1095).

Sweet.—A Lemon without acidity.

Sweet Brazilian.—Like the preceding.

White.—One of the largest and best.

Limes.

Bitter.—Remarkable for the great fertility and dwarf habit of the tree; resembles the Bijou Lemon so closely as to be distinguished with difficulty except by the colour of its fruit.

Citron.—A very good variety.

Common (fig. 1096).—An abundant bearer; fruit excellent for cooling drinks.

Persian.—Like the preceding, but larger.

Sweet.—A pleasant fruit without acidity.

Pomalos.

Forbidden Fruit.—Fruit very large and globular, flesh coarse-grained, sweet.

Grape Fruit.—Fruit Pear-shaped, medium in size, with a smooth skin; fleshy, juicy, pleasantly acid.

Shaddock (fig. 1097).—Fruit very large.

CHAPTER XXI.

THE MELON.


The Melon (Cucumis Melo) is, like the Cucumber, largely cultivated in all warm and warm-temperate countries, and it also resembles that plant in being of obscure origin. It is said to have been carried from Armenia to Rome by Lucullus. According to M. Jacquin, the Cantaloup varieties were originally brought from the same region by some missionaries to Cantaluppi, a villa belonging to the Pope, and situated a few miles from Rome. Afterwards they were introduced into France in 1495; from thence they passed into Spain, and from that country into England.

In Persia Melons are exceedingly plentiful, and their cultivation in the open air in the plains of Isphahan and at Bokhara is considered to be unsurpassed. At Cabul Melons are grown in great abundance. The country, although in latitude 34° N., is covered with snow to a great depth in winter, but in summer the valleys become very hot, and in these the fruit acquires a high degree of perfection. Travellers in Cabul have sent home seeds of the different varieties of Melons, which when grown in this country have proved exceedingly prolific, some being very melting and sugary; they are all, however, apt to degenerate. The climate of the middle and southern states of America is remarkably favourable to Melons; consequently they are raised as field crops by market-gardeners, who sow the seeds in the open air early in May, and obtain ripe fruit in August. At Washington the mean temperature towards the end of May is about 70°, that of June 75°, of July 78½°, and August 76½°. This temperature nearly corresponds with that which prevails over a great portion of the American states, and it is sufficient for the hardier sorts of Melons; but where these succeed in America, it is found that the Persian and some other sorts require a higher temperature, with the protection of glass, till July, and occasionally afterwards during cold nights and stormy weather. Hence it appears that certain varieties of Melons require a higher temperature than others.

The Rock and Cantaloup varieties may be successfully cultivated in a house or pit with a bottom-heat of 70°, rising gradually to 80°. With sun-heat the atmospheric temperature may be allowed to rise to 85° when the plants are young, afterwards to between that and 90°, or even higher if the plants are well conditioned, and plenty of air be judiciously admitted. Although this is not higher than is frequently borne from sun-heat by vegetation out-of-doors in summer, yet under artificial treatment, and after a period of dull, cloudy, wet weather, such as frequently occurs in our climate, the leaves of the Melon are not adapted for bearing the full force of the sun’s rays. It must, accordingly, be modified in the first instance by shading, which should be gradually diminished as the plants become more accustomed to the light. The powerful effects of sunshine, and often the density of the air in the house, are too extreme, making the leaves tender, a condition that can be avoided by giving more air, especially when the conditions are favourable.

Soil.—This should be obtained from an old pasture where cattle have grazed, taking the top spit about 3 or 4 inches deep. It should be cut and stacked a few months before it is required for use. No manure should be added, or a too luxuriant growth will most probably
result. Light loams may be improved by adding a fourth part of fine marl or clay. Good rich turfy loam is the best of all soils for Melons. If the soil be adhesive or close some old mortar rubble will be beneficial. In fact any soil that is likely to generate canker should have such an addition made to it.

Pigeons' dung has been employed in Eastern countries for the growth of Melons from time immemorial, and it may be advantageously given in moderate quantity. The best mode of using it is to mix with loam, in the proportion of ten parts of the latter to one of pigeons' dung. Where the roots have no source of food except that contained in the soil, this should have a depth of from 12 to 18 inches.

The means of supplying the necessary amount of artificial heat require next to be taken into consideration. Formerly the heat, both top and bottom, was obtained by means of fermenting materials. Now, however, it is usual to grow Melons in houses or pits built specially for them, and treated with hot-water pipes. But even a moderate amount of fermenting material is most beneficial in accelerating the crop. In fact for first early forcing it is most helpful in keeping down the attacks of Red spider.

Sowing.—Melons, like Cucumbers, can be grown to a tolerable size without much sun-heat, but the fruit will not ripen except under the influence of bright sunshine. In the absence of this no amount of artificial heat will effect the conversion of the crude juices of the fruit into saccharine matter. May is the earliest period that well-flavoured Melons can be expected, although some have been produced in April. Such very early fruit, however, can be obtained at least expense from plants in boxes or pots. For this purpose the seeds should be sown early in January in light friable loam and leaf-soil, using 3-inch pots, and placing in each pot one good seed half an inch deep; plunge the pots in a bed at about 75°. As a protection against mice the pots should be covered with panes of glass, and when the plants come up they should be placed near the roof-glass. At this early season every care and attention is needful to get the plants ready for planting out as soon as possible. They should be staked early, kept free from insects, watered judiciously, and repotted into 4- or 5-inch pots when they are fit. From these they may be transferred to the large pots or boxes in which they are to be fruited. Warm soil is necessary for potting, and tepid water for watering. The
object being to obtain early fruit, the earliest flowers should be set as soon as the plants are strong enough to carry them, two on each plant being enough for first early crops.

**Beds.**—The soil is commonly placed in the beds in the form of a ridge, as it affords a larger surface for the roots, and enables the rootlets to readily absorb the nourishment applied. The ridge should be 2 feet wide at its base, and 18 inches high; the soil should be made compact, and its surface left rough. In houses with large beds it is a good plan to make up two walls of fresh turves, leaving a space of 18 inches between them to be filled with the compost in which the plants are to be grown.

**Planting.**—Melons in beds should be planted singly at 1 foot apart for the single-cordon system, and 2 feet for the double-cordon, leaving the surface of the soil rough. They should be well watered after planting.

**Training and Stopping.**—Many growers prefer to limit each plant to a single stem, which is allowed a good run and then stopped, and for first early and late work this method is com-

mendable. But for mid-season crops, if the plants are stopped sooner, a branching habit will result, and a heavier crop be obtained.

About four months is considered the average time which elapses between sowing the seeds and ripening the fruits. In summer it may be reduced to three months with early varieties.

Melon plants delight in heat; the minimum at night should not be less than 70° in the early spring months, and 75° later on, and the day-heat 75°, and 80° to 85° as daylight increases, and 90° or even, on exceptional days, 100° without fear of injury. If too much moisture is present, give a little air at the apex of the house. During very hot weather it is a good plan to leave a little top air on all night. This will permit of slightly more warmth in the pipes. The *dew-point*, be it noted, is reached much sooner in hot weather than in cold, hence the slight amount of top ventilation will permit the superfluous moisture to escape. Syringe the plants early every day, and again in the afternoon at the time of closing the house.

**Setting the Flowers.**—Except for very early crops the flowers should be removed until the plants have become strong. To secure a good, uniform crop of fruit the flowers should all be set at about the same time.

The Melon is monoecious (see fig. 1098); that is, it bears male and female flowers on the same plant; the former are essential for the fertilization of the latter, therefore a sufficient portion of them should be retained for that purpose. The male flower has three stamens, united by their anthers; but the filaments are distinct, and the part between the stalk and base of the corolla is slender and cylindrical. The female flower has a short style surmounted by three large bi-lobed stigmas, and the ovary is of an ovate form. In the male flower may be seen an abortive style in the midst of the stamens, and in the female flower, on the contrary, three imperfect stamens surround the base of the style.

When the weather is fine, and plenty of air can be given, the female blossoms usually be
come fertilized without artificial aid, but the process of setting them is generally necessary. This operation, which should be performed when both male and female flowers are fully expanded, consists in taking some of the pollen from the anthers, by means of a camel-hair pencil, and applying it to the stigma; or a male blossom may be stripped of its corolla, and inverted in the female one.

When the young fruit is as large as a cricket ball it should have support. For this purpose most growers prefer a mode of their own; the chief object is to avoid an accumulation of water beneath the fruit, where it rests on the supporter.

Melon-house.—For the earliest crop a lean-to house facing south may be used. For summer culture a span-roofed house is better, with the end to the south. The house ought not to be large, nor yet so small that a person cannot walk through it with comfort. If more than 30 feet in length, it ought to be in divisions, so that a succession may be obtained; indeed, a house of the above length may with advantage be divided into two, and if required another 15 feet may be added, making three divisions, which would give a supply of Melons for at least six months in the year. The width of the house should be about 12 feet, and the height from floor line to the highest point 10 feet. This will admit of a stage at the back 3 feet, a path 2 feet 6 inches, and
a bed 3 feet wide. The plants will succeed without any bottom-heat, but they do much better with it. Two 4-inch pipes will supply all the heat required in summer.

The pipes to supply bottom-heat should be enclosed in a chamber, the top of which may be formed of thin slate or some material that will allow the heat to pass through quickly into the soil resting upon it. Valves should be fixed so that the bottom-heat can be controlled.

A trellis must be provided, to which the plants are to be trained, and it is most convenient to have a movable one. In winter, or late in autumn, or very early in the year, the trellis should be near the glass, say 12 inches from it; in summer this distance may be increased to 18 inches. The trellis may be made in panels or fixed, about the width of the lights, and under each rafter is fixed a bar of iron projecting downwards, and provided with pinholes 2 inches apart, so that the panels rest upon a stout pin projecting through the bar; the whole trellis, if thus constructed, is movable, and can be stowed away when the house is devoted to the culture of any other class of plants.

It is a fact known to all cultivators of the Melon, that if one or two fruits are set two or three days before the others, these will have the start, and will swell away at such a rapid rate that the fruit set later will either be inferior or drop off. Of course it is sometimes necessary to have a succession from the same house, and this is obtained by planting the strongest plants at the warmest end of the house and the weaker at the cool end. The earliest plant may thus be in flower a week before the one next to it, and the second the same period before the third, and so on, allowing six days between the flowering of each plant; or if the plants do not come naturally in this way, they can be made to do so by picking off the earlier female blossoms, as plenty more will come on in time for setting, so that in a house containing only six plants, managed in this way, a succession of fruit may be kept up for four weeks longer than by the usual way of setting all the fruit as soon as it is ready.

When the fruit has grown to a considerable

![Meredith's Melon Nets](image_url)
MELONS

Melons are the fruits of *Cucumis Melo*, an annual, native of some parts of tropical Asia and Africa. It has been cultivated from a very remote period, and consequently has developed a multitude of forms or varieties in the shape, size, and colour of the fruits, and also in the thickness and flavour of the flesh, which is usually very sweet and highly perfumed, and coloured either green, white, or orange. The varieties usually come fairly true from seeds, but to ensure this it is necessary to prevent cross-fertilization by bees and to pollinate the flowers artificially. Being tropical, the Melon can only be successfully cultivated in England in a heated house or frame. The varieties grown in this country are usually small-fruited, spherical or egg-shaped, and thin-skinned. A well-grown, properly-ripened fruit weighs from three to four pounds.

TOMATOES

Tomatoes, or Love Apples, are the fruit of *Lycopersicum esculentum*, a South American annual with long trailing stems. Under cultivation and selection it has considerable variety in the form, size, colour, and flavour of the fruit, and it is remarkable that many of these varieties are reproduced by means of seeds. Although cultivated in Europe for its fruits for several centuries, the Tomato has only recently become universally popular both as a dessert fruit and when cooked. In some parts of England acres of glass are devoted to the production of Tomatoes for the London market alone. Large quantities are also imported from the Canary Islands, Portugal, etc. The plant is too tender to be grown in England without some protection, except for a period of about four months in summer. Under liberal treatment each plant will yield from eight to ten pounds of fruit. The size of the fruit varies from four inches in diameter to the size of Cherries (Cherry Tomato) and of Currants (Red Currant Tomato).
size, it becomes necessary to support it, not only because its weight might cause the slender vine to break off, but when the ripening stage is reached the fruit would part from the stem, and fall on the ground and be spoiled. The old plan was to have small boards made of ¾-inch deal, 9 inches square, provided with holes at the four corners, by means of which they may be fastened to the trellis with fine copper wire, so as to support the fruit. The most up-to-date method of supporting the fruits of plants trained upon trellises is by means of Meredith’s Melon nets, shown in fig. 1101. No better plan has yet been devised than this; all accumulation of moisture at the base of each fruit is thereby prevented. The fruit must not be allowed to remain on the plant until it parts from the stem, but it ought to be cut when it cracks round the stem, and as soon as it gives off that agreeable perfume so much prized by those who are fond of the fruit. The flavour of most of the varieties is improved if the fruit is laid on the shelves of an airy fruit-room a week before using it.

Red spider is certainly the most injurious pest that attacks the Melon. Precaution should be taken to thoroughly cleanse the house beforehand by washing all the woodwork with strong soft soap and water, and syringing into the crevices—which form retreats for these pests—a strong paraffin mixture, also painting the woodwork with it, and limewashing the walls. Another precaution is to rear the seedlings where spider does not exist, as after it is established no amount of syringing will eradicate it. Green-fly often attacks Melons, covering thickly the under sides of the young leaves. Fumigating with XL-ALL is not only safe but effectual; tobacco smoke will destroy the insect, but the tender leaves of Melons are easily injured, so that great caution is necessary.

Varieties.—These may be arranged under three heads—Scarlet, White, and Green FlesheL The varieties are exceedingly numerous, as it may easily be supposed must be the case in a tribe of plants propagated by seeds, and readily fertilized both naturally and artificially; and new ones are being continually produced. Many of these are submitted to the Royal Horticultural Society, by whom those of sufficient merit are awarded certificates. These come into commerce subsequently, so that in a few years the old sorts become supplanted by new.

Scarlet-flesheL Varieties.

Blenheim Orange.—Main crop, fruit large, flavour good. Eureka.—Medium size, similar to Hero of Lockinge in appearance.

Frogmore Orange.—Robust constitution, heavy cropper, flavour extra.

Invincible.—Flesh thick, high-class flavour, sets freely.

Sutton’s Scarlet.—Solid fruit, extra fine in appearance and quality.

Triumph.—Large, heavy cropper, rather late in ripening.

White-flesheL Varieties.

Golden Orange.—One of the best; fruit medium in size, a good cropper, best in mid-season.
Hero of Lockinge.—The best for all purposes of this section. Ripens early, keeps well.
High Cross Hybrid.—Larger than the preceding, deep in flesh.
Longest Perfection.—One of the best of the older sorts.
Ne plus ultra.—Flavour extra fine, deep flesh, constitution robust.
Royal Favourite.—Flesh deep, sets freely, handsome netting.
The Countess.—Large, fine appearance and quality, nets freely and well.

Green-fleshed Varieties.

British Queen (fig. 1109).—A handsome fruit, excellent in every way; flesh green-white. May be grown in an unheated frame in summer.
Earl's Favourite (fig. 1099).—Strong grower, free setter, fine flavour. Fruits 19 inches round and weighing 4 lbs. have been grown.
Emerald Gem (fig. 1103).—A fine Melon, heavy fruits, appearance pleasing.
Épíbere.—Medium size, flavour extra fine, grows freely.
Exquisite.—Very thick flesh, flavour fine, thin rind, extra juicy.
Monarch.—Oval-shaped, thick flesh, rich-green in colour, of first-rate quality.
Ringleader.—Extra early, heavy fruits, sets well, flavour superb; one of the best.

CHAPTER XXII.

THE CUCUMBER.

Origin—Soil—Sowing—Treatment—Fructifying-bed—
Watering—Ventilation—Coverings—Pruning—
Crooked Fruit—Training—House Culture—
Raising the Plants—Root Treatment—String—
Winter Culture—Saving Seed—Ridge Cucumbers—Varieties.

The Cucumber (Cucumis sativus) is cultivated in all warm and warm-temperate countries, but its origin is not known. The genus to which it belongs is represented by wild species in Africa, Asia, Australia, and America, the two best known being the Cucumber and the Melon (C. Melo). The Cucumber was cultivated and in general use in Egypt in the earliest ages. In Rome recourse was had to artificial means to obtain its fruits throughout the year. The mode of effecting this for the table of the emperor Tiberius was not widely different from that employed in the present day. Heat was obtained in frames filled with hot dung, and light was admitted through thin plates of tile, which would doubtless answer the purpose exceedingly well, especially under the strong light of an Italian sky. Pliny mentions beds mounted on wheels, so that in cold weather they could be removed under the shelter of buildings at night. The plants were also reared in baskets or in large vases, in order that they might be placed in the open air when the temperature was favourable, and taken in-doors when it was otherwise.

The Cucumber requires for its successful cultivation a rich light soil, a bottom-heat of from 75° to 80°, and a top-heat between 70° and 80°. Moisture ought not to be at any time deficient; and it is of the utmost importance that the foliage be exposed to as much light as possible; a thin shading, however, from the direct rays of the sun, when these are too powerful, is advantageous; and it may be added that air should be given when it can be admitted without danger.

Soil.—The soil in which the seeds are to be sown should be rich and light; it may consist of well-decomposed leaf-mould or finely-sifted peat, a lump of the same soil being placed at the bottom of the pot for drainage, or two parts turfy loam, one part peat, and one part leaf-mould, with some sharp sand. Some growers use turf of old maiden loam taken off not more than 3 inches thick, laid up, at least six months before being used, in narrow ridges with alternate layers of fresh horse-dung and a good portion of straw. When required, this compost is chopped up, but not sifted. Turfy loam may not be obtainable, and loam that is not turfy may have to be substituted. In this case a less proportion of loam, and more peat, leaf-mould, or decayed dung should be used, in order that a sufficient degree of porosity may be secured. For winter forcing peat alone has been very successfully employed in dung-beds. Good peat has the property of preserving the roots during winter, when in other soils they are apt to damp off.

Where composts of the above description cannot be obtained, any tolerably rich, rather light soil, mixed with an equal quantity of well-decomposed dung, will answer very well, or layers of soil 6 inches thick, and layers of the same thickness of fresh horse- and cow-dung mixed together may be placed alternately one above the other several months previous to use, and after the whole has been frequently turned, and has undergone a slight fermentation, it will be suitable for the purpose. A Cucumber plant will grow vigorously in common garden soil, and it may be observed how healthy Cucumber plants are when growing in the open air and exposed to full light. This method, however, is uncertain; means must therefore be employed to produce artificial heat, as well as shelter from cold winds, rain, and snow. The
mode of doing this was formerly confined to
dung-beds and linings, by which heat could be
obtained with little expense for constructions
in the first instance; but various other methods
are now employed, rendering the maintenance
of a proper degree of heat, even in the middle
of winter, less precarious.

Treatment.—To obtain a supply of Cucumbers
in winter, the best plan is to erect struc-
tures heated with hot water; but where the
necessary outlay for houses or pits cannot be
made, it is better not to attempt very early
forcing by means of dung-beds, indeed no
earlier than is consistent with the chance of
being successful with a moderate amount of
labour applied on good principles. Keeping
this in view, the seeds may be sown in the first
week in February.

About the middle of January a quantity of
good stable-dung should be thrown into a conical
heap, mixing it thoroughly. There should, if
possible, be as much short moist dung as will
prevent the litter portion from becoming dry
in the course of fermentation. If the litter is
dry, and in too large a proportion, it may be
soaked with drainings from the stables, or
with water alone. When the heap is in a full
state of fermentation, it should be turned and
thoroughly mixed. In a few days the materials
will be again in a full state of fermentation,
when the heap should again be turned, and
when fermentation has for a third time become
general, the formation of the bed may be com-
menced.

The situation of the bed should be sheltered,
but open to the south. The less obstruction
to the full light from this quarter the better.
The dimensions of the frame being known, an
area 6 inches larger should be marked out, so
that when the bed is built up and the frame
placed, it will be 6 inches from the outside of
the bed at both sides and ends. Some put a layer
of brushwood on the ground, others long dung.
Proceed next to form the bed, layer after layer,
the materials of each being well shaken and
mixed, and then beaten with the back of the
fork, so as to be uniformly compact. The
upper layer should consist of some of the
shortest materials. The bed should be 6 inches
lower at the front than at the back, and at the
latter the height may be from 3½ to 4 feet.
When the bed is formed the frames should be
put on, and the lights kept close till the heat
exceeds 80°, when the sashes ought to be raised
to permit the escape of moisture.

After the bed has been allowed to settle for
a few days, some light soil, peat, or half-spent
tan should be spread regularly over the surface
to the depth of 5 or 6 inches. In a few days
more this covering will acquire the temperature
of the materials on which it is laid. It would
be well to try the heat of the bed by a ther-
mometer. The indications of this should be
frequently noted at regular intervals in order
to ascertain the rate at which the heat increases.
If at the first trial it is, for instance, about 75°,
and if it progress but slowly towards 75° or
80°, the seed-pots may be safely plunged. If
higher than 80°, and from the rate of increase
likely to be much higher, precautions must be
taken lest the young plants should be injured
by too much heat.

The seeds should be proved before sowing by
putting them in water, when those only
which sink to the bottom ought to be sown.
It will be found most convenient in many cases
to sow singly in 3-inch pots. Let the seed be
pressed into the soil, and covered not more
than ½ inch.

The temperature of the bed being between
75° and 80°, the seed-pots may be plunged
about half-way in the soil; but should the heat
be above 80°, or likely to increase beyond that
point, it will be advisable to sink a small pot,
mouth upwards, placing on this the bottom of
the seed-pot. The latter will thus be cut off
from immediate contact with the hot materials
of the bed, and its temperature must be in-
fluenced by that of the air of the frame, and
this can be regulated to the required degree
by giving air. When, however, the pots can
be plunged in soil, tan, or other materials pos-
sessing the requisite degree of bottom-heat, it
is better to do so. When the plants appear
above the soil they should be within 6 inches
of the glass.

When the plant has formed two joints it
must be stopped above the second, and again
when the shoots which push in consequence
of the first have grown so far that they can be
stopped above the third joint. Some growers
occasionally stop again above the fourth joint,
whilst others stop in the first instance above the
first joint, and the next time above the second.

Should the temperature of the bed be on the
decline, then linings must be applied in time,
using materials either for preventing the escape
of heat, or for generating a fresh supply. If
the temperature is found to decline but slightly,
it will probably be sufficient to apply a coating
of litter, straw, or some other slow-conducting
substance not in a state of fermentation, using
materials already in a state of fermentation, such as hot stable-dung, for the purpose of affording additional heat. Dry litter or straw will prevent the escape of heat, and is therefore proper for surrounding the bed. Straw mats may also be advantageously employed above the linings.

Fruiting-bed.—Materials must be prepared as directed for the seed-bed. Where leaves can be had it is a good plan to mix a quantity of them with the dung, to make the fermentation less violent and more lasting. If the bed is made up in the first week in February, the height may be 4 feet in front and 4½ feet at back. The bed is formed layer by layer, like the seed-bed. The frame and lights ought to be put on and kept close till the heat has risen to the surface of the bed, which should then be forked over several times, at intervals of two or three days, to the depth of 9 inches or 1 foot, still, however, keeping the short materials at the top. If the dung should be dry, or likely to become so, it must be watered; but care must be taken not to give such a quantity of water as to chill the bed. Holes are occasionally bored in the sides of the bed with a stick when it is necessary to lower the temperature before or after the plants are introduced. The sticks should be put in about two-thirds above the foundation of the bed, and ought to point a little downwards towards the centre. If the heat is not above 85°, or even 90°, there is no danger of its injuring the plants.

Three or four days at least before the plants are introduced into the frame the soil should be added.

It will be well to place the plants in the frame a day or two before planting out. Each plant should be elevated on a little mound a few inches above the level of the bed.

Watering.—Cucumber plants should always have plenty of moisture regularly supplied, the demand increasing as the plant develops. It depends also on the temperature, and on the amount of ventilation. Care should be taken that the temperature of the water, both for watering the bed and for syringing, is about the same as that of the soil in which the plants are growing. In winter or early in spring the soil should be watered at about 10 a.m., closing the lights for a short time to prevent a chill through rapid evaporation, then gradually admitting more or less air according to circumstances. In dull, moist weather it is advisable not to wet the foliage, and the stem as well as the soil immediately surrounding it should be kept dry.

In summer, watering is usually done at about four o'clock in the afternoon.

Ventilation.—Air requires to be admitted with great caution in the early part of the season, when the disparity between the temperature within the frame and that of the external air is considerable. When the plants are young and tender from growing in a warm, moist atmosphere, they are very delicate. In winter and early spring little air should be given. It must never be given to lower the temperature, but rather to prevent it from becoming too high; for example, if 90° may be permitted by sun-heat, air should be given in such time and manner as will prevent the temperature from rising above that point, instead of allowing it to rise, say to 100°, and then lowering it to 90° by giving a large amount of air. Doubtless the true principle of giving air is to admit it as progressively as the temperature increases. This, of course, could not be carried out in practice; nevertheless, it should be borne in mind and acted on as far as circumstances will permit.

The bad effects of a draft of cold air admitted directly into the frame might be prevented by employing small-meshed garden netting placed so that the ingress of cold air and egress of warm must be through two folds 3 or 4 inches apart.

Coverings.—Until the nights become warm these are necessary. It would be desirable to have them of a description that would keep the glass both warm and dry. Double mats are used in severe weather. When the nights are very cold, and especially if the heat of the bed is not very strong, a thin coating of hay next the glass is a great protection. As the cold decreases, the covering may be reduced to a single mat, and in summer that may be dispensed with.

Shading is necessary when the sun's rays are powerful but the air is too cold to be admitted to an extent sufficient to counteract their effects. It is employed at other times when the plants are evidently suffering from a very hot sun, as is most apt to be the case on a sudden outbreak of sun after dull weather.

Pruning.—The Cucumber naturally extends its branches to a much greater distance than the width of an ordinary frame; and if their growth were not regulated by pruning, they would become overcrowded and weakened in consequence. Stopping the plants at every stage of their growth, as already directed, will cause several shoots to break near the base. Select three, or at most four of these, of as nearly equal strength as possible, for principal branches. En-
courage laterals from these to fill the frame sufficiently and to bear fruit. Stop at one, two, or three joints above the fruit, according as there is room. All weak shoots ought to be removed at an early stage of their growth, and those which are left should be kept moderately thin and regular.

Crooked Fruit.—In dry weather the fruit is apt to become crooked. To prevent this various means are resorted to. Glass tubes made for the purpose are very convenient; or three pieces of thin board may be nailed together like the bottom and sides of a box, 3 inches wide and 2 inches deep, and lined with three slips of glass. A number of these can be prepared, and they answer the purpose very well.

Training.—Instead of training along the surface, some prefer training the shoots on trellises. To allow space for the leaves, these should be placed from 9 inches to 1 foot from the glass, and from 12 to 18 inches from the surface of the bed, to admit of the fruit growing downwards in a perpendicular direction. The plants must be trained with a single stem to an upright rod till they reach above the trellis, when the leader should be stopped in order to obtain ramifications for covering the trellis. The principal among these must be stopped when other branches are required. Unfruitful laterals ought to be removed, and those which are bearing fruit should be stopped, so as to leave one joint beyond the fruit till such time as it can be seen whether or not a shoot will push from the same joint as the fruit. If one do so, pinch off that which is above it.

House Culture.—By far the greater portion of Cucumbers produced in this country are grown in houses, this in a measure being due to the cheapness with which suitable structures can nowadays be built and heated. In forcing pits or houses every attention can be bestowed upon the plants in all weathers, and with the aid of fire-heat a uniform temperature can be maintained without risk of overheating. Houses are necessary if Cucumbers are wanted in winter and early spring; in fact it is only during the hottest part of the year that either brick-pit or frame culture is resorted to in many gardens,
while the market growers rarely, if ever, bother with them. Small three-quarter-span and span-roofed houses, the former facing south, and the latter running from north to south and of any length, are suitable, and if ample boiler power and a sufficiency of hot-water pipes are provided to easily keep the night temperature up to about 70°, Cucumber culture will be a comparatively easy matter. Pipes to supply bottom-heat are frequently provided, but are not absolutely indispensable.

Cucumbers ought never to have a great mass of manure and soil to root in, the best results attending the practice of growing them in raised hillocks of open compost, and with plenty of top-heat these mounds of soil soon become and continue to be quite as hot as required.

The plants should be trained over trellises fixed to the roof at a distance of fully 9 inches from the glass, another 3 inches being desirable if head-room admits.

_Raising the Plants._—It is of the greatest importance that the start be made with strong, clean young plants. During winter and early spring a brisk bottom-heat is needed to cause the seeds to germinate strongly. Sow them singly in 2½-inch pots and treat them as already advised for plants for hot-bed culture. If wanted very early in the year the first sowing may be made in the first week in December, and this batch be fruited in pots. To succeed these, sow again early in January, the plants raised this time doing good service during April and May, a few Cucumbers probably being cut from them in March. It is unwise to keep old or exhausted plants, the better plan being to raise young plants in readiness to take their place. This is the market-growers' plan, many of whom grow and exhaust three sets of plants before the winter arrives. Before the old plants are really exhausted, sow more seeds, allowing from a fortnight to a month, according to the time of year, for the development of the plants. If at any time the young plants are ready for planting before they are wanted, either throw them away and raise more, or shift into 6-inch pots and keep them growing strongly a week or so longer.

It is possible to cut Cucumbers within six weeks of the date of sowing the seeds, but this is very sharp work, and eight or nine weeks is nearer the mark. The most quickly-grown fruit are the best as regards quality, and if at any time bitterness is complained of, this may be said to be principally due to slow growth, coupled probably with an unhealthy root action. Young plants produce the handsomest fruit, a fact that would-be prize-winners should bear in mind.

_Root Treatment._—Reference has already been made to the kinds of soil or compost that suit Cucumbers, and it only remains to be added that a great mass of this ought never to be used at one time. More failures have resulted from ignorance of this fact than from any other cause, or perhaps all other causes combined. Instead of providing a bed of manure, or manure and leaves, beneath a great heap or ridge of soil, the former should be dispensed with altogether, and the latter used far more sparingly than of old. It is true hot-beds, a relic of former days before fire-heat was so common, produce a strong growth at the outset, but they decay quickly, and the roots that have been enticed down into them soon fail. The roots must be kept constantly active on and near the surface of the soil, and once they are driven, or allowed to descend, deeply, or to where they derive little or no benefit from the warmth and air in a house, they no longer form sap-producing root-fibres in abundance, top-growth and production of fruit failing accordingly.

There would be fewer cases of root-knot or eel-worms if no hot-bed material and less soil were used. It is surprising how small a quantity of soil the most successful growers for the London markets provide for their plants, and also what an extraordinary crop they rarely fail to obtain from them in the course of a month or six weeks cropping. It is not a question of so many bushels of soil to each plant, but rather of pecks. About a peck should be given to each plant at the outset, and another peck in the form of frequent and light top-dressings. That is the secret. No top-dressing with a heavy weight of fresh soil or enough to smother the old soil and roots at one time, but only sufficient to scarcely hide the roots. These latter then never feel the loss of air, and heat and moisture being constantly supplied to them, they take active possession of the new soil in a few hours.

In addition to supplying water as often as the soil approaches dryness, some manorial assistance must also be given. Once let strong sunshine reach plants dry at the roots, and burning, red spider, and other evils will result, while it is scarcely reasonable to expect plants with a heavy strain on them to derive all the assistance they require from a small mound of soil. At the same time no manures that would clog the soil and exclude the air from the roots should be used. An occasional light surfacing, with some approved fertilizer, should be given,
or the grower may make one as follows:—To 3 lbs. of nitrate of soda add 2 lbs. of muriate of potash and 2 lbs. of superphosphate of lime, about 2 ozs. of this for each plant being mixed with the soil used for top-dressing, or 2 ozs. may be dissolved in 3 gallons of warm water and applied in that way. Peruvian guano is a good change, using this at much the same rates.

Training and other cultural details need only be further lightly touched upon. Instead of topping the young plants as advised in the case of frame cultivation, they ought to be early planted out at about 2 feet apart, and trained upright till the roof trellis is reached—all side shoots below the latter being pinched out as fast as they form. Some growers train the leader straight up the trellis, not topping till the limit is reached. Lateral branches are laid in thinly, right and left, and topped at the second or third joint of both laterals and sub-laterals. In this way a very heavy crop of fruit soon forms, as many as three or four forming at many of the joints.

Market-growers seldom cut off any small fruit, but allow all to attain a saleable size. Naturally this greatly exhausts the plants, and the sub-laterals produced are not so strong, and the fruit scarcer accordingly. Yet even this ends in the production of what a private gardener would consider a good crop. After being once pruned hard back and another crop obtained, it is not long before the plants are rooted out and a fresh lot planted. This pays better than keeping them cropping less heavily for some time longer, though the latter course may be desirable as far as the private grower is concerned, who usually tops his plants when the roof trellis is reached, and frequently after, the haulm only gradually covering the roof. Crowding the haulm should in all cases be avoided, or otherwise the knife may have to cut away many shoots that the finger and thumb might well have pinched out earlier.

Syringing.—A free use of the syringe is desirable, especially during bright weather, the plants receiving a thorough and rather forcible wetting when the house is closed early in the afternoon, and again moderately early the next morning. If this fails to keep the foliage free of insect pests, then it is advisable as a rule to start more plants, and as soon as they can be spared, to root out the old ones, as it is very difficult to clean Cucumber plants if once insects get the upper hand. In addition to overhead syringings, frequent dampings down must also be given. As often as the atmosphere feels dry, or the soil, paths, and walls give signs of dryness, either syringe or damp down heavily. If a hose is used, be careful not to overdo it, or the soil may become saturated. Where little air is given, a modification of what is known as the "express system", in which no air at all is admitted—this maintenance of a moist atmosphere is most imperative. One hour's neglect may end in the loss of much of the foliage by burning.

Low temperatures are most injurious. During the night 70° is none too high, this being gradually increased to 80° without air in the daytime, and from 85° to 90° with, closing in time to run the heat up to about 95°. See also what has already been said with regard to Ventilation and Shading.

Winter Culture.—In many places Cucumbers are wanted during the late autumn and winter months, and if well-heated forcing-houses are available, no great difficulty need be experienced in producing them. They may be grown on small mounds or ridges, or in pots. The latter are preferable, not only for fruiting in autumn and winter, but also for plants to be fruited in February and March. In any case they do not continue growing and fruiting during the winter nearly so strongly as do those grown with the aid of more sunshine, and in order to be sure of a steady, continuous supply, fresh plants ought to be raised to take the place of those no longer profitable. If, then, seeds are sown late in August or early in September, a successional batch should be raised by sowing more seeds early in September, and again a month later. In each and every case a brisk bottom-heat should be provided for hastening germination, and also for maintaining a strong growth in the young plants.

From the small pots in which the plants are raised, shift before they are root-bound, either into 6-inch pots or into their fruiting quarters—using rich porous soil, previously warmed. Pots varying from 12 inches to 16 inches in diameter are suitable, and these in the first instance should be only about three parts filled with compost, with a view to leaving some room for future top-dressings. Train uprightly, and pinch out side shoots till the roof trellis is reached, afterwards continuing the leader straight up the roof, laying in side shoots thinly on both sides. Stop the latter at the fourth joint, and do not allow a very heavy crop of fruit to form at one time. Rather more foliage should be left on plants to fruit during the winter than is required when the days are longer and there is
more sunshine, otherwise the root action will be sluggish.

The night temperature must range from 65° to 70°, with an increase of from 5° to 10° in the daytime whenever this can be given without making the pipes unduly hot. In such a brisk heat it will be necessary to damp the walls and surroundings of the pots two or three times a day, resorting to overhead syringings only on bright mornings. Little or no air need be given throughout the winter. Keep the soil uniformly moist, apply liquid manure often, and give a light top-dressing every ten days. Brown fibrous loam in lumps, gradually piled up on and about the pots, is just what the plants most appreciate, a net-work of root-fibres soon taking possession of it.

Saving Seeds.—Some varieties are shy in producing seeds, Tender and True being a noteworthy example of this. The most successful growers of seeds for the trade start their plants in May or June, and when the trellis or bed is well covered with haulm, the embryo fruits are thinned out, all the best in form being saved. These are carefully fertilized, and three days later once more gone over with a view to removing all that are not of good form. Even after this is done a heavy crop is left, and these on house-grown plants are all secured to the trellises and allowed to attain their full size. Not till they are fully ripe, or on the point of decaying, are they cut, when they are sliced open and the pulp separated from the seeds in water. The good sound seeds will sink to the bottom, and after the water is drained away they may be partially dried, polished in a cloth, and then harvested on an inverted fine sieve in the full sunshine. Private growers may fertilize a few female flowers on their plants, and allow these to hang, and otherwise treat as advised in the case of trade-growers. Unless effectively fertilized, there is little likelihood of fruit of superior varieties giving perfect seeds.

Ridge Cucumbers.—Cucumbers may be produced abundantly on ridges in the open air in warm summers, protected in the first instance by hand-glasses. The plants should be raised in heat in April and planted out under hand-glasses on ridges formed over hot dung. In making the ridges a trench should be thrown out 3 feet wide and 1 foot deep, laying the soil on the north side. The trench must then be filled with hot dung, and if this can be raised to the thickness of 2½ feet, so much the better. The dung should be covered with about 9 inches of the soil dug out of the trench, or with other rich soil, the surface being made to slope towards the south, and backed up with the soil thrown out of the trench. The hand-glasses must be kept on as long as the growth of the plants will permit, and on cold nights mats or other covering should be thrown over them. The application of any means that may be contrived to afford shelter on cold nights will of course prove advantageous, and so will be a mulching of litter; but fresh stable litter is injurious to the foliage.

In the Home Counties, also near Bristol and other large towns, ridge Cucumbers are extensively grown in the open fields, the net profits ranging from £20 to £80 per acre, according to the season. In these instances the site preferred is ground sloping gently to the south, and the ridges run from north to south. One foot or less of hot decaying stable-manure is covered by about 6 inches of the best of the soil thrown out of the trenches. This is done early in May—that is, if there is no convenience for raising the requisite large number of plants under glass—and the seed is sown directly the soil has become warm. Sow three or four seeds at distances of 2 feet apart, where the selected resulting plants are to grow. Protect the seedlings, and also any plants that may be turned out of pots late in May, with bell-glasses (cloches), hand-lights, baskets, or other make-shift coverings on cold nights, or till all danger from spring frost is past, after which thin out the plants where necessary, leaving two at each site. Strong winds from any quarter are most injurious to Cucumber plants, and these to a certain extent can be broken by means of a thick row of Rye-grass disposed between or on each side of the ridges. The Rye seed ought to be sown in the autumn.

It is possible to injure the stems of ridge Cucumbers by a too frequent and free application of water, this leading to an early and complete loss of plant. Enough water should be applied to give the plants a good start, after which they seldom require further assistance in this way. If watering is persevered with, risk of injury to the stems may be obviated by keeping the water away from these to a distance, say, of 3 inches all round. Putting out Cucumber plants in a basin of soil simplifies watering operations, but it is unwise and risky all the same.

When the leading growth of each plant has attained a length of about 30 inches they should be topped, and beyond keeping the
plants free of weeds no other cultural details are needed.

**Gherkins.**—A small sort of Cucumber, grown for pickling, is now also frequently grown on ridges instead of being raised under glass and planted out as heretofore. The French growers top the plants beyond the third leaf, the resulting growths spreading and cropping freely.

**Insects, &c.**—See chapter on this subject.


**Varieties.**—The varieties of Cucumbers to be found in seedsmen’s lists are extremely numerous, and many more exist in gardens throughout the country, where they are esteemed on account of their real or supposed superiority in size, productiveness, and flavour. A trial of 118 varieties was made at Chiswick in the year 1861 by the Fruit Committee of the Royal Horticultural Society, and the results were reported in the *Proceedings of the Society* for 1862. They were grouped in two classes, one distinguished by the fruit being of a bright-green colour, destitute of glaucence or bloom, as well as of mammillae or warts, and never furrowed and ribbed; the other distinguished by the fruit being covered with a thick glaucous bloom, and by having the surface set with mammillae surmounted with spines, which are either black, white tipped with black, or white. The 118 were reduced to 15, as being all that were necessary for furnishing every quality and requirement. Since that date many more novelties have been added to the lists, all being more or less distinct improvements on the older sorts they have replaced. The two classes above alluded to have become inextricably mixed, and the varieties most popular, say, in 1901 will, in their turn, give place to others. A selection of twelve varieties for growing under glass, and four for ridge culture, is here given.

**For House and Frame Culture.**

**Beckett’s Victory.**—Fruit 18 inches to 24 inches in length, of good form, few spines, dark-green in colour, carrying a good bloom; quality superior. Plant robust and free bearing. Fine for exhibition.

**Cardiff Castle.**—Fruit 12 inches to 15 inches in length, thick, straight, and handsome; quality superior. Plant vigorous and productive. An excellent variety for the winter crops.

**Everyday.**—Raised in the Royal Gardens, Windsor. Sets fruit freely at all seasons of the year, hence the name. The plant has an excellent constitution, fruit of good length, deep-green in colour, almost smooth, and very attractive in appearance.

**Frogmore Prolific.**—Fruit of medium length, perfect in form, colour, and quality. Moderately strong grower, and very productive.

**Lockie’s Perfection.**—Fruit 12 inches to 15 inches in length, somewhat thick, smooth, perfectly straight, short neck; quality good. Plant fairly robust, and a good cropper. Succeeds well in frames, and is occasionally grown for market.

**Lord Roberts.**—A cross between Telegraph and Prize-winner. May be described as a superior and darker form of Telegraph, and the fruit retains its excellent colour for some time after being cut—a great advantage where Cucumbers are required for market. Its prolific habit may be judged from the illustration (fig. 1104), taken from a photograph supplied by Messrs. Sutton & Sons, Reading.

**Matchless** (fig. 1105).—Fruit 18 inches to 24 inches in
length, straight, smooth, thick, dark-green in colour, neck short; quality excellent. Plant robust and very productive. Succeeds well in either house or frame. Fine for exhibition.

Model.—Fruit 18 inches to 24 inches long, ribbed, smooth, dark-green in colour, neck short. Strong grower, fairly productive. Good exhibition variety.

Peerless (fig. 1106).—Fruit about 18 inches long, thick, smooth, dark-green in colour, and of excellent quality, neck short. Strong grower, and a heavy cropper. A handsome variety.

Rockford's Market.—Fruit 15 inches long, thick, ribbed, with few spines, colour dark-green, and quality superior. Sturdy, short-jointed in growth, and very productive. A great favourite with market-growers, and also one of the best for frame culture.

Royal Osborne.—Fruit 15 to 20 inches in length, very even, smooth, light-green in colour, and of excellent quality. Tapering neck. Plant short-jointed and productive. Good for exhibition.

Telegraph.—Fruit 15 inches to 18 inches long, thick, slightly ribbed, few spines, colour dark-green; quality excellent. Plant fairly robust and very productive. An old favourite, good for either summer or winter culture.

Tender and True.—Fruit 24 inches to 30 inches in length, of medium thickness, few spines, dark-green in colour, and of superior quality. Plant fairly robust and prolific. Another old favourite.

RIDGE CUCUMBERS.

Best of All.—Fruit 12 inches to 15 inches in length, straight, few seeds; quality good. Plant hardy and prolific.

King of the Ridge.—Fruit 12 inches to 16 inches in length, straight, smooth, and of good flavour. Plant hardy, vigorous, and productive.

Short Prickly (Gherkin).—Grown principally for pickling purposes.

Stockood (Long Prickly).—Fruit 9 inches to 12 inches in length, thick, prickly, and the quality fairly good. Hardy, vigorous, and free-bearing. An old favourite.

[W. I.]

CHAPTER XXIII.

THE TOMATO.

ORIGIN.—Cultivation in the Open Air.—Market-growers' Methods.—Under Glass.—Pot-grown Plants.—Soil.—Temperature.—Successional Supplies.—Manures.—Training.—Autumn and Winter Crops.—In Pits and Frames.—Diseases.—Insect Pests.—Varieties.

The Tomato, or Love Apple (Lycopersicum esculentum), is a tender annual, a native of South America, and some say of Mexico as well. It is now very extensively cultivated for its fruit, which forms the principal ingredient of various sauces, but is more valued as a salad, immense quantities being eaten in an uncooked state, with condiments varying with the tastes of those who eat them. Tomatoes are also cooked and served in a variety of ways, and very excellent soup is made with their aid, while the green fruit is made into pickles and otherwise utilized. Apart from having become almost indispensable as a daily article of diet, they also possess medicinal properties which render them particularly desirable as a remedy for affections of the liver and other organs where calomel is prescribed. This ever-increasing demand has led to the establishment of a very important industry in this and other countries, thousands of workers now being almost solely occupied in producing the requisite supplies. Extensive trials of Tomatoes are held periodically in the Royal Horticultural Gardens at Chiswick, and the reports published in the Journal of the
Society have been of considerable assistance in the preparation of this chapter. Upwards of one hundred varieties of Tomatoes, more or less distinct, are now available for cultivation.

Cultivation in the Open Air.

Our climate is far too uncertain for any great reliance to be placed on open-air crops of Tomatoes. In a hot and dry summer they succeed admirably, not only against sunny walls and fences, but also quite in the open, with no extra shelter, and only a stake to each plant. The weather experienced in the last three summers (1899–01) proved this, the great heat and sunshine suit Tomatoes well, even self-sown plants reaching a productive state in time for a portion of the crops to ripen. Such weather, however, is unusual in this country.

By starting with strong plants, and striving to keep them growing and setting crops rapidly, it is possible even in an ordinary summer to get a good crop, the bulk of which may ripen before bad weather sets in, or disease works havoc among the plants. When house-room was more limited, the old-fashioned plan of raising the plants early, and gradually shifting them on into 10-inch pots with a view to having a crop already set on them before placing them outside against a sunny wall, answered well, especially seeing how slowly and indifferently the fruit ripens under the shade of Vines. Nowadays those who must have Tomatoes in abundance nearly or quite all the year round, have houses devoted chiefly to their culture, and the open-air crop is not relied upon other than as supplementary.

Unless the plants can be kept growing moderately strongly, it is a mistake to raise them as early as is usually advised, starvelings being very slow in attaining a healthy productive state—if ever they do. Late in March, or the first week in April, is soon enough to sow the seed, and the preference should be given to moderately strong-growing, free-setting, early-maturing varieties—notably Champion, Frogmore Selected, Early Ruby, Golden Nugget, Holmes’ Supreme, Comet, and Veitch’s Glory, all of which are heavy croppers.

The seeds should be sown thinly in well-drained 6-inch pots, or in pans and boxes, using light sandy soil, and place on or plunge in a mild hot-bed, or, failing this, on a bed or staging in a forcing house or frame of any kind. If the soil is kept uniformly moist the seedlings will appear in a week to ten days. Before they become leggy, raise them up to the light in the same house, pit, or frame, and thin out if necessary.

When they have formed two leaves above the cotyledons, either plant them singly in the centre of 3-inch or 4-inch pots, or in pairs against the sides of 6-inch pots. Light loamy soil, previously warmed by means of hot bricks plunged in the heap, should be used, and the plants ought to be buried up to their seed-leaves. If they can be given the benefit of bottom-heat and a little shade they will quickly recover from the check given, but if the house or pit can be kept at from 60° to 70°, bottom-heat may be dispensed with. Water carefully at first, especially where the larger pots are

Fig. 1107.—Tomato—Dwarf Gem.
used, but when they are growing strongly much more water will be needed, and the plants must also be raised well up to the light to prevent them from becoming leggy. When small pots are used the plants should be shifted again into 6-inch pots, otherwise they quickly become root-bound and starved. On the whole it is better to place the seedlings direct into the 5-inch and 6-inch pots, as it saves labour, and stronger, sturdier plants are usually obtained.

Towards the end of May the first bunch of bloom will be showing, when the plants may be hardened off ready for their fruiting quarters. If they can be got out well in advance of this first flowering, there is a chance of a good set being effected, whereas when raised earlier in the season and half starved, the first flowers drop prematurely, and a late crop is the consequence.

Blank spaces on walls between Peach and other trees are suitable positions for Tomatoes. It is even worth while to erect temporary fences for the purpose. High front walls of forcing and fruit houses may likewise be similarly utilized. If there are no borders, they can be formed on quite a hard bottom if need be, a foot in depth and width of good soil and a summer mulching of straw and manure sufficing.

No great amount of pains need be expended on the preparation of the soil, ordinary well-enriched garden soil being capable of supporting strong plants bearing heavy crops. If the plants are placed in the same sites every year, then not less than a good shovelful of fresh loam and solid manure ought to be given to each plant.

If protection of some kind can be afforded, the planting may be done during the third week in May; but, as a rule, when only a few are grown, little is gained and some risk is run by planting before the first week in June. Those to be trained against walls and fences should be planted 1 foot apart and kept confined to a single stem, but if plants are scarce they may be arranged 3 feet, or rather less, apart, and two side-growths be laid in additional to the central one.

No lateral shoots ought to be allowed to grow on either the single, central, or side growths (as shown in fig. 1108), but all should be pinched out before they have a chance to either smother or rob the fruit of much sustenance. Keep the leading growths carefully fastened by nails and shreds to the walls and fences, or secured to wires or stakes, as the case may be, as they are very liable to break down if neglected. Stop the leaders beyond the third or fourth cluster of fruit.
When the fruits are approaching maturity, ripening will not be hastened by the complete removal of the leaves about them. Where the leaves cover the fruits they may be reduced somewhat in size, but the too common wholesale removal (as shown in fig. 1110) is senseless in the extreme. All the defoliating advisable is shown in fig. 1111. Much of the fruit should ripen during July, August, and September. What there are still hanging late in September should be cut before being injured by frosts. In the more moist localities ripening fruit are very apt to crack badly, and the remedy is to gather them when beginning to change colour, and to finish the ripening in boxes or shallow heaps in a warm, dark room, or they may be covered up with paper, the colouring being more satisfactory and the foot-

![Diagram](image)

**Fig. 1110.—Common example of reckless defoliating.**

**Fig. 1111.—Tomato Plant, partially defoliated.**

stalks fresher when ripened in the dark than is the case when the gathered fruit is exposed to sunlight. It is the smaller green fruits that should be utilized for making into pickles, the largest of those gathered in September colouring in due course.

**Market-growers' Methods.**—Market-growers who have gone intelligently to work have found the open-air crops of Tomatoes remarkably profitable, as much as £200 per acre net profit having been obtained in favourable years. Bad years there are occasionally, but the average is highly satisfactory in spite of these. The ground ought always to be well cultivated and manured, as for Potatoes. Hot soils may have a dressing of about 20 tons of half-decayed stable or farmyard manure, dug or ploughed in well in advance of planting-time. For moderately strong ground that has been previously cropped with Potatoes or Tomatoes, a dressing of a chemical manure is preferable to solid manure, the former giving the requisite support to the plants without promoting a too sappy, leafy growth. A chemical manure that has repeatedly done good service is made up as follows:

- **Nitrate of soda** ... ... 4 cwts. per acre.
- **Superphosphate of lime** 8 .. .. ..
- **Kainit** ... ... 3 .. ..
- **Sulphate of iron** ... ¼ cwt. ..

The three last-named being somewhat slow to take effect, they should be thoroughly mixed with the top spit of soil well in advance of planting-time, while the quickly-dissolving, easily-lost nitrate of soda should be applied
in the form of surface dressings, the first soon after the plants are put out, and another a month or six weeks later.

Where so many thousands of plants are required they must necessarily be prepared for putting out in quite small pots, also taking care not to raise them long in advance of planting-out time, or starvelings will be the result. Where spring frosts often occur as late as the third week in May, planting-out should not commence before that time; but in the more favoured localities planting is frequently commenced about the middle of May, starting with well-hardened plants.

The most profitable arrangement is to dispose the plants 15 inches apart in rows 3 feet apart, confining them to single stems; but if the requisite number of plants cannot be raised, it is more economical to put them out 20 inches to 2 feet apart, and lay in a second growth from each, keeping both primary and secondary stems free of side-shoots. At the ends of the rows extra stout stakes (see fig. 1112), and at intervals of 12 to 20 feet lighter stakes, should be driven in. These are for the purpose of straining and supporting one length of No. 16 gauge galvanized wire 3 feet from the ground. (See figs. 1112 and 1113.) Each plant should be supported by a 4-foot bamboo cane fastened at the top to the wire. This forms an admir-

able trellis for the plants, and may be used several years in succession if duly stored in the winter.

In all other respects the treatment of Tomatoes for market should be much the same as advised in the case of garden crops. It should be added that occasional waterings are needed by all open-air plants till such times as they are growing strongly, after which a mulching of short manure or leaf-soil will be all that is further necessary during the average summer. During exceptionally hot and dry seasons plants in comparatively poor soil, and heavily-cropped, are improved by an occasional good soaking of water or liquid manure.

**Cultivation under Glass.**

Tomatoes can be successfully grown in houses either with stove plants in the coldest half of the year, or with greenhouse plants in the summer; they are also frequently seen in satisfactory condition in houses with either Melons, Cucumbers, Grape-vines, or Peach-trees. Where separate structures can be afforded them there is a far greater likelihood of their succeeding than when they are grown with other plants. They are less liable to disease, and crop the most heavily, when kept constantly in a dry, buoyant atmosphere, and this does not suit most of the other kinds of fruit and plants named. High temperatures, accompanied by a moist atmosphere, have been the cause of very many failures. Even if the first or second bunches of flowers are followed by a good set of fruit, the disease, when it has once effected a lodgment on the foliage, spreads so rapidly as to practically spoil the crop.

The various diseases to which the Tomato is liable—and one intelligent grower living in the neighbourhood of Bath asserts he counted no less than ten forms of disease on his plants during one summer—makes its culture partake somewhat of a lottery at all times, and particularly so in mixed houses. It is, therefore, desirable to keep them by themselves in a house as much as possible, or to locate them where they can be given more air than the other occupants of the house require.

**Pot-grown Plants.**—The earliest supplies of
fruit can be had the most surely from plants in pots. Under good treatment and favourable conditions, they succeed remarkably well, single plants in the 10-inch size being capable of producing 8 lbs. of fruit and upwards. Naturally pot-plants require closer attention than do those planted out, and in particular must have abundance of water and liquid manure to keep them going; but they pay for it. It is not long before the soil in unplunged pots becomes heated to much the same temperature as the house, and in addition to this the roots also get the benefit of the aeration afforded by the porous pots.

If fruit is wanted early in the year, the seed should be sown in September, and the seedlings be potted singly in 2½-inch pots, and kept growing in a temperature of 55° by night to 60° and 65° by day, in a position near the glass. With this treatment good sturdy plants ought to be ready for the fruiting-pots by the middle or end of December. The 10-inch pot is recommended, but if they cannot be given this size just when they need a shift, place them first into 6-inch pots, and from these transfer to the fruiting-pots before they become root-bound.

Plants raised thus early should produce ripe fruit early in April, and to succeed these more seeds should be sown in January or early in February. In either case avoid raising many more plants than are really required, as they only spoil each other when at all crowded, and it does not pay to keep leggy plants for planting in borders later on. The fruiting-pots should be clean and well drained, the roughest of the compost going over the crocks.

Soil.—A fairly rich soil may safely be used, a mixture of two parts fibrous or good yellow loam to one of horse-droppings only partially decayed, with some charred soil and a sprinkling of soot and superphosphate of lime added, answering well. The soil ought to be stored in the house where it is to be used long enough to get warmed prior to use, or else the heap should have several red-hot bricks plunged in it. Press the soil firmly about the roots when potting, and leave plenty of space for subsequent top-dressings. If only a few plants are grown, these may well be arranged as thickly as they will stand on the staging or shelves along the front of a small forcing-house, train-
ing and fruiting them on a trellis fixed from 9 inches to 12 inches from the glass. They can also be grown at the ends, but do not fruit so freely in such positions. Many more plants could be grown in a house, however, if the pots were arranged nearly as close as they will stand in cross rows 3 feet apart, and staked upright. Or they could be set on the back staging of lean-to houses and trained upright, a row of plants also being arranged along the front and trained up the roof as far as they can be taken without detriment to the other plants.

In each and every case keep the plants to a single stem, pinching out all side-shoots as fast as they form, and training the leaders up the roofs or stakes till three or four good clusters of fruit are set on them, when they should be stopped and not allowed to extend any farther—unless the attempt is made to fruit them continuously as long as they pay for the trouble. Avoid unduly mutilating the leaves. If they are so thick as to conceal the fruit, cut away a portion only of each leaf so as to expose the fruit. Directly the soil is well occupied by roots, give a top-dressing of loam and horse-droppings in a warm state, and do not be misled by the condition of this when watering, as the fresh soil may be quite moist, while that which is full of roots is far too dry for the good of the plants. Also give frequent doses of liquid manure, or else occasional surfacings of nitrate of soda and superphosphate in equal quantities, one ounce to each plant. Yet another top-dressing might be given with advantage, especially if strips of zinc were used for keeping the soil together and facilitating watering.

**Temperature.**—Whether the crops shall be heavy or light largely depends upon the maintenance of a dry, buoyant atmosphere, the fruit failing to set when the plants are grown under conditions most suitable for Cucumbers. Allow enough fire-heat to keep up a temperature of about 55°, increasing to 60° and 65° in the daytime. A chink of top air should be left on whenever the nights are mild, and top air be given more freely in the daytime whenever this can be done without appreciably lowering the temperature.

Tomatoes thus treated are not likely to become diseased, and thus one hindrance to a good set will be avoided, while the flowers will open more naturally and pollen be more abundant than is the case when more heat and moisture abound. Nothing should be left to chance. In order to be certain of a good set, go over the plants, when in flower, towards noon every day, and smartly tap the stems of the bunches with a padded stick; this effectually distributes the pollen, a portion of which lodges on the moist stigmas and effects a perfect fertilization. When grown strongly the central flower of each bunch is nearly always misshapen, having fasciated pistils, and these, if left, are followed by equally misshapen fruit. These flowers should therefore be removed, and the rest of the bunch will produce stronger flowers and finer fruit.

**Successional Supplies.**—Early Tomatoes and successional crops can be grown in boxes instead of pots, and in narrow ridges of soil arranged along the fronts of houses, rather less water being needed in both instances. The great bulk of fruit grown for the markets is, however, obtained from plants in a variety of houses with a clear inside border largely or wholly devoted to this profitable crop. In most instances nothing else is grown, and this admits of full justice being done to the Tomatoes, but they also succeed well in vineyards till such times as the Vines cover the whole of the roof. It is useless to attempt growing them under Vines, and, besides, the Vine roots must have a fair share of the border, as they fare badly when they have to compete with hungry Tomatoes.

At the outset the ordinary garden or field soil over which the houses are built should be broken up or bastard trenched two spits deep, taking care not to bring any poor clayey subsoil to the surface. This is usually quite rich enough to give the Tomatoes a good start, surfacings of special manures being washed in and mulchings of short manure serving to sustain the plants in a healthy, productive state till the end of the season. In the following and future years some extra preparation of soil is needed, Tomatoes being great impoverishers of the soil. Trenching should be resorted to each winter, and if during the second operation the subsoil is freely manured, a complete reversal of the spits may be carried out during the third winter, thereby placing a fresh supply of fertile soil within easy distance of the roots.

A light, non-retentive soil would be greatly improved by a liberal dressing of pulverized clay or clayey soil, which ought to be well mixed with it. No one should start Tomato-growing over a very heavy clayey soil, as to get this into a finely divided state and keep it thus
is usually an expensive undertaking. Mortar rubbish, burnt earth and ashes, sand, leaf-soil, and such like, when freely mixed with heavy soils, improve their character considerably.

**Manures.**—Various fertilizers have been suggested for Tomatoes, and most authorities are agreed that a too free use of animal manures is liable to promote a luxuriant, disease-inviting growth of plant, and in retentive soils especially they ought to be somewhat sparingly used. American experts are mostly in favour of chemical manures, and exhaustive series of experiments have demonstrated the fact that it pays better to use certain mixtures at a fixed rate at planting-time than to distribute a similar quantity over a period of two or three months. Nitrate of soda and sulphate of ammonia, as previously intimated, act quickly, and if a full dressing is given at one time, a portion of it is liable to be washed away before the plants can avail themselves of it, and this means so much waste of a valuable manure. Special mixtures for Tomatoes are to be obtained from various vendors at reasonable prices, and if these are applied according to the directions given with them no mistake will be made. Those who prefer to buy and mix their own manures are referred to the formula already given (p. 333), using the mixture at the rate of about 12 lbs. per square rod, or roughly, 6 ozs. to the square yard of ground. For the more clayey, retentive soils sulphate of ammonia may be substituted for nitrate of soda, and lighter dressings all round are desirable in the case of soils not previously cropped with Tomatoes. Where animal manures have been frequently applied rather freely, this might well be withheld for one season, and a surface-dressing of newly-slaked lime, at the rate of half a bushel to a square rod, given by way of economy, and as a corrective of acidity.

**Training.**—As a rule Tomatoes produce the heaviest crops when trained up the roof near the glass; but a far greater number of plants can be found room for, and a much greater weight of fruit be had, by planting in rows across a house, and either providing each plant with a bamboo stake, or else twisting them round strings secured to pegs in the ground or to the stem of the plant and to the roof. It may here be added that the durable bamboos are the best in the long run, though they may seem a little expensive at the outset. Crowding the plants is a great mistake. When planted 12 inches to 14 inches apart, in rows 2 feet or so apart, the crops set well for a time, but eventually the plants smother and rob each other, and the fruits in consequence are light in weight and poor in quality. The

![Tomato](image)
wholesale removal of the lower leaves is but a poor way out of the difficulty. After repeated trials we have come to the conclusion that a distance of not less than 3 feet should separate the rows, the plants in the rows being 12 inches apart. Given this space there will be no necessity to remove many leaves, but they usually require to be reduced to about one-half their natural size, according as they begin to press against each other. For these later crops the smooth round varieties are very suitable, those of a medium size, such as Cropper and Champion, finding most favour in the markets, while the larger varieties, of the Duke of York type, are preferred for exhibition purposes, heavy as well as handsome fruit being needed.

If the plants have been prepared as already advised, and planted before they become root-bound, progress will be rapid from the first. The soil about the roots must be made quite firm. The plants when young must not suffer for want of water. Later on they will require copious supplies, which should be given as much as possible in the mornings of bright days with a view to getting the house dry before night. A mulching of rotten straw manure saves the hose or watering-pot considerably, but it is thought to favour the spread of fungus and other diseases, that attack the underground portion of the stem and cause the collapse of the plants; still, this may be risked. It is a great mistake to delay removing the side-shoots until a knife has to be used (see Fig. 1108), better attention repaying well, as shown in Fig. 1109.

As the days lengthen, and it is possible to ventilate more freely, a good set of fruit is easily effected; but no risks should be run, and the puddled stick must be used daily as long as necessary. If handsome fruit are required, on no account neglect the early removal of the central ugly flower, and if the other flowers are thinned out the rest will be stronger, and if duly fertilized will develop finer fruit. If the flowers have not been thinned, then the number of fruit must be reduced, that is, if show examples are wanted. Topping the leading growths beyond the second or third cluster of fruit may have the effect of slightly increasing their size, but, as a rule, no topping need be practised till the tops of the stakes or the roof is reached. Sometimes the plants next to the sides or fronts of houses are not topped when the glass is reached, but are allowed to extend up the roof, when they continue to fruit heavily till later in the season, those underneath being cut out as fast as they are cleared of fruit. There should be enough heat in the hot-water pipes to maintain temperatures not lower than 55° during the night; a slight heat in the pipes during the day, accompanied by top-air, more or less according to external conditions, serves to keep the house dry and the air buoyant. Never delay opening the top ventilators till a high temperature, accompanied by a great increase in the humidity of the atmosphere, is reached, nor close early enough to bring about the same undesirable state of affairs, as this invariably leads to a rapid spread of fungus diseases, “scalding” of the fruit, and the like. The season of 1898 was one of the worst on record as far as Tomato diseases were concerned, but little or nothing was seen of them in houses where little or no fire-heat was given.

AUTUMN AND WINTER CROPS.

The demand for Tomatoes is greatest from May to September, but it is considerably on the increase during the colder months of the year. Trade growers will therefore do well to meet this demand, while private gardeners will gain credit with their employers if they also grow as many as possible for late autumn and winter consumption. There is really no good reason why they should not be far more plentiful in winter than they are.

The secret of success, if secret it may be termed, lies in realizing the fact that Tomatoes fail to produce perfect flowers late in the year; but this difficulty can be surmounted by starting the plants soon enough to flower and set the fruit before dull, sunless weather sets in, these ripening in succession throughout the winter. But for the Potato disease the simplest plan would be to grow enough plants in pots in the open, and when these were well set with fruit, or say about the middle of September, to house the whole of them. The Bouille Bordeaux or sulphate of copper and lime remedy is too destructive to the flowers; but a mixture of sulphate of copper and lime in a powdered state, and applied through a dredger or other distributor, would check the spread of disease without greatly injuring the flowers. For these late crops, whether they are to be wholly or only partially grown under glass, it is a mistake to start later than May for plants to be prepared in the open, or the early part of June for any to be grown wholly under glass.
A few ripe fruit may be had from these comparatively early-raised plants before they are wanted, but the bulk will ripen more slowly and keep a long time after they are ripe, whereas later-raised plants will not only produce lighter crops, but will also very probably become badly diseased before much of the fruit has ripened.

Tomato plants can be propagated from cuttings as well as from seed, but few nowadays adopt the former practice, seedlings proving quite as productive, or even more so, than plants raised from cuttings; they are also less liable to be affected by disease.

When pot-plants are to be prepared in the open, use the 10-inch size with one plant in each, and arrange them 14 inches apart in rows about 3 feet apart on a hard bottom, placing a bamboo or other stake 4 feet high to each. Give a rich top-dressing after the soil is well filled with roots, and keep well supplied with water and liquid manure. No side-shoots should be allowed to form, and the one leading growth must be secured to the stake.

Late in the summer some of the lower older leaves should be reduced to about half their size, and when the plants are carefully transferred to the house or houses, they may be stood rather more closely together than formerly, or even between or among older Tomato plants that have been cleared of their lower clusters of fruit and leaves. Those planted under glass early in July may either be treated similarly to earlier batches, planting them in rows across the house or houses, or the roofs of small houses may be covered with them. A few plants might be allowed to spread over a roof, the extension system answering well for these late crops. Some that have already borne good crops are sometimes roughly pruned, and a number of side-shoots laid in from them in an irregular fashion. These leading growths should not be allowed in their turn to form any side-shoots, but ought to be trained thinly, or about 12 inches apart, clusters of fruit forming on them to their entire length. The greater portion of old plants from the borders or ridges should be removed; a top-dressing with some rich compost and applications of liquid manure are good for these old plants, whilst young ones put out thickly ought not to be starved.

Late Tomatoes are also grown in boxes on the back shelves of vineries, and fruited down
the roof; but these have to be cut and ripened in stronger heat before the house is set widely open, so as to give the Vines their needed rest. If the pot and other late-cropping plants trained up roofs are kept in a temperature ranging from 55° by night to 60° to 65° in the day, they will not only give a long succession of well-ripened fruit, but they will push out side-shoots freely, which, if duly thinned, will each give a cluster of fruit in the spring before it is possible to have any from plants raised in January.

Tomatoes in Pits and Frames.—Success with Tomatoes in pits or frames is not frequent. More often than not the plants become badly diseased before a profitable crop can be had from them, owing to imperfect ventilation; or if they escape disease they yet fail to set and produce good crops. Those in frames are apt to grow too rank, and the same thing happens in pits unless the roots are confined to either pots, boxes, or narrow ridges of soil. Various contrivances have also to be adopted in order to keep the haulm raised clear of the soil. Instead of attempting to grow Tomatoes under such disadvantageous conditions, it would be far better, where possible, to devote a house to their culture during the summer, and to relegate the ordinary occupants of these structures largely to the pits and frames.

Frame culture will answer if care be taken not to grow the plants too strongly, nor to unduly crowd the leading growths, and to ventilate freely on all favourable occasions. Tomatoes may be planted in pits and frames in succession to early Potatoes, with a view to giving them a good start prior to removing the lights and exposing the plants to all weathers. Two rows of plants may be disposed from the front to the back of each light in close succession to the Potatoes. They should be kept rather close and warm till growing strongly, and directly they require tall stakes, wholly remove the light and place a 4-foot stake to each plant. Plants thus started should be well ahead of those in the open air, and in most seasons would produce a heavy crop of ripe fruit before much disease was in the air.

Diseases.—The well-known Potato disease (Phytophthora infestans) affects Tomatoes also, open-air plants with their crops succumbing to it in a wholesale manner whenever Potatoes are badly affected. During a hot, dry summer very little is seen of this disease. In a wet season, if the plants cannot be kept dry by a temporary protection, the only other remedy is either occasional sprayings with Bordeaux mixture, as recommended for Potatoes, or frequently dusting with "Anti-Blight" powder, a mixture of newly-slaked lime and sulphate of copper. Both remedies are apt to seriously check the growth of the plants.

Yellow Spot (Cladosporium fulvum) occurs principally on plants grown under glass, and in some seasons is most destructive. At the outset a few leaves only may be affected, but if neglected the disease spreads rapidly from one house to another. The under side of the leaves is attacked, patches of brown mottle-like fungus destroying the cuticle and tissues of the leaves, causing yellow spots to show on the upper side. A warm, moist, stagnant atmosphere, such as Cucumbers revel in, favours the spread of this disease; and the soft leaves of overfed plants are the first to succumb, soon being left without a healthy leaf on them, the fruit also being spoilt. Close planting, that is, crowding the plants together, favours the spread of the disease.

The best preventive measures should include an effort to grow sturdy plants, by maintaining a warm, dry, airy atmosphere. Fire-heat is essential to success, as without this it is impossible to prevent stagnation in the atmosphere in dull, damp weather. Plenty of fire-heat, coupled with careful ventilation, opening the houses in the morning and not closing them till the evening, and not then if it will give rise to a high temperature. During the summer a little top air may be left on all night. A close look-out should also be kept for any symptoms of disease, carefully removing and burning any diseased parts.

Bordeaux mixture is considered a good remedy, though applications of this have the effect of checking the plants in growth, and unless precautions are taken it also necessitates wiping every fruit before it can be used or packed, as the case may be. The following method of preparing and applying the Bordeaux mixture is from the Journal of Horticulture:

Sulphate of copper, 4 ozs., powdered, dissolving in a vessel by itself in 3½ gallons of water; then slake 4 ozs. of quicklime (quite fresh) in another vessel, and form into a thin lime-wash with water, and pour it through a hair sieve slowly into the vessel containing the copper solution, adding enough water to make 7½ gallons altogether. To make sure this will not injure the plants, drop a few drops of ferrocyanide of potassium into the Bordeaux mixture after it has been well stirred; and if it turns brown it will injure the plants, but if it remains
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a clear celestial blue it is perfectly safe. It should be used as soon as it is made, not letting it stand for several hours. Cut any fruits that are ripening, and then spray the plants in every part, repeating in the course of a week or ten days. The mixture may be kept from the fruit by wrapping it in oil-skin before spraying, removing it afterwards.

A simpler and more perfect remedy consists of turning or concentrating the fire-heat on to the affected area, to the extent of making the hot-water pipes unbearably hot, running up the temperature to 110° or 120°, repeating this every second day for a week, with the result that all the disease germs will be destroyed. It should be done in the daytime. Those who have not tried this remedy may be encouraged to do so by having their attention drawn to the fact that this “yellow spot” disease is rarely troublesome in the well-heated houses in which Tomatoes are grown for an early crop.

Black Stripe (Macrosporium Lycopersici) is another fungus disease of a most destructive nature to which Tomatoes are subject. A good start may be made with the plants, and a crop of fruit set on them, before the disease manifests itself. Suddenly a shrinkage and discoloration of parts of the stems, in the form of black stripes, are to be seen, and if the stems are soft the upper portion of the plants collapses entirely, while if they are moderately hard a partial recovery may take place, a poor crop of malformed fruit being obtained from them. The trouble commences at the roots, and once started, nothing seems capable of checking the progress of the disease short of carefully removing and destroying affected plants and soil, and disinfecting the sites with quicklime prior to adding more soil and replanting.

Preventive measures are most imperative. The very seeds are liable to carry contagion with them, and ought to be disinfected before sowing. This may be done by coating them with flowers of sulphur, or by soaking them in a weak solution of Condy’s Fluid. The soil used in the seed-pan should also be treated by the addition of enough newly-slaked lime to whiten it, or by subjecting it to strong heat, red-hot bricks placed in the centre of a small heap of soil destroying disease germs. Soil to be used in pots or for ridges should be treated in the same way. Where the plants are put out in borders, market-growers’ fashion, these should also be limed. Lime obtained from chalk and newly slaked should be applied at the rate of 1 lb. per square yard, and forked in, well mixing it with the top spit. If in spite of these precautions a few plants early show signs of disease, these ought to be quickly drawn and burnt, and lime applied to the soil they came out of, to prevent the spread of disease to adjoining plants.

Sleeping Disease (Fusarium Lycopersici). Plants affected by this much-to-be-dreaded disease may apparently be in good health and in a fair way to produce extra heavy crops on one day, and during the next flag badly, never again to recover. This disease also attacks the roots, and may be prevented by taking the precautions advised for Black Stripe.

Slime Fungus also attacks Tomato plants with deadly effect at times. It should be combated in the same way as recommended for the other diseases in preceding paragraphs.

Black Rot (Macrosporium Tomato), another fungus disease, attacks the fruit at the eye very soon after it has set, the decay spreading slowly but surely, causing black circular patches; fruit injured in this way colour prematurely, but are quite worthless. Scalded fruits are frequently thought to be affected by this disease, but the cause and effect both differ. In the case of scalded fruits there is a rapid shrinkage of tissues or pulp, the injured parts being quite soft and green for a day or two, afterwards becoming black. The remedy, however, is the same in both cases. Sufficient fire-heat must be turned on to prevent the temperature becoming low during cold nights preceding or following clear days, and also be admitted quite early in the morning to prevent any sudden rise in the temperature. When the fruit becomes very cold at night, and there is also a delay in ventilating, not opening the house or houses till long after the sun strikes on them, the heated air condenses on the cold fruit, and the rapid evaporation of this moisture, consequent upon a sudden late opening of the top ventilators, results in the disruption of the tissues or “sun scald” —hence the necessity to avoid a low temperature, and for early ventilation, followed according as the sun gains in power, by the admission of all the air possible. Keep the fruit dry, and neither Black Rot nor Scalding will be much in evidence.

Insect Pests that affect the Tomato are not particularly numerous. Remedies for Green-fly, Red Spider, and Snowy Fly will be found in the chapter devoted to Insect Pests, but the Root-gall or Eel-worm must not be thus summarily dismissed, as it is one of the worst enemies to the Tomato, and the most difficult to deal with. Plants with their roots badly affected
by this minute pest are practically failures, soon ceasing to make any further progress. The small thread-like worms pierce and deposit their eggs on cysts in the Tomato roots, causing galls or knots to form which paralyse the roots and deprive the plants of their assistance while forming crops of fruits. A more deadly species of eel-worm, known as Tylenchus obsulus, destroys the bark and soft tissues of the stems below the surface, flagging leaves being the first intimation of the attack. Both species are difficult to cope with. All that can be done is to keep the soil about the roots steadily moist, and to apply lime-water occasionally, or, better still, Little’s Soluble Phenyle, at the rate of 1 oz. to 6 gallons of soft water. Neither lime-water nor soluble phenyle will wholly check the ravages of eel-worms, but they serve to keep the roots active long enough to save the crop.

Thorough preventive measures should be adopted the following autumn or winter, or the chances are that eel-worms will be even more destructive the following season. Where possible all the old soil should be cleared out, the beds limed, and the walls lime-washed. If the new compost prepared has been well frozen through that would clear it of eel-worms, and, failing this, add enough newly-slaked lime to whiten it. Market-growers could not well clear out their large borders and substitute new soil, and the only way out of the difficulty is to trench the ground well, mixing 2 lbs. of basic slag and 12 ozs. of kainite with every square yard of border. This ought to be done at least six weeks prior to planting Tomatoes in the ground, as these manurial insecticides when first applied in such excessive quantities are liable to be somewhat destructive to plant as well as to insect life.

Wire-worms are destructive to Tomato plants planted in newly-broken-up ground, eating their way into and up through the centre of the stems, flagging foliage being the first signs of their presence. At this stage there is no remedy, quite large plants having in many instances to be pulled up wholesale and replaced with healthy plants. Gas-lime mixed with fresh soil at the rate of 1 half-peck to 12 bushels of soil, or well-mixed with soil in borders at the rate of 1 peck to the square rod of ground, helps to clear the soil of wire-worms; but ground treated with this kind of insecticide cannot safely be cropped for at least six weeks after its application, or until the poisonous properties are got rid of. Super-phosphate of lime is both distasteful to wire-worms and a good manure for Tomatoes, but it cannot be termed a really effective remedy.

Trapping is the only safe and perfect remedy, and this should commence either in advance of or simultaneously with planting. Short (2-inch) lengths of carrot, each with a label or stick thrust into it, ought to be inserted with the aid of a trowel just below the surface of the ground and 2 feet or so apart, and in these the wire-worms will assuredly collect. Every second day is often enough to raise and examine the carrots, the wire-worms being found sticking out of them. They should be destroyed, and the carrots returned to the ground.

**Selection of Twenty-four Varieties.**

*Best of All* (fig. 1115).—Sets freely and is an immense cropper, producing heavy bunches of fruit at short intervals all over the plant. Excellent in form, of good size, solid; colour deep-scarlet.

*Blenheim Orange.*—A somewhat strong grower, the fruit setting freely under glass, not so freely in the open. Fruit large, round, smooth, good form, bright-yellow faintly flushed with red, solid, of fine flavour; averaging four to a cluster.

*Champion.*—Sturdy growing and free setting both under glass and in the open. Fruit of medium size, round, smooth, deep-scarlet; averaging five inside and nine outside to a cluster. Ripens in the open first week in August. One of the best for all purposes.

*Chiswick Desert.*—Fairly robust. Fruit rather small, round, smooth, scarlet; averaging eight in a cluster; solid, of fine flavour. A heavy cropper inside, of no value outside.

*Duke of York.*—Strong grower, but not free in setting. Fruit large, flattish round, smooth, scarlet; averaging three to a cluster; of good form and fair flavour.

*Decauv Geoff* (fig. 1107).—Plant seldom exceeds 2½ feet in height; foliage large, dark, curled, the plant presenting a very striking appearance. The pale-yellow fruits are perfect in form, and borne in immense clusters.

*Early Ruby.*—A dwarf grower and very free set. Fruit medium, uneven, some fruits smooth, others corrugated, particularly outside, deep-red; averaging five to a cluster. One of the best for the open air, the fruit commencing to ripen late in July.

*Frostmore Selected.*—A strong grower and heavy cropper. Fruit medium to large, deep, round, slightly corrugated, handsome, scarlet; averaging six to a cluster; solid, good flavour. Good both under glass and in the open.

*Golden Jubilee.*—Plant robust and free bearing under glass, but no good in the open. Fruit large, round, deep-yellow suffused with red, smooth, handsome; averaging five to a cluster; solid, fine flavour.

*Golden Nugget.*—A moderately strong grower, free setting and distinctly ornamental both under glass and in the open. Fruit small, roundish-oval, smooth, bright-yellow; averaging eight to a cluster; solid, fine flavour.

*Ham Green Favourite.*—Moderately strong growing and more reliable than Chemin Rouge, which it resembles. Fruit large, flattish-round, smooth, deep-scarlet; averaging seven to a cluster; solid, good flavour. A heavy cropper inside and outside.

*Holmes’s Supreme.*—Of sturdy habit with rather finely-cut leaves; setting freely under glass and in the open. Fruit medium, round, smooth, bright-red; averaging nine
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decorative, with numerous bunches of elegant fruit having all the charm of a handsome Peach; flavour good.

Princess of Wales (fig. 1117).—Free growth. Fruit of medium size, smooth, round, bright-red in colour, and of excellent quality. A heavy cropper, and one of the best for all purposes.

Ravenscroft’s Red.—Moderately strong growing and free bearing. Fruit large, flat, corrugated, scarlet; averaging six to a cluster; solid, good flavour. A heavy cropper, and one of the best for all purposes.

Sunbeam (fig. 1116).—Robust in constitution, sets freely, and carries an extraordinary crop. Plant distinctly

solid, good flavour. A very heavy cropper inside and outside, where the fruit ripens late in July.

Peachblow (fig. 1116).—Robust in constitution, sets freely, and carries an extraordinary crop. Plant distinctly

flavour. Ready outside early in August. One of the best for all purposes.

Winter Beauty (fig. 1114).—A sturdy grower and very free setter. Fruit large, round, smooth, occasionally

slightly ribbed, bright-scarlet; solid, excellent flavour. Good for autumn sowing; crops heavily in the open.

Young’s Eclipse.—A moderately strong grower and a free bearer inside and outside. Fruit medium, round, smooth, scarlet; averaging five to a cluster; solid, of good flavour. Ripens in the open middle of August.

[W. L.]
CHAPTER XXIV.
FRUIT-PRESERVING.


Advantages.—One of the most important subjects connected with the cultivation and utilization of hardy fruits is that dealing with their preservation in a convenient form for use as food. Briefly summarized, the advantages of an extension of knowledge in this matter may be stated as follows:—

1st. To prolong the season during which fruit is available for use in the home or for sale.
2nd. To provide methods of utilizing the surplus produce in seasons of heavy crops.
3rd. To enable the fruit-grower to convert waste or unsaleable fruits into a useful and marketable product.

Wherever hardy fruit is grown on an extensive scale, it is essential that some provision be made for the purposes enumerated, and even when grown only to a moderate extent the matter demands some consideration. The whole subject is of great importance; in fact, the ultimate success of increased fruit-culture must depend mainly upon the attention that is paid to this department. It constitutes the key to several of the chief problems, for usually the difference between a profitable balance and absolute total loss is influenced by the care or neglect in making the most of all fruit produce, by means of the various methods of preservation.

At the present time the waste of fruit in both large and small establishments is deplorable in the extreme. A large proportion of this waste is either due to want of knowledge of methods that have proved satisfactory, or to ignoring them, under the impression that they are not adapted for general use in this country. In the "gluts" which occur periodically, especially with stone fruits, when the market prices are depressed to a point that will not cover the cost of gathering and carriage, many tons of good fruits are allowed to fall and rot on the ground. At the same time, every year enormous quantities of similar fruits, preserved in different ways, are imported into Great Britain, and find a ready market. From one of the recent Board of Trade returns we learn that over ninety million pounds of preserved fruits and vegetables were imported in 1899, a large proportion of which consisted of products that could have been profitably prepared in this country.

As regards fruits preserved as jam or bottled whole, British manufacturers hold their position satisfactorily, and some of the larger jam firms export to the colonies and other countries. In the processes of drying or canning, and in the utilization of otherwise waste fruits, American and Continental competitors have taken the lead, and developed an enormous industry. In the United States, where the advance within recent years has been most marked, the work was practically commenced by the efforts of individual fruit-growers to provide an outlet for surplus or waste. For a considerable period the main supplies were thus produced, and necessarily resulted in a great variety of brands and styles of preparation, which were confusing and objectionable to large buyers. As soon as it was found, however, that a demand existed for good samples of dried or canned fruits, factories were established, which in some cases have now assumed wonderful proportions, and the trade passed from the fruit-grower to another class of men who were dealers or preservers simply.

Mr. F. A. Waugh, in a recent work on Fruit Harvesting, has the following remarks on this subject, which illustrate the advance in the business:—"Formerly the home manufacture of dried Apples, &c., was common in all the farming districts of the United States—at least in the north—and home-dried fruit was to some extent an article of importance in the country stores. That day has passed. Home-dried Apples and Peaches went out with home-knit socks and home-made soap. There are still families who dry their own Apples, just as there are some who still make soap and knit socks; but for the most part these have all been given up. The change has been the same in all cases, and has resulted from the same causes. It is cheaper to buy soap than to make it, and it is equally easier to buy dried fruit than to dry it one's self. It is a question of division of labour. The man, or the stock company, that makes a business of drying fruits on a large scale can do the work to greater advantage than the farmer or the farmer's wife. His product is more uniform, better in appearance, and perhaps better in quality than the
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A home-made article, while at the same time it can be sold at a lower price. Fruit-drying or evaporating, therefore, has been wholly taken out of the fruit-grower's hands, and has fallen under the management of specialists."

This is a proof of the advance of our transatlantic cousins; but in Britain, where so many hardy fruits flourish, we have at present much to do before the first stage is passed. It is true that in many country houses it is customary to preserve a small quantity of fruits for use during the winter, but this does not affect the supplies materially; it is part of the domestic economy which obtains in well-ordered households. But there are numbers where nothing is done in this direction, and it is rare even in fruit-growing districts to find anything like an organized attempt to deal with the matter on a business basis.

The improvement effected in the needful appliances, and the invention of numerous ingenious contrivances to facilitate the work, now afford an opportunity to many who have hitherto been deterred from attempting fruit-preserving, bottling, or drying in a systematic manner and as a direct source of profit. One difficulty has to be faced by those who commence fruit-preserving in a small way as part of their business, and that is the competition with the established firms of repute, who have controlled the trade for many years. Amongst those who have started to place their produce on the market, there has been a prevailing idea that the only way to obtain a sale was by cutting the prices as low as possible. This underselling has proved disastrous in some cases, and has led to the production of inferior samples that have occasioned considerable prejudice against the smaller manufacturer. The policy is a mistaken one; there is a far better chance of success in seeking to establish a reputation for a really first-class article, and a local trade can thus be ultimately developed into one of much wider scope.

The present head of a large and profitable fruit-preserving business began as a fruit-grower in a small way some thirty or forty years ago, and when utilizing his surplus produce he aimed at the production of the best quality of preserves. The superiority was soon discovered by the consumers, with the result that, so far from reducing prices to undersell older firms, he has been able to command rates in excess of theirs throughout the greater portion of his career.

The co-operative system has been advocated as a means for enabling the smaller producers in a district to share in the advantages of utilizing surplus crops without incurring large individual expenses. If well organized and judiciously managed, there is no doubt that such a system might be rendered very beneficial. The cost of preparation would be proportionately reduced, and greater uniformity in quality and general appearance of the products would be ensured. But in certain localities this has not been found to work satisfactorily, and the growers have preferred to deal with their own fruit. In some cases this can be done with comparatively little preliminary expense for buildings, as, if substantial sheds or packing-houses already exist, a portion can be readily converted to the purpose of providing for the needful apparatus required in fruit-preserving. Several methods by which this can be accomplished will be indicated later in this chapter under the respective divisions, but with a moderate amount of ingenuity a fruit-grower should find little difficulty in adapting existing buildings for the work, or in devising cheap structures that could be utilized in different ways according to the season.

As previously indicated, however, there is ample room for the extension of the home production of preserved fruits, and if this could be carried out on definite lines generally, it would afford the greatest encouragement to small holders to increase their culture of fruit-trees, and would also enable landlords to assist cottagers and others in the same direction, with a better prospect of good results. From this point of view, the late Mr. W. E. Gladstone was undoubtedly considering the welfare of the people, and the best means of assisting fruit-growing as a special or additional industry, when he advocated the increased and more general production of preserved fruits.

Methods and Appliances.—To convey an adequate idea of what can be accomplished by due care in the economic utilization of surplus fruits, it will be necessary to review the principal operations by which preservation is effected, and to refer to the appliances that facilitate the processes. The methods which demand special notice here are as follows:—1, Jam-making; 2, Jelly-making; 3, Bottling; 4, Crystallizing and Glazing; 5, Marmalade and Chutney production; 6, Evaporating or Drying; 7, Canning; 8, Cider and Perry manufacture; and 9, Non-alcoholic fruit drinks. These methods may also be classified according to the form in which the fruit is used, as:
A Whole fruits (1–3–4).
B Fruit pulp (1–2).
C Sliced fruits (5–6–7).
D Fruit juices (8–9).

Jam-making.—This constitutes the most extensively adopted method of dealing with fruits both for home use and in British factories, and many thousands of tons are produced annually to meet the general demand. It is especially adapted for all the soft fruits, such as Strawberries, Gooseberries, Black and Red Currants, together with such stone-fruits as Plums and Apricots, and it is the most satisfactory means of dealing with these fruits immediately they are gathered. The method is essential wherever large supplies have to be utilized quickly to avoid loss, and it is equally necessary in small establishments, because, with Strawberries particularly, a large proportion of the crop is often ready for gathering at one time, being influenced by the weather conditions. As soon as the demand for the fruit in a fresh state is exceeded, there will either be a regrettable waste or jam-making must be resorted to promptly.

Whether on a large or a small scale the principle is the same, the fruit must be subjected to heat sufficiently long to sterilize it, but not long enough to alter its character or impair the flavour or colour. With the aid of a due amount of sugar employed in addition (which may vary from a weight equal to that of the fresh fruit to half as much again) such jam, carefully prepared and secured in jars with air-tight coverings over the mouths, should remain good for an indefinite time, certainly until fresh fruit is again obtainable.

On a small scale and for home use the operation is both simple and inexpensive, while at the same time it is as effectual as that carried out in a factory. A wide shallow stew-pan of copper or bell-metal is the only essential utensil, which can be had in various sizes at proportionate prices, but the smaller ones can be had for a few shillings. One of these pans 14 inches in diameter and 6 inches deep will hold 20 lbs. of fruit and sugar, and with the help of such a vessel a little experience will enable anyone to produce 1 cwt. of good jam per day. This applies to any of the soft fruits which will not require more than twenty minutes or half an hour’s exposure to the fire, but with stone fruits, which will need perhaps three-quarters of an hour, rather less could be prepared within the same time. A pan like that described is adapted for placing on an ordinary kitchen range, or it could be heated over an oil-stove, but the former is preferable, and where large ranges are available, two, three, or more of these pans could be heated at once, and it is quite possible without any special factory to produce a quarter of a ton of jam a day, or two to three tons in a week, which would suffice for most of the smaller fruit-growing establishments.

Where considerable quantities of fruit are converted into jam as a regular part of the business it is more convenient and economical to erect a building for the purpose, which need not be of a pretentious or costly character. Larger pans are then employed, which will hold from half to a hundredweight of fruit; they are double-cased and connected by pipes with a boiler so that a constant supply of steam is maintained at a high temperature immediately under and around the fruit. The advantage of this method is that the boiling is done rapidly, and there is not the danger of burning, which has to be avoided when the preparation is done over an ordinary fire.

An idea can be formed of the routine work in a large preserving establishment where the fruit is grown, from the following particulars of an extensive factory. The fruit is gathered in the early hours of the morning, when dry, by a number of women who come from the neighbouring country, and who are glad to have the opportunity of obtaining labour in the open air. At 8 a.m. the factory work-people arrive from the surrounding villages, the total number of hands in the height of the season being about five hundred. Those from a distance are lodged on the plantations. The hour for the first delivery of fruit to arrive at the factory is 8 a.m. This may consist of Strawberries, Red or Black Currants, and Raspberries, which are picked free from the stalks on the plantations, and are ready therefore at once for the boiling-pan,
ensuring the retention of flavour and freshness in the fruit. This is continued throughout the day, the average quantity of fruit gathered being from 15 to 20 tons daily. Should the fruit come into the factory in larger quantities than can be conveniently made at once into jam, it is put down in large stone bottles and casks, perfectly air-tight, for future use, this process being known as "pulping". The fruit turns out when required in a month's time as fresh and bright as when gathered, if the work is thoroughly done and immediately the fruit is received. The sugar used in the manufacture of these jams is known in the market as White Dutch Crushed, and no other kind, or any substitute such as glucose, is allowed on the premises. There are sixteen steam pans in use, each capable of turning out 1 cwt. of jam about every twenty to forty minutes, or from 20 to 40 tons of jam per day of ten hours.

The essentials to the production of the best results in fruit-boiling and jam-making are as follows. A steady, clear fire must be maintained wherever the ordinary methods are employed, i.e. those in which the pans are placed directly over the source of heat. To ensure this, attention must be paid to the fuel used, and in our experience the best results have been obtained by a mixture of hard coal and coke broken small, in the proportion of two-thirds of the former to one of the latter. This we have found suitable for all the principal operations to be afterwards described. In the boiling itself much care is also required, with slight occasional gentle stirrings and the removal of the scum which forms
on the surface by the aid of a wooden ladle. The stirring must not be done to excess, or the fruit is broken down unduly, an undesirable result, except where pulp alone is required. In the case of such fruits as Strawberries and Raspberries it is important to retain the form of the fruit as far as possible; but though this can be accomplished with the first-named fruits it is very difficult with the others. Whole-fruit Strawberry jam has gained for some firms a considerable reputation, and commands prices well in advance of the pulped products. Special sorts must, however, be used, to which reference will be made later in this chapter.

In the effort to produce a high-quality jam that will take a good place in the market it is important to turn it out bright and clear. Colour has a material effect on the selling value of fruit preserves, and a dull, muddy-looking compound has no chance side by side with a bright product which has a distinctly appetizing appearance. So well is this recognized that artificial colouring is resorted to for the purpose of improving dull-looking jams. These colouring matters are now manufactured largely, and analyses are published to show that they are free from all injurious substances, but the pure-fruit product must have the preference, and it only requires due care to ensure the desired effect. One of the chief points is absolute cleanliness in all respects, the fruit should be gathered when dry and clean, the utensils should be cleansed after every boiling, and the best sugars only should be employed. Common or imperfectly purified sugar will often spoil a large boiling of good fruit.

For all the best jams neat and clean glass jars should be used, and though this is an expensive item in the small quantities such as 1-lb. or 2-lb. vessels, it is a needful provision and helps the sale considerably. The cheaper jams and fruit-pulps that are sold in 3-lb. to 7-lb. quantities are usually placed in stone jars, and in some populous districts there is a large demand for this quality at low rates. Where glass jars are used careful filling is required to ensure a uniform appearance and to exclude air, but in all cases the latter must be ensured, or the jam will not keep well. The surface of the jam should be covered with a slip of specially-prepared, thin, oiled or waxed paper, and the mouth of the jars must be covered with bladder or vegetable parchment and tied down tightly and neatly. A tastefully-designed label indicating the character of the jam and the maker’s name should complete the operation.

The only other questions to be considered are those relating to the storing and packing. In storing, a cool dry place should be chosen, where a fairly uniform temperature can be maintained, and where the jam is not exposed to full light. Under such circumstances well-prepared jam will keep good for a great length of time, but obviously there is no object in retaining such preserved fruit until the next season, except that an unusually heavy crop one season may be followed by a poor one the next, when good prices can be obtained. But to take full advantage of such an occurrence it is necessary to prepare the preserve very cheaply, and even then, with the cost of storing, the possible losses, and the interest on the capital, it is not a very encouraging risk. Then, too, there is always the chance that a second “glut” may follow, which would mean a heavy loss. As a general rule, if jam is prepared so that it will keep sound for at least a year, it is all that is requisite, and most traders dispose of the bulk of the produce within a few months of the end of the fresh fruit season.

In packing, straw is usually employed, but the coarse grades of wood wool are now cheap, and are preferable for all small consignments of glass jars. With well-constructed boxes or
cases some dozens of 1-lb. or 2-lb. jars can be packed as securely as could be desired, and they can be sent with safety long distances by road, rail, or sea. In the latter instance, especially if the consignment is to pass through tropical regions, it is preferable to have double cases, as then the space between the inner and outer case can be packed with non-conducting material, which will ensure much better results when the consignment is opened at the end of the journey.

Jelly-making.—This is a more tedious and expensive process than that just described, but well-made fruit-jelly commands a good price, and the method is especially valuable as applied to some kinds of fruits which do not yield a jam that is readily saleable. Its greatest utility is, however, found in the fact that it is one of the best and most profitable means of dealing with the waste from other processes, or for converting into a market product refuse fruit that would otherwise be lost altogether. Beyond this, it is desirable wherever fruit-preserving is attempted on a systematic basis, to introduce as much variety as possible; one class of goods will sell when another will not, and frequently where high quality is aimed at they help each other. Therefore jelly-making should be recognized as an essential part of the preserving department, and the attention demanded to ensure the best results should be duly provided.

The apparatus and appliances already indicated will suffice for jelly-manufacture, though some of the larger firms that make a specialty of this department employ boiling-pan of a more costly character, lined with non-corrodable metals, but these are not essential, though they undoubtedly assist in the production of a high-class article. The principal requirement is, however, the greatest care on the part of the operator, with close observation, as experience teaches many little details that cannot be set down in writing. The object is to extract the largest possible portions of those compounds present in the fruit which constitute the pectin or vegetable jelly, together with the essential flavour and colouring principles that distinguish the particular fruit under treatment. Some kinds of fruits are notably abundant in pectin or pectin, and especially remarkable in this respect is the Apple, not only the cultivated varieties, but also the common Crabs. Indeed, Apples that from a horticultural point of view are considered so inferior as to be not worthy of cultivation, can often be converted into an excellent jelly. The paring and coring refuse from the preparation of Apples for drying is similarly productive when properly dealt with. Gooseberries, Red and Black Currants, with Plums and Quinces, are all utilizable in the same way with satisfactory results.

The first part of the work after cleaning and duly preparing the fruit so that no foreign substances be present to affect the flavour, is boiling for the extraction of the juice. In the case of jam-making the only object is to sterilize to assist in the preservation, and the operation is therefore performed as quickly as possible; but in jelly-making the boiling must be prolonged considerably. It is here that the judgment and experience of the worker are so important, for if insufficiently done the whole of the subsequent labour is thrown away. As much as two hours' boiling is needed for some fruits, such as refuse Apples, Crabs, &c., but this may be taken as a limit, and for Apples of less substance an hour to an hour and a half will suffice. For the more delicate fruits, such as Currants and Gooseberries, from half an hour to three-quarters will usually be enough to effect the desired object. In this first boiling no sugar is used, and the next part of the process is a careful straining of the prepared juice through a very fine meshed sieve or straining-bag. The subsequent clearness and brilliance will depend upon the way this straining is performed, as a very small amount of the solid substances will cause a cloudiness that detracts materially from the value of the jelly from a selling point of view.

The most critical part of the work is the second boiling, with the sugar, where the fruit-extract alone is depended upon for the formation of the jelly; an insufficient or slightly too long exposure to heat will effectually prevent the gelatinizing process. For some juices, such as Red Currant, a few minutes will suffice, while for others, such as Apples, from half an hour to an hour and a half will be needed. In every case the substance should be tested at frequent intervals by placing a little in a cold plate to see if it thickens. The quantity of sugar necessary will also vary with different fruits, from half the weight of the extract to an equal weight; or from about 5 lbs. to 10 lbs. per gallon. The principal details under this head will be given under the respective fruits later in this chapter; we are only seeking here to make the general process understood.

Immediately it is seen that the boiling has proceeded far enough, the concentrated juice should be poured into the glass jars placed in
readiness for the purpose, and if the work has been successfully performed the jelly should set in a few minutes. To avoid loss, if it is seen before the extract is poured out that it is not likely to set properly, a little of the purest gelatine may be added, and when the work is carried out on a large scale this is often adopted as a general precaution. With experience and care that course is not however essential, and the pure-fruit jelly is such a delicious substance that it is not desirable to introduce any foreign matter even though it be absolutely innocuous. Still, a considerable quantity of imitation fruit jellies is manufactured, and by means of artificial shading and artificial flavours, a large number of which are produced chemically, a substance of very good appearance and pleasant taste can be turned out, which may command a sale in preference to the genuine extract of the fruit by reason of its price. This is regrettable, because there is an ample field for the extension of fruit-jelly production, and a little experience in the comparison of the true article with the imitation will conclusively prove the superiority of the former from a dietetic point of view.

Marmalade.—This is practically a form of jam-making, in which the whole fruit is cut into thin slices and boiled with sugar until the solid portions are thoroughly cooked, and sufficient pulp is formed to render it agreeable. Though employed so extensively in the conversion of Oranges into a confection, this process is not applicable to hardy fruits grown in this climate, with the exception of the Quince. From this a richly-flavoured and highly-coloured preserve can be made at comparatively small cost beyond the value of the fruit and the sugar employed. The supply is always limited, and the demand is fairly good at paying prices for the best quality. Where it is sought to provide a general stock of preserves for sale it is advisable to have a few boilings of Seville Oranges in addition; Lemons also are occasionally employed in the same way. The clearest and brightest products appear to the best advantage in glass jars, but some of the large firms use 1-lb. white glazed earthenware gallipots in enormous numbers, the surface either plain or fluted, and suitably labelled.

Crystallizing and Glazing.—By far the most costly and troublesome process connected with fruit-preserving, is that concerned in the production of crystallized or glazed fruits, but at the same time there is no form which commands such large prices. At certain periods of the year, especially at Christmas, the demand is considerable, but large supplies are obtained from the Continent or America, and to compete with these the British manufacturers must be prepared to produce a first-class article and exercise the utmost taste in displaying the goods. The neat little boxes of crystallized fruits which reach our markets have the fruits carefully packed in layers separated by white paper, and, margined with delicately-stamped paper-lace, they have quite an artistic appearance. They serve as seasonable and attractive presents, and the extra care and taste bestowed upon them yield a large return in the higher price realized. It is only in this way that crystallizing can be made to pay, and that is one reason perhaps why it is seldom attempted here on a large scale. Still, so long as sugar is not excessively dear, it is a method that should be included in the operations of any producer, particularly as there is practically no limit to the time the fruit will keep, provided it is not exposed to damp or excessive heat. In consequence it is admirably adapted for exportation, as many of the American firms have realized in recent years, and it constitutes a growing portion of their business.

Almost any kind of fruit can be treated in this way, but those most usually employed are Green-gages, Apricots, Cherries, small Pears, and occasionally small Apples. The first three generally have their stones removed, while the others are cut into quarters, pared and cored. With all, the object is the same, namely, to substitute sugar-syrup for the natural moisture of the fruit, a process which can only be accomplished in a very gradual manner. The samples must be selected with great care also, as, if too ripe or not sufficiently ripe, they will not absorb the sugar freely enough to effect the desired purpose. It is customary to place the prepared fruits in clean willow baskets and dip them in boiling water until the fruit is slightly softened and a portion of the juice extracted. But though this is a safe process with regard to Apples, Pears, the firmer Plums, and Apricots, yet with the more delicate Plums, such as Green-gages, for instance, it requires to be done with the greatest caution or the fruit will be spoiled for the intended purpose, the skin being cracked or the substance softened to an undue extent. For some a few minutes will suffice, for others perhaps ten minutes or a quarter of an hour will be needed for the first soaking; but judgment must be exercised in all cases, as absolute rules cannot be laid down.

A thick syrup of fine white sugar must be
prepared, and, after the fruit has been placed in layers, in large shallow earthenware jars, poured over them slowly, so that all the spaces between the fruits may be filled. In this way the fruit is often allowed to remain a considerable time—not less than three weeks, and perhaps for a month or more. But in the meantime it will require to be frequently examined, and if indications of fermentation or mouldiness are perceived, the vessels should be placed on a stove and the temperature increased until the above tendencies are checked; this being repeated until the fruit is thoroughly saturated with the syrup. It is then removed, cleaned, and sorted.

To glaze or crystallize fruit that has been through this process, a hot syrup of the best sugar is prepared, and the fruits are dipped into it (either in sieves or baskets) until they are well covered; if to be glazed, they are dried rapidly in a cool, dry, airy place free from dust; if to be crystallized, they are dried very gradually in a warm position; should the process be not quite satisfactory the fruit may be dipped a second time.

Chutney.—Although this method is only suitable for two kinds of fruit, i.e. Apples and Tomatoes, it is of sufficient importance to merit a few words of reference, because it is a means that has been generally neglected, or performed in so unsatisfactory a manner as to excite a prejudice against it. The majority of Apples can be utilized in this way, and they need not be either the best fruits nor the best varieties from a garden point of view. As frequently prepared, the Apples, after being pared, cored, and sliced, are cut into small slices after the style of Marmalade, but we have found it far better to pass the Apple rings through a small mincing machine, which reduces the divisions to a uniform size, and small enough to be readily mixed with the other ingredients. What these should comprise will depend upon the taste of the producer to a great extent, but a small portion of finely-chopped Onions or Garlic, a little mustard-seed, and a pinch or two of ginger are essential, while other flavourings will suggest themselves. The whole should be thoroughly boiled for about two to three hours, and then placed in glass or earthenware jars, and tied down as with jams and jellies.

Bottling Whole Fruits. — However skilfully fruits may be preserved with the aid of sugar it cannot be done without, to some extent, sacrificing the essential flavours of the finest sorts; any system, therefore, which can effect the same purpose without the addition of sugar will always command favour with a great number of persons. For several years the bottling of fruits has been extending as a portion of the preserving industry, and the only matter which checks its development in a much more rapid degree is the cost of the bottles. Some continental glass manufacturers are now entering into keen competition with British makers, and it is probable that prices will be reduced, as in many cases they are out of proportion to that of other cheap glass-ware in the market. It is of course requisite to have well-made bottles of clear glass, and if they could be charged and allowed for when returned in the same way that beer bottlers do, it would facilitate this important work considerably.

The method is particularly adapted for Plums, Green Gooseberries, Damsons, Cherries, and Red Currants, and when well-selected fruits are employed and care is exercised in filling the bottles a very attractive result is obtained. The quantities displayed in shop windows prove that the retailers find a substantial demand, and also that they appreciate the show value of such goods. But it is not only on a commercial scale that bottling is important, it is a method that can be employed by the smallest fruit-growers and in the houses of farmers or cottagers. The desirability of extending the system in this direction has been recognized by some of the horticultural societies and county councils, and either prizes or other inducements have been offered to encourage competition amongst cottagers and those in the occupation of small holdings.
The process is very simple, and is essentially the same whether provision is being made for a dozen bottles or as many thousands. If the fruit to be dealt with is gathered clean and dry from the trees, and the bottles are in a similar condition, no further preparation is required. It can be placed at once in the bottles, and all is ready for the final operation. A wide boiler must be used sufficiently deep to hold water up to the necks of the bottles, or about a foot in depth, a convenient size of bottle being from 10 to 11 inches high, with the mouth 2 inches in diameter. It is well to have a layer of canvas or some similar material at the bottom of the boiler, and this is equally useful between the bottles, as it will assist in reducing the danger of breakages.

The fruit should be placed in the bottles, the mouths of which should be left open. They are then placed in the boiler, which is filled with water to the desired height, and then it must be slowly raised to the boiling-point. As a rule, by the time the water is boiling the fruit is sufficiently cooked for keeping; it is not advisable to overdo it, or when turned out for use subsequently it will be soft and flavourless. The form of the fruit should be preserved, as if any of it splits, or the skin of Plums is broken, its appearance is spoiled and the selling value greatly diminished. A kettle of boiling water must be at hand, and as fast as the bottles are removed from the fire they should be filled with this water and immediately tied down with bladder, or corked and sealed with common sealing-wax or bottle-wax, in such a manner as to effectually prevent the admission of air; the fruit will then keep for a year or more.

Several manufacturing firms have brought out simple, cheap appliances for bottling fruits on a small scale. One of these is a round metal boiler that will contain about a dozen bottles at a time, and is adapted for use on an ordinary stove or fire. This is sold with two dozen patent bottles at as low as 35s., the bottles themselves being fitted with metallic tops, which are secured by spring clips that are easily removed and replaced though they answer all the purposes of an air-tight cork or bladder top. In some of these apparatus a kettle is connected with the side, and steam thus takes the place of a direct application of heat from a fire. Whatever method is adopted the essential part of the business is that the boiling should not be done too rapidly, and the more gradually it is done within reason the more likely is the fruit to retain its form, colour, and flavour, so that when required for use it should as nearly as possible resemble the fresh product.

Fruit Evaporating or Drying.—As regards its economic bearing upon the fruit culture of other countries, but especially in America, Germany, and France, the process of preserving fruits by evaporating or drying is by far the most important and extensive. In Great Britain at present it has only been tried in an experimental or tentative manner, but some have already proved that it can be utilized to good purpose, and there is an increasing demand for information of a reliable character, i.e. that resulting from experience. The Royal Agricultural Society and the Royal Horticultural Society have endeavoured to draw attention to the matter in England, both by the institution of experiments and by the publication of reports. Individual experimenters and a few firms have also taken up the work, and evidence is now accumulating bearing upon the possibility of making the operation profitable in this country.

A few years ago Mr. D. Pidgeon contributed a report to the Journal of the Royal Agricultural Society, which summarized the case as regards the United States, and it is interesting to compare what he says with the conditions that prevail in Great Britain:—“Why is the British farmer so slow and his transatlantic cousin and competitor so quick in adapting himself to altered conditions of cultivation? The entry of the Great West in the character of a wheat-grower upon the agricultural stage of the world created a depression in the agriculture of the Eastern States of America, no less marked than that which followed from the same cause in England. New England no more than Old England could after that entry any longer
afford to raise the traditionally important crops. A change of front became inevitable there as here, and was made with a rapidity which England might envy, but has not approached. In Massachusetts the depression was great and the population declined, yet in the same period, owing to the increase in the production of milk, eggs, vegetables, and fruit, the total value of farm produce for the state was nearly twenty per cent greater. Western New York, again, was itself formerly the granary of North America, and Rochester was a city of mills. All has been changed by the introduction of Western wheat. Wheat-fields have become orchards. Throughout twelve of the most fertile counties of Western New York the cultivation of fruit, especially Apples, has superseded that of every other crop. The orchard products of New York State have been valued at nine million dollars in one year. The greater part of these Apples are grown round Rochester, where, within a radius of a few miles, 2000 fruit-drying establishments are now in operation. Only by the aid of these evaporators could such a condition of cultivation be maintained. Thousands of tons of Apples are prepared annually from grades of fruit formerly wasted or allowed to rot on the ground. The fruit-drier and the extension of fruit-farming have gone hand in hand, and following naturally upon their union the dried-fruit merchant has appeared and flourishes. It is estimated that during the autumn and winter of one year about thirty million pounds of dried Apples were produced in the district named, and no less than twelve million pounds of dried cores and parings were exported from America in the same year. This is an example of one kind of fruit only, as Peaches, Plums, Pears, and other fruits are also dried, though in smaller proportions. While in California the dried-fruit trade, especially as regards Prunes and Peaches, has assumed enormous dimensions."

In France the drying of fruits has for many years been one of the leading industries in some districts. With regard to Prunes alone (the French Plums imported so largely to this country) it has been stated officially that in one department, that of Lot-et-Garonne, the annual commercial value of this fruit dried there amounts to £400,000.

The drying trade in Germany has been greatly increased in recent years, for not only has fruit been largely dealt with, but vegetables have also received much attention. Dr. J. A. Voelcker, who a short time since undertook an inspection of the principal factories, thus reports concerning them and the trade generally:—"In Germany, unlike England, from the beginning of November until the end of April there are no fresh vegetables to be had. Nor is there any fresh fruit until the end of May or the beginning of June, when Cherries come in. Germany with its protective tariff is not, as we in England are, able to constantly receive fresh fruit and vegetables from other lands, nor, on the other hand, is it so overrun with foreign produce to the detriment of the sale of its own. Hence the preservation of fruit and vegetables in the dried state acquires a greater significance in a country like Germany than it would with us. As a further proof of the importance of the subject in Germany it is sufficient to mention that the army and navy are provisioned, alike in times of peace and war, with dried fruit and vegetables prepared by the evaporating process; so also is the merchant service to a very large extent. The steamships of the North German-Lloyd and the Hamburg-American Line are similarly provisioned, and I was informed at the time of my visit to a certain factory, where fruit and vegetable drying was conducted on a large scale, that upwards of 20,000 people were being fed daily at the Berlin Exhibition on the produce of that establishment. As a contrast to this, I may say that the result of certain inquiries which I made in England showed that in the British army and navy the quantities of dried fruits and vegetables used are quite small, and that the contracts for these are mainly in the hands of French and German firms."

From these statements it will be seen that the evaporating process plays a highly important part in the business of the world, that it renders substantial assistance to fruit-growers, and confers a benefit on the people generally in providing a means for the utilization of much produce that would otherwise be wasted. There have been strong prejudices against its employment in Britain, and some, who have only given the system an imperfect trial, have condemned it as unprofitable upon limited or unreliable evidence.

A few years ago it was only possible to obtain large expensive fruit-evaporating machines, and some of them were of doubtful efficiency. Now they can be had in sizes ranging from those suitable for a cottage home up to machines adapted for large fruit growers, from which upwards of a ton of dried fruit and vegetable produce can be turned out in one day. The prices are proportionate, and between the extremes of 30s. for the smallest size and
£120 for the largest, there are many intermediate sizes and prices. The principle is alike in all, but the modes of application employed divide the apparatus into two classes, each of which have their advantages and their advocates. The drying is effected by passing highly-heated pure air through and over the fruit; but while in one series of machines the heating power is at one end of the apparatus containing the drying-trays, the extreme end being raised above the level to ensure the circulation of the air, in the other type the stove is immediately below the trays, which are placed in a vertical framework above it, but separated by a hot-air chamber from the fire itself. The first-named or horizontal forms comprise the machines of the Dr. Ryder’s patent and Invicta types, which are employed in America for the more extensive factories. The vertical forms, chiefly modifications of the Waas patents, are in favour in Germany, and being obtainable in small sizes are those chiefly used for home-drying on a moderate scale. In both systems wire trays are used for holding the fruits, thus permitting free access of air to them on all sides.

The preparation of the fruit for drying requires considerable attention, and much assistance has been derived from the production of numerous appliances which render the work of paring, coring, and slicing in the case of Apples, and the removal of the stones in Plums and similar fruits, an expeditious and simple process. The Apple-parers can be had in several forms and sizes; one type is an ingenious little machine, the “Gnom”, which can be screwed on to a kitchen table, and which pares, cores, and slices at one operation. It can be bought at as low a price as 3s. In the larger machines increased strength is obtained, and contrivances are added by which the cores are forced off automatically, the peelings are cast on one side, and the Apples are cut into slices instead of into a continuous ring. The fruits can only be done singly, but with a little experience in the “feeding”, as much as 80 bushels of Apples a day have been prepared by the larger machines by hand-power, which has been increased by steam-power to 100 bushels a day. But this has been accomplished in the American factories under special circumstances, and the average amount of work that could be performed would be much below this.

Still, it is surprising how rapidly the work can be done after some practice, as even with the smallest machines, by continuous application, as much as a bushel of medium-sized Apples per hour can be thoroughly and carefully prepared.

A simple but effective machine is used for stoning Cherries, which can be had for 2s. or 3s., and this might be used for Damsons or similar small fruits, which when dried have an undue proportion of stone as compared with the flesh.

Apples can be dried in several forms, but the rings are usually preferred, as they are the most readily prepared; it is also a convenient form in which to pack them for storage or export. Whole Apples can also be dried after being peeled and cored, but they require a longer time, and consequently more expense in fuel to produce satisfactory results, while the additional prices obtainable are hardly commensurate with the increased outlay. Still, some prefer this style to the rings, and a limited quantity should therefore be produced. Occasionally Apples are prepared in a third way, namely, peeled and cored and then cut into quarters, which may be regarded as intermediate in cost between the whole fruits and the rings.

One difficulty has to be contended with, especially in the case of Apples, that is, liability of the dried product to become discoloured after it has been made for a short time, unless it receives some preservative treatment previous to packing. In America the sulphuring process is commonly employed, namely: immediately after the drying operation is completed (or while it is proceeding) the Apples are exposed to the fumes of sulphur, which ensures a clear and bright appearance, while at the same time preventing fungoid attacks. But except in the hands of the most experienced workers, this is a source of danger to the dried product, in two ways: one is, that the true flavour may be partially or wholly destroyed; and the other is, that a little excess will impart a distinct odour and taste of sulphur to the fruit. As a substitute the rings, &c., are sometimes allowed to
soak in water containing about 1 oz. of salt to 3 qts. of water for about five minutes previous to being placed in the evaporators.

It is rarely necessary to dry Pears in Britain, there is usually sufficient sale for them in a fresh state, but when it is desired to dry them they require to be steamed for about ten minutes after being peeled, whether they are used whole or cut into quarters. Obviously the best-quality Pears are too valuable to be treated in this way, and only the inferior sorts should be used, and these before they are ripe.

Stone fruits require careful selection, and as regards nearly the whole of them the work in the apparatus is greatly aided if the fruits can be previously exposed for some hours out-of-doors to a bright sun in a dry but not dusty position. This is an advantage which the evaporators in America and in France often possess over the British manufacturer. It diminishes the time and expense of the operation and ensures a better product. To compensate for this, extra care must be devoted to the selection of the varieties, to gathering the fruit at the right stage, and to the regulation of the heat in the early part of the process. Plums should be ripe without being dead-ripe, as if too far advanced they are either liable to split or there is a deficiency of substance in the result. Thin-skinned and delicate Plums are useless for this purpose. Apricots as produced in Britain would never pay for drying; if not used in a fresh state they are preferably preserved in the form of jam. Cherries also are more frequently bottled, and drying is scarcely applicable unless the crop is very heavy. Strawberries, Raspberries, and Gooseberries do not pay for drying here, and the real benefit of the method can only be fully secured in the case of Apples and Plums, both of which, however, are very important crops.

The fuel to be employed will depend upon the machine used. In some of the smaller machines it will be necessary to use coal alone, but in most of the others a mixture of small coal and coke gives the best results. According to the different sizes the upright or Waas patent evaporators will consume per 12 hours from 18 lbs. to 1 cwt., with a drying-tray surface of from 100 to 233 square feet, the last-named being equal to the production of 4 cwt. of dried stone-fruits or 400 lbs. of dried Apples as rings in the day. The Dr. Ryder's patents consume about the same proportion of fuel, namely, 1 cwt. to 4 cwt. of fresh Apples, but these can be had with a larger drying area, namely, 800 square feet (120 trays), in which over a ton of Apple-rings can be dried in 12 hours.

In filling the trays the prepared fruits should be arranged as evenly as possible, so that all may be exposed equally to the heated air. Apples should be placed near to the fire at starting, and gradually shifted upwards, whereas Plums and all other stone-fruits are better started at the top of the Waas machines, or at the end of the Ryder apparatus, away from the source of heat, and gradually brought nearer or lower as the work proceeds. In the upright evaporators the removal of trays, and the insertion of fresh ones at any part of the pile, is easily effected by means of a lever and cross-bars back and front, which catch the projecting ends of the trays, and as they are raised, those beneath them can be taken out and others put in their places. A good deal of judgment is needed in thus regulating the position of the trays, but it
is a matter which can only be learnt by experience.

The temperature can be determined by means of a thermometer placed over the hot-air chamber, and this should be at least 180° Fahr. to start with, for either Apples or Plums, ranging up to 212° Fahr.; but a steady heat of 200° Fahr. will do better work than one that fluctuates between the extremes. It is advisable to finish the fruit right off at the maximum temperature, as, if it is allowed to fall towards the close of the drying, the fruit will sometimes become soft, and does not keep so well.

Since these machines are equally well adapted for drying vegetables, and as they can be frequently applied to this purpose with advantage after the fruit is disposed of, a few words may be admissible here respecting the best methods of dealing with them. Potatoes, Carrots, and Onions are peeled and sliced, and steamed or slightly boiled for about 5 minutes, then drained and placed at once on the trays. Dwarf Kidney-beans or Scarlet Runners must be young and tender; they are cut into thin slips, steamed, drained, and placed in the trays in thin layers. Cabbages have all hard stem or midribs cut out, and are then cut into thin strips; Cauliflowers also have all stem removed, and just the head divided into small pieces. Celery is used in strips, and, like the two preceding, is steamed previous to drying. For herbs the process is especially useful, as, if they are gathered quite clean, no preparation is needed. Parsley, Mint, Thyme, and Sage pay well for drying in quantity, though, for convenience in bottling or placing in packets, they may be somewhat reduced before they are placed in the machine.

The following table, giving the comparative weights of fresh and dried fruits and vegetables, the temperature needed, and the length of time required to complete the work of evaporating in a satisfactory manner, combines the results obtained by Dr. J. A. Voelcker in the Leicester experiments, with those obtained by several other operators in this country, corrected by personal experience where necessary. In such results there must always be some variation depending upon the machine employed, the fuel used, the condition of the fruits at the time, and the kinds dealt with.

In the Leicester experiments a Waas evaporator was used, while in those of the Royal Horticultural Society one of the Ryder type was employed. Where there is much divergence in the results, the figures given by American dryers are added:—

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Temperature</th>
<th>Hours</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fresh</td>
</tr>
<tr>
<td>Apples—Whole</td>
<td>180°-212°</td>
<td>4-6</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Sliced</td>
<td></td>
<td>3-4</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Rings</td>
<td></td>
<td>2-3</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Pears—Whole</td>
<td>180°-212°</td>
<td>8-10</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Sliced</td>
<td></td>
<td>5-8</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Plums (not stoned)</td>
<td>180°-212°</td>
<td>12-20</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Cherries and Damsons</td>
<td>140°-160°</td>
<td>4-6</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Apricots (stoned)</td>
<td>180°-212°</td>
<td>10-12</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Strawberries</td>
<td>140°-160°</td>
<td>4-5</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Raspberries</td>
<td>140°-150°</td>
<td>4-5</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Peaches</td>
<td>180°-212°</td>
<td>10-12</td>
<td>100 lbs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Temperature</th>
<th>Hours</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fresh</td>
</tr>
<tr>
<td>Potatoes</td>
<td>200°-212°</td>
<td>3-4</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Carrots</td>
<td>200°-212°</td>
<td>3-4</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Onions</td>
<td>200°-212°</td>
<td>3-4</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Kidney and Runner Beans</td>
<td>190°-200°</td>
<td>2-4</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Cabbages</td>
<td>190°-200°</td>
<td>2-3</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Celery</td>
<td>190°-200°</td>
<td>3-4</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Cauliflowers</td>
<td>190°-200°</td>
<td>3-4</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Peas</td>
<td>190°-200°</td>
<td>2-3</td>
<td>150 lbs.</td>
</tr>
</tbody>
</table>

Apart from the actual care essential in the operation itself, much of the pecuniary success of drying fruits or vegetables will depend upon the way they are afterwards placed upon the market. Apples, in whatever form, can be conveniently packed in wooden or tin boxes lined with paper, but the rings or whole fruit are nearly always sold in the shops loose by the pound. Dried Plums, Apricots, and Pears are also placed on the market in the same style and retailed loose. Some of the best-quality French Plums are, however, usually packed in wide-mouthed glass jars with metal tops, and, being tastefully labelled, form attractive goods at substantial prices. They are frequently put up in 2-lb. jars, and sold at about 10d. or 1s.

As regards the actual expenses and profits attendant on fruit-drying, it is possible from the foregoing facts to arrive at an idea of both the outlay and the returns. The chief factors in the case are the prices of fuel and the economy with which it is employed, the market value of the fruit at the commencement of the work, the skill exercised in the utilization of the waste (the cores and parings in the case of Apples), and the conditions of the dried product when sold, so that it may take a place amongst the numerous competitive imports from other countries. As an example, if 100 lbs. of medium-size Apples are taken, as shown in that table, 12 lbs. of dried produce may result. The cores and peelings, as removed by a machine, amount to about one-fourth of the total weight of fresh fruit. We thus have 12 lbs. of dried Apples,
saleable at 4d. per lb., and 25 lbs. of refuse, which, with the addition of sugar, would yield the same amount of jelly. Deducting the value of the sugar employed and of the jars needed for the jelly, this would be worth about 2d. per lb. net. The result would thus stand:

<table>
<thead>
<tr>
<th></th>
<th>s.  d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 lbs. Dried Apples at 4d.</td>
<td>4 0</td>
</tr>
<tr>
<td>25 lbs. Apple Jelly at 2d.</td>
<td>4 2</td>
</tr>
<tr>
<td>Total</td>
<td>8 2</td>
</tr>
<tr>
<td>Value of 100 lbs. fresh Apples, 3d. per lb.</td>
<td>4 2</td>
</tr>
<tr>
<td>Balance</td>
<td>4 0</td>
</tr>
</tbody>
</table>

From this balance the cost of fuel, labour, and packing, and the interest on the capital expended in the purchase of evaporating machines, must be deducted, which may be placed at from 2s. to 3s., and the net result would show that the value of the Apples has been increased by about 25 per cent. At 3d. per lb. (the value of the Apples taken above), the price per bushel (44 lbs.) would be 1s. 10d.; but it sometimes happens that when sent direct to market in a season of abundance that even good Apples will not bring as much as that clear of all expenses, and the inferior samples that could be utilized (provided they are not decayed) would often be hardly saleable at 1s. per bushel. It is here that the advantages of drying fruits with the attendant processes comes in. Much the same could be shown with Plums, as, though there is not the waste to be utilized as a secondary product as with Apples, the percentage of weight in the dried result is so much larger that it comes to nearly the same in the end. It is evident also that the more extensively the operations are being conducted, the better chance there is, with good management, of showing a profitable margin.

There is another point in favour of the dried fruit which becomes highly important when large quantities are being dealt with, and that is the saving effected in the cost of carriage. An example of this is afforded by the fruit sent from America. The cases of dried Apples, containing 50 lbs. of fruit, have been delivered in Liverpool at 1s. 3d. per case, whereas it is estimated that the same quantity of fresh fruit in barrels will cost 10s., or of canned fruit 8s. 9d. Though this does not apply with quite the same force to British dried fruit, yet a saving of something like 50 per cent could be effected in the expenses of carriage as compared with fresh fruit. For winter use and in seasons of scarcity the dried fruits would always command a market.

Canning.—Though extensively adopted in America, canning is never likely to be carried out in Britain on a large scale, chiefly because we have not the same class of fruits to deal with, and also because more convenient means are available. Pears, Peaches, Pine-apples, and other soft fruits are principally treated in this way, the preparation being similar to that for drying. The fruits are subjected to a temperature of not less than 212° Fahr., but only for a sufficiently long period to ensure thorough sterilization, as, if unduly prolonged, it results in the softening of the fruit. Tins are employed that may hold from 2 to 5 lbs., and the hot fruit is placed into these rapidly, the cap being soldered down immediately to prevent the admission of air. Sometimes a little sugar is added.
to act as a preservative and also to improve the flavour, but this must be done with judgment or a syrup will result that will conceal the distinctive flavour of the fruits.

**Miscellaneous Methods.**—Besides those already described, there are various other means for preserving or utilizing our hardy fruits. Amongst these the pulping previously referred to incidentally is important, especially with Apples. The pulp of Apples is employed as the basis of enormous quantities of cheap jams, which are either flavoured with other juices, or mixed with the whole fruits of such kinds as Strawberries, Raspberries, Blackberries, Red and Black Currants, a comparatively small quantity of the flavouring fruit sufficing to constitute the mixture. The extraction of fruit juices for various purposes is also of some commercial value, and large quantities of Black Currants have been bought up of late years for such extracts.

Another branch of manufacture has been developed in the production of non-alcoholic drinks flavoured with fruit juices. Cider and perry are receiving more attention now, and the adoption of improved methods with carefully-formed blends, and the latest scientific aids in the fermentation, have resulted in an improved quality. The subject is too large a one to enter upon here, but there is no question that there is a demand for the best brands of cider, which might be increased by an extension of the same systems on a scientific basis. The old rough-and-ready methods sometimes resulted in a liquor worth drinking, but very often the product was not fit for human beings, and it is this uncertainty which has caused a prejudice against cider.

**Hardy Fruits—Varieties—Modes of Preserving.**—In all the methods of preserving fruits already described, the measure of success attainable must partly depend upon the varieties grown or utilized. We therefore now propose to point out the special uses of each kind of hardy fruit, and at the same time indicate the varieties that have been found to give the best results. It is necessary to keep this in view in the formation of any commercial fruit plantation, because the greater the number of ways available for marketing fruits, the better chance there is of substantial results.

**Apples.**—It is most profitable in these times to grow only such varieties of Apples as will, by reason of their size, colour, and quality, ensure a ready sale fresh, at fair prices. There are plenty to select from which combine these properties in a high degree, and where land is being freshly planted those are the sorts to rely upon, as indicated in earlier chapters of this work. But there are thousands of acres occupied with Apples of inferior quality compared with those now available. The destruction of these old trees is not always possible for the occupiers of the land, and even where it is, the expense of "grubbing" out an old orchard and preparing it for other crops is too heavy to be undertaken in a time of agricultural depression. If the tenants cannot face this, neither can many of the landlords at the present time, and so the old orchards are allowed to exist, and the fruits are used or sold in seasons of moderate crops, while in times of abundance a large proportion is wasted. The inability to replant or renew an orchard is no excuse for the neglect often seen. The actual annual expense of keeping a plantation in fair condition is not so great that it cannot be provided by any occupier.

These old neglected trees and poor varieties often yield heavy crops of small Apples that would not pay for carriage to market in that form; in fact, they are usually practically unsaleable, and, except where cider-making is followed out systematically, the greater portion of such crops is absolutely lost. With the appliances now at command, and with the demand existing for preserved fruits in various forms, this waste might be turned to good purpose. Then, too, even with the best varieties in time of heavy crops there are always large numbers of small fruits which cannot be marketed to advantage, and if thinning is resorted to, the fruits removed may amount to a considerable weight in a large plantation. Yet the whole of this surplus or waste produce might be turned to good account, and the methods applicable are those already described in general terms, namely—1, drying; 2, Apple pulp or jam; 3, Apple jelly; 4, Apple chutney. For the first-named process the larger fruits should be selected; for the second, any sort or size can be used, either alone or in mixture; for the third and fourth it is preferable to have the varieties separated for each boiling, unless a large and equal blend can be formed, so that both colour and flavour may be uniform.

**Jelly.**—The great advantage of this process is that the refuse coring and parings from the drying can be readily converted into an excellent preserve. The smallest Apples can be similarly utilized without any preparation beyond cleaning. The common wild Crabs, and the cultivated ornamental Crabs, such as the Siberian,
the John Downie, and the American, can be employed in the same way, and all yield an admirable result. The only fruit which should be excluded from this method is that which is partly decayed. The Crabs and the smaller hard green Apples as a rule afford the best-coloured and most highly-flavoured jelly. But amongst Apples there is a considerable difference in the proportion of this substance obtainable under the best treatment, and it also varies somewhat in different seasons. The best general guide is that the early soft Apples and those which do not keep well are the least satisfactory. The process is the same in every case, but the time required may vary slightly for different varieties. The simplest way is to cut the Apples into quarters, place them in the stew-pan, and cover with water. This should be allowed to simmer slowly over a clear fire for about an hour, then strain the juice through a fine sieve or cloth without pressing, and to every gallon of liquid add 8 to 10 lbs. of sugar and boil rapidly for an hour and a half. At intervals a little should be tried, by pouring it in a plate to see if the process is effectual, and when that is found to be the case, i.e. that the gelatinizing process is complete, it should be poured at once into the jars and glasses and allowed to “set” and cool before being tied down.

An excellent chutney can be formed of Apples as the basis, the fruit for which must be prepared by coring, paring, and slicing, then passing the rings through a mincing machine. To this small quantities of vinegar, sugar, mustard seed, finely-cut onions, cayenne, ground ginger, salt, and stoned raisins must be added, the whole boiled for three hours, and then placed in glass or earthenware jars. The proportion of the different ingredients may be as follows:—namely, 12 lbs. of Apples, 2 lbs. of sugar, 2 quarts of vinegar, and the other portions in small amounts according to taste. It can be very well prepared in two forms, like many sauces—i.e. mild and piquant—by regulating the mustard seed, cayenne, and ginger accordingly. This is a convenient and useful mode of utilizing Apples, and there is an increasing demand for it.

For crystallizing or glazing, only small fruits with a moderately soft or crisp flesh should be used; those with hard or fibrous flesh are worthless for the purpose. They may be cored and pared, and prepared in that state, or they could be cut into quarters if of rather large size, before being subjected to the syrup-absorbing process already described.

Pears.—Dried Pears are not very satisfactory, they are frequently insipid, and it is seldom that they are in sufficient quantity in this country to be unsaleable in a fresh state. Even in America, where they are dried to some extent, this is a secondary means of disposing of them, as canning takes the primary place. It is possible that the latter process might be profitable here, where crops are very abundant and the sale limited, but prices are low for canned fruit, and the carriage is a heavy item on Pears prepared in this manner. Some of the small Pears with a flesh free from “grit” or fibre, and possessing a marked flavour, are well adapted for the crystallizing or glazing method of preserving, as, if the distinctive aroma can only be partly retained, a delicious sweetmeat is formed. These, with other fruits similarly prepared, made up in ornamental boxes that could be sold at about 1s. in the shops, would be in demand at Christmas, and might well compete with the Continental produce. Pears about 2 inches in length are generally crystallized whole, and these are preferred; but larger sizes are halved or quartered.
Quinces.—Though cultivated to a limited extent Quinces are worth more attention, as there is a steady demand for the fruits, which will frequently sell readily at 8s. per bushel for preserving. There are now several varieties in cultivation which differ in their properties, the Portugal being one of the best for most purposes. The flesh has less astringency than most of the others, and in the operation of boiling, the colour is changed to a deep-reddish tint. The Apple-shaped Quince is also a good one, possessing abundant pulp and a fine flavour.

One of the richest preparations is that of marmalade, for which the fruits are pared and cored, and cut into small thin slices. This is boiled in water for two hours, after which sugar is added at the rate of 1 lb. to each 1 lb. of pulp, and boiled again for an hour and a half. Placed in glass jars and tied down securely, this will keep for a great time; it has a very pleasing appearance, and sells at a good price. An excellent jelly can also be obtained from Quinces, with the addition of an equal weight of Apples, prepared as for the marmalade. The mixture should be boiled for an hour and a half, then strained and 2 lbs. of sugar added to each quart of juice, and boil again for an hour and a half. This will possess all the distinctive colour and flavouring of the Quince.

Stone-fruits.—The majority of the stone-fruits can be utilized in a variety of ways, each of which has its own special recommendations, and all are applicable in Great Britain, though not always with an equal degree of profit. Still, there should never be adequate reason for the waste which is a frequent cause of comment and regret.

Plums.—In cases of very large crops drying is the most inexpensive and convenient means of disposing of the fruit, and the work has been performed in this country on several occasions with a considerable measure of success. One essential is to select Plums with tough skins that will not readily crack. A celebrated Plum for drying in France is the Prune d'Agen, which is also known as Prune d'Ente and Robe de Sargent. This variety succeeds well in England, and is a blue-black Plum of good quality, which ripens in September. Enormous quantities of this fruit are sent to Britain every year. Another good French Plum much valued for drying is St. Catherine, which also succeeds in this country, as well as a third Continental favourite for the same purpose, i.e. Quetsche. The Bordeaux Prunes are said to be the product of a Plum called St. Antoine, a variety which is not generally known in Britain.

In California the varieties which have given the most satisfaction for drying, in addition to the above-named, are the Italian Prune or Fellemberg, the Silver Plum (which is said to be a seedling from Coe's Golden Drop), the Bulgarian, the Hungarian, the Hungarian Date, and the German Prunes.

In England some of the varieties which have proved most profitable for drying are Prince Englebert, Monarch, Diamond, Victoria, and Pershore, but there are many others well worthy of trial for the same purpose.

All Plums should have the stalks removed,
and be placed in the trays with the apex downwards. They require to be exposed to the heat gradually; in fact, some recommend the removal of the trays occasionally to allow the fruit to cool, and thus harden the skin until it can be seen that shrivelling has commenced, when the fruit is safe from bursting. The length of time required to complete the drying of Plums varies to some extent according to the variety employed, and it is not advisable to attempt drying several varieties at the same time, as some will be finished hours before others. The larger Plums with thick skins, like Monarch, need a longer time than the smaller sorts with more porous skins. Damsons are well suited for drying, especially the larger sorts, such as Bradley's King, which yields a fair proportion of produce.

Bottling is well adapted for the smaller Plums and Damsons, also for Bullaces and the little-known Mirabelles and St. Etienne. They require great care to prevent the too rapid rise in the temperature, or the fruits burst. The same rule applies to most of the fruits used for bottling; the water in which the bottles are placed should be brought very gradually to the boiling-point, and for Plums an hour and a half to two hours may be allowed. When the bottling is effected in a small apparatus heated by steam a longer period is required. Red or Yellow Plums are generally preferred for bottling.

Another favourite mode of utilizing Plums is in the form of jam, and some sorts yield a very rich preserve. Equal quantities of fruit and sugar should be taken, and a quick boiling of three-quarters of an hour usually suffices to ensure a thoroughly-cooked product that will keep well. The varieties with the best-coloured flesh—other qualities being equal—aid in the manufacture of an article that will take a place in the market, and the free-stone varieties are also preferable. As regards the colour of the flesh, examples of the richest may be found in Belle de Septembre, crimson; Coe's Golden Drop, or Autumn Compôte, golden yellow; Green-gage (delicate-green); and the Damsons for a very dark and rich red.

Most Plums are rich in the substance which is converted into jelly on cooking, and Professor Church has pointed out that although in the Green-gage only 1½ per cent of sugar has been found, yet the same fruit contained “not less than 10½ per cent of pectose substance or vegetable jelly”. This is about double that contained in Apples, so that the production of jellies from the Plum is a comparatively simple matter. The fruit should be boiled alone for half an hour, then strained as in the other cases, add 2 lbs. of sugar to each quart of juice, and boil again for twenty minutes. A firm, clear, and bright-coloured jelly should be the result.

In crystallizing and glazing, Green-gages and small Yellow Plums are the chief favourites, and the first-named make a particularly rich product by this method.

Apricots.—One of the most popular stone-fruits for preserving in various ways is the Apricot, which is always in demand. Enormous quantities of this fruit are grown in France for drying or crystallizing, and most of the varieties are known here, though they are not usually so valued for consumption in a fresh state as the favourite dessert varieties of British gardens. The Alberge is a variety or type (for there are several of this name) that is largely grown and employed for preserving; Alberge de Montgamé (known here as Montgamet) is another favourite in other districts; in the Valley of the Rhône the Laizet has been found a superior variety; Précocé de Saumur has been extensively grown in the department of Maine-et-Loire, where also the Peach Apricot (which is nearly related to our popular Moorpark) takes a prominent place. Mons. F. Jamin states that “In La Limogue d'Auvergne large numbers of Apricots are grown, and these represent for the most part a variety with large white fruits bearing the name of the province. The produce is almost wholly utilized by the manufacturers of Apricot preserves, into which an appreciable quantity of Pumpkin pulp finds its way. It is easy to imagine the enormous profits realized by the manufacturers who were the first to direct their attention to this particular business.”

It is seldom that large producers of preserved Apricots can secure sufficient home-grown fruits for this purpose, and they import quantities from France every year. This is mostly used in the production of jam, which has a wide sale at good prices. The fruit is prepared by being cut in half and the stones removed, sugar is added in the proportion of 7½ lbs. to each 10 lbs. of fruit, the stones are broken and a small number of kernels are added, the whole being boiled for about half an hour. Drying and crystallizing Apricots, though constituting such important industries in France, are rarely resorted to here except in a small way for home use. They are treated in a similar way to Plums, except that the stone is always removed.

Cherries.—These can be either dried, bottled, made into jam, or crystallized, and they are largely used in all these methods. The Morello
is a great favourite for bottling, as also is the Kentish, which, when ripe, has a very rich colour. Many other brightly-coloured sorts can be used for the same purpose, but neither the very dark Cherries nor the light-coloured Bizarreus are well adapted for bottling. For jam, which is not so much in favour as that of others in this section, the fruits should always be stoned, and the best results are obtained by mixtures, as Cherries alone are apt to be insipid. An excellent mixture can be formed of Apricots and Cherries, as a small quantity of the former with a few kernels will impart a fine flavour. About 7½ lbs. of sugar to 10 lbs. of fruit boiled for half an hour suffices for Cherries to be converted into jam. When the crops of common Cherries are very abundant it might pay to dry them, but the stoning is a rather troublesome process even with the aid of the special machines now available, and some driers consider that it is better to prepare the fruit without removing the stones. Crystallizing is largely done, small bright-red fruit being preferred, and these are always stoned.

Peaches.—In America, and in some British colonies, as the warmer parts of South Africa, where Peaches are grown on an extensive scale, the preservation of the fruit is a matter of vital importance, because all the fresh fruits produced cannot be disposed of immediately. Drying and canning are therefore employed for preserving them, the latter being the more satisfactory of the two, though both are difficult to render thoroughly successful. The Peach is such a delicate and succulent fruit that the residue from drying is very small; and in canning, if the fruit is subjected to the heat necessary to sterilize it for keeping, it is reduced almost to pulp. Obviously for the latter process the fruit must not be allowed to become dead-ripe. In Great Britain fresh Peaches are too choice and expensive for such methods.

Small Fruits.—In fruit-preserving of all kinds it is highly important to provide for the due utilization of small fruits, of which such wonderful crops are produced in some seasons that it is almost impossible to market them fast enough. When there is a rush like this, too, the prices fall rapidly, and when the cost of gathering, carriage, and sale are deducted the balance is very small, or possibly on the wrong side. Any means of dealing with these surplus crops must therefore be serviceable to growers.

Strawberries.—The varieties of Strawberries which are now mostly in favour for general cultivation to be sold fresh are those with large handsome fruits, and for market purposes their value is unquestionable. These are not always the best for preserving purposes, and where the surplus from the large, soft-fruitied sorts has to be used it is difficult to produce anything but Strawberry pulp. In the second or third gatherings smaller firmer fruits may be secured, and these can be employed to better purpose. Some varieties of Strawberries are, however, admirably adapted for preserving, and when the fruits are of bright colour and retain their form and flavour, the beau ideal has been reached. One of the most useful Strawberries in this way is Vicomtesse Hericart de Thury, which is also extensively grown under the name of Garibaldi. The fruit is of a bright scarlet colour, firm, and of excellent flavour when ripened. Another good variety is Grove-end Scarlet, as, though the fruits are small, they are very bright in colour, firm, and with a slight acidity, which renders the jam much more sprightly in flavour than is usual. Elton, though rather dark in colour, is also excellent for preserving, and forms a very rich jam. Roden’s Duke of Edin-burgh, though little grown now, is admirably adapted for the same purpose, and to these may be added Scarlet Queen for a combination of the characters necessary in a variety for general use. Others could be named, and several recent additions to the best of novelties seem likely to become valuable in this and other ways, but the general requirements are fairly indicated by those already mentioned.

It is seldom that Strawberries are preserved in any other way than as jam in this country. Drying is carried out in America to some extent, but it is not a profitable operation, the return of solid matter is so small in proportion. Certainly here it would never be worth doing on a large scale. In the manufacture of jam much care is needed to preserve the essential qualities of such a delicate and aromatic fruit, and it can only be accomplished by quick boiling. Equal weights of Strawberries and sugar are used in a general way, but some large manufacturers contend that they can produce a better jam, and one that will keep for a longer time, by employing a larger proportion of sugar to the extent of one-fourth or even one-half more than that stated. The result is in many cases an excessively sweet and syrup-like compound, which retains the colour and some of the aroma of Strawberries, but the flavour is almost entirely disguised. A shorter period of boiling is also needed when the amount of sugar is increased, and the time required will thus vary from fifteen
minutes to three-quarters of an hour to complete the process.

**Raspberries.**—These are even more delicate fruits than the Strawberry, but the flavour is so rich and distinct that they are invaluable for preserving, indeed they are chiefly used in this way. Amongst the older varieties Red Antwerp has always been a great favourite for jam, owing to its fine colour and high flavour. Baurnforth's Seedling is also valuable for the same reasons, together with Fastolf. Some other varieties have, however, come into favour for their fertility or the large size of the fruits, and amongst these Carter's Prolific, Superlative, and Hornet are notable.

For Raspberry jam alone 7½ lbs. of sugar to 10 lbs. of fruit are required, and twenty minutes boiling is sufficient. This will also be enough if a mixture of Raspberries and Red Currants is prepared, in the proportion of one-third of the former to two-thirds of the latter; but if Apples are substituted for the Red Currants it is advisable to partly cook the Apple-pulp before adding the Raspberries. Both the above mixtures are excellent and saleable products.

There is a limited but constant demand for Raspberry vinegar, which can be readily prepared in the following manner:—The fruit must be thoroughly ripe, of the best-flavoured varieties, and should be placed in a large earthenware vessel; upon this the vinegar must be poured and allowed to stand for a day. A fresh supply of Raspberries must be used the next day, and if the vinegar has not absorbed sufficient of the flavour the process must be repeated a third time. It is often recommended to use the best white vinegar, but an ordinary pure brand may be employed, and the proportion of fruit for each steeping should be about 3 lbs. to a gallon of vinegar. If the Raspberries are abundant, or the grower has a quantity of fruit too smashed for ordinary sale, a larger proportion may be used, say about 4 or 5 lbs. to the gallon. After the steeping is completed the liquor is strained, 8 lbs. of the best sugar is added to each gallon, the whole is simmered for an hour, and then bottled after it has cooled sufficiently. The bottles should be neat ones, with long narrow necks, and from ½-pint to ¾-pint are the usual sizes, the former being the more convenient.

**Blackberries.**—In some instances attempts have been made to cultivate the Blackberry with a view to profit, and where land is suitable, but not fitted for better crops, fairly good results can be had. Still, under these circumstances, it is not advised to grow the common type; the best is the cut-leaved variety, *Rubus laciniatus*, which crops heavily, and has large fruits of good flavour. This, however, repays for liberal treatment. By far the greater quantities of Blackberries used in preserving, and for culinary purposes, which amount to many tons, are grown wild in hedgerows, are gathered by villagers and collected by dealers.

The chief mode of utilizing the fruit is in the form of jam; but this is rarely used alone, though in conjunction with Apples an excellent and popular preserve is produced. A serviceable proportion may be formed by 10 lbs. Blackberries, 7½ lbs. of sugar, and 5 lbs. Apples. Rather acid varieties of the last-named are preferred, as they serve to correct the tendency to insipidity in the other fruit when cooked. It is advantageous to use the prepared Apple-pulp already described, as then it will only be necessary to boil the mixture sharply for twenty minutes, and place it at once into jars. If the Blackberries are not fully ripe a longer period will be needed.

Jelly can be prepared from this fruit, but it is difficult to obtain it of a good flavour and well coloured, it is apt to be dull and muddy-looking.

**Red Currants.**—This fruit can be readily turned to a good purpose in a variety of ways. They are popular for bottling, as, if the best varieties are employed, they have a pleasing appearance and are very serviceable. For bottling, the larger-fruited varieties of bright colour should be used, such as Raby Castle or Cherry, as these are seen to much greater advantage than the smaller-fruited sorts, like Red Dutch, which is so valuable for general preserving purposes. In bottling Red Currants less time is required than for stone-fruits, but a fierce and sudden heat must be avoided, as well as a too long exposure to it, or the fruit becomes colourless. A gradual rise to the boiling-point in about one hour should suffice. If Red Currant jam is prepared alone, 10 lbs. of fruit and 7½ lbs. sugar, with a boiling of twenty minutes, will be all that is required; but, as previously pointed out, this fruit is much more frequently used in combination with Raspberries.

An excellent jelly can be produced from Red Currants and is in good demand. The fruit should be simmered slowly for twenty minutes, then strained, and sugar must be added at the rate of 8 lbs. to each gallon of juice, and then boiled for ten minutes. This process must be carefully watched and tested, as a few minutes' excess will be enough to spoil it.
Black Currants can be treated in the same way as Red Currants, but it is not usual to bottle the fruit, as it can be better preserved by other methods. Two of the best varieties are Black Naples and Baldwin’s Black, as they possess size of berry, abundant pulp, and good flavour, but Lee’s Prolific is one of the richest and sweetest Black Currants when at its best. Both jam and jelly can be prepared in the same way as recommended for Red Currants; but there is a larger demand for this, and Black Currant jelly, especially if manufactured with care, is always sure of a ready sale at remunerative prices. Perhaps there is no fruit of which the preserving could be more safely increased commercially than that under notice.

Gooseberries.—The two principal methods in which Gooseberries can be profitably preserved are in bottles and as jelly; there is not a good sale for the jam, except at such low rates that it hardly pays for the cost of manufacture unless some foreign substances are introduced to increase the bulk, which is strongly condemned.

Green Gooseberries are chiefly employed for bottling, and large well-shaped varieties are preferred, such as Whitesmith, Keepsake, Whinham’s Industry, Lancashire Lad, and Crown Bob. Where rich flavour is required for jam or jelly and ripe fruit is used, the last two varieties are valuable, but some of the small-fruited varieties, such as Red and Yellow Champagne, Early Sulphur, Green Walnut, Pitmaston Green-gage, and others of similar character are used.

In bottling, the fruit must be sound and clean; the eyes and stalks are removed and the bottles filled as previously described. The boiling must be slowly performed, and from one and a half to two hours may be needed. If overdone, the berries have a blanched appearance which is not attractive, and they are so soft when turned out for use that they will scarcely bear a second cooking.

For jam, employ only well-flavoured fruits, and use equal weights of sugar, boiling for three-quarters of an hour. Jelly is produced by adding water equal to about half the bulk of fruit; boil for an hour, then strain, and to every gallon of juice add 8 lbs. of sugar, and boil rapidly for three-quarters of an hour. With care in the selection of the fruit and in the straining, a well-coloured and excellent jelly can be thus made, which can be profitably sold at a lower price than the majority of jellies. It provides a ready means of disposing of the surplus in very abundant crops.

Miscellaneous Fruits and Methods. — Besides those enumerated, other hardy fruits are occasionally employed for preserving or other uses in quantities. Sloes, for instance, are in considerable demand for steeping in spirits, such as gin, to prepare a kind of liqueur. In some country districts in abundant seasons large quantities of these are gathered by the villagers for sale to distillers. Black Currants are also used in the same way both for whisky and gin, while the use of Morello Cherries for brandy is a large industry in some places. Most of these are, however, outside the scope of this chapter, in which the writer has been chiefly concerned in pointing out methods of utilizing surplus and waste produce in fruit plantations and gardens generally.

[R. L. C.]

CHAPTER XXV.

PACKING FRUITS FOR ROAD OR RAIL.


The utmost skill a grower may expend upon the production of first-class fruits will be seriously discounted if the best systems of preparing the produce for conveyance by rail or road are not adopted. Necessarily, the importance of this matter is proportionately greater where fruits are extensively grown for market than in private gardens where the greater portion is required for home consumption. Still, even in the latter case the subject of fruit-packing cannot be slighted without causing considerable dissatisfaction, and loss of reputation to the gardener. In some instances it may be that consignments of fruits by rail are rarely required, but in many establishments the packing of fruit and vegetables for long-distance journeys is a regular part of the work during a portion of the year. In fact, there are few horticulturists at the present time, who are concerned with fruit in any degree, that are not expected at some time to possess a knowledge of the matter under consideration in this chapter.

From the commercial stand-point it is absolutely indispensable; the difference in money-value at the market of the same grades of fruit,
respectively well and carelessly packed, often amounts to fifty per cent. This is very apparent at the auction sales of imported fruits, where the effects of loose packing are occasionally evident immediately the cases are opened, and the prices will fall from 5s. to 10s. in the £1 instantly, the goods in other respects being identical with those previously sold at the full price. There is little doubt that, next to neglect of grading, imperfect packing is responsible in a large measure for unsatisfactory returns when the general prices are good. Some American authorities go so far as to state that the prices realized depend more upon the packing and the cases employed than upon the fruit itself. This, perhaps, is a slight exaggeration, but it conveys an idea of the importance with which the subject is invested by those who have had extensive experience in the conveyance of fruit long distances. The Californian growers, for instance, who consign their produce to Chicago and the Eastern towns of the United States, have to prepare their fruits for railroad journeys of 1000 to 2000 miles, and then place them in the markets in competition with the productions of growers comparatively near to the various centres. This has caused extra attention to be paid to the matter, with the result that Californian fruits have been found to stand high in the Eastern markets quite apart from the actual merit of the fruits.

Similar results may be seen amongst individual growers; in Britain those who have paid the closest attention to packing in addition to the other essentials can command a place in the markets regardless of distance. Special districts also become noted in this way for the excellence of the packing, and preference is given to consignments from such localities. In our country, unfortunately, there is ample room for improvement in these matters, and this is more marked in the case of horticultural products than in many other trades. A great advance has been made in some industries concerned with the production of fancy or ornamental articles, in the packing of which much taste and care are now displayed, to the manifest advantage both of the manufacturer and the retailer. It is desirable that this may extend to other businesses, and particularly is it needed in connection with the conveyance of fruits of all kinds, from the choicest and most delicate to the cheapest and most hardy.

The railway companies of this country show very little favour to home producers, either in the rates charged or in the care bestowed upon the consignments. Where large quantities of fruit are forwarded at one time, and whole trucks or special covered vans can be filled, less difficulty is experienced, but for all ordinary small packages of fruits the best possible packing is the only safeguard the sender has against damage. Considering the comparatively short distances that fruit has to be conveyed by rail in this country it is deplorable to witness the amount of injury that is caused to packages of fruit by careless handling. It is perhaps a little worse on a few of the Continental state-controlled railways, but this is poor consolation to the grower here, and it only remains for him to protect himself as far as possible by perfecting his methods and thus reduce the risk to a minimum.

Though the conveyance of packages by passenger trains is more expeditions, and at owner's-risk rates not greatly in excess of the goods rates for moderate distances, yet it does not always follow that it is the safer mode except for very perishable fruits in small quantities. It often happens that a number of small packages, secured together in a thorough manner, will travel with less injury by goods train, in vans that go through to the station of delivery, than they do in passenger trains. This risk is increased in the latter case if the goods have to be transferred to another train at some point along the route. Of course with regard to small single packages the passenger trains are the more suitable.

The method of packing that will suit fruit to be sent by rail is also adequate preparation for consignments by road, but in the latter case a good deal will depend upon the kind of vehicle employed and the nature of the roads. A cart or van furnished with good springs is one of the best means of conveying choice fruits with little damage, but anything in the style of the old farm wagons on a rough road will prove a severe test for the best method of packing that can be adopted.

For exportation on shipboard special systems are essential, and though it does not often come within the experience of British growers to have to prepare their fruits for such journeys, yet many who go to the Colonies have to deal with it on a large scale, and the subject will therefore be referred to later in the chapter.

Packing-houses, -rooms, or -sheds.—In proportion to the extent of the operations, provision must be made for the work of packing, and any preliminary attention paid to this will yield an ample return in efficiency, convenience, and
economy of labour. Even on the largest scale packing-houses need not be elaborate, ornate, or expensive. Sufficient space for the due performance of the work, careful consideration of the arrangements to facilitate this to the utmost, and substantiality are the chief considerations. Buildings of this kind can be constructed as separate erections or as adjuncts to other structures; in the latter case it is often an advantage to have the packing department as a portion of the fruit storage, though that may be subject to some inconveniences where large quantities of fruits have to be dealt with quickly.

A ground-plan of a simple, useful form of packing-house, the size of which can be adapted to any requirements, is shown in fig. 1132. It is rectangular in form, running from east to west, the south side being of bricks, boards, or corrugated iron as desired, and the north side glazed from about 3 feet from the ground-level up to the eaves. This can be done more cheaply than having a series of windows, and it is important to provide for a free admission of light. The eaves should be not less than 7 feet from the ground and the roof may be either in the form of a lean-to at a low angle or as a span, the former being convenient when there is another building against which it can be pitched, and the latter being suitable for separate buildings. The roof can be formed of slates, tiles, or corrugated iron, or boarded and tarred, or covered with felt, but it must be waterproof. Where there is a sufficiently high wall, with a north aspect, the whole structure can be glazed and applied to other purposes when not required for packing, which in the case of the fruit trade generally is mainly confined to the summer and early autumn months.

There should be a door space of at least 6 feet width at each end, double doors 3 feet wide being convenient, and facing each other as shown in the plan. This provides a clear gangway for the gatherers to bring in the fruit to the sorters and packers, and to pass out with the empty baskets without interfering with each other. The packing-table should be placed just clear of the gangway, the packers being on the one side only, facing the path, so that the fruits can be placed upon the table immediately at their command. As the packages are filled they can be passed on to be weighed, nailed or tied down, and stacked ready for removal.

Another simple form of packing-house is shown in the plan (fig. 1133). This is a square, two sides being open, the roof supported on pillars, and a verandah extending beyond this to serve as temporary dry storage for empty baskets or the completed packages. Two tables can well be used in such a building, placed transversely, the packers being supplied with the fruits from the open sides. In such a
structure it is desirable to provide roof-lights, otherwise it is likely to be rather dark.

Various modifications of these two places could be made to suit different requirements, or either could be adapted as a department for an existing fruit-storage by little alterations which will readily suggest themselves. Well-built sheds can also be easily fitted for work of this kind, and where the strictest economy is necessary, and the work is limited, wooden sheds suitable for the purpose can be constructed for a few pounds by the exercise of a moderate degree of ingenuity. As most of such structures are only required for a short period of the year, they can be utilized for many other objects with advantage. For example, where the packing-cases, boxes, &c., are made on the place in the winter months, or in other slack time, such buildings are well adapted for the work.

The tables for sorting and packing upon require a few words of description, though they are simple enough; there are some details that may be overlooked until experience has taught a few lessons. One point is, that it is a great mistake to have tables too wide. It is far better to have them long and narrow, as the fruit is more at the command of the packer, and it is not rolled about and damaged to the same extent as when it has to be repeatedly pulled towards the workman. From 2 feet 3 inches to 3 feet is a convenient width, and if such tables are formed of ordinary 9-inch boards, this allows for three or four respectively without any cutting. The height is also a matter of some importance, and usually, if men of average size are employed, either standing, or sitting on stools, about 2 feet 7 inches is suitable, but where women are employed, and chiefly sitting, 2 feet 4 inches is more convenient.

When narrow tables are used they answer the purpose quite well if level, but if wider than the dimensions given it is helpful if the top slopes slightly towards the packer. Very little rise is required, however, about 3 or 4 inches in a width of 4 or 5 feet being sufficient.

With all the small soft fruits it is a great advantage if they can be placed upon the tables in sloping trays, as these can be then removed when emptied and fresh ones put in their places. It is also a more convenient way to dispose of the refuse or damaged fruits, which otherwise have to be cleared off the table by hand. Such trays may be of any size to suit the table space, but they may be somewhat larger if desired, so that they project a little either back or front. A handy size is 3 feet square, the backs about 6 inches high, sloping to about 2 inches in front, with spaces cut for the hand, one each side, so that the tray can be easily lifted to and from the table. A slight slope is advisable, as for the larger tables, and the bottom boards should be of hard wood well planed or preferably polished. An ordinary level tray can be easily propped up at the back to form a slope.

For the hardier fruits, such as Apples and Pears, it is well to cover the tables with some soft substance that can be removed occasionally, but care is needed in this, as if anything is used of a linty nature some Apples will take up portions on the skins, which spoils their appearance. Again, also, if there should be much dust or small particles of rubbish (a little cannot be avoided), this will accumulate and have a similar effect. Still, the use of a material that will minimize the risk of bruising in the sorting, and which can be readily removed, is of distinct service, and we have found a few sheets of common white packing-paper answer the purpose well.

The Packers.—In fruit-growing establishments of ordinary size the packer has to serve also as grader and sorter, and there is an advantage in this, for it avoids the repeated handling of fruits in two or three operations. It sometimes effects a saving if the actual packer passes the box or basket on to another for the fastening-down process; the division of labour is beneficial, and enables a man to become more expert in his special department. Where very large quantities of fruits have to be disposed of, or when they are reserved for storing, grading must always be a separate operation.

Men are indispensable as packers where Apples, &c., are made up into half-bushels, bushels, or barrels, as there is a good deal of heavy work connected with the moving of such packages. For weighing and fastening-down they are also necessary, but for grading or for packing all soft and choice fruits women can be trained to perform the work equally as well, and sometimes much better, than men. In every case it is better to have a few practical hands at the work than a number of inexperienced persons who may effectually spoil a large consignment, and will cost more for supervision than will cover the additional wages of skilled operatives. In both grading and packing, judgment and quickness are required, and an experienced manager will soon detect those who show the greatest aptitude.

Arrangements should be made for weighing
the fruit immediately it leaves the packers' hands, so that any defects may be made good before the package is finally secured. The machine employed may be either at the end of the packing-table, or close to where the fastening-down is done; but the former is the better method, as a few fruits can be kept there to fill up as required. There are plenty of well-constructed machines to select from, but the platform steelyard types are the more generally useful, and can be had to weigh up to 7 cwts. and graduated to ½ lb. It is seldom, in regard to ordinary fruit packages, that it is necessary to weigh up to more than 2 cwts. Some of these machines are constructed on low roller wheels, so that they can be moved about readily from place to place, and such portable machines are very useful in many establishments, though they cost somewhat higher prices. But good machines can be had for £1 or £½; the ordinary type can be had as low as £2.

Packages.—Before discussing the various forms of packages suitable for fruits it will be necessary to give some consideration to a few essentials which have an important bearing on ultimate results. First, there is the question of cost, which must be a leading factor in all commercial undertakings where the packages employed are not to be returned to the sender. For home use, namely, in private gardens where the boxes, cases, or baskets are sent to and fro frequently, strength is the main object, and the cost must be a subsidiary consideration. Similarly, where a grower supplies baskets or large boxes, or where the salesman supplies the baskets, which have to be returned when empty, the cost is too great to allow of their being given with the fruit. But there is an increasing tendency to favour the non-returnable packages because they effect a saving of labour for growers and salesmen, as well as being a decided benefit to the purchaser. Wherever boxes or baskets can be procured at from 1d. to 1s. each, suitable for the kind and quality of the fruit they are intended to contain, it is far better to reckon this as part of the necessary expenses, provided the prices obtainable allow sufficient margin, and it will often be found to yield a distinct gain in the end.

Strength must have attention also, but this must be taken in conjunction with weight, for any undue increase in the latter will result in an addition to the cost of carriage, which means a proportionate reduction in the net profits. At the same time, having in view the risk attending parcels sent by train in Britain, it is wise to have the packages well tested before investing very largely in them, or entrusting bulks of choice fruit to them. Appearance is an indispensable consideration where the markets and the general public have to be studied. Neat boxes or baskets of a size that can be readily carried by a retail purchaser always command attention in shops, and there is ample room for an extension of this mode of increasing sales. It has been well said that good fruit is worth any reasonable care in presenting it to the public, as it is sure to bring satisfaction, but it is a profitless task to try to foist inferior fruits on the market by means of attractive packages.

Uniformity of style and sizes is equally an advantage to the seller and buyer, especially when the exact number and weight of the contents is stamped on the box, as this, if honestly adhered to, results in a confidence that ensures a trader both reputation and business. There is also an advantage, in the packing for journeys by rail or sea, in economizing space and securing the safety of the consignments. But if a grower has made a speciality of any kind or quality of fruit, he may occasionally find it to his advantage to adopt a distinct kind of package, which has somewhat the same effect as a well-displayed advertisement. But it should always be in good taste, and artistic rather than eccentric.

Labels of all kinds should be rather large than otherwise, and boldly printed to indicate the fruit contained in the package, its destination, and the route by which it is to travel. They should be preferably nailed on the upper side of boxes, and for baskets should be of the stoutest material, and firmly secured with wire or strong cord. Much delay, annoyance, and loss is caused by labels being indistinct, or by their becoming detached from the packages.

Boxes.—The manufacture of boxes for fruit-carriage is becoming an industry of some importance, and it is likely to develop considerably in the future. We are only following our Continental and American friends in this matter, instead of leading as we should have done, for then we might have kept a better control over our markets. For small quantities of Apples, Pears, Plums, Cherries, Apricots, Peaches, Gooseberries, Currants, and Strawberries, boxes are well adapted, provided in every case that the fruit is not overripe, and that all the small and softer fruits are placed only in the smaller-size boxes. There is one
disadvantage about large boxes for fruit, in hot weather especially, and that is, the fruit is liable to become slightly fermented. This can be obviated to a great extent by the method of packing, by the careful selection of the fruits, and by employing shallow boxes only for all those most liable to suffer from overheating. Further, they should not have the lids fastened down until the last available moment, and the quickest possible conveyance to the consumer should be provided. For Apples and Pears boxes are especially adapted, and there is not the same danger with these as with smaller fruits when packed in large quantities, as a good deal of air is enclosed with them. As regards home production, however, boxes that will contain half a bushel or a bushel of Apples are the most suitable for good-quality fruits. The large-size boxes can be so constructed that a quarter of an inch or half an inch space between the boards forming the top and bottom will provide for ventilation sufficient for the kind of produce they are constructed to carry. This cannot be done with the smaller fruits, which require the boxes to be secured tightly.

Many of these small shallow boxes are used for imported Tomatoes, which arrive in British markets by thousands, each holding from 4 to 7 lbs. A method adopted for securing these together in packages might well be employed here for other fruits that are sent to market in boxes of similar size and shape. Five or six are placed in a pile as shown in the sketch (fig. 1134), strips of wood about 2 inches wide are placed at each side and top and bottom, and are then secured tightly at the corners by strips of zinc, or generally hoop-iron, suitably bent and punched with holes for nails. Occasionally two pieces are laid lengthwise, top and bottom, the connecting belt then coming outside these, which gives additional strength. It is common, however, to run stout cord round these packages of boxes as a further protection.

As regards the sizes of boxes now obtainable, and the prevailing prices, the following particulars will give some information. For Apples especially, unplaned boxes with lids to be nailed on are provided in these sizes and prices:

<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Depth</th>
<th>Gross</th>
<th>Doz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 bushel</td>
<td>10½ x 10½ x 6½</td>
<td>in.</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>½ bushel</td>
<td>15 in.</td>
<td>10½ in.</td>
<td>8 in.</td>
<td>42</td>
</tr>
<tr>
<td>1 bushel</td>
<td>21 in.</td>
<td>15 in.</td>
<td>8 in.</td>
<td>66</td>
</tr>
<tr>
<td>15 lbs.</td>
<td>16 in.</td>
<td>10 in.</td>
<td>6 in.</td>
<td>35</td>
</tr>
<tr>
<td>25 lbs.</td>
<td>22½ in.</td>
<td>11 in.</td>
<td>6 in.</td>
<td>44</td>
</tr>
</tbody>
</table>

For Plums the sizes usually made are as follows:

<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Depth</th>
<th>Gross</th>
<th>Doz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 lbs.</td>
<td>10½ x 10½ x 6½</td>
<td>in.</td>
<td>26</td>
<td>6</td>
</tr>
<tr>
<td>28 lbs.</td>
<td>22 in.</td>
<td>10½ in.</td>
<td>6½ in.</td>
<td>46</td>
</tr>
<tr>
<td>42 lbs.</td>
<td>27 in.</td>
<td>15 in.</td>
<td>8 in.</td>
<td>54</td>
</tr>
</tbody>
</table>

Conveniently-formed fruit-boxes, which are furnished with lids to be nailed on, or which can be supplied with framed lids at 9d. to 1s. 6d. per dozen extra, are included in the following list. The wood employed for the lids, tops, and bottoms is five-sixteenths of an inch thick, and the ends half an inch thick, the latter being an important aid in the durability of the box.

A lighter form, which can be employed either for cut flowers or small fruits, are as follows, being furnished with lids to nail on:

<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Depth</th>
<th>Gross</th>
<th>Doz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 in. x 6 in. x 3 in.</td>
<td></td>
<td></td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>14 in.</td>
<td>6½ in.</td>
<td>3½ in.</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>10 in.</td>
<td>6½ in.</td>
<td>4½ in.</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>16 in.</td>
<td>7 in.</td>
<td>4 in.</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>10 in.</td>
<td>8 in.</td>
<td>8 in.</td>
<td>27</td>
<td>4</td>
</tr>
<tr>
<td>18 in.</td>
<td>7¾ in.</td>
<td>5½ in.</td>
<td>31</td>
<td>6</td>
</tr>
<tr>
<td>18 in.</td>
<td>8 in.</td>
<td>8 in.</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>22 in.</td>
<td>15 in.</td>
<td>4 in.</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>16 in.</td>
<td>12 in.</td>
<td>6½ in.</td>
<td>52</td>
<td>0</td>
</tr>
</tbody>
</table>

A cheap form of box is also provided in the appended sizes and prices:

<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Depth</th>
<th>Gross</th>
<th>Doz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 in. x 6½ in. x 3 in.</td>
<td></td>
<td></td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>9½ in.</td>
<td>6½ in.</td>
<td>3½ in.</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>10½ in.</td>
<td>6½ in.</td>
<td>2½ in.</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>11½ in.</td>
<td>6 in.</td>
<td>3½ in.</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>12 in.</td>
<td>7½ in.</td>
<td>4 in.</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>19½ in.</td>
<td>7½ in.</td>
<td>5 in.</td>
<td>20</td>
<td>0</td>
</tr>
</tbody>
</table>

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The light boxes which the principal railway companies are now providing at low rates for garden and farm produce, and which they deliver carriage-free to any station on their own systems, have previously been alluded to in the chapters on Apples and Pears, still it may be of service to include the full list here, so that they may be compared with those just given. It must, however, be added as a cautionary note that the larger sizes are rather fragile, certainly not fitted for any heavy goods. Upon some of the lines the boxes, when packed for sending by rail, are collected within a certain radius of the principal centres by the company's officials. This is a step in the right direction, and should lead to further improvements. The Great Eastern Railway now supplies annually over 130,000 of these boxes, and the same company also issues a list of farmers and fruit-growers who will forward their produce by rail direct to the consumers. The prices here given vary slightly on the different lines, but those furnished are the usual rates.

<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Depth</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>10\frac{3}{4} in.</td>
<td>7\frac{1}{4} in.</td>
<td>3 in.</td>
<td>1\frac{1}{2} d.</td>
</tr>
<tr>
<td>12 in.</td>
<td>9 in.</td>
<td>4\frac{1}{4} in.</td>
<td>2 d.</td>
</tr>
<tr>
<td>15\frac{3}{4} in.</td>
<td>10\frac{1}{4} in.</td>
<td>5 in.</td>
<td>2\frac{1}{2} d.</td>
</tr>
<tr>
<td>16\frac{1}{2} in.</td>
<td>11\frac{1}{2} in.</td>
<td>5\frac{1}{2} in.</td>
<td>3 d.</td>
</tr>
<tr>
<td>18\frac{1}{4} in.</td>
<td>13 in.</td>
<td>6 in.</td>
<td>4 d.</td>
</tr>
</tbody>
</table>

In some of the Colonies much attention has been paid to the provision of suitable boxes for
fruit, and at a conference of fruit-growers in Auckland, New Zealand, the following conclusions were arrived at:—

"The ideal shaped package for fruit is one of cubic form, the fruit being thus, whichever way the package stands, always subject to the same pressure. Bearing this principle in mind, the use of a case is proposed consisting of two cubes, each $11 \times 11 \times 11$ inches inside measurement, with a total capacity of $2662$ cubic inches, the external dimensions of which would be $12 \times 12 \times 24$ inches, and would stack in any manner exactly 20 to the shipping ton of 40 cubic feet, such case to be provided with a central division of $\frac{1}{2}$-inch wood, ends of $\frac{3}{4}$-inch, and sides of $\frac{3}{8}$-inch timber, or thinner; the sub-

division of the same to be $11 \times 5\frac{1}{2} \times 22\frac{1}{2}$ inches, capacity $1331$ cubic inches, and $11 \times 2\frac{3}{4} \times 22$ inches, capacity $665$ cubic inches, both with a central $\frac{1}{2}$-inch division. In the full-sized case this bi-cubic form would minimize heating and bruising of fruit, consequent on one or more fruits decaying, therefore loosing packing. Laid down in any way, the bottom layer of Apples or Oranges would have to bear only 8 or 9 inches of fruit-pressure, as against 15 inches in Tasmanian and 17 inches in Californian cases. Whichever side were opened would display a broad array of fruit. Only one breadth of stuff (11 inches) need be used, which could be cut from waste, effecting a saving in the timber and in the time required in manipulating lesser widths, also in nails and time consumed in driving them; further, in

time and material taken in making the three additional cases required to hold a ton of fruit according to Tasmanian dimensions. If necessary, $5\frac{1}{2}$-inch-wide timber could be used in making both full and half-sized cases, the ends of the full-sized cases being held together by metallic dowels. The depth of the half-case ($5\frac{1}{2}$ inches) closely approaches the depth ($5\frac{3}{4}$ inches) of the Californian fresh Peach, Plum, and Apricot package, and their Grape case of 5 inches in depth. The depth of the quarter-case of $12\frac{3}{4}$ inches varies but a quarter of an inch from the standard Californian Cherry-box, with a depth of 3 inches, and would be found very suitable for packing the more tender berries."

**Baskets.**—A well-made basket of the best thoroughly seasoned Willows is one of the most
durable and serviceable forms of packages that can be used. That this is recognized generally is proved by the adoption of baskets in several branches of public service, notably in the Post-Office, for parcels. The only difficulty is that they are too expensive to be included in the price of the fruit, and in consequence there is all the trouble of providing for the return of "empties" and the risk of loss, which in large businesses is a serious matter. The ordinary round baskets—bushels, half-bushels, sieves, and half-sieves—are objectionable, since the most careful system of covering the fruit always leaves the upper layers exposed to some damage. The more delicate soft-skinned Apples and Pears are especially liable to injury when sent in such baskets, and it is one reason why large quantities of British hardy fruits present such a poor appearance in the markets. The baskets cannot be packed economically as regards space, and they are awkward for carrying about. The "flats", as the rectangular baskets with lids are usually termed, are much more serviceable, and these in different sizes are valuable for garden use. If two or three gradations are employed, they are readily returned when empty in "nest" fashion.

The handle-baskets that are now so largely used for Grapes (fig. 1136) are almost indispensable, as in no form can this fruit be so satisfactorily forwarded by rail. We shall have to refer to this more particularly when describing the methods of packing suitable to special fruits, but it may be said now that these baskets are obtainable in several forms, either open or with lids. One make of the latter type, in which the lid is formed in one piece with a slit in the centre, so that it can be placed over the handle, fitting it tightly, is a distinct improvement on the older style, affording more protection to the fruit. These baskets are also used for the best Tomatoes (fig. 1137), and smaller sizes for Plums and Strawberries, but their price is against the extension of their use for other fruits. No doubt if strong, neat, tasteful baskets could be produced at lower prices, there would soon be a large demand for fruit in this form, because the baskets themselves are so serviceable.

_Cases or Crates._—When numbers of small packages of choice fruits are being dealt with, it is a material advantage if they can be packed together in well-designed cases or crates. The risk of damage or loss is diminished, as it is more easy to ensure a few large collective packages like this being duly cared for in transit than a much larger number of separate small ones. The chief disadvantage is the additional weight, which increases the cost of carriage greatly. Such cases must, therefore, be of considerable size, and can only be employed with a prospect of profit for the earliest, the finest, and the most valuable fruits. Grapes, Peaches, Nectarines, the choicest ripe Plums and Strawberries, and the best ripe Pears or Dessert Apples, may be thus provided for with advantage to the grower.
One of the best forms of crate has been several times shown at the Royal Horticultural Society's Fruit Exhibitions in the Crystal Palace, Sydenham (fig. 1138). It is from a Channel Island grocer, and, though heavy, is admirably constructed for the safe carriage of choice fruits, as was proved by the condition of the samples it contained. It is in the form of a deep cupboard, with double doors opening in the front. Three tiers of shallow trays are provided for, four in each tier, and each tray holds three oblong, shallow handle-baskets, the handles coming into a line in the centre of the trays. An upright wooden bar is secured to the front of the tray and rises to the level of the basket-handles, where it is hinged to another bar extending the length of the tray, and thus fixing the three handles, when it is secured by a metal loop at the other end. It is chiefly used for Grapes, and will convey a considerable weight of the best fruit quite safely.

Somewhat similar crates are employed for early Strawberries, which are placed in punnets, then these are packed in trays, and the latter are placed like drawers in the case (fig. 1139). For these fruits cheaper crates are sometimes formed of stout lath or battens, and the trays are filled in from the top, a false bottom being inserted above each tray, or these are constructed with raised corners so that the upper trays are raised clear of the fruit in the lower ones. Many modifications of this system are in use, and it will be readily seen how it can be altered to suit special circumstances.

Barrels.—Though barrels are seldom in request for British-grown fruits, yet such enormous quantities of Apples are sent into this country from America and our Colonies in this way that the method demands some attention here. Great efforts have been made to ensure the uniformity in size of the barrels used, and in 1899 a law was passed in the State of New York which provides that "A barrel of Pears, Quinces, or Potatoes shall represent a quantity equal to one hundred quarts of grain or dry measure. A barrel of Apples shall be of the following dimensions:—Head diameter, 17½ inches; length of stave, 28½ inches; bulge, not less than 64 inches outside measurement. Every

or Potatoes, unless such barrel is plainly marked on the outside thereof with the words, 'short barrel', in letters of not less than 1 inch in height."

In Canada, also, a statute was passed in 1901, of which the principal clause in reference to the barrels is the following:—"All Apples packed in Canada for export for sale by the barrel, in closed barrels, shall be packed in good and strong barrels of seasoned wood, having dimensions not less than the following, namely: 26½ inches between the heads, inside measure, and the head diameter of 17 inches, and a middle diameter of 18½ inches, representing as nearly as possible 96 quarts". These barrels hold practically three English bushels of Apples, and in the filling it is permitted to face two or three layers of Apples at each end. Those

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![Fig. 1138.—Crates for punnets of Strawberries and other berries.](image-url)
in the first two or three layers are carefully packed by hand at the bottom of the barrel stalk downwards, and again when the top is nearly reached the last two or three layers are packed stalk upwards. It does not matter, therefore, which end of the barrel is opened—the Apples exposed are all "faced." This is not necessarily a cover for dishonesty, as both in Canada and in the United States stringent rules are now in force respecting this matter, though the former have been more lately brought into operation.

It is usual also to fill the barrel about an inch above the head, which is then put on and brought down to its right level by pressure, either applied by a lever arrangement or by a screw somewhat like letter-book screws, but the former is preferred. The pressure has to be applied with care, or the fruit is liable to be damaged, but, properly done, it is found to give the best results in the safe carriage of the fruit. Sometimes the heads of the barrels are filled up with a cushion of paper, which obviates the necessity for leaving the Apples above the level for compression, the paper serving the purpose with less risk.

**Bags.**—These are generally employed for nuts, such as walnuts prepared for use, and chestnuts. They are also occasionally used for inferior Apples, but it is a great mistake, as in no way does the fruit suffer so much in the course of rail journeys. Commonly when the fruit is turned out it is absolutely unsaleable.

**Packing Materials.**—In the best packing, important aid is afforded by the choice of good materials for rendering the fruits firm in the cases employed, or in protecting them from injury by external means. For all choice fruits the best material yet introduced is the finest, white, and odourless brands of wood wool. These can be purchased at about 18s. per cwt., and at this rate half a pound of the substance, costing 1d., will suffice for a large box or basket of fruit. It can be used as a basal layer upon which to place the fruit, and it is equally useful for arranging between such individual fruits as choice Dessert Apples or Pears. As a final layer before the package is closed it is specially adapted, as, owing to its elastic nature, it can be pressed down firmly on to the fruit without injury. When using it the dust should always be shaken out first, and very delicate fruits, or those with any exudation or bloom on the skin, should be carefully wrapped in soft white tissue-paper and not allowed to come in direct contact with it. The commoner and coarser kinds frequently possess a rather penetrating odour, and must be used with judgment, or the aroma of Dessert Apples and Pears is easily spoiled. If the wool be exposed to the open air or sun for a day or two this objection is much reduced.

Cotton wadding is still very useful for some fruits, though the improvement in the last-named material has decreased the demand for this. Folded with the smooth or skin side outwards (i.e. next to the fruit) it is commonly employed for wrapping round Peaches, Apricots, and the best Plums after these have been enclosed in tissue-paper. It is also serviceable as a basal layer, to be covered with paper, on which to place fruits of a choice character. It is, however, very absorptive of moisture, and soon causes undue heating.

Dry moss, thoroughly cleaned and sweet, is useful when only small quantities of a moderately elastic substance are required as a pad, cushion, or bed, covered with paper. It has been found to be cooler and less liable to overheat the fruit than several other substances, notably cotton wadding. A proper course of preparation must, however, be accorded to it, and, obviously, fresh-gathered moss is totally unsuited for fruit packages, useful as it is for other purposes.

Straw is seldom satisfactory as a fruit-packing material, though it is often employed as a covering for Apples in bushels and similar baskets. When short of other materials barley straw, being softer and cheaper, may be used. Hay is still more objectionable on account of its odour, and fresh grass is too moist and heating. Bracken is free from several of the previous objections, it is also elastic, and we have found it very serviceable for covering the larger baskets of Apples. Wood shavings can seldom be used with advantage, except perhaps in large crates containing several boxes of Apples or other hard or unripened fruits. Paper shavings are not so much used as formerly—they are not sufficiently elastic.

Paper is an important substance in packing arrangements, and needs a few words. It can be employed in a variety of ways for protective purposes as well as for ornament, which from a market point of view are equally worthy of attention. Tissue-paper is particularly useful, especially the white kind, of which the best brands, that may be had from 4s. to 6s. per ream, are excellently adapted for packing purposes inside boxes or cases. But a cheap class of paper is now produced as low as 2s. 6d. per ream, which, though not quite so soft and
Packing Fruits for Road or Rail.

flexible as the other, is yet sufficiently so for all ordinary work, and it has the advantage of a glazed surface. Such paper we have found especially useful for wrapping any fruits of which it is desired to protect the "bloom" or skin, the smooth surface being turned next the fruit. As every sheet can be cut into eight or ten slips of a suitable size for wrapping round Apples, Pears, Peaches, &c., the cost is so insignificant that it is surprising it is not more frequently used in market packages. The time needed in the wrapping and packing is the chief expense, but with a little practice a man or woman can soon perform the work so expeditiously that the comparative cost is slight. The white tissue-paper is also well adapted for covering the inside of boxes, for separating layers of fruit, when wood wool is employed, and it looks particularly well in contrast with brightly-coloured fruits of any kind, but especially Apples and Plums. For light-coloured fruits, pink tissue-paper is the best, and for the dark fruits, blue, yellow, or cream can be used. When a large consignment of different kinds of fruits are being sent to market in boxes or packages of similar size, the use of the different colours is helpful in distinguishing them. It is generally preferable to cover the sides of a box or basket with two separate sheets of paper, so that there will be sufficient to cover the top with two overlapping portions. This is more efficient than having a separate piece for the top, as it is less likely to be misplaced, and when the package is opened the two pieces fold back naturally as a set-off to the fruit.

For small boxes of the finest fruits that are to be sold without being unpacked, the use of white paper-lace, like that used for bouquets, will often furnish a graceful edging to the box, but it must be narrow, so that it does not conceal the whole of the fruit.

In packing of various kinds, where the paper is not in contact with the fruit, and where it is simply used as protective padding, there are various brands of a strong make that can be had from 2s. to 3s. per ream, while, as a top outside covering for boxes or baskets without lids, brown paper in different degrees of stoutness and strength can be purchased at from 10s. to 30s. per ream. We have found a paper of this class, with a glazed surface, at 12s. to 14s. per ream very serviceable, strong, and light.

Packing Choice Fruits.—The essentials in the packing of all choice fruits are: 1st, they must be perfectly sound and dry at the time; 2nd, they must be handled with the greatest care, i.e. as lightly as possible, avoiding undue pressure; and 3rd, they must be rendered as firm as can be ensured without a compression that will indent or bruise the skin. By attention to these details, by providing the correct form of boxes or cases and packing material, as already described, any intelligent person should, with the aid of the following hints, be able to master the difficulties of successful fruit-packing after some practice.

Grapes.—In recent years a great improvement has been effected in the packing of this important fruit, both for market and private use. It was at one time the custom in some places to wrap the bunches up in stiff paper and then pack them in paper shavings, filling up with the same material and then closing the lid of the box or basket to secure them all. Another plan was to employ soft tissue-paper round the bunches and fill in with cotton wadding until sufficiently firm. But with neither of these methods could the bloom be preserved, and the bunches often turned out in a condition that would not give much satisfaction at the present time. The only other mode which has been in general use in Britain has been that which, with some modifications and improvements, is still employed for Grapes intended for exhibition. In this method sloping boards or blocks are padded on the surface with cotton wadding or dry moss, covered with tissue-paper, upon which the bunches are rested, being secured by the stalk, and portion of the stem attached, to the top of the board. These boards are then placed into cases, where they are fastened so that the bunches are kept point downwards. Such cases must always, for safety, be sent in the charge of some person, as they must be kept perfectly upright, and removed with the greatest care, or the fruit is certain to be injured, if not rendered absolutely useless for the intended purpose.

For general conveyance by rail this method is too costly and laborious, and the large growers for market soon realized the defects in the ordinary systems and set about remedying them. Although at one time it was thought almost impossible to send Grapes any distance without greatly damaging the "bloom", yet now many tons are sent into the chief markets from vineyards hundreds of miles away, with the "bloom" as fresh and the fruit as good as if only just cut from the vines. This is effected mainly by two methods: 1st the "Baby" basket system; and 2nd, the Cross-handled basket plan. In the former a shallow basket is employed,
with the side 4 to 6 inches high, which is slightly padded with soft, dry moss covered with soft tissue-paper, or several layers of paper are used alone. Upon this are laid the bunches of Grapes with the points to the centre, and the stalks at the top of the basket sides, where they are tightly secured. Considerable skill, the result of experience and practice, is displayed in at once placing the bunches close together so that they fit in well, thus securing each other and avoiding the necessity for shifting them for re-arranging. When well done it is astonishing how firmly Grapes thus packed are fixed in the baskets, which may be tilted to a large extent without disturbing them, and with ordinary fair treatment they will travel a long distance without shifting. These “Baby” baskets, as they are termed, are then fitted into and secured in other larger baskets, each provided with a lid, which is properly fastened and duly labelled. The last-named is an important part of the proceeding, for it should be clearly indicated in large letters that the basket must be kept one side upwards, as well as showing what the basket contains, its destination, and the sender’s name. It is well, in fact, to have two labels for these purposes, rather than run the risk of not making the details conspicuous.

The Cross-handled basket system is managed in a similar way, but these are deeper, and the bunches are nearly in a vertical position. They are placed in with the same care to ensure due fitting, and when baskets without lids are employed, stout wooden hoops are sometimes arched over the sides next to the handle, and these again are covered with stout brown paper tied round the rim-edge of the basket. If the hoops are not employed the sides are papered as in the other case, but this is avoided when the handle-baskets with lids are used. For individual bunches, to be sent by parcel-post or by rail, small wood boxes are the most suitable; but the Grapes must be very closely packed to avoid injury, and it is difficult to send these in a way that will render them very presentable when removed from the boxes, owing to their being rubbed. Most of the late and thick-skinned varieties are the best for all kinds of packing.

Peaches, Nectarines, and Apricots.
—Perhaps of all fruits these are the most difficult to pack with success, but the majority of failures are traceable to using too ripe or unsound fruits, and to the neglect of little details. That Peaches can travel long distances with safety has been proved by the Californian growers, who send enormous quantities by rail to the Eastern States. It has been recorded that the daily receipt in Chicago of Californian Peaches has ex-

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**Fig. 1140.**—Grapes in flat basket with lid. Packed with paper.

**Fig. 1141.**—Grapes in shallow handle-basket. Packed with paper.
PACKING FRUITS FOR ROAD OR RAIL.

judgment is needed here. There is also considerable difference in the varieties, some of which ripen more gradually and are of firmer skin and texture, more fitted for enduring travelling, than others. It is necessary also to consider the different sizes of the fruits according to the variety and the crop, so that boxes of proportionate sizes may be obtained both as to depth, length, and breadth. All the fruits named should be packed in single-layer boxes, which are often made with separate partitions, like egg-boxes, so that there is a separate place for each fruit. These are condemned by some, but have been used by many with success, and a good deal depends upon the way the fruit is packed as to the respective results. Boxes to hold a dozen or two dozen fruits may be 3, 3\(\frac{1}{2}\), or 4 inches deep (according to the size of the fruits), and these may be, for single dozens, 9 inches by 12 inches, 10\(\frac{1}{2}\) inches by 14 inches, or 12 inches by 16 inches; for two dozen fruits in the same proportion the boxes would be 12 inches by 18 inches, 14 inches by 21 inches, and 16 inches by 24 inches. The larger boxes must be of stouter material, with good bottoms and lids.

Each fruit should be wrapped in tissue-paper, brought up to the apex of the fruit, and screwed there. Upon the base of the box a layer of dry, clean moss, or the finest wood wool, can be placed and covered with paper. The fruits should then be surrounded by strips of cotton wadding, glazed side outwards, i.e. next to the fruit, and then arrange each firmly in position. Wood wool can be substituted for the cotton wadding if it is placed carefully between and around the fruits. Over all a sheet of paper and a layer of wood wool will enable the lid to be pressed down gently but firmly, and then secured by nails or string. If the boxes with partitions are used, each compartment must be carefully padded, the fruits must be filled round firmly. The chief danger in these is that the fruits are liable to be left too loose.

A similar method is adopted for Apricots, ripe Plums, and Figs, but the last-named must be perfectly dry and distinctly underripe to ensure safe carriage. They decompose very rapidly, or are affected by mould if packed too ripe.

Pine-apples.—These are best packed in wooden cases, with a partition in the centre, through which the stems can be passed and secured. British growers do not often have to pack Pine-apples in these days, but the large supplies which reach our markets from other countries are always packed in the way described, usually from six to eight in a case, with some soft material to keep them firm.

Packing Small Fruits.—As regards all small fruits the grading should be done at the time of packing, thus avoiding undue handling. For the finest fruits it is often the rule to gather direct into the baskets or boxes ready for sale or use. On a large scale this is open to many objections, and though the increase of hand-work in connection with soft fruits is not desirable, this must be done occasionally, and it will necessitate extra care in supervision.

The finest early Strawberries should be gathered in trays or shallow baskets and taken direct to the packing-room without being turned out. The packer then selects all the best for punnets, and the others may be again sorted for sale at different prices. From the earliest gatherings of the leading varieties there should, however, be few that are not fit for punnets. The earliest fruit is generally put up in \(\frac{1}{2}\)-lb. punnets, the main crops in 1-lb. punnets, and occasionally 2-lb. punnets are used, but these are not convenient for packing, though they answer very well for shop sale. Both square chip punnets (with and without handles) and round plaited punnets are in use, the former having the advantage of packing closely together in a small compass, but the fruit is seen to best advantage in round shallow punnets, and these are generally preferred by purchasers, while they unquestionably look better on a table. Nothing so well suits the Strawberry as its own leaves for punnet packing, the only difficulty is to avoid using very rigid or springy leaves, as those are liable to disturb the fruit in the jolting of railway journeys. Some varieties have soft pliable leaves, exactly adapted for the purpose, especially if they are of a bright or dark-green colour. The bottom and side of the punnets are lined with these leaves, and upon that the fruits are placed singly and firmly, the stalks of the fruits all in one direction, with the best-coloured side of the fruit uppermost.

All punnet Strawberries should be packed with the stalks, and even good fruits must be excluded when they are defective in this respect.

The round punnets can be conveniently packed in trays, either for market or home use; if they are to be sent by rail, several trays can be tied together. Those in general use which we have found most satisfactory are 3\(\frac{1}{2}\) inches deep, 12\(\frac{1}{2}\) inches wide, and 20\(\frac{1}{2}\) inches long, which will hold six 1-lb. punnets and allow sufficient
room for packing material at the ends and sides to keep the punnets steady. Over the fruits a number of leaves are placed, the upper surface downwards, then a sheet of paper, and the lid (which is either hinged or loosed) is then secured by cord. These trays can also be placed in crates constructed with shelves or slides to hold about a dozen in two tiers.

The main-crop and cheaper fruits are best packed in small boxes or baskets that will hold about 3 or 4 lbs. The smallest-size boxes supplied by the railway companies are very useful for this purpose, and nothing is needed beyond a lining of good paper, provided the firm-fruiting varieties of Strawberries are employed, and these only are fitted for the purpose. Carefully selected and packed, such boxes can be sent hundreds of miles. The size of the box in question is 7½ inches by 10½ inches by 3 inches deep, and it holds 3 lbs. of good fruit.

Fruit for preserving is generally placed in baskets holding about 12 lbs., and those with necks curved in at the rim are the best for this purpose. Raspberries for packing should be gathered with the stalks, and may be packed in deep punnets or in a similar way to Strawberries if for dessert. For preserving, baskets are the best, but large bulbs should never be placed together. Baskets holding about 6 lbs. are the most suitable.

The finest ripe Gooseberries are sometimes packed in deep punnets, like Raspberries, but more usually they are placed in small baskets or boxes, and sorted in the house or shop for immediate use or sale. Gooseberries should be carefully selected, and never packed immediately after rain, the fruits are so liable to split and spoil the others.

Stone-fruits.—It has already been indicated that the best Dessert Plums are preferably treated in a similar way to Peaches, and they pay for the most careful packing. For all large Plums the small-box system, with at most two layers of fruits, can be followed with satisfaction. Varieties of the Monarch type require a box at least 4 inches deep to allow sufficient space for packing material, and about 6 lbs. of fruits can then be provided for in each box. The bulk of Plums for ordinary use can be packed in boxes holding 12 lbs. to 14 lbs. of fruits, but these should be despatched before they are ripe, and even then they need the most careful handling. It should be seen, too, that all spaces are well filled, so that, when the lids are on, they cannot shake loose. Where still larger supplies are dealt with, half-sieves, i.e. stout baskets that will contain about 26 lbs. to 28 lbs. of Plums, are most generally used. In either of the latter cases the upper layer of fruit must be covered with paper, upon which the packing material should be placed, and over this two stout willows or other flexible sticks should be crossed in the centre, with the pointed ends through the sides of the basket below the rim. This is the regular market style, but for home use flat Hampers with lids are preferable in every way.

Damsons can be packed in the same way as Plums, but, except for convenience in sending small quantities, boxes are seldom required, flat baskets being more serviceable.

The finest Dessert Cherries should always be packed in small boxes or baskets, or for special purposes they can be made up in punnets like Strawberries. The general crop for eating or culinary purposes can be treated like Plums and forwarded in boxes, half-sieves, or flats as desired, the same precautions and care being necessary in each case.

Apples.—With no fruit is the skill of the grader and packer combined more in request than with Apples, and though a distinction may be made in this respect between dessert and culinary varieties, yet both are affected in an important degree as regards market value. It is so usual in this country to consign all Apples for sale in open baskets (bushels and half-bushels) that it is difficult to induce some growers to try other methods. Yet the best samples are worth more careful treatment, and where a thorough system of grading is adopted, it is found profitable to pack the finest selected samples in a different manner. The advantage of doing this is becoming recognized, and boxes holding a dozen of the best British-grown Dessert Apples have been seen in some of the leading London fruitiers' shops priced at 2s. 6d. and 3s. Referring to this method the editor of the Gardeners' Chronicle says: "Growers are very apt to complain of the low prices they obtain for their produce, but this is not infrequently the result of their own carelessness. When fruits are handled like so much gravel and coals, as they often are, it is no wonder they become bruised and unsaleable except at ruinous prices. But if the fruit be carefully gathered, sorted, and packed, the prices obtained will be higher. We have an illustration of this in the shape of a box of Apples from the Duke of Bedford's fruit farm at Ridgmont. It is a small wooden box containing twelve carefully-selected Apples,
resting on a bed of wood wool, which is covered with a sheet of tissue-paper. Each Apple is wrapped round by a broad band consisting of several folds of tissue-paper. By this means the fruit is not bruised in transit, and the should be left uncovered to show its character and quality.

Culinary Apples can well be classed in three grades for sale. The half-sieves or bushel baskets employed for market are only suitable for the inferior grades, the best are always worth boxes or flat baskets. These should hold about half a bushel, and the fruit should be packed by hand, with paper and wood wool, as the finest examples well packed will always bring sufficiently advanced prices to more than pay for the extra cost and trouble.

Growers with a large business would do well to give more attention to keeping up a uniform standard of grading in Apples, and to mark their packages in a regular manner. In Canada a law has been passed upon this subject, which renders it compulsory to clearly indicate the quality of the Apples being shipped, and conviction of erroneous labelling is punishable.

_Pears._—All the best and largest Pears should be packed in shallow boxes or hampers, two or

![Fig. 1142.—Apples in flat basket with lid. Packed with fine wood wool.](image)

Apples have a most appetizing appearance. As each box is conspicuously marked with the name of the fruit farm, the purchaser has a guarantee of the quality of the fruit. All that we can suggest further is that the name of the Apple—in this case Cox's Orange Pippin—should be placed on the box. Small boxes like this would be eagerly bought by householders, once it were known where they could be obtained, and even the grocers would in time realize the fact that selected fruit carefully handled would be more profitable than the miscellaneous stuff they sell under the name of fruit." Small boxes like these weigh about 5 lbs., the packing costs a mere trifle, and the price obtainable is often 50 per cent in excess of the same grade of fruit placed in larger boxes or baskets. Every fruit must be selected by hand, and be as free from defects as it is possible to determine by eye-examination.

If the best Dessert Apples are packed in larger quantities, boxes or flat baskets that will hold 12 lbs. or 22 lbs. to 24 lbs. should be used. The layers and the lines of fruits should be separated by bands of white tissue-paper or the finest wood wool, but sufficient of the fruit three layers being sufficient, and the former is the better plan. If Pears are carefully selected of uniform size, they lend themselves to neat and tasteful packing even better than Apples. By placing the fruits diagonally, and reversing the position of every line, they may be made to fit with almost geometrical exactness. A plentiful use of the finest wood wool and paper will suffice to ensure the safety of Pears in boxes.

![Fig. 1143.—Pears in shallow box. Packed with paper and wood wool.](image)
if care is exercised to provide firm packing, and no fruits are used that are too advanced in ripening.

Miscellaneous.—A few other fruits may be incidentally mentioned that require special packing. Melons, for instance, should be wrapped in paper, and packed with wood wool either in boxes or flat baskets, never more than a single layer in one package. Cucumbers are almost invariably packed in flat wooden trays that will take a single layer of about a dozen fruits. Paper is generally used as packing material. Tomatoes are packed in small boxes or baskets, usually with paper, but sometimes cork dust is used with imported fruits, as it is with the Almeria grapes sent in barrels to British markets. [R. L. C.]

CHAPTER XXVI.
STORING FRUITS.

Requisite Conditions.—Storage Conditions.—Stages, Shelves, Trays, and Drawers.—Preservative or Non-conducting Materials.—Temperature.—Atmosphere, Ventilation, Moisture.—Light.—Floor and Path Materials: Dust.—Special Fruits for Storing.—Apples.—Pears.—Soft Fruits.—Grapes.—Cold Storage.

Every year considerable quantities of British-grown fruits are temporarily stored, for periods of varied duration according to the nature of the fruit being dealt with, and the requirements of the storer. In all private gardens attention to this matter is a necessity, and in the greater proportion of commercial establishments it is now recognized as an essential demanding due care as regards the principal varieties of Apples and Pears. With the majority of soft fruits storing is of much less importance, or other methods have been resorted to when it is desired to retain some for use at a later period than their ordinary season of maturation. As a rule, there is little to be gained by attempting to store the early fruits; they so quickly deteriorate in quality, even under the best care, that growers for sale usually prefer to place them on the markets immediately they are ready to be gathered. Even in this case, however, storing may occasionally be utilized to a very good purpose, and may enable the grower to secure better prices. For instance, the fruits of most of the early Apples and Pears must be taken from the trees as soon as they are ripe; in the high temperatures which usually prevail at that time of year the chemical changes in the substance of the fruit proceed with great rapidity, and the result is that when maturation is reached incipient decay at once follows. Though such fruits deteriorate to some extent under the best systems of storing, it is in a less degree than if they are left too long upon the trees. The markets also are soon “glutted” with early hardy fruits, and the prices fall in proportion, therefore sometimes the possibility of holding over a portion of the supplies for a few days may be of commercial advantage.

In private gardens and for home use the reservation of fresh fruits for particular dates is often a matter of importance, but the variability of the seasons and weather conditions may cause disappointment unless some means are adopted for storing fruits that ripen too early.

For most of the mid-season and late fruits storing is indispensable; indeed, as regards all the latest varieties of Apples and Pears a long period is usually required under the right conditions to ensure the full development of the characteristic qualities. This is especially the case with many of the finest Pears grown in British gardens, which have to be gathered months before they are fit to be eaten, yet with proper care they acquire an aroma and a delicacy of flavour that cannot be surpassed by any other fruits. Similar remarks also apply to many Apples of the Russet type, which under the right conditions develop an unrivalled spicy flavour. Even amongst Apples for cooking purposes there are some which improve greatly both in flavour and substance by a period of storing—the acidity is mellowed, and the flesh breaks down under the operation of cooking into an excellent pulp. Notable examples of such improvement are afforded by Dumelow’s Seedling, and by Bramley’s Seedling, which from a culinary point of view must be ranked with the best Apples, especially when the fruit has been kept a suitable time.

Requisite Conditions.—The ripening of fruit is one of Nature’s most elaborate and delicate operations. The changes in the combinations of the constituents are numberless, and present a great and difficult study even for the most advanced chemical authorities. The general effects are easily perceived, but the processes by which these results are reached are not so apparent or so easily understood. The majority of unripe fruits while in a green state perform
in a measure similar work to the leaves, i.e. they absorb and break up carbon-dioxide from the atmosphere under the influence of sunlight, liberating the oxygen and utilizing the carbon in the building up of tissues or cell-contents. In the case of such fruits as Apples and Pears, where the chief part of the edible portion consists of the floral receptacle or enlarged peduncle, the leaf-like function is still more marked, and these are undoubtedly materially self-assisting though not self-dependent. As the stage of full development is approached the normal leaf-work is gradually diminished until ultimately a reverse process is commenced, namely, oxygen is used up and carbon-dioxide is liberated. The changes in coloration, the formation of sugars, and the elaboration of the special essences and aromas, are attendant on a process of oxidation, the final result being the perfected fruit. But under favourable conditions of temperature and moisture, these changes advance with great rapidity to the destruction of the fruit as an edible product. Fermentation and decomposition are extensions of the process of ripening, and the success of all attempts at storing fruits must depend upon the efficiency by which the changes named can be arrested, or at least retarded.

What is required in the storing of fruits, therefore, is to provide such conditions that the full development of their characters may be ensured, that these qualities may be preserved as long as desired, and that undue loss of weight or shrivelling be avoided. To keep fruits satisfactorily a distinction should be made between those which are ripe, or which have nearly reached that stage, at the time they are gathered, and those that may need weeks or months of storing before they are matured. Some material differences are needed in the treatment, but too often this fact is either overlooked or disregarded.

In the case of the ripe fruits, which will mainly consist of early or mid-season varieties of Apples and Pears, with such soft or stone fruits as may be fit for treating in this way, the object must be to arrest as far as possible all further change until they are wanted for use. For the others the conditions should be proportioned in some degree to their period of development; this cannot be adhered to absolutely, but the treatment of stored fruits might be considerably modified on the lines indicated with advantage.

The avoidance of loss of weight is difficult to ensure, but when fruit is sold by measure or by the bushel, unless it is of stipulated weight, this is not a matter of serious import, unless the loss proceeds to such a length that shrivelling takes place on the exterior, and a sponginess of the internal substance renders the fruit almost worthless. As regards Apples, there is a great difference in the loss of weight of the chief varieties when stored. Under equal circumstances, and for equal periods, we have known this loss to range from 5 to 20 per cent. Something will, however, depend upon the size of the fruit, the way it has been grown, and the state it is in at the time of harvesting. Medium-size fruits that have been produced by sturdy trees grown under suitable circumstances fully exposed to sun and air usually keep the best of all. Very large, rapidly-grown fruits of many varieties lose weight in a marked degree. It is somewhat the same with Pears, except in the case of the large sorts of the Stewing type, such as Catillac, Bellissime d'Hiver, Verulam, and others, which are of a particularly firm texture and resist the drying effect for a long period.

One preliminary is essential in the highest degree, and that is, fruit for storing with the best results must be thoroughly sound. Bruised, insect-injured, or fungus-attacked samples will not only fail themselves, but will affect other good fruits with which they might be placed. Wherever the stock is generally defective, it is far better to dispose of it as soon as convenient after the gathering is completed. It is a waste of time, and may lead to a large money loss, if any attempt is made to store such fruits. Nothing is worse than the seab fungus for thus rendering fruits unsuit for keeping; even when there are no external signs of the disease at the time they are placed in the storage, if they come from an infected source it will probably appear speedily when under cover.

Besides the influences indicated as opposed to the successful storing of fruits, there is that of careless gathering. The importance of paying attention to this method has been dealt with in other chapters, but it must be urged here that when a large fruit-room has to be filled with produce to be reserved for use over a period of some months, the greatest care in every detail should be exercised. Avoid clasping and pinching the fruits in the hand; place them in padded shallow baskets, and remove them from these to their final quarters with the same care.

To summarize the preliminary conditions connected with satisfactory fruit-storage—we
must first have good cultivation to ensure due development and maturation; secondly, the fruits must be kept clear of insect or fungus injuries; and thirdly, care must be exercised in gathering and handling them.

With all the care that can be exercised, much must depend upon seasonal influences as regards the length of time fruit will keep. In moist sunless summers, when the fruit develops fast but is not fully matured, difficulty will be experienced in keeping fruits for anything like the usual time. It also happens occasionally that even a brief period of moist dull weather, when a critical stage in the ripening process has been reached, will suffice to cause a special liability to fungus attacks, and the consequent bad-keeping results. Such effects obviously cannot be guarded against, and it is here that a grower for sale must exercise his judgment, for in some seasons it is preferable to clear out his stock at moderate prices, than to attempt to store the fruits in the anticipation of realizing higher rates later on.

Storage Conditions.—Descriptions and illustrations of well-constructed fruit-rooms have already been given in earlier chapters, and it will not be needless to repeat what is there said on this subject. There are, however, many details which require consideration, and with these it is proposed to deal in the following remarks. Wherever large quantities of fruits have to be provided for, a distinct advantage would result from having two or three divisions in the storage. In an ordinary way for home use one department is sufficient, but if the varieties are numerous, and the season during which they should be in use extends over six or eight months, the benefit derivable from the divisions will be apparent. For moderate collections and crops two departments will be enough, but for the largest numbers of varieties and the heaviest crops it is helpful to have three divisions. The separating partitions can be formed in a simple manner, so that they are readily removable when necessary. Match-boarding or feather-edge boards are convenient for the purpose, and are easily secured or disconnected as desired.

In the best-designed structures there should be a porch or small entrance space, which could be utilized for many purposes, and it aids materially in the regulation of temperature and moisture in the main space of the storage. This is much more effective than double doors, and very little additional expense need be incurred; in fact, various existing buildings could be adapted in the way indicated without incurring the expense of fresh structures.

Stages, Shelves, Trays, and Drawers.—If fixed stages are formed in a fruit-room for the reception of Apples and Pears in bulk they require to be of considerable depth to enable the fruit to be placed in or removed conveniently. Where the stages are 2 or 3 feet wide there must be a space of at least 1 foot between the stages in each tier, and usually it is far better to allow from 18 inches to 2 feet, according to the quantity of fruit to be placed under cover. This should, however, be only a temporary arrangement preparatory to sorting and sale, or to a more thorough system of storage. There are many objections to storing fruit in this way even for a short time, not the least of which are the injuries which result from the repeated removals and handling that are unavoidable under the system. Where fixed shelves are employed, that may be allowed less space than the stages referred to, the same difficulty applies, and in addition the fruit cannot be stored or removed so quickly and conveniently.

All the advantages are in favour of movable or sliding trays, which are easy of construction, readily adaptable to any size storage or fruit-room, are economical of space, permit the frequent and thorough inspection of the fruit, and by avoiding storing in bulk also assist materially in its preservation. These trays should be made as light as is consistent with the requisite strength: the front, back, and sides can be made of laths $\frac{2}{3}$ inches wide by $\frac{3}{8}$ inch thick, and the bottom can be formed with laths 1 inch wide for all the smaller sizes, but for the larger sizes it is preferable to employ the same kind of lath throughout. Fig. 1144 illustrates a simple method by which these trays can be constructed. The frame-work, $A$, is a rectangle of laths placed on edge and nailed together at the corners; beneath each side runs a piece of lath, $B$, similar to those composing the framework, and these serve two purposes, one to act as slides, and the other as supports for the

![Fig. 1144.—Movable or sliding Fruit-tray.](image-url)
cross-pieces, c, placed at 1 inch apart to form the body of the tray.

The trays are arranged in tiers, one above the other, and from 5 to 6 inches apart is ample where single layers of fruit only are to be stored (fig. 1145). The uprights back and front are formed of 2-inch by 2-inch posts, and attached to these at the stated intervals are the slides upon which the trays are to run. In an ordinary way it is not advisable to take these to a greater height than 5 or 6 feet, because above that it is difficult to remove or replace the trays when the workman is standing on the ground-level. This difficulty can, however, be to some extent overcome by the aid of a small pair of steps, and there is then no reason that the tiers should not be taken up to the height of even 8 or 10 feet if desired.

It will be entirely a matter of convenience what size should be adopted for such trays. Those of undue width are difficult for a workman to handle, and those that are exceptionally deep from back to front take up a great deal of space when pulled out to their full extent, thus demanding a larger gangway than can usually be accorded in fruit stores. Trays 3 feet square can be managed with ease, but sometimes it is better to have them with the length, i.e. from back to front, rather more than the width, and in this way 2\(\frac{1}{2}\) feet wide by a length of from 3 to 3\(\frac{1}{2}\) feet will meet the case. When using the last-named size, namely 2\(\frac{1}{2}\) feet by 3\(\frac{1}{2}\) feet, the number of Apples that can be stored in single layers in each tray are approximately as follows: (i) large size = 70–80; (ii) medium size = 120–140; (iii) small size = 250–300. Trays 3 feet square will hold respectively about 50 large, 70 medium, and 150 to 200 small Apples. This means about half a bushel to each tray, and allowing 6 inches between the tiers, would provide for a bushel for each foot of vertical height.

It is not essential that the wood be planed unless it is very rough; where cost is not an urgent consideration, however, there is an advantage in so preparing it, as the trays can be more readily cleaned, and the surface is not likely to cause damage to the fruits when these are being moved. The sharp edge of the last where the fruits rest may also be taken off for the same reason.

Drawers or trays with lids are chiefly used for Pears when it is desired to hasten the ripening process, but they are also well adapted for many of the late varieties of Pears which require a long period of maturing.

Where an effort is made to keep soft or stone fruits for a short time beyond their season in the summer, assistance can be derived from the construction of a tier of slate, zinc, or galvanized-iron shelves. These provide a cool base upon which to rest the punnets or paskets containing the fruit. Usually the slate slabs prove the most suitable.

Rats and mice are occasionally very destructive in fruit store-houses, and some provision must be made against them. If the building rests upon brick foundations and low walls, there will be little danger of the pests gaining an entry. But with wooden erections it is a good plan to place zinc or finely-meshed hexagon wire-netting round the outside, partly above the ground-level and partly below, with the lower part turned outwards thus L. The vertical portion can be from 6 inches to a foot in depth (half below the ground surface), and the horizontal out-turned part may be 4 to 6 inches wide. If, however, the creatures should still find a means of entry, trapping must be resorted to immediately. Poison is the most efficacious mode, but unless all the dead rats or mice can be found and removed the results are very troublesome and offensive.

Preservative or Non-conducting Materials.—Dry straw, hay, wood-wool, and other substances are often placed as layers on the shelves of storehouses to protect and preserve the fruit, but a comparison of different materials and methods has not shown any special advantage from their use, and occasionally the result has been quite against them. In any case they need frequent renewal; then, too, they are liable to affect the flavour of the fruit, and this renders hay especially objectionable; straw also
when damped by the exudation from the fruit, or by the condensation of moisture from the air, soon emits an unpleasant odour. Beyond this, any organic substance that is likely to be decomposed is a source of danger to the fruit it is in contact with, and there is the probability that it may furnish a supply of fungus spores or bacteria germs that will hasten the work of destruction. In an ordinary way no substance whatever is needed on the open lath trays described, but in the case of choice Apples or Pears we have found that white tissue-paper which has one surface glazed is beneficial. A single sheet is placed on the tray, glazed side uppermost, for the fruit to rest upon, and this generally suffices; but where there is danger of dust finding its way to the fruit, or fluctuations of temperatures are feared, another sheet over the fruit, glazed side downwards, will prove an additional protection.

**Temperature.**—The degree of heat that can be maintained in a fruit-storage is a consideration of much importance if the best results are to be secured. In the earlier part of the storing season—the end of summer and the beginning of autumn—the chief difficulty is in keeping the temperature down sufficiently low to prevent the hastening of the changes in the fruit substance. Later in the season the difficulty is reversed, i.e. the prevention of injury by frost is the object. In either case material help is rendered by the efficiency with which the walls and roof of the storage are constructed as non-conductors of heat. The results will also be influenced by the position of the house, which, if much exposed, will be subjected to greater extremes than one in a sheltered or shady place. Heavily-thatched roofs and sides provide the simplest means of ensuring a regular temperature at all times, but double walls help in this way, and it is desirable that heating power may be at command, so that in severe weather frost may not prove a source of danger.

A steady temperature of from 35° to 45° F. during the winter has given the most satisfactory results with Apples and Pears, and in a well-built storage it is generally possible to secure this without much artificial aid. But for buildings containing a large quantity of fruit, it is a needful precaution to have some means at command by which heat can be utilized when requisite in times of sharp frosts. A very moderate heating power is sufficient for the purpose, but the source should be thoroughly isolated, and if pipes are used for the conveyance of hot water these should be at the lowest part of the building, preferably sunk in the floor, covered with iron grating, and in the centre of the path, so that the heated air may rise without coming into immediate contact with the fruit. Whenever it is compulsory to resort to artificial heat the work must have close attention, or irreremediable damage may be done to the fruit, either by excessive drying of the surface, or by the undue condensation of moisture following the subsequent discontinuance.

**Atmosphere—Ventilation—Moisture.**—One important point in good storing is to disturb the air as little as possible. Every current of air passing over the fruit has some effect upon it, either in the way of drying it and hastening its maturation or in reducing its bulk; or in the case of the fruit being cooler than the air, a deposit of moisture follows, which will also carry with it many objectionable substances contained in the atmosphere. When a storehouse is kept closed for a length of time there is a marked accumulation of the exhalations from the fruit, which include gases that are not helpful to the keeping process. Besides, there is the presence of organic substance undergoing, though slowly, various chemical changes; there are also numbers of the minute forms of life (collectively and popularly termed microbes) that are mainly concerned in the fermentative and decomposing changes. By completely sterilizing the air in a fruit-storage a great step would be taken in the direction of rendering the work a scientific and economical success, and there is no doubt that the future will bring some important developments in this respect. Already a process (the Lawton) has been patented to effect this object, and the trials to which it has been subjected have satisfied a number of experts that there is a good prospect of substantial results.

"It is designed to enable fruits, at or before maturity, to be stored for a long time either on board ship or on land without suffering deterioration; and this, broadly speaking, is accomplished by charging the chamber in which the fruit is stored with a sterilized and deoxidized atmosphere. Fruit which has undergone this treatment is, if anything, improved in flavour, and when again exposed to the ordinary atmosphere remains good for a much longer period than is possible under existing conditions."

The inventor, in the course of a recent speech, thus described his method. He said that in dealing with both green and ripe fruit it was necessary to ascertain the requirements and nature of the fruit to be kept, some fruits
oxygenizing more quickly than others. This process of oxygenation was in reality, so to speak, slow combustion of the fruit. All fruit was covered with breathing pores, and repeated experiments which he had made by placing fruit in air-tight glass vessels, and making an analysis of the atmosphere some time after, proved that the free oxygen in the vessel had all disappeared, having been absorbed by the fruit, and that it had been replaced by carbon-dioxide. Unless this was removed, the fruit would soon lose its vitality and strength and become tasteless and worthless, so the vital forces of the fruit must be kept in a healthy condition in order to produce the most perfect flavours. He had made numberless experiments in connection with this matter, and by placing the fruit in air-tight vessels he had found that it absorbed less oxygen at night than in the day. By shutting off a known proportion of oxygen the rapid combustion of the fruit was nearly stopped. Under this process, therefore, he removed from time to time from the storage-chamber all the carbon-dioxide and replaced it with just sufficient oxygen to keep up the necessary circulation and life principle in the fruit, and to keep it in the best and healthiest possible condition. This was the secret of the wonderful keeping qualities and long life of the fruit which had been treated under this process.

For the carrying out of the above process a specially-constructed storehouse would be requisite, but in effect we have to seek an approach to this in our present style of fruit-rooms, and only a rough approximation can be ensured by a judicious control of the ventilation. The selection of the time and condition under which air is admitted will influence the results materially. A renewal of the air within the storage is all that is required, and a short period will suffice for this if there is means of ventilation at the bottom as well as at the top. The best plan is to have outside ventilators at the bottom communicating with pipes that can be opened or closed inside the building as well as outside. Select a time when the internal and external atmosphere are nearly equal in temperature and moisture, preferably when the outside air is clear and rather dry, then from ten to fifteen minutes should be sufficient time to have the ventilators open at one time. This need not be repeated more than once a week, except it is found that there is an undue accumulation of moisture on the fruit; under the best conditions even less frequent ventilation will be needed.

It must be remembered in regulating the moisture conditions that air at 40° F. is comparatively soon saturated, and that when this is effected the slightest fall in the temperature forms a deposit of moisture. It is therefore advisable to keep the atmosphere of a fruit-storage well below the saturation point, and if a dry-and-wet-bulb hygrometer be employed the minimum difference between the thermometer readings should be about 3° F.

Light.—The admission of direct sunlight must on all occasions be avoided where fruit is stored, as it has a most potent effect in hastening the changes which the operator is seeking to retard. Indirect light, or that from a window on the north side of the building, is not so marked in its effects, but as a general rule the less light is admitted into a fruit-room the better it is for the contents. All windows should be relatively small, and must be closed with shutters or some similar means of thorough exclusion when light is not required for the examination of the fruits.

Floor and Path Materials: Dust.—It is of urgent importance to avoid dust in a fruit-store, and any material employed that is a possible cause of this is also a source of danger which may neutralize all the best contrivances and care of the grower. An ordinary earth floor and path are suitable where the soil is of a firm character, so that it can be rendered solid and without a loose surface. After the room is cleared of its contents, such paths can be readily put in order or renewed for another year. Where, however, the soil is light and soon reduced to dust, it is preferable to employ concrete or cement. Where expense is not an object, tiles, bricks, or stone slabs can be employed for the same purpose. Most kinds of asphalt are objectionable by reason of the odours given off.

Where conveniences and storing spaces are very limited, it is sometimes necessary to employ fruit-rooms as storehouses for other garden products, but it is undesirable where it can be avoided; and whenever extensive fruit-storage is attempted all other products should be excluded, or placed in divisions completely isolated from the more important department.

We have seen Mushrooms grown on the lower stages of the fruit-room with great success; but this was rather seriously discounted by the fact that a large crop of valuable Apples was at the same time completely spoiled.
Special Fruits for Storing.—It has already been indicated that the choice of fruits that are available for ordinary storing with success in this country is somewhat limited, but we may now refer more particularly to the kinds and varieties which lend themselves to the process. In regard to private gardens and for home use, it is not always a question of whether the storing is a profitable proceeding; the main point is whether it can be performed successfully. Commercial fruit-growers, on the other hand, have to consider both aspects, namely, the practicability and the costs. We have endeavoured to treat the matter so that some judgment can be formed on each side.

Apples.—It is seldom necessary, nor does it usually pay, to attempt keeping the early varieties of Apples either for dessert or cooking. The only circumstances in which it is worth attention are when there is a heavy crop of early varieties, and the markets become filled to such an extent that prices fall to a very low level; or when the home supply is likely to be short owing to deficient crops of the later varieties. Of the earliest Apples, such varieties as Beauty of Bath, Mr. Gladstone, Devonshire Quarrenden, and Margaret may be kept for a week or a fortnight, and thus bring more profitable returns by choosing a suitable time for the marketing; or for home use they can be kept a month after they are gathered.

It is with the mid-season Apples that the best results are obtained (apart from the main-crop varieties) as regards the temporary storing in abundant seasons for sale or use. A few only of these may be mentioned as examples, such as Duchess of Oldenburg, Keswick Codlin, Lady Sudeley, Lord Grosvenor, Lord Suffield, Potts' Seedling, Yellow Ingestrie, and Worcester Pearmain. None of these are adapted for long keeping, and though under the most favourable conditions they may be had in usable or even marketable condition for two months from the gathering, yet the sooner they are disposed of the better, unless there are urgent reasons for prolonging their season.

In the great bulk of Apples, comprising the autumn and winter varieties, they may be conveniently classed in two groups: (i) those to be used or sold before Christmas, and (ii) those to come in for January onwards. It is impossible, however, to draw a hard-and-fast line between the two, as many of those which may be more profitably classed in the first from the salesman’s point of view, will yet prove useful in gardens until long past the assigned period. In the first group good examples are afforded by Blenheim Orange Pippin, Golden Winter Pearmain, Margot, Fearn’s Pippin, and Ribston Pippin amongst dessert Apples; with Cox’s Pomona, Gloria Mundii, Golden Noble, Lane’s Prince Albert, Ecklinville, Hawthorn-den, Lodddington, and Stirling Castle amongst kitchen varieties. In the other group, comprising all the latest Apples, the majority must be kept for a period to develop their highest qualities, and if these have been gathered carefully, and not too early, so that there is no danger of shrivelling, they are worthy of the greatest attention that can be bestowed upon the storing of fruits. A few of these may be selected as specially notable, as follows:—Dessert: Ashmead’s Kernel, Boston Russet, Brad-dick’s Nonpareil, Claygate Pearmain, Cornish Gilliflower, Court Pendú Plat, D’Arcy Spice, Duke of Devonshire, Kedleston Pippin, Mannington’s Pearmain, Nonpareil, Ross Nonpareil, Sturmer Pippin, and Wyken Pippin. Kitchen Apples: Alfriston, Beauty of Kent, Bramley’s Seedling, Brownlee’s Russet, Dumelow’s Seedlings, Norfolk Beefing, Royal Russet, and Striped Beefing.

Pears.—A similar classification may be adopted with Pears for storing purposes as with Apples, and it is for that reason it was pointed out earlier in this chapter that three divisions in a large fruit-storage would be advantageous. The earliest Pears are much more difficult to keep than the same class of Apples, they so often commence rotting at the core when the exterior is apparently sound, and this seldom occurs in the case of Apples without there is insect injury. To have any chance of preserving them even for a short time the conditions must be most carefully regulated to arrest all tendency to change. Of the earliest Pears that are worth trying to keep for a time may be named Aston Town, Beacon, Beuré d’Amanlis, Beuré Giffard, William’s Bon Chrétien, Clapp’s Favourite, Colmar d’Été, Dr. Jules Guyot, Fertility, Jargonelle (very difficult to keep), Madame Treyve, Marguerite Marillat, Souvenir du Congrès, and Triomphe de Vienne, but all these should be gathered well in advance of the ripening.

The Pears for use up to Christmas comprise the greater number of those in cultivation which can be subdivided into October, November, and December Pears, as representing the time at which they mature naturally. There are few of these, however, which if harvested in the best state and given the most thorough
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Air compressing and expanding machines are represented, diagrammatically, by fig. 1, where A is the chamber to be cooled, B a compression cylinder driven by power, C a cooler, and D an expansion cylinder whose piston is operated by the air which has been previously compressed in B. This pump, after drawing air from A, compresses it to three or four atmospheres, the mechanical energy thus exerted being simultaneously converted into heat. The compressed and heated air passes through the cooler C, into the expansion cylinder D, where it assists the driving agent, as already indicated. Upon the final discharge of the cooled and expanded air into the chamber A, it abstracts heat from the atmosphere therein.

Machines working on the principle of evaporation and condensation by compression of a volatile liquid are represented, diagrammatically, in fig. II, where A is again the chamber to be cooled, B a compressor driven by power, C a condenser, and D the refrigerator, the two latter vessels consisting of coils of pipe charged either with ammonia or carbonic acid, both highly volatile substances, of which, however, the former is more generally used. The ammonia enters the refrigerator as a liquid, and, rapidly evaporating within its coils, abstracts heat in so doing from the atmosphere filling the chamber A. The vapour thus generated in D is drawn into the pump B, and there compressed to such a tension that, upon entering the condenser, it assumes the liquid form. The condensed ammonia then returns to the refrigerator D, through a regulating valve E.

Fig. III represents, diagrammatically, a cold store having three floors of chill-rooms; and here, as in the case of fig. II, ammonia, leaving the compressor B, situated in the engine-room C, enters the condenser C, and, passing as a liquid through the regulating valve E, becomes vaporized in the refrigerator D, whose coils are submerged in a brine-tank F. Above this tank, and occupying its whole length, two or more spindles, carrying a number of plate-iron discs L, L, slowly revolve. The discs are about 2 feet diameter, 3/4 inch thick, and set about 3/4 inch apart; their total superficial area being considerable. They dip, as they rotate, into the cold brine below, and emerge with damp chilled surfaces, over which a stream of air is constantly impelled by the action of the fan H. The latter sucks its supply through the openings J, J, J, from all or any one of the rooms A, A, A, at will, and having urged it through the numerous narrow spaces separating the discs L, L, from each other, delivers it again into the cold chambers through K, K, K, both inlet and outlet apertures being furnished with sliding shutters. A constant circulation of air results, and whatever moisture arises from the goods stored in the chill-rooms is carried thence by the outgoing current from the fan, condensed upon the cold surfaces of the revolving discs, and by them transferred to the brine, which, weakened by these fluid additions to its bulk, requires to be occasionally dosed with salt.
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(From the Journal of the Royal Agricultural Society. By permission)
attention cannot be kept for at least two months. In the list of latest Pears, i.e. those to come in use from January up to April, there are smaller numbers of varieties to select from, but these include some of the best in British gardens, which are indispensable alike for sale or home use. Amongst these may be named, somewhat in the order of maturation, Winter Nelis, Chaumontel, Beurré d’Aremberg, Glou Morceau, Zéphirin Grégoire, Beurré de Jonghe, General Todleben, Beurré Sterckmans, Joséphine de Malines, Bergamotte Esperen, Beurré Rance, Easter Buerré, Nee Plus Meuris, Passe Cra- sanne, Nouvelle Fulvia, and Olivier de Serres. In all storing arrangements Pears require even more care than Apples to allow them to mature as slowly as possible, as if unduly exposed they either ripen and decay with great rapidity, or, what is equally bad, and more common with the later varieties, they shrivel, and are then practically useless for table or sale.

**Soft Fruits.**—These are much more fitted for cold storage than the ordinary system of keeping fruits, but where an effort is made to preserve them for a short time in a fresh state in a room of the usual type, the slate or metal shelves previously advised will be found an advantage. The chief points are to provide as low a temperature as possible, exclude light, and keep the store-room closed throughout the day; if it is opened at all it should only be at night, when the air is cool.

Raspberries, Strawberries, Red Currants, and Gooseberries may be so kept for a few days, although it is always better to prolong the supplies by growing varieties which ripen later. Red and Black Currants can be best kept on the bushes if these are in a shaded position. Plums can be stored for a week or two in a well-constructed place, and some of the best-quality dessert varieties, if not dead-ripe when gathered, become very rich when carefully stored for a period. Later varieties of the Monarch type can also be kept in good condition for a week or two.

**Grapes.**—Some of the leading growers of Grapes for market prefer to keep late crops of fruit on the vines as long as possible without attempting any storing, and the results are satisfactory where large houses are devoted to one variety. It often happens in gardens, however, that several sorts are grown together, or that the vineries have to be utilized for the accommodation of other plants, when systematic storing becomes a necessity. For small establishments it is hardly possible to provide a special storage for this fruit, but where vines are extensively grown a well-designed Grape-room repays for the trouble and expense. In France this has been carried out on a large scale, and at Thomery enormous quantities of Grapes have been so preserved. Mr. W. Robinson relates that when this method was introduced to the Thomery vine-growers it resulted in an annual gain to the village of from £4000 to £6000.

In Britain the Grape-room is a frequent and an indispensable adjunct to the fruit-room. In gardens where these fruits are in demand it is not unusual to find excellent accommodation provided in this way for large crops. Most of the conditions requisite in an ordinary fruit-room are applicable to Grapes, namely, they must be kept in the dark, and a temperature of from 40° to 45° is needed, but the air should be kept much drier than is desirable for Apples or Pears, and it is this which renders it important to have a separate department for Grapes. The walls should be fitted with racks projecting from the wall, with apertures and rests to hold bottles in a slanting position, the neck directed upwards and outwards, so that the Grapes may hang quite clear of the rack. The bunches must be well ripened and coloured, any damaged or decaying berries should be removed, and the Grapes must be cut with a sufficiently long piece of the wood attached to place in the bottles and reach nearly to the bottom. Clear water should be used (preferably that which has been boiled first), and a small piece of charcoal placed in will aid in keeping the water fresh. It is important that the water be changed occasionally, neglect of this seriously affecting the quality of the fruit.

The varieties best adapted for storing in this way are the thick-skinned late Grapes, but it is possible with due attention to keep Black Hamburg in good condition for several months. Alicante is well adapted for the method, also Lady Downe’s, Gros Colmar, Alnwick Seedling, Muscat of Alexandria, West’s St. Peters, and Gros Guillaume, with several others.

**Cold Storage.**—One method of preserving fresh fruit, which has been carried out on a most extensive scale in the United States and Canada, i.e. cold storage, has not been adopted in Britain commercially at present, but increasing attention is being paid to the matter, and there is little doubt that in the course of a few years it will be in more general use. Companies are being formed for the development of different systems, and though these have been
chiefly applied to the preservation of meat, yet experiments with fruits have in several instances given encouraging results. In one case recently the Technical Education Committee of the Kent County Council undertook some experiments with various soft fruits at the cold-storage works in Dartford, and Mr. W. P. Wright prepared a report of the results, which pointed out the practicability and probable commercial advantage of the system. The fruits tried were Strawberries, Black Currants, Red Currants, and Cherries, which were placed on wire shelves in three chambers in which temperatures were maintained varying in different instances from 26° to 42°. As regards the Strawberries, it was found that “the fruit cannot be kept long in a temperature of 35° or upwards; it can be kept for three weeks at least in a temperature of 30°; it is necessary to surround the fruit with cotton-wool, or in the case of fruit in sieves, to place a pad of that material over the top. If this precaution is not taken, the fruit though sound becomes dull, and loses the fresh, inviting appearance which is so important when it is offered for sale.”

The results of these experiments are summarized as follows:—(i) The fruit must be placed in store in advance of dead ripeness. This is particularly the case with Strawberries. Fruits that are fully ripe will keep for some time, but lose surface freshness. (ii) It is useless to put injured fruit in store. Cherries pecked by birds soon go off, and other fruits impaired in any way will not keep. To achieve success the fruit must be sound. (iii) The fruit should be covered or surrounded with cotton-wool. It was observable that fruit so treated retained its freshness much longer than that left exposed. (iv) The chambers must be kept dry, and close-fitting doors are necessary, otherwise damp and gritty impurities find entrance. (v) All decaying or impure matter must be rigidly excluded.

The directions given for the preparation of some fruits for cold storage in the United States are:

1. The fruit when packed should be fully grown but not quite ripe.
2. Such fruits as Pears, Peaches, and large Plums should be wrapped separately in tissue-paper.
3. Wooden boxes are preferable to baskets in which to place the fruit for storage.
4. Such fruits as Peaches and Plums cannot be relied upon to store longer than two or three weeks.
5. Early Apples and Pears may be stored four to six weeks and even longer. [J. CRAIG.]

The systems adopted for obtaining the necessary temperatures are usually modifications of one of three methods most generally employed in America, namely; (i) direct expansion, by the use of either carbonic anhydride, i.e. carbonic-acid gas, or anhydrous ammonia; (ii) brine circulation or indirect expansion, and (iii) air circulation.

Machinery is employed to effect the compression, condensation, and expansion of the gas used (see Plate), and the principle depended upon is the power of a compressed cooled gas to withdraw from surrounding objects a great amount of heat when it is allowed to expand. Pipes are taken round the sides and along the ceilings of the chambers to carry the expanding gas, and a similar arrangement is made in the indirect or brine system, but in this the gas is employed first to cool the solution of salt, which is then forced to circulate through the pipes at the rate of about sixty feet per minute. Almost any temperature suitable for preservation purposes can thus be obtained, and the system is adapted to railroad cars, storage-chambers on ship-board, and to large central permanent storages for food supplies.

The installation of a method of this kind is especially adaptable for working either on the co-operative principle or by companies, who prepare a list of prices for different food products according to the length of time they are desired to be stored. In Chicago, for instance, the charges are by the week, first, second, or third month, or season; thus, for Apples, the charge per barrel is 25 cents the first month, 15 cents the second, and 10 cents the third, or 50 cents, i.e. 2s. 1d., for the season; Pears are charged 30 cents per barrel for a month, Plums are 6 cents a bushel for a month, Raspberries 12\frac{1}{2} cents a bushel for a week, and Strawberries 1\frac{1}{2} cent per quart for a month. It will be seen that if such rates were obtainable here, and the fruit could be kept in good condition, as there is ample evidence that it can, the results might prove extremely advantageous to numbers of growers who are at times overburdened with heavy crops of perishable fruits. [R. L. C.]